

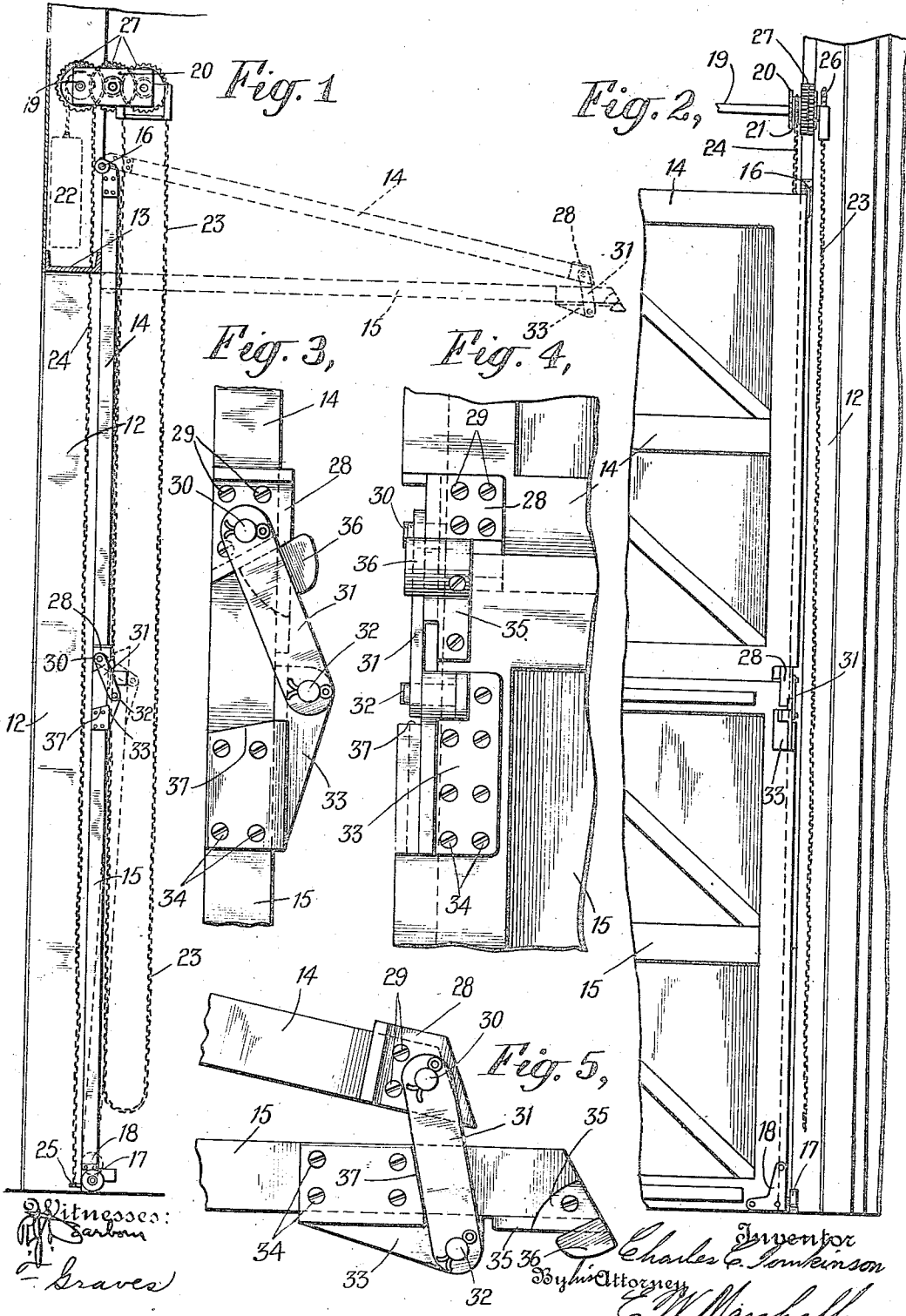
C. C. TOMKINSON.
DOOR.

APPLICATION FILED MAY 14, 1914.

1,209,360.

Patented Dec. 19, 1916.

