

Feb. 13, 1945.

W. D. FERRIS ET AL

2,369,141

GARAGE DOOR

Filed July 31, 1939

2 Sheets-Sheet 1

FIG. 1. —

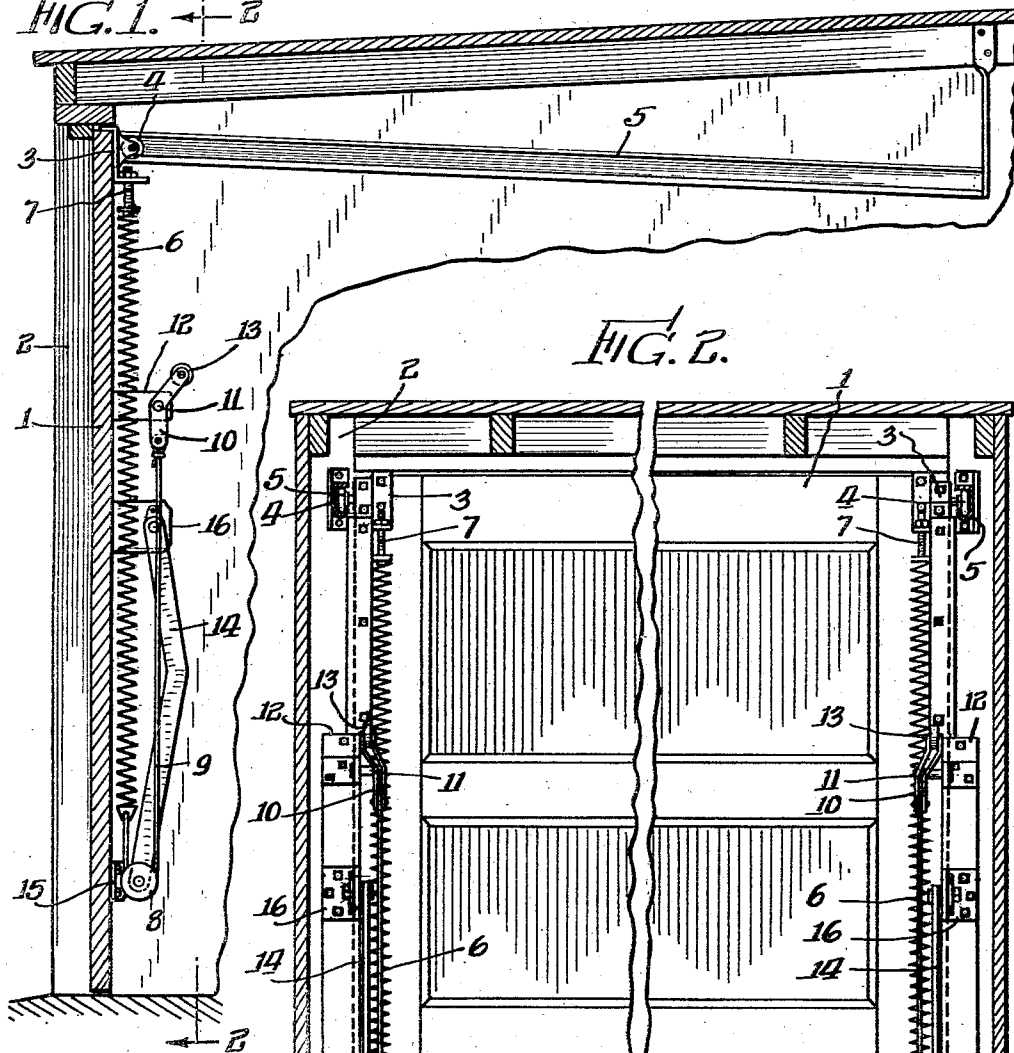
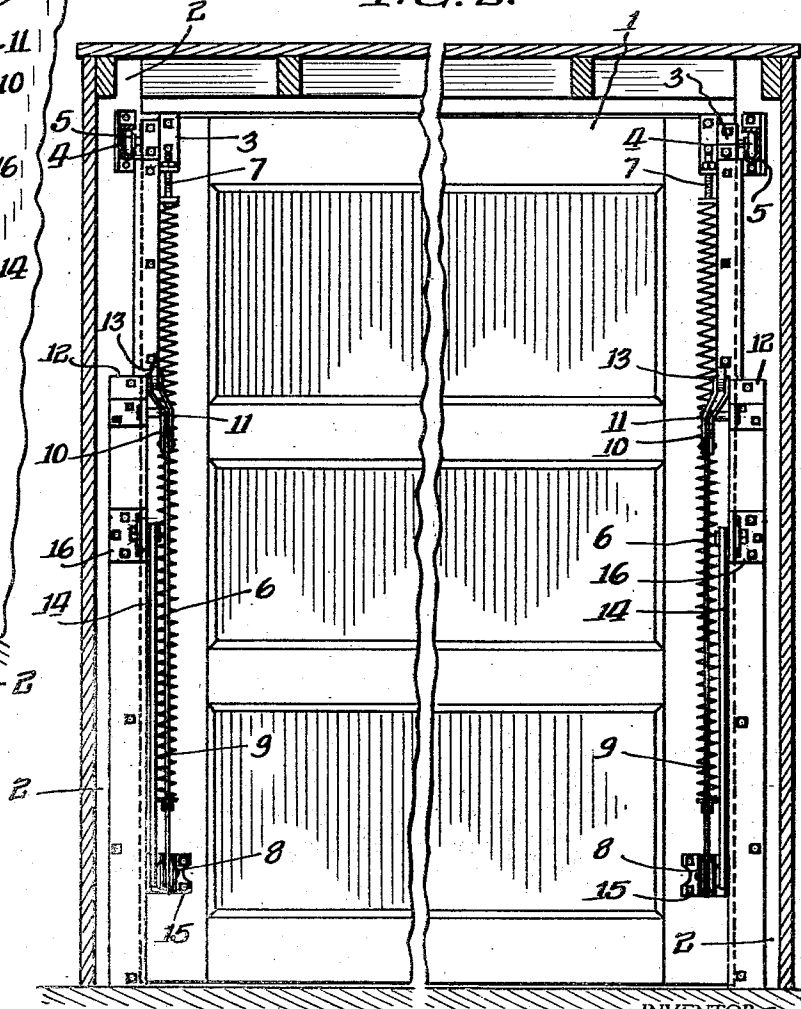


