

Jan. 13, 1931.

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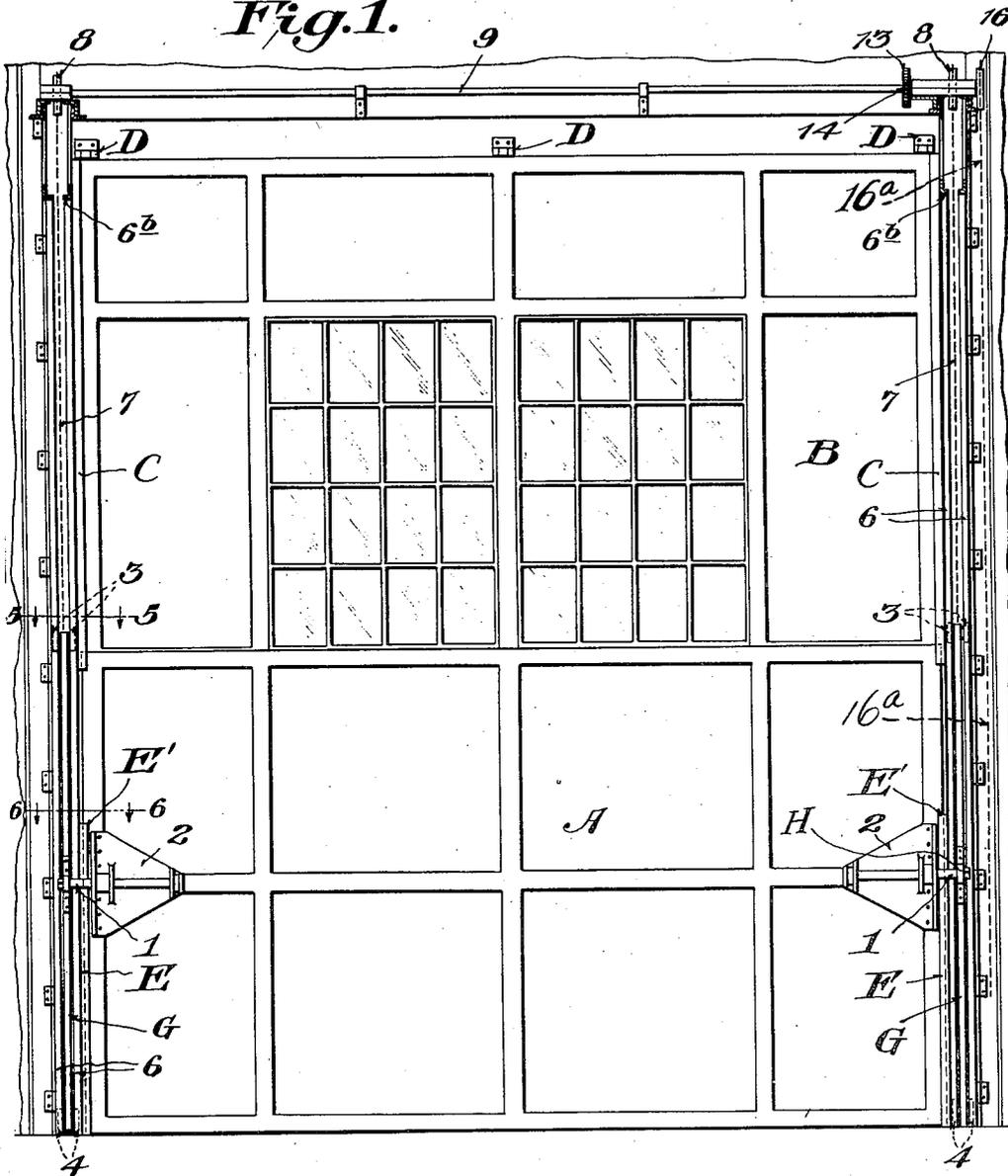
1,789,189

DOOR OPERATING MECHANISM

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4 Sheets-Sheet 1

Fig. 1.



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Fig. 2.