3 SHEETS—SHEET 1.



C. C. TOMKINSON.

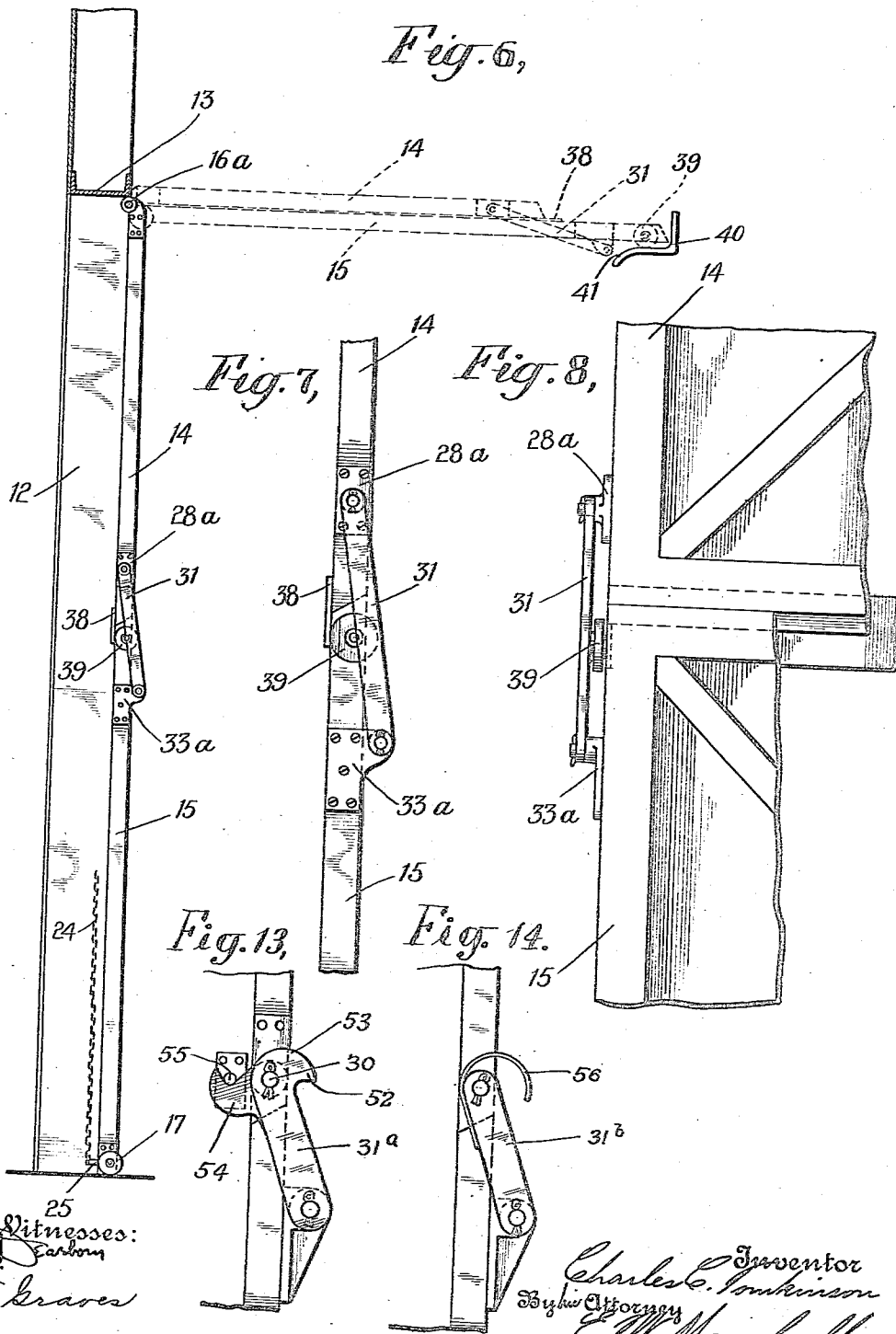