FIG. 2.



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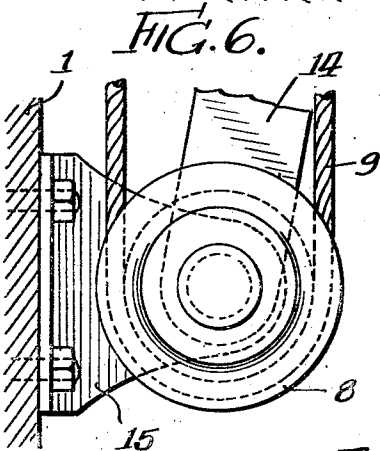
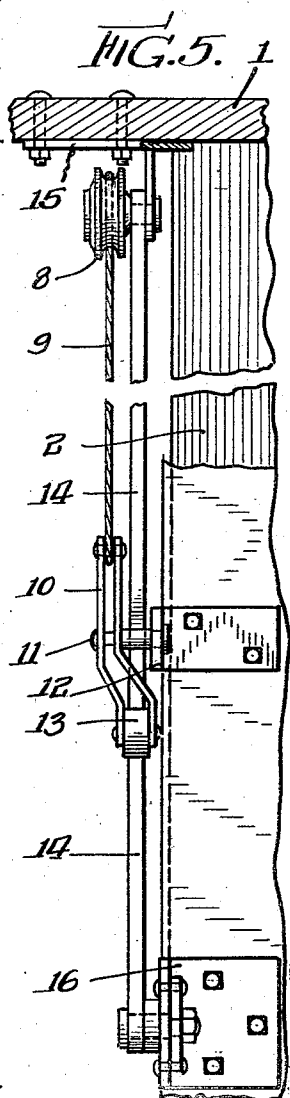
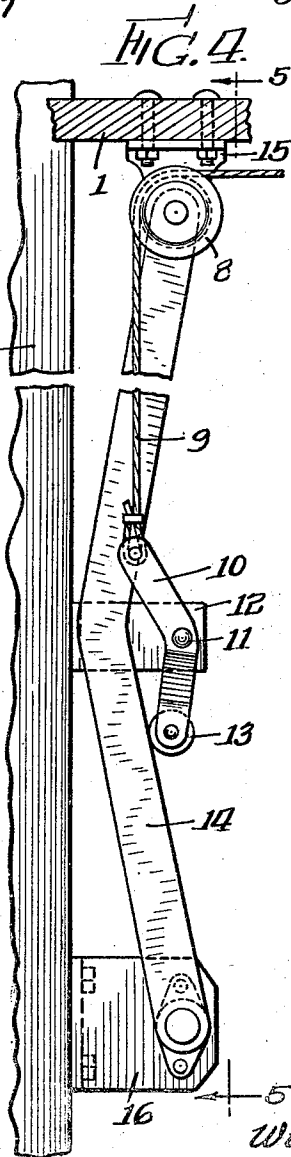
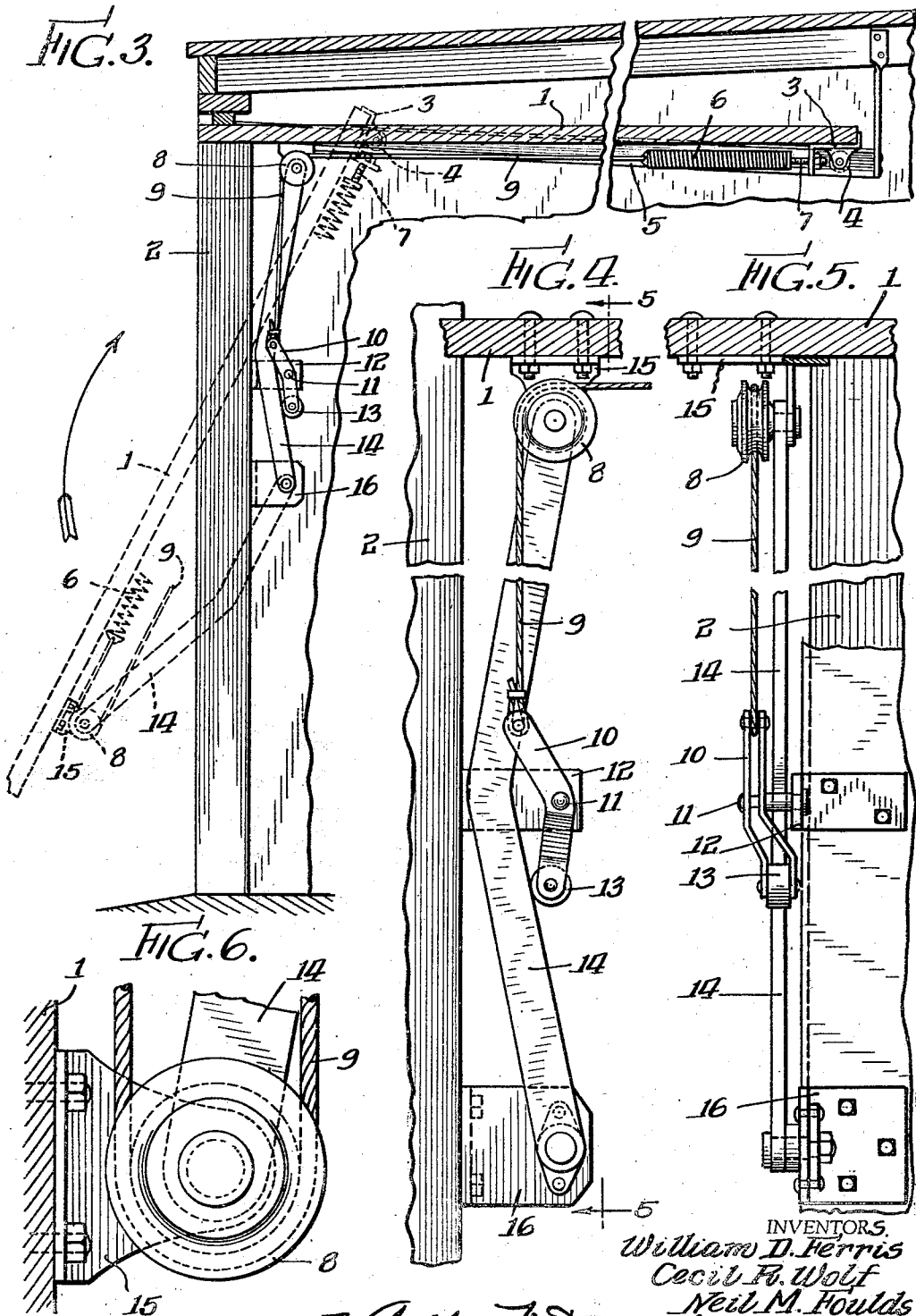
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2 Sheets-Sheet 2



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GARAGE DOOR

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Application July 31, 1939, Serial No. 287,510

21 Claims. (Cl. 20—19)

This invention relates to garage door equipment, and more particularly to that type of equipment in which the door is in one rigid rectangular section, and in which means are provided for moving the door from its vertical or closed position into an overhead and more or less horizontal open position.