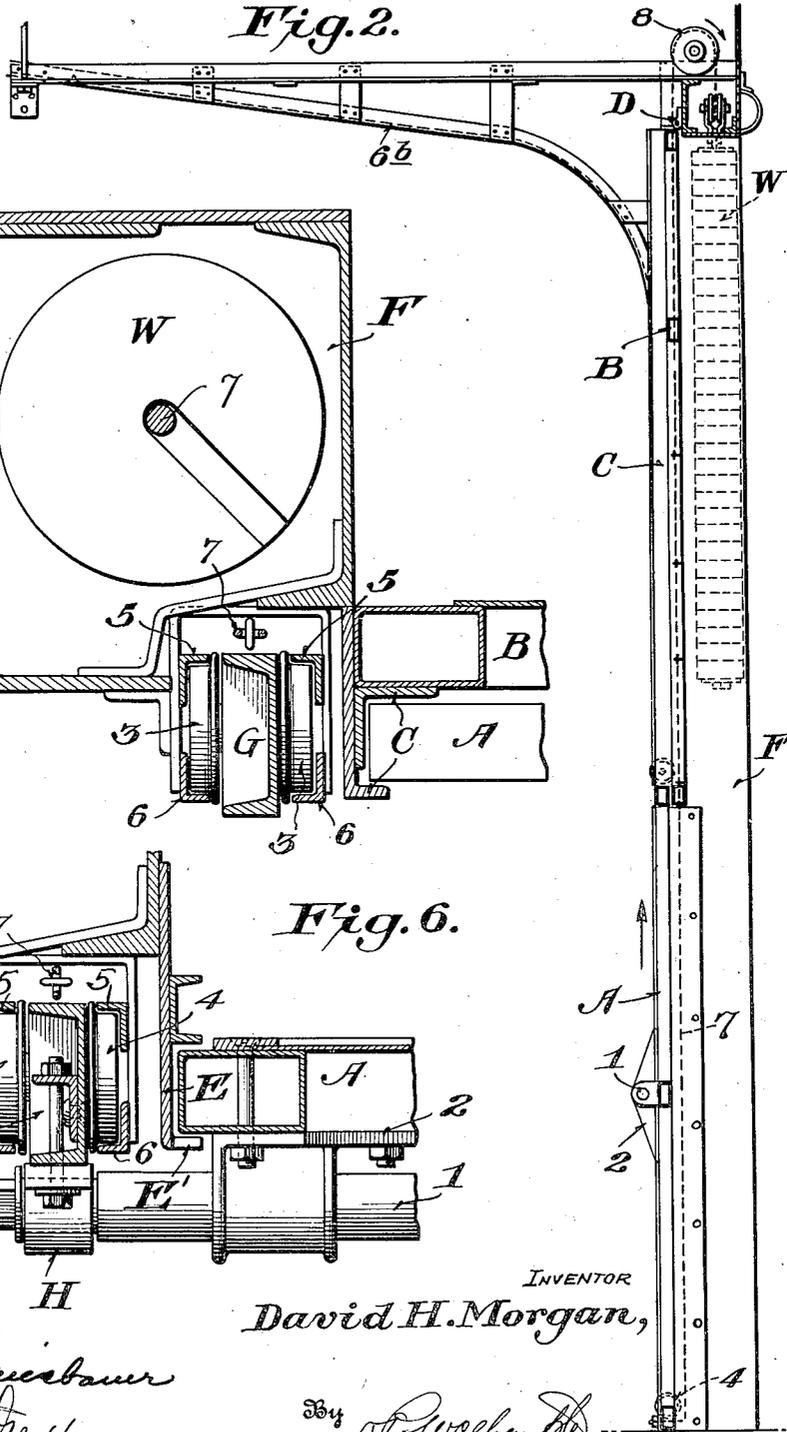


Fig. 5.