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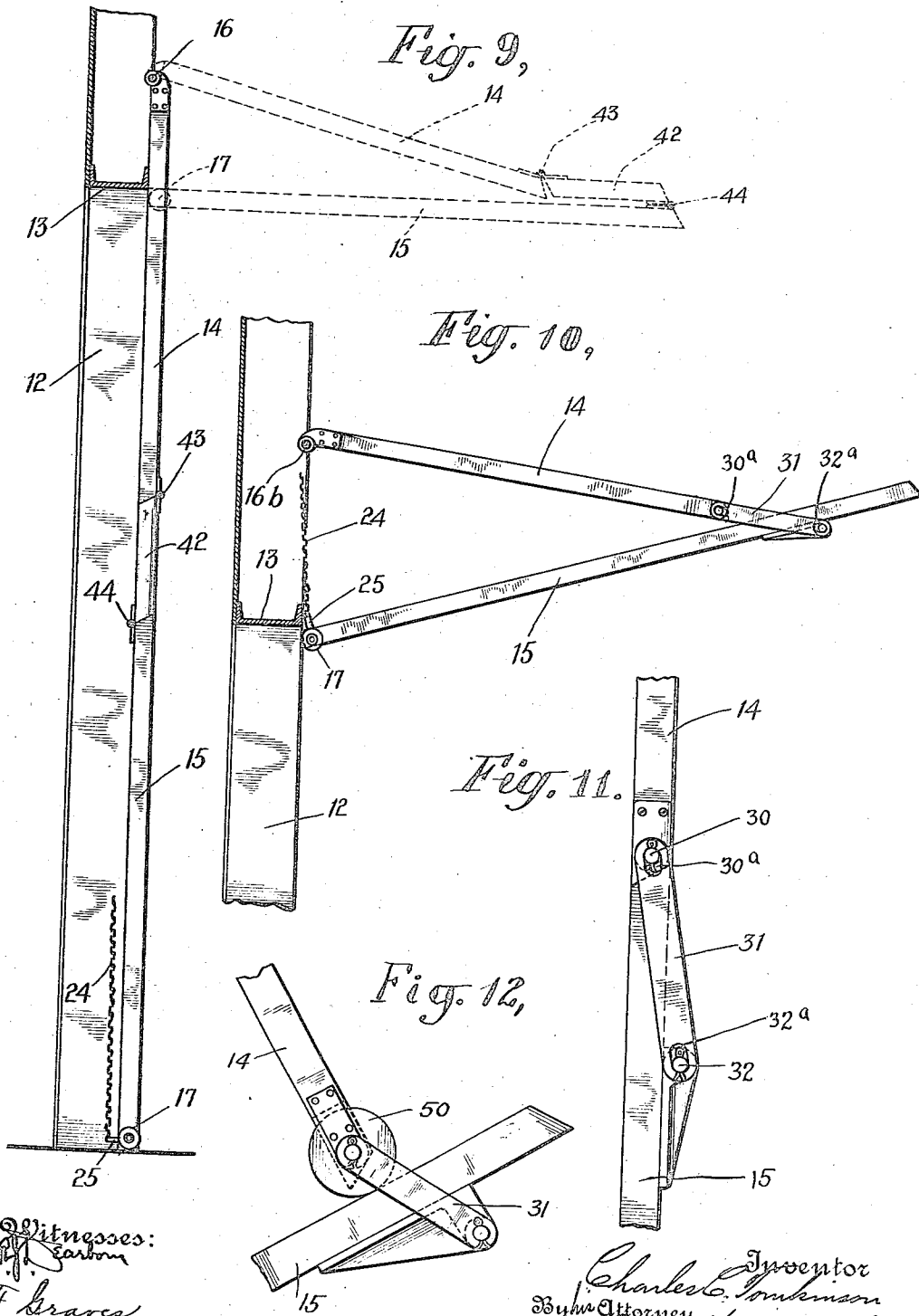
3 SHEETS—SHEET 2.



