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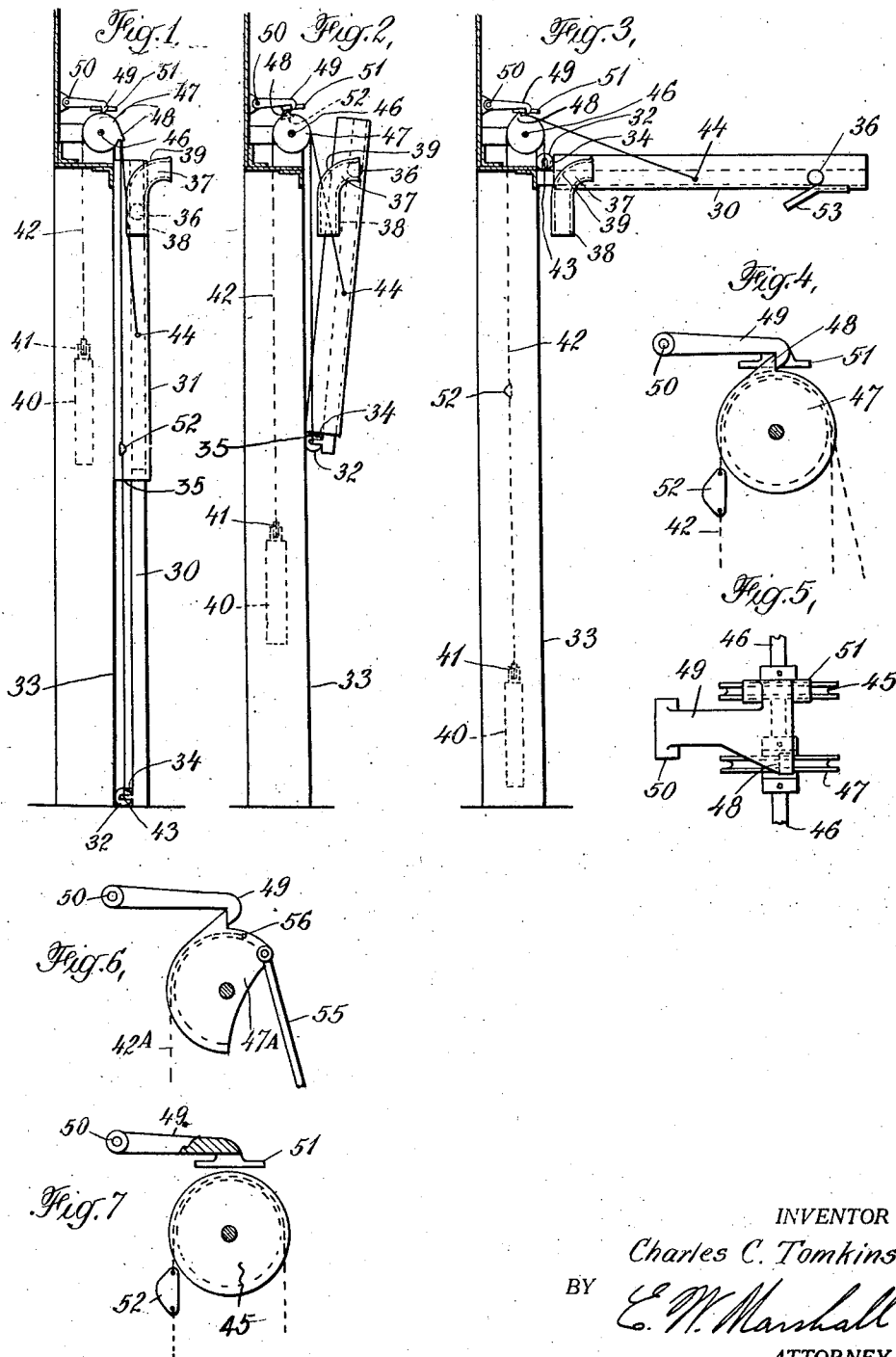
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C. C. TOMKINSON

DOOR MECHANISM

Filed Sept. 15, 1922

5 Sheets-Sheet 1



INVENTOR

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BY

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Oct. 25, 1927.