Generally stated, among the objects of the present invention is to provide an improved construction and arrangement of operating mechanism for an overhead door of the one-piece rigid type having lever means pivotally connected to a fixed support and to the door so that the door is adapted to shift bodily from a substantially vertical closed position to a substantially horizontal overhead open position and wherein counterbalancing means is provided for the door which is disposed entirely behind the substantially vertical plane of the door when closed, such counterbalancing means including a spring and a connected elongated flexible member, one of the ends of the counterbalancing means being connected to the door and arranged so that when the door is shifted to overhead position the door is maintained completely housed within the structure and cannot be affected by rain or snow nor will its lower end project outwardly beyond the door opening of the structure; to provide a construction of the foregoing character wherein the flexible member operates upon the lower extremity of the door member for bodily swinging the door completely within and for maintaining it completely within the structure when the door is fully open; to provide counterbalancing means for the door comprising a spring and connected elongated flexible member, which means has a portion thereof connected to the door and is located entirely behind the door when closed and wherein also the ends of the counterbalancing means are relatively movable with respect to each other as the door is shifted from closed to open position; to provide a counterbalancing means of the foregoing character wherein the rigid door is shifted from substantially vertical closed position to a substantially horizontal open position by means of a lever pivoted to a fixed support and to the door and wherein the counterbalancing means provided for the door is located completely to the rear of the door when closed and comprises a spring and connected flexible member, there being means for operatively connecting the counterbalancing means to the lower extremity of the door in such a way that the door is shifted bodily and wholly within the structure when the door is in open position;

to provide counterbalancing means having one end fixed to the door member and which counterbalancing means comprises a connected spring and elongated flexible member disposed entirely behind the door when closed and in which position the spring and elongated flexible member are disposed substantially U-shaped; to provide a door opening structure for a rigid one-piece door including means engaging the upper portion of the door for slidably supporting the same together with a lever pivoted to a fixed support and to a lower portion of the door, there being counterbalancing means for the door which includes a spring and a connected elongated flexible member located wholly to the rear of the door when closed, one end of the counterbalancing spring and connected flexible member being connected to the door and the other end of the spring and flexible member operating on the door to shift it wholly within the confines of the structure when the door is fully open; to provide a novel and improved construction and arrangement whereby springs with cords and sheaves are employed, to assist in raising the door into its overhead or open position, and cushioning the closing of the door, and in which means are provided for enabling the springs to not only act directly upon the door, but also to enable the spring tension to be communicated through pivoted arms or levers to the door, thereby more effectively to insure against jolting of the door when it is opened, as well as against objectionable slamming of the door when it is closed, the springs being carried entirely by the door for that purpose.

It is also an object to provide certain details and novel features of construction tending to increase the general efficiency and the desirability of a garage door equipment of this particular character.

To the foregoing and other useful ends, the invention consists in matters hereinafter set forth and claimed and shown in the accompanying drawings, in which—

Fig. 1 is a vertical section of a garage door, and of the adjacent portions of the building overhead, showing the door equipment involving the principles of the invention.

Fig. 2 is a vertical section on line 2—2 in Fig. 1, with the middle portion thereof shown broken away for convenience of illustration, both of said views showing the door in closed position.

Fig. 3 is a view similar to Fig. 1, but showing the door in open position, in full lines, and showing it in partially open position in dotted lines.

Fig. 4 is an enlarged side elevation of certain portions shown in Fig. 3 of the drawings.

Fig. 5 is a vertical section on line 5-5 in Fig. 4 of the drawings.

Fig. 6 is an enlarged side elevation of one of the sheaves that are mounted on the door for engaging the cords.

As thus illustrated, the invention comprises a rectangular rigid door member 1, adapted to rest in a vertical position in the doorway 2, when the door is in substantially vertical and closed position, and provided at its upper corners with brackets 3 having rollers 4 that engage the more or less horizontally disposed and parallel tracks 5 arranged at opposite sides of the doorway, whereby the door is more or less horizontal when in its overhead or open position, as shown in Fig. 3 of the drawings.