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3 SHEETS—SHEET 3.



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DOOR.

1,209,360.

Specification of Letters Patent.

Patented Dec. 19, 1916.

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To all whom it may concern:

Be it known that I, CHARLES C. TOMKINSON, a citizen of the United States of America, and a resident of Plainfield, Union county, and State of New Jersey, have invented certain new and useful Improvements in Doors, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

My invention relates to doors and particularly to such large and heavy doors as are utilized in pier sheds, warehouses, factories and the like.

More specifically, my invention has reference to doors of the aforesaid general character which comprise a plurality of hinge-connected sections and are arranged to be opened by raising the lower section by upward pressure applied near the bottom, the upper section being pivoted at the top and the lower section guided vertically at its lower corners.

One object of my invention is to provide a simple and durable door having the characteristics set forth above and equipped with an effective and reliable mechanism for facilitating the opening and closing of the door.

Other objects and advantages of my invention will be set forth hereinafter, and in order that my invention may be thoroughly understood I will now proceed to describe the same in the following specification and then point out the novel features thereof in appended claims.

Referring to the drawings: Figure 1 is an elevation looking at one edge of a door in its closed position, embodying my invention, the arrangement of parts when the door is slightly and fully opened, being indicated in broken lines. Fig. 2 is an elevation at right angles to Fig. 1, of a portion of the same door, looking upon it from the interior. The mechanism by which the door sections are connected, is shown in elevation on a larger scale, in Figs. 3 and 4, the two views being taken at right angles to each other and corresponding, respectively to Figs. 1 and 2. Fig. 5 corresponds to Fig. 3 except that the mechanism, is shown in the position which it occupies when the door is open. A modified arrangement of my invention is shown in Fig. 6 which corresponds to Fig. 1, and in Figs. 7 and 8 which correspond re-

spectively to Figs. 3 and 4. The mechanism of these figures is adapted for use when the overhead room is particularly restricted. Still another modification of my invention is shown in Fig. 9 in which an intermediate door section replaces the link mechanism of the other figures. This view corresponds to Figs. 1 and 6. Fig. 10 is an elevation showing a door in its open position, the operating mechanism constituting another modification of my invention. Fig. 11 corresponds to Figs. 3 and 7 and shows the operating mechanism of Fig. 10 on a larger scale. Fig. 12 is a view corresponding to Fig. 5, of an arrangement which is somewhat similar to that of Figs. 6, 7 and 8. Figs. 13 and 14 are detail views showing modified link structures which may be substituted for those of the other figures.

Corresponding parts are designated by the same reference numerals in all the figures.

With special reference to Figs. 1 to 5 of the drawings 12 is a side post and 13 a transom of a door opening, which is adapted to be closed by a door comprising an upper section 14 and a lower section 15. The upper section 14 is pivotally suspended at its upper corners above the door opening, as shown at 16 in the drawings. The lower section 15 has outwardly extending projections near its lower corners which may preferably take the form of rollers 17 which are pivoted on corner brackets 18. The door overlaps the side posts 12 over which the rollers 17 run as the door is opened and closed. Any suitable hoisting mechanism may be employed and may for example comprise a transverse shaft 19, which is rotatively supported in plates or brackets 20 and carries near its respective ends pocket sheaves 21; counterweights 22, and a hand chain 23. Each of the counterweights is suspended from a chain 24 which extends over one of the sheaves 21 and is connected to a projection 25 located near the lower corner of the lower door section 15. The hand chain 23 has the usual endless construction and coöperates with a sheave 26, the sheave being connected to the shaft 19 by suitable reducing gearing 27. The adjacent edges of the upper and lower door sections are oppositely beveled to form a close fitting scarf joint when the door is closed and the sections are in vertical alinement. The two

side edges of the door are correspondingly equipped and only one edge will be discussed. Secured to the edge of the upper door section near its lower corner, is a bracket 28 which is held in position by screws 29, and preferably overlaps a portion of the inner surface of the door section, as shown in Fig. 4. It has a laterally extending pin projection 30 which constitutes a pivot pin for a link 31. The link at its opposite end is connected to a pivot pin 32 which forms a part of a bracket 33 which is secured to the edge of the lower section 15 by screws 34 and overlaps the face of the door. It does not however correspond in location to the bracket 28 because its pin 32 is spaced from the upper corner of the door section by a material distance depending upon the length of the link. Attention is directed to the fact that while the pivot pin 30 is located substantially in the central plane of the door, the pin 32 is materially offset inwardly therefrom, this being the direction in which the door is arranged to open. It is also desirable although not essential that the lower edge of the upper section be beveled inwardly while the upper edge of the lower section is beveled outwardly. This is for the purpose, as more fully explained hereinafter, of giving the door sections a tendency to readily overlap to a slight extent during the initial opening movement of the door. There is a bracket 35 at the upper corner of the lower section although the link 31 is not connected to it. It is provided with a stop projection 36 which overhangs the link and is adapted to engage the edge of the link when the door is closed and the sections in alinement, as clearly shown in Fig. 3. The bracket 33 also forms a stop projection or shoulder 37 which limits the rotative movement of the link 31 about the pivot 32 in one direction, and engages the edge of the link when the door is open as clearly shown in Fig. 5.