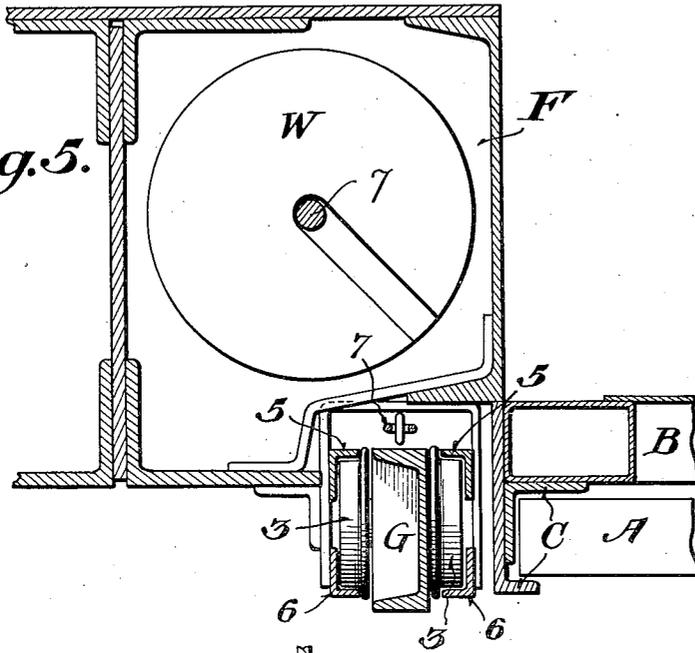
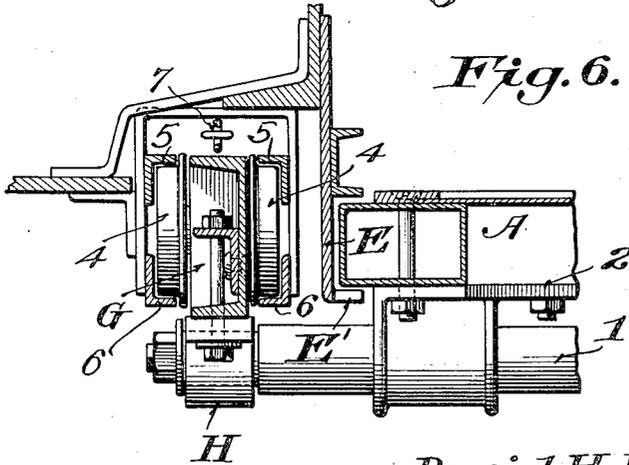


Fig. 6.



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Fig. 3.