The door is supported for opening and closing movement by means carried by the rollers 4 engaging the track 5 and also by lever means hereinafter described. In addition, the door is provided with counterbalancing means for assisting in the opening and closing movements of the door, which counterbalancing means comprises a spring and an interconnected elongated flexible member. The counterbalancing means has a portion thereof connected to the door. In the present instance one end of the counterbalancing means is connected to the door and the other end of the counterbalancing means is connected to an anchorage disposed within the structure.

In addition, the counterbalancing means is wholly and completely disposed behind the plane of the door member when the latter is in closed position and is arranged to shift the door and to maintain the door wholly and completely within the structure in the open overhead position of the door so that it is protected from rain and snow and has no portion thereof objectionably projecting outwardly beyond the door frame when the door is in open position. In the present instance the spring is shown as a coil spring 6, and the elongated flexible member is preferably shown as a cord or cable connected to one of the ends of the coil spring. In addition, guide means is provided about which the elongated flexible member is adapted to pass.

It will be seen that the coil springs 6 are connected at their upper ends with the said brackets 3, by adjusting devices 7 for adjusting the tension of the springs, and that the lower portion of the door is provided with sheaves 8 for engaging the cords 9a. Each cord has one end fastened to the lower end of one of the springs, and has the other or upper end connected to a pivoted lever 10, pivoted at 11 on a bracket 12, secured to the upper frame. The upper ends of these levers 10 have rollers 13 for engaging the edges of the levers 14, which latter have their lower ends pivoted on the brackets 15 on which the sheaves 8 are mounted, and the upper ends of said levers are pivoted on brackets 16 that are secured to the opposite sides of the door frame.

Assuming that the door is in closed position, as shown in Fig. 1 of the drawings, and that it is desired to open the door, a slight push inwardly on the upper end thereof will start the door upwardly as shown in Fig. 3 in dotted lines. The tension of the springs is exerted in a manner to counterbalance and assist in raising the door into open position, and it will be seen that before the door reaches its fully open position, the rollers 13 will engage the edges of the levers or arms 14, thus cushioning the action and preventing jolt-

ing of the door as it reaches its fully open position, as shown in Figs. 3, 4 and 5 of the drawings. With regard to the action of the arm 10 and its roller 13 cooperating with the pivoted arm 14, it is to be noted that as the arm 14 swings upwardly during the opening movement of the door 1 the arm as shown in Figure 4 comes in contact with the roller 13 on the brake lever 10 whereby said smaller arm 10 pivots at 11 to cause the upper portion of the arm to swing in a counterclockwise movement, thereby pulling downwardly on the cable 9 and thus putting the spring 6 which has been contracted by the upward swinging movement of the door under increased tension whereby slightly to expand the spring to check the inward or opening movement of the door thus effectively preventing jolting or slamming of the door toward the termination of the opening movement thereof. Thus, the springs are carried entirely by the door, and act directly on the door, but also act indirectly through the levers 10 and 14 at the time when the door is in nearly fully open position.

In this way, therefore, with the springs carried entirely by the door, and combined with the cords and sheaves and levers or pivoted arms, the tension of the springs is utilized to better advantage in cushioning the final opening movement of the door, into its overhead position, and in cushioning the final closing movement of the door, thus more effectively preventing jolting or slamming in the opening and closing of the door and also automatically holding the door in closed position.

In effect therefore both ends of each spring are supported on the underside of the door, when the latter is in its overhead open position. One end of each spring is supported by a bracket 3 on the door and the other end of each spring is supported by a sheave 8 and its bracket 15 on the door. With this arrangement, each spring pulls against the fixed and stationary point 11 in order to open the door as shown. The pull of each spring is through a lever 10 to the point 11, and as the spring contracts the pull on the sheave 8 assists in raising the door into its overhead open position. As is shown and described, one end of each spring has a variable position on the door, because of the lengthening and shortening of the spring, while the other end of each spring has a fixed position on the door.

Looking at Fig. 5 of the drawings, for example, it will be seen that the sheave 8 is at the outer side of the pivoted arm 14, and is really carried by the latter, so that the flexible member 9 is trained around a sheave on the said pivoted and swinging supporting arm for the door.

Of course, each spring 6 is broadly a power device and has many known and perhaps unknown equivalents, for performing the same function. In any event, the power device for opening or assisting in opening the door, or for cushioning or assisting in cushioning the door, is mounted on the door itself.