Before describing the structure set forth in the other figures, I will describe the operation of that of Figs. 1 to 5. Assuming that the door is closed, the parts occupying positions as shown in full lines in Figs. 1, 2, 3 4; if the hand chain 23 is now actuated to produce an upward pull on the chains 24 there will first be produced an upward movement of the lower section 15, the parts then assuming positions as shown in the broken lines midway between the top and bottom of the door opening in Fig. 1. It is evident from the fact that the pivotal point 32 for the link is offset inwardly from the plane of the door and from the hereinbefore described arrangement of beveled edges between the door sections, that this initial opening movement is very readily effected and that no strain is put upon any of the parts. This is one of the important features of my invention. Further actuating the

hand chain in the same direction continues to raise the lower end of the lower section until the shoulder 37 engages the edge of link 31 and the link connection between the sections causes the lower end of the upper section to swing inwardly until finally the lower section occupies a substantially horizontal position as shown in broken lines at the top in Fig. 1. It is evident that in this position a portion of the weight of the lower section is supported by the upper section and by the links. The shoulder 37 is intended primarily to prevent the lower edge of the upper door section which extends beyond the pivot pin 30, from scraping on the lower door section and is not an essential feature of my invention. The door sections 14 and 15, together with the links 31, constitute a double toggle joint in view of the fact that the upper section is pivoted at the top and the lower section guided at the bottom. This toggle will break easily as the lifting pull is exerted at the outside of the lower corners of the lower door section and as the first result is that the links throw the upper edge of this door section inwardly. When the operation is reversed and the door is closed, the stop projection 36 engages the other edge of the link and limits its movement and insures the alinement of the two door sections.

In cases where the overhead room is limited so that the upper section is preferably pivoted at the top of the door opening instead of above it, the modification shown in Figs. 6, 7 and 8 may be employed. Referring to these figures, the upper section 14 is pivoted at 16^a near the top of the door opening, the lower section being provided with a roller 17 and guided vertically like the structure shown in Fig. 1. The sections are joined by links 31 but the stops 36 and 37 are unnecessary and are omitted from the brackets 28^a and 33^a which correspond respectively to the brackets 28 and 33. The upper section is provided with a weather strip 38 which overlaps the upper end of the lower section when the door is closed as clearly shown in the drawings. Pivotaly mounted on the edges of the lower section near its upper corners are rollers 39 which, as indicated in broken lines in Fig. 6, are adapted to engage a stationary bracket or rest 40 which is arranged to support the upper end of the lower section when the door is open and the section is swung into a horizontal position. The desirability of providing the stationary support for the door constructed in this manner, is evident from the fact that the guide rollers 17 and the pivotal points 16^a of the upper section are very close together when the door is open. Consequently it would be practically impossible to support a heavy door in a horizontal position by merely depending on the pivotal points and on the

counterweight chains which are attached to the bottom of the lower section as in the structure hereinbefore described. The operation of this door is substantially the same as that of Figs. 1 to 5 inclusive, the upper end of the lower section being first swung inwardly as an upward pull is exerted upon its lower end, except that when the door is almost open and the guide rollers 17 are approaching the pivotal point 16^a, the rollers 39 come into engagement with the surface 41 of the stationary support 40. The support then takes a portion of the weight of the door and relieves the door pivots from dangerous, if not disastrous strains to which they would otherwise be subjected.

In the modification shown in Fig. 9 the mounting of the upper door section corresponds exactly to the structure of Fig. 1 and the lower section is guided in a similar manner by rollers 17 but the toggle joint between the sections provided by the links 31 is in this structure comprised of an intermediate door section 42. This section is connected to the upper section 14 by hinges 43 which are arranged to permit the joint at this point to break outwardly and is connected to the lower section 15 by hinges 44 which permits the joint at this point to break inwardly. The door section 14 is beveled inwardly at its lower edge and the lower section is beveled outwardly at its upper edge so that they correspond to the sections of the previous figures, the intermediate section being beveled at both its top and bottom edges to cooperate with the beveled edges of the other sections. The operation of this structure is similar to that of Fig. 1, the first upward pull upon the door serving to break the joints at the hinges 43 and 44 oppositely and swing the upper end of the lower section inwardly, the lower end of the upper section being prevented from swinging outwardly by the door frame. As the hoisting mechanism is still further actuated the upper section is swung outwardly at its lower end until finally the parts assume the position shown in broken lines in Fig. 9.