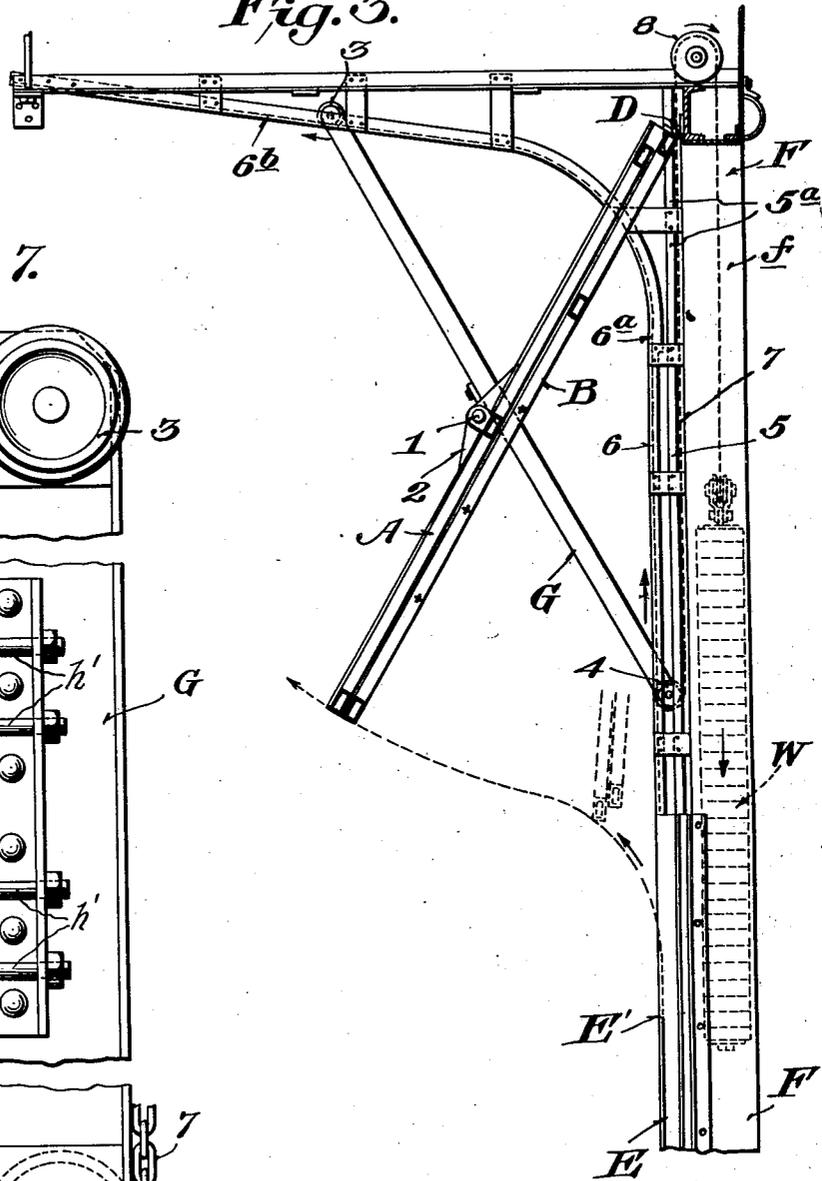
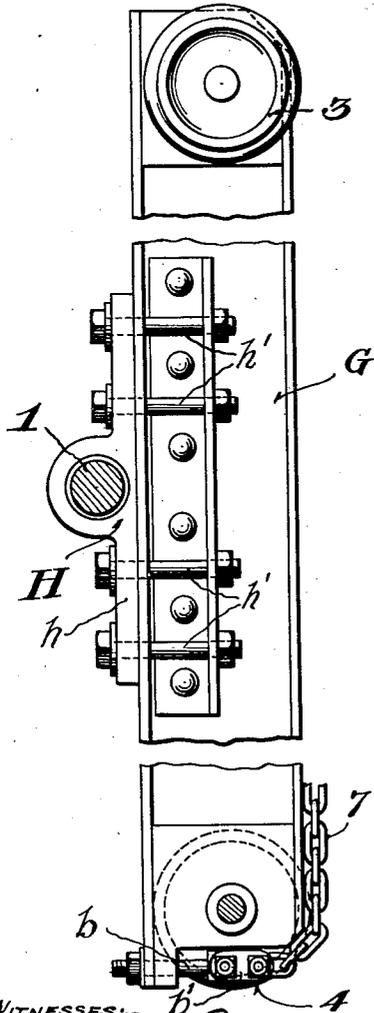


Fig. 7.



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UNITED STATES PATENT OFFICE

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DOOR-OPERATING MECHANISM

Application filed March 13, 1928. Serial No. 261,365.

This invention relates to door operating mechanism particularly adapted for facilitating the opening and closing of two-part telescopically related doors of the large heavy type used in freight and pier sheds, factories and the like, where large doorway openings are necessary.

A primary object of the invention is to simplify the mechanism for controlling the opening and closing of doors of the type referred to and to provide a mechanism which will operate with a minimum amount of manual effort. In that connection the invention contemplates novel means which can be reliably depended upon to initially telescope the door sections in the opening movement, and then lifting the telescoped sections, into approximately the horizontal plane of the top of the door opening so as to provide a full uncovered opening for whatever use required. The constructions heretofore employed have required the expenditure of considerable energy or force to accomplish the swinging movement of the collapsed door sections, and for that reason have required more or less complicated mechanism not only to effect the initial lifting movement but also to support the weight of the combined door sections.