It will be seen that each spring 6 pulls against the fixed point 11, and that this pulling point, to which one end of each spring is connected, serves also as the fulcrum of one of the levers 10 shown and described. In addition, it will be seen that each spring 6, which is a power device, is mounted entirely on the door. Of course, in addition, each leverage device 10 is connected by a flexible member 9 to the lower end of one of the springs.

In other words, an important aspect of this invention is that each counterbalancing spring is

carried bodily by the movable door and this is true regardless of whether it is a spring or some other power device.

What we claim as our invention is:

1. In combination with a structure having an opening, a door therefore having a vertical, closed position and a more or less horizontal open position, counterbalancing spring means having an end secured to the door and having its other end provided with means for acting on a lower portion of the door, lever means connected through said second mentioned means with said other end of said spring means and an arm pivoted to a stationary support and to said door, said lever means having means for engaging said pivoted arm to cause the shifting of said lever means on a predetermined movement of said arm.

2. In combination with a door frame defining an opening, a door therefor made in one rigid section and disposed vertically when closed with respect to said opening and more or less horizontal when open, an arm pivoted at one end on said door and also pivoted on a fixed support, guide means on said door, a spring anchored at one end on said door and provided at its other end with a flexible member trained around said guide means so that the spring is carried bodily by the door, there being a fixed anchorage located above said pivot of said arm on said fixed support for the other end of said flexible member to pull against, said flexible member being disposed wholly within and behind the plane of the door when the door is in closed position and yielding means for engaging said arm yieldingly to limit the final open movement of the door but normally out of engagement with said arm when the door is closed.

3. In an apparatus of the class described, the combination with a structure having a door frame defining an opening, a door made in one rigid section which is substantially vertical when closed and more or less horizontal when open, more or less horizontal guides adjacent the upper portion of said opening and on which the upper end of the door is pivotally and slidably supported, an arm pivoted at one end on the lower part of the door and also pivoted on a fixed support, a spring having one end stationarily anchored to the rear face of the door, flexible means connected to the opposite end of the spring for normally disposing said spring for contraction and expansion on the rear face of said door, said flexible means connecting the free end of said spring with anchorage means located above said pivot of said arm on said fixed support to the rear of the plane of said door when said door is in closed position, and said flexible means having all portions thereof disposed wholly on one side of a face of the door when said door is in closed position.

4. In an apparatus of the class described, the combination with a structure having a door frame defining an opening, a door made in one rigid section which is substantially vertical when closed and more or less horizontal when open, more or less horizontal guides adjacent the upper portion of said opening and on which the upper end of the door is pivotally and slidably supported, an arm pivoted at one end on the lower part of the door and also pivoted on a fixed support, spring means having one end mounted on the upper rear inner face of the door, a flexible member connected to the free end of said spring and extending substantially parallel to and along the inner face of said door, a guide mounted on

the lower inner face of said door and having the flexible member passing therearound and extending inwardly of said structure to an anchorage located therein above said pivot of said arm on said fixed support and within the vertical plane of said door when said door is in closed position whereby said flexible member is completely disposed behind the inner face of said door when closed.

5. The combination with a structure having a door opening, a rigid one-piece door therefor having means at its upper end for pivotally and slidably supporting the door with respect to the door opening whereby said door may swing bodily from a vertically closed position to a more or less horizontal overhead, open position, a stationary support disposed on one side of the door opening within said structure and at a substantial elevation above the bottom of the door when closed, an arm pivoted to said support and to the lower portion of said door, counterbalancing spring means for said door, a flexible member connected to said spring means, guide means on the inner face of said door, anchorage means within said structure disposed constantly at an elevation above the pivot point of said arm on said stationary support, said flexible means being disposed around said guide means and connected to said anchorage means, said flexible means being disposed wholly on the inside of the door when closed.

6. In combination with a structure having an opening, a rigid one-piece door for said opening, counterbalancing means for said door including flexible means, said counterbalancing means being connected to the top of said door and extending therefrom along the back of said door and operatively connected to the bottom of said door and to an anchorage within said structure, said counterbalancing means being disposed solely along the back of the door for all positions of said door.