If it is not essential that the lower section be horizontal when the door is open and if the overhead room is adequate, the arrangement of Fig. 10 may be utilized. With this arrangement it is possible to employ a pair of links 31 without utilizing the stops 36 and 37, or, in other words, the structure may correspond in this particular to that of Fig. 6. The stationary support 40 shown in Fig. 6 is however, not necessary because the upper section constitutes a supporting means for the upper end of the lower section and the sections are oppositely inclined to the horizontal. The joint between the door sections of Fig. 10, together with the links, are shown in Fig. 11 in the relation which they

assume when the door is closed. The links 31 of this modification are preferably provided with slots 30^a and 32^a in order to provide a certain amount of lost motion in the pivotal connections formed at these points. This will prevent subjecting the links to strains in compression when the door is supported as shown in Fig. 6, by means of a bracket or other suitable device which lifts the inner end of the door as it moves into its horizontal position. The guide rollers 17 which are shown as located near the lower corners of the bottom section may be located at a material distance from the end of the door in which case a greater or less proportion of the lower end of the door will extend outwardly, when the door is elevated to its horizontal position, and project through the doorway to form a canopy.

According to the arrangement of Fig. 12, a roller 50 is pivotally mounted on the edge of the upper door section near its lower end, the arrangement of parts being such that the roller engages the outer surface of the lower section and so prevents this surface from rubbing on the bottom edge of the upper section.

In Figs. 13 and 14 are shown links 31^a and 31^b which may be substituted for the links 31 of the other figures. The link 31^a has a projection 52 having a cam surface 53 which is adapted to cooperate with the door casing and force the upper section away from the door jamb when the link is rotated about the pin 30. The link may also have a lug projection 54 which is adapted to engage a stationary pin 55 on the door casing. The lug-shaped projection will be automatically released from the pin as the door is open but will hold the central portion of the door firmly in position when the door is closed.

In the arrangement of Fig. 14 a curved spring 56 is attached to the link and performs the same functions as the cam surface 53 of Fig. 13. In addition to this however it serves to take the shock of the door when closing. The weather strip 38 may be placed on the inner surface of the door and attached to the lower section instead of being attached to the upper section and located on the outer surface. This arrangement may be considered preferable because when so placed there is no danger of its interfering with the opening and closing of the door. The stationary bracket 40 is intended to be illustrative of any suitable means for supporting the inwardly projecting portion of the door in its horizontal position and other well known means may be employed.

While the adjacent edges of the door sections are shown beveled in the arrangement of Fig. 9, this is not essential and in fact right angle edges may be considered preferable. The length of the links and their