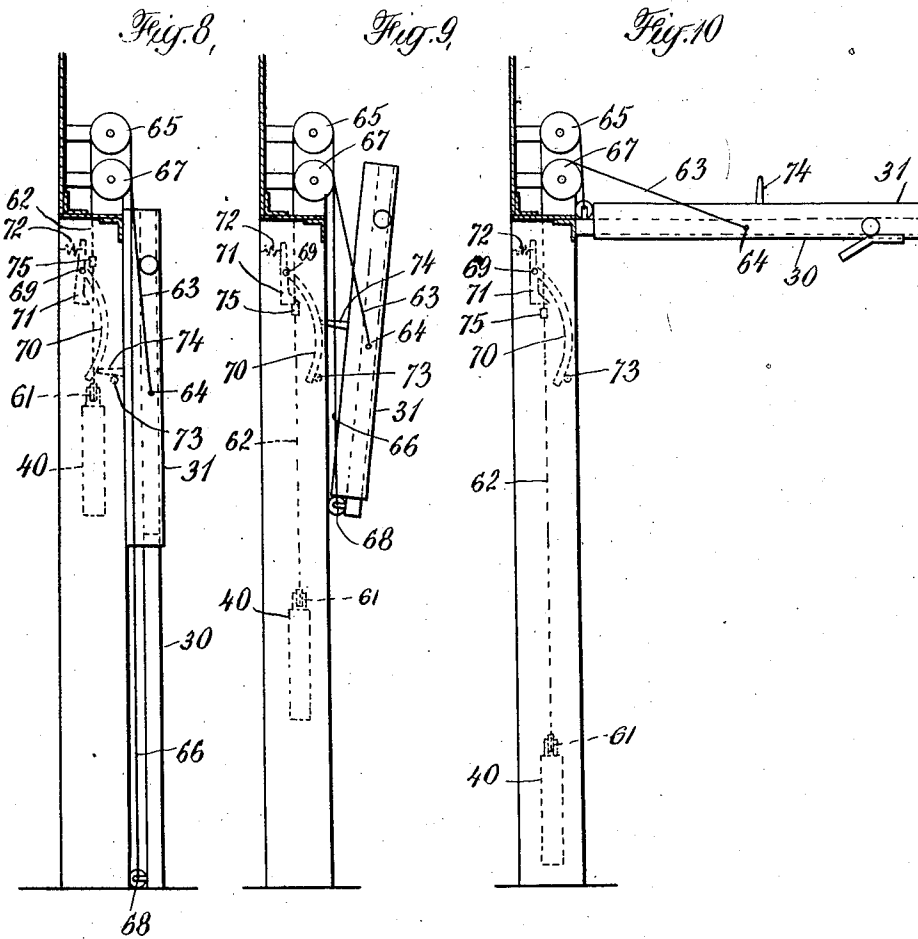
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DOOR MECHANISM

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5 Sheets-Sheet 2



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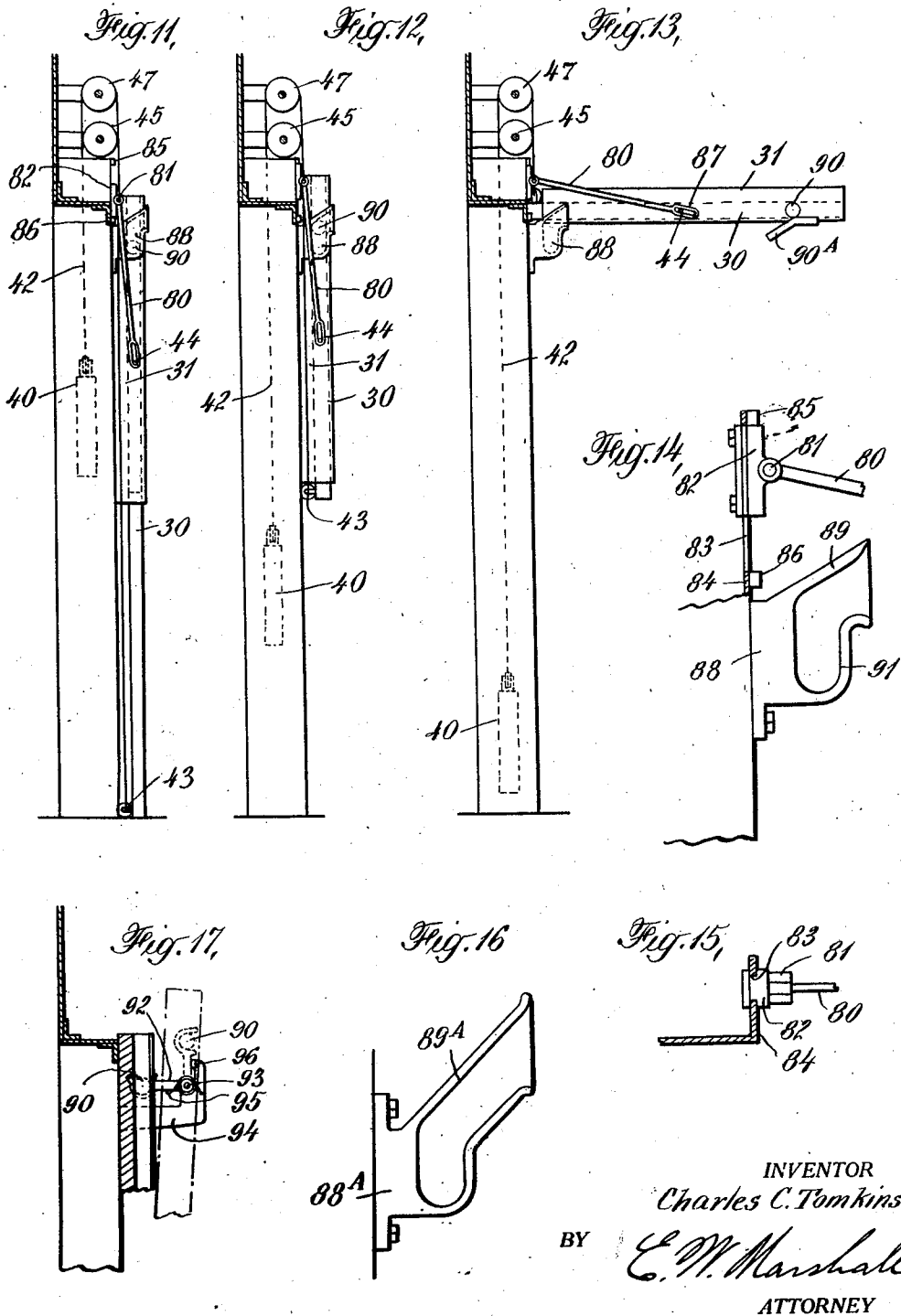
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C. C. TOMKINSON