7. In combination with a structure having an opening, lever means pivotally connected to said door and to a stationary anchorage, rigid closure means for said opening, counterbalancing means for said closure means including spring means mounted solely on the inner face of said closure means and flexible means connected to said spring means and operatively associated with the lower portion of said closure means and having an anchorage, said flexible means being disposed wholly within the lateral margins of the door and also wholly within the plane of the interior face of said closure means when the latter is closed.

8. In combination with a structure having an opening, a rigid door for said opening, a lever having a fixed pivot and pivotally connected to the bottom of the door, counterbalancing means for said door including a spring and a flexible connection operatively connected to said door and to an anchorage whereby said spring tends to contract to assist in swinging said door from a substantially vertical closed position to a substantially horizontal overhead open position, and means actuated by said lever and operative during the final contractual movement of said spring approaching the terminal open position of said door for placing said spring under substantially increased tension or expansion for checking the ultimate opening movement of said door.

9. In combination with a structure having an opening, a rigid door therefor adapted to move from a substantially vertical closed position to a

substantially horizontal open overhead position, a substantially horizontal track, and rollers at the upper portion of said door cooperating with said track for pivotally and slidably supporting said door during its opening and closing movement, a pair of arms pivoted to the lower portion of said door and to stationary anchorages, spring means operatively connected at one end to said door, and mechanism connecting the other end of said spring means with a stationary anchorage, said last named mechanism including lever means actuated by the opening movement of at least one of said pivoted arms for placing said spring means under tension to cushion the opening movement of said door.

10. In combination with a structure having an opening, a rigid door therefor adapted to move from a substantially vertical closed position to a substantially horizontal open overhead position, a substantially horizontal track and rollers at the upper portion of said door cooperating with said track for pivotally and slidably supporting said door during its opening and closing movement, a pair of arms pivoted to the lower portion of said door and to stationary anchorages, spring means having one end connected to said door, a flexible member connected to the other end of said spring means, a second lever connected to said flexible means and pivoted to a fixed support above said stationary anchorages, said second lever having a portion adapted to be contacted by the opening movement of one of said arms pivotally connected to the door during the opening movements of said door and arranged so as to place the spring means under tension whereby to cushion the opening movement of said door.

11. The combination of a structure having a door opening, a rigid one-piece door therefor having means at its upper end for pivotally and slidably supporting the door with respect to the door opening, whereby said door may swing bodily from a vertically closed position to a more or less horizontally open position, a stationary support disposed on one side of the door opening within said structure and at a substantial elevation above the bottom of the door when closed, an arm pivoted to said support and to the lower portion of said door, counterbalancing spring means having one end connected to said door, a flexible member connected to the other end of said spring means, guide means for said flexible member, anchorage means located above the point at which said arm is pivoted to said stationary support and located within the structure and rearwardly of the door when in closed position, said flexible member being disposed around said guide means and connected to said anchorage means and being disposed wholly on the inside of the door when the latter is in closed position.

12. An overhead door construction comprising a frame having an opening to be closed, a rigid, one-piece door member, a lever pivotally connected to the door and to a stationary anchorage to cause the door to be moved from a substantially vertical position closing said opening to an open substantially horizontal position adjacent the upper part of the opening, counterbalancing means comprising a spring and a connected elongated flexible member for controlling the movements of the door member, said spring being mounted bodily on said door so that the line of action of the spring is substantially vertical when the door is in closed position and so that the angle of the spring with the door never changes

and said flexible member being disposed entirely to the rear of the plane of the door member when the door member is in closed position, said counterbalancing means being back of the door in all positions of the door.

13. An overhead door construction for a structure having a frame forming an opening to be closed, a door member, a lever pivotally connected to the door to cause the door to be moved from a substantially vertical position closing said opening to an open substantially horizontal position adjacent the upper part of said opening and completely within the structure, counterbalancing means for the door comprising a spring and a connected elongated flexible member for controlling the movements of the door, said counterbalancing means being disposed entirely behind the door when the door is in closed position, one of the ends of said counterbalancing means being connected to the door, and the other end being anchored above the point of pivot of said lever.

14. An overhead door construction for a structure having a frame forming an opening to be closed, a door member, a lever pivotally connected to the door to cause the door to be moved from a substantially vertical position closing said opening to an open substantially horizontal position adjacent the upper part of said opening and completely within the structure, counterbalancing means for said door comprising a spring and a connected elongated flexible member disposed entirely behind the door member when the door member is in closed position, and means connecting one end of the counterbalancing means on the door member to a stationary anchorage to assist in shifting said door and for maintaining said door within said structure when the door is open, said last named means imparting an additional tension to the spring of said counterbalancing means as the door approaches the end of its closed position.