- point of connection to the door sections may be varied materially,—for example, the points of connection may be offset in either direction from or located in the central plane of the door. Furthermore, the hoisting mechanism may be omitted entirely or varied as is desired, in accordance with conditions of service and the weight and size of the door.
- 10 Variations in size and arrangement of parts may be effected within the spirit and scope of my invention, and I intend that only such limitations be imposed as are indicated in appended claims.
- 15 What I claim is:
1. A door comprising an upper section pivotally suspended on a fixed pivot at the top, a lower section guided vertically at its bottom end, and links between the sections constituting in conjunction therewith a connection which is arranged to break readily when an upward pressure is applied to the lower end of the lower section.
 2. A door comprising an upper section pivotally suspended on a fixed pivot at the top, a lower section guided vertically near its lower end, a pair of links interconnecting the sections and joined to one of them at points laterally offset relative to their pivots of connection with the other section.
 3. A door comprising an upper section pivotally suspended on a fixed pivot at the top, a lower section guided vertically near its lower end, a pair of links interconnecting the sections and joined to the edges of the upper section near its lower corners and joined to the lower section at points relatively offset in a lateral direction.
 4. A door comprising an upper section, hinged at the top of a door opening, a lower section guided vertically near its lower corners, a pair of links interconnecting adjacent portions of the door sections, said links being pivotally connected to the upper door section at the lower corners thereof and pivotally connected to the lower door section at points below and laterally inside of its upper corners, said links constituting a connection between the adjacent edges of the door sections which is arranged to break in readily when an upward pressure is applied to the lower end of the lower door section.
 5. A door comprising an upper section pivotally suspended at the top, a lower section guided vertically near its lower end, a pair of links interconnecting the sections and joined to one of them at laterally offset points, the section to which the links are connected at offset points being provided with stops for limiting the pivotal movement of the links relative thereto in either direction.
 6. A door comprising an upper section pivotally suspended at the top, a lower section guided vertically near its lower end, a pair of links interconnecting the sections and joined to the edges of the upper section near its lower corners and joined to the lower section at laterally offset points, said lower section being provided with stop projections to limit the pivotal movement of the links relative to the lower section.
 7. A door comprising an upper section pivotally suspended on a fixed pivot at the top, a lower section having guided pivots, a pair of links interconnecting the sections and joined to the edges of the upper section in the central plane of the section and joined to the lower section materially below its upper edge and offset laterally inward from the central plane of the door, whereby an upward pull exerted on the lower section near the bottom breaks the toggle joint constituted by the links and the door sections.
 8. A door comprising an upper section pivotally suspended from above on a fixed pivot, a lower section guided near its lower end, a connection between the sections constituting in conjunction therewith a double toggle joint arranged to break readily when an upward pressure is applied to the lower section, an outwardly extending projection near the lower end of the lower section, and hoisting means connected to said projection.
 9. A door comprising an upper section pivotally suspended from above on a fixed pivot, a lower section guided vertically near its lower end, and having outwardly extending projections near its lower corners, a pair of links interconnecting the sections, and hoisting chains secured to the outer ends of the projections whereby an upward pressure is exerted beyond the central plane of the door tending to break it inwardly at the point of connection between the sections.
 10. A door comprising an upper section pivotally suspended from above, a lower section guided vertically near its lower end, and a pair of links interconnecting the sections and having cam projections adapted to cooperate with the door casing to force the lower end of the upper section away from the casing when the links are rotated about their points of connection to the upper section.
 11. A door comprising an upper section pivotally suspended from above, a lower section guided vertically near its lower end and a pair of links interconnecting the sections and having cam projections adapted to cooperate with the door casing to force the lower end of the upper section away from the casing when the links are rotated about their points of connection to the upper section, said cam projections comprising curved springs adapted to cushion the closing of the door.
 12. A door comprising an upper section pivotally suspended from above, a lower section guided vertically near its lower end,

stationary pins near the upper corners of the lower section, and a pair of links interconnecting the sections and having cam projections adapted to cooperate with the door casing to force the lower end of the upper section away from the casing when the links are rotated about their points of connection to the upper section, said cam projections having hooked extensions adapted to engage said stationary pins when the door is closed.

13. A door comprising an upper section pivotally suspended from above, stationary projections from the door casing, a lower section guided vertically near its lower end and a pair of links interconnecting the sections and having hooked projections adapted to cooperate with the projections from the door casing to hold the middle portion of the door firmly against the casing when closed.

14. A door comprising an upper section pivotally suspended at the top, a lower section guided vertically near its lower end, a pair of links interconnecting the sections and joined to one of them at laterally offset points, and stops on one of the sections for limiting the pivotal movement of the links relative thereto.

15. A door comprising an upper section pivotally suspended on a fixed pivot at the top and having its bottom edge beveled, a lower section guided vertically near its lower end and having its upper edge oppositely beveled to cooperate with the beveled lower edge of the upper section, and a pair of links interconnecting the sections whereby the connection between the sections is arranged to break readily when an upward pressure is applied to the lower end of the lower section.

16. A door comprising an upper section pivotally suspended on a fixed pivot at the top, a lower section guided vertically near its lower end, a pair of links interconnecting the sections, and stops on one of the sections for limiting the pivotal movement of the links relative thereto in either direction.

In witness whereof, I have hereunto set my hand in the presence of two subscribing witnesses, this 12th day of May, 1914.

CHARLES C. TOMKINSON.

Witnesses:

I. B. MOORE,
I. M. MULCAH.