Accordingly, a further object of the invention is to provide a construction which functions more or less as a carriage or truck which comes into play after the upper and lower door sections are in telescopic relation to assist in supporting the weight of both door sections so that the final or last half of the movement of the door opening operation may be accomplished with greater ease. That is to say, it is proposed to provide a construction whereby the door parts, during their swinging movement, are supported while travelling, thus relieving the elevating mechanism from more pull or strain than is required to initially lift the lower section into telescopic relation with the upper door section.

With the above and other objects in view which will more readily appear as the nature of the invention is better understood, the same consists in the novel construction, combination and arrangement of parts herein-

after more fully described, illustrated and claimed.

A preferred and practical embodiment of the invention is shown in the accompanying drawings, in which:—

Figure 1 is an inside elevation of a door equipped with the present improvements.

Fig. 2 is a side edge elevation with the doors closed, showing door frame in section.

Fig. 3 is a side edge elevation with the lower door telescoped in the upper door and both partly elevated.

Fig. 4 is a side edge elevation of the door sections completely elevated to provide full doorway clearance.

Fig. 5 is a detail cross-sectional view taken on the line 5—5 of Fig. 1.

Fig. 6 is a detail cross-sectional view taken on the line 6—6 of Fig. 1.

Figure 7 is an enlarged detail side elevation of the operator or lifting lever which constitutes a part of the carriage for the lower door section.

Figure 8 is an enlarged detail view of the lifting mechanism.

Similar reference characters designate corresponding parts throughout the several figures of the drawings.

The novel operating mechanism forming the present invention is not concerned with the particular door construction nor the specific mounting thereof, but is directed more particularly to a novel operating means for the door which during a part of the movement thereof functions as a carriage since it assumes and sustains the dead weight of the telescoped sections during substantially the last half of the door movement.

An example of a door to which the present invention may be applied is shown in the accompanying drawings wherein the lower door section designated generally as A is adapted to register with the upper door section B by a sliding movement accomplished through the movement of the section A relative to section B in the guide members C carried at opposite sides of the section B. The upper door section B has a permanent hinge mounting D at the top or lintel portion of the doorway so that when the two

door sections are telescoped they are free to swing together in a lateral and upward direction, see Figs. 3 and 4 of the drawings.

As will be observed from Figures 1 and 3 the lower door section A when in its closed position rests in the guide channels E carried by the hollow posts or columns F of the door frame which house the counter-weights W, and as will also be seen from said figures the inside portions of the channels E terminate at the top as indicated as E' so that before the lower door section has completed its telescopic movement with reference to the upper section B it may be free to swing outwardly to begin its swinging or folding movement caused by the present novel operating mechanism, as shown by the dotted line in Fig. 3.

Referring now more particularly to said operating mechanism it will be observed from Fig. 1 that the same includes a pair of lifting levers G which are provided at one edge portion with intermediately located offset bearing eyes H. For each lifting lever the bearing eye therefore is preferably carried by a strap *h* securely and rigidly fastened to the lifting lever by a series holding bolts *h'*. These intermediate offset bearing eyes H of the offset lifting levers G are adapted to receive the trunnions or pivot bars 1 carried by the offset door brackets 2 fitted to the lower door section A, thereby to support the lower door section in such a way that the upper and lower pairs of rollers 3—3 and 4—4 carried respectively at the top and bottom ends of the levers G provide a carriage for the lower door section. These rollers 3 and 4 are adapted to travel in a trackway formed by the front and rear guides or angle members 5 and 6 respectively. It will therefore be seen that the lower door section A which is slidably guided in the channels E is supported and carried by the operators or lifting levers G having suitable travellers or rollers at the opposite ends thereof which are guided between and by the said angle members.

As will be apparent from Figs. 2 and 3 of the drawings the said angle members 5 and 6 are parallel for substantially the full height of the door opening but at a point indicated at 6^a, the rear angle 6 curves from a vertical plane into substantially a horizontal plane 6^b, while the front or forward angle 5 continues vertically upward in the same plane as its lower portion, as indicated at 5^a, to form a guiding bearing or base against which the lower rollers of the lifting lever 4 engage.