15. An overhead door construction comprising a frame having an opening to be closed, a door member adapted to be moved from a substantially vertical position closing said opening to an open substantially horizontal position adjacent the upper part of said opening, counterbalancing means comprising a spring and a connected elongated flexible member for controlling the movements of the door member, said counterbalancing means being disposed entirely behind the door member when the door member is in closed position, lever means pivoted to a fixed support and to the door member for further controlling the movements of the door member, and means for operatively connecting the counterbalancing means to a lower portion of the door member and to an anchorage located above the pivot for said lever on said fixed support.

16. An overhead door construction for a structure having a frame forming an opening to be closed, a door member, means for causing the door to be moved from a substantially vertical position closing said opening to an open substantially horizontal position adjacent the upper part of said opening and completely within the structure, counterbalancing means for the door comprising a spring and a connected elongated flexible member disposed behind the door member and within the lateral limits of the door member when the door member is in closed position, and said counterbalancing means being of substantially U-shape when the door member is in closed position and having one end fixed to the door

member for maintaining said door completely housed within the structure when said door is shifted to open position.

17. In combination with a structure having a door opening, a rigid door therefor, means engaging the upper portion of the door for slidably and pivotally supporting said door, a fixed support disposed within said structure, a lever pivoted thereto and to a lower portion of the door, means forming an anchorage disposed above said fixed support and within said structure and located to the rear of the plane of the door when the latter is in closed position, counterbalancing means for said door including a flexible member and a spring having their adjacent ends interconnected, one of the non-adjacent ends of said interconnected flexible member and spring being connected with said anchorage to pull thereagainst and the other non-adjacent end being directly connected to an upper portion of the door tending to shift the latter from vertical closed position to substantially horizontal open position.

18. In combination with a structure having a frame forming an opening, a rigid door therefor, lever means pivotally connected to the door for causing the door bodily to shift from a substantially vertical closed position to an open overhead substantially horizontal position, substantially wholly within the confines of the frame opening, counterbalancing means for said door including a spring and a connected flexible member disposed wholly within the plane of the door when closed, said spring having a portion connected to the door and said flexible member operatively interconnecting the spring, the door and an anchorage located within the structure, tending to shift the door to overhead open position and to maintain it in open position substantially wholly within the confines of the structure, said counterbalancing means being located back of the door in all positions of the door.

19. In combination with a structure having a frame forming a door opening, a rigid door therefor having means including a lever pivoted to the door and to a fixed support within the structure for causing said door to swing bodily from a substantially vertical closed position with respect to said opening to a more or less horizontal overhead open position within the structure, counterbalancing means for said door including a source of power connected to the door, and an elongated flexible member interconnecting the source of power, the door and an anchorage lo-

cated within said structure and operative to shift said door from a substantially vertical position to a substantially horizontal open overhead position, said source of power and all of said flexible member being constantly disposed wholly behind the inner face of said door when said door is closed, said counterbalancing means being back of the door in all positions of the door.

20. In an overhead door construction of the type wherein the upper end of the door is slidably engaged in substantially horizontal, overhead tracks and the lower end thereof is pivotally connected to a pair of supporting arms each pivotally mounted on stationary supports located at opposite sides of the door opening and substantially midway between the top and bottom of said opening, the improved means of facilitating the opening of said door comprising: a fixed sheave mounted near each bottom corner of the door on the inner face thereof, a flexible element trained over each of said sheaves and anchored at one end to a stationary support located above the stationary pivotal mounting of the adjacent supporting arm but below the top of the door opening and inwardly of the plane of the inner face of the door when said door is in its closed position, the other end of said flexible element being connected to tensioning means comprising a spring fixedly mounted on the inner face of the door thereby setting up a tension in the flexible element and causing said element to exert a pull on the sheave which urges the door towards its open position.

21. In combination with a structure having an opening, a rigid door for said opening, counterbalancing means for said door including a spring and a flexible connection operatively connected to said door and to an anchorage whereby said spring tends to contract to assist in swinging said door from a substantially vertical closed position to a substantially horizontal open position, and means actuated by a portion of said counterbalancing means and operative during the final contractual movement of said spring approaching the terminal open position of said door for placing said spring under tension or expansion for checking the ultimate opening movement of the door, said counterbalancing means being back of the door in all positions of the door.

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