The lower end of each lifting lever F has fitted thereto a chain adjusting bolt *b* carrying a clevis or coupling head *b'* to which is secured the lower end of a lifting element which preferably is the chain 7. These chains extend upwardly, at the front sides

of the lifting levers G and over the sprocket wheels 8 mounted on a cross shaft suitably supported horizontally on the inside of the door frame at the top thereof, as is best seen in Fig. 1 of the drawings, and said chains are directed by the sprocket wheels 8, into the hollow column F and have the counter-weights W attached thereto. The said shaft 9 is provided with a gear 10 meshing with a pinion 11 carried by shaft 12 which latter is in turn connected by the gear 13 and pinion 14 with an operating shaft 15. This shaft may be provided with a sprocket wheel 16 for receiving a looped or equivalent operating element or chain 16^a to permit of the operator turning the wheel 16 to cause the shaft 9 to accomplish the lifting of the levers G constituting the carriage for the door.

Assuming that the door is in its closed position, namely, that shown in Fig. 1, the lower and upper sections A and B will be in the relation shown in side elevation in Fig. 2. If the operator desires to open the doors the operating mechanism will be moved through the pulley 16 and its associated gearing to thereby turn the shaft 9. The rotation of the shaft 9 will turn the sprocket wheels 8 and the pull thus exerted and aided by the counter-weights W will be transmitted to the lower end of the lifting levers G. The initial upward movement of the door A will be to telescopically engage the upper door section B, such telescopic movement persisting until the upper rollers 3 of the lifting levers G reach the curved track section 6^a. By the time that the upper rollers begin to follow the angle member forming the curved track section the bottom edges of both door sections will be clear of the channels E and both doors will be permitted to start their swinging movement (Fig. 3) on the hinges D. By reason of the fact that the rear track section 6 curves outwardly and away from the front of the door, there will be a gradual transfer of the dead weight or load of the combined door sections A and B to the substantially horizontally disposed section 6^b of the track which will materially assist and ease up on the final movement of the door to the full open position shown in Fig. 4. On the other hand when the door is desired to be closed there will be a correspondingly gradual closing movement effected not only because of the resistance of the counter-weights but because in the initial downward swinging movement of the door, the weight of the two door sections is partially suspended until the hinges D relieve the weight of the upper section incident to the swinging movement. This action is made possible because of the fact that the pivot joint 1 for the lifting levers G is offset from a line connecting the rollers 3 and 4 and the lifting chain, but is so attached that its center line is still further offset from the

center point 1 so that the tendency when lifting on the lifting chain, with a load hinging at the center 1, is to tip the top roller 3 to the left, causing the upper rollers 3 to follow and bear against the upper curved part of the track 6—6^a—6^b, until the top rollers 3 reach the position shown in Fig. 4. During all of this movement the bottom rollers bear against and ride on the other track or guide 5—5^a.

From the foregoing it will be apparent that a novel and distinctive feature of the invention resides in the provision of a novel operating mechanism for a two-part telescopic door wherein the telescopically mounted section is arranged on a travelling carriage or carrier which not only assists in the vertical manipulation of the telescopic section but also functions as a load suspending element and carrier for both doors during their swinging and pivotal movement to provide full doorway clearance.

Without further description it is thought that the features and advantages of the invention will be readily apparent to those skilled in the art, and it will of course be understood that changes in the form, proportion and minor details of construction may be resorted to, without departing from the spirit of the invention and scope of the appended claims.

I claim:—

1. A door operating mechanism including in combination with a two-part telescopic door, an operator pivotally connected intermediate its ends with the lower door section and adapted to have an upward and lateral movement, and guide means cooperating with both ends of said operator to direct it upwardly and laterally when it is lifted.

2. A door operating mechanism including a two-part telescopic door, an operator pivotally connected intermediate its ends with the lower door section, means cooperating with the ends of said operator for guiding same to initially effect telescopic relation between the two parts of the door and subsequently to effect unitary swinging movement of the telescoped door sections, and lifting means for the operator.

3. A door operating mechanism including in combination with a two-part telescopic door, an operator pivotally connected intermediate its ends with the lower door section, means forming a guide-way for slidably receiving the operator, the sides of said guide-way diverging at the upper end thereof to provide vertically and laterally extending track portions with which the ends of said operator are adapted for cooperation respectively when the operator is lifted to effect swinging movement of the door, and means for lifting the operator.

4. A door operating mechanism including in combination with a two-part telescopic door, two upright guide tracks, one of which

has a top lateral track extension, a lifting lever having its lower end in bearing engagement with one of said tracks and its upper end in bearing engagement with the other of said tracks, said lifting lever having a pivotal connection intermediate its ends with an intermediate part of the lower door section and lifting means for said lever.

5. A door operating mechanism including in combination with a two-part telescopic door hinged at the top of the doorway, guides arranged at each side of the doorway and including a laterally offset supporting track portion, roller equipped operators adapted to travel in said guides and pivotally connected at their intermediate portions with the lower door section, and means for raising said operators.

6. A door operating mechanism including in combination with a two-part telescopic door hinged at the top of the doorway, guides arranged at each side of the doorway and including a laterally offset supporting track portion, roller equipped operators adapted to travel in said guides and pivotally connected at their intermediate portions with the lower door section, and means connected with the lower ends of said operators for raising the same in the guides to effect initial telescopic engagement of the two-part door sections, and then subsequently causing the upper ends of the operators to move onto the laterally extending track portions of the guides while the front portions thereof continue in engagement with the front members of the guides.

7. A door operating mechanism for doors including top and bottom sections adapted to be moved into registering relation and the top section being hinged at the top of the doorway, and means for guiding the lower door section into registry with the upper door section and then swinging said sections when brought into registry on the hinges, said means including operators pivoted to the lower door section and provided at their upper ends with rollers, and means forming opposite guideways having laterally deflected portions with which the rollers at the upper ends of the operators cooperate to sustain the load of the doors while they are swinging on the hinges.

8. A door operating mechanism including in combination with a two-part telescopic door, the top section of which is hinged to the doorway, a lever pivoted intermediate its ends to the lower door section, rollers at opposite ends of the lever, front and rear track members arranged in parallel relation to substantially the full height of the doorway and constituting guides for said rollers, and the rear track section being provided with a laterally and rearwardly extending section on which the rollers at the upper end of the lever are adapted to bear, and lifting

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means connected with the lower end of the lever.

9. A door operating mechanism, including in combination with a door including upper and lower sections adapted to be moved into registering relation and the upper section being hinged to the top of the doorway, guide means for the lower door section, channels carried by the upper door section for telescopically receiving the lower door section, and means for lifting and swinging said door sections comprising front and rear track members, said front track members being vertical throughout their length and the rear track members being provided with an approximately horizontally disposed and rearwardly extending section, roller equipped levers pivotally carried by the lower door section and adapted to move between the parallel portions of the tracks until the lower door section moves out of the zone of its guideway, and means connected with the lower ends of the levers for lifting the same whereby after the lower door section has moved out of its guideway the levers may rock so that the upper ends thereof move onto the approximately horizontal portions of the track-way to carry both door sections in their swinging movement.

10. A door structure comprising an upper door hinged at its upper end for swinging movement, a lower door adapted for movement into overlying relation to said upper door, means connecting said doors together for unitary swinging movement when said doors are disposed in overlying relation, vertically and laterally extending guide means, means connected with the lower door cooperating with said guide means to move the lower door initially into overlying relation to the upper door and subsequently to impart unitary swinging movement to the doors, and means for operating said last-named means.

11. A door structure comprising an upper door hinged at its upper end for swinging movement, a lower door adapted for movement into overlying relation to said upper door, means connecting said doors together for unitary swinging movement when said doors are disposed in overlying relation, vertically and laterally extending guide means, a member cooperating at its ends with said guide means and pivoted intermediately to said lower door, and means for moving said member to move the lower door initially into overlying relation to said upper door and subsequently to impart unitary swinging movement to said doors.

In testimony whereof I hereunto affix my signature.

DAVID H. MORGAN.