DOOR MECHANISM

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Oct. 25, 1927.

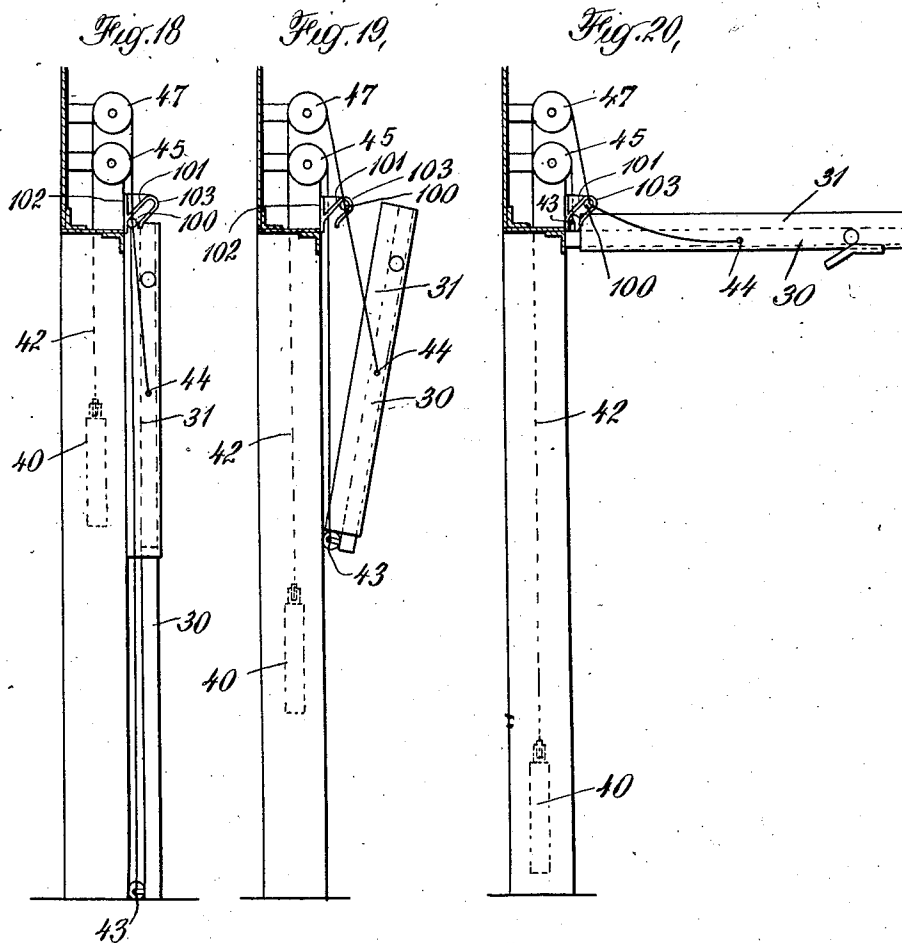
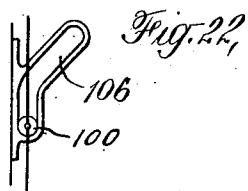
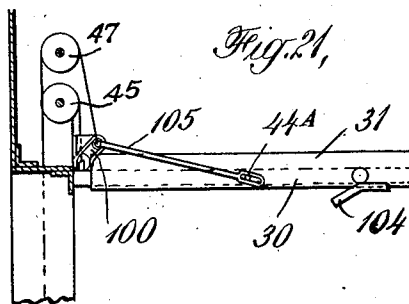
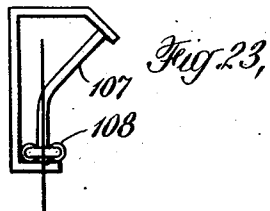
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DOOR MECHANISM

Filed Sept. 15, 1922

5 Sheets-Sheet 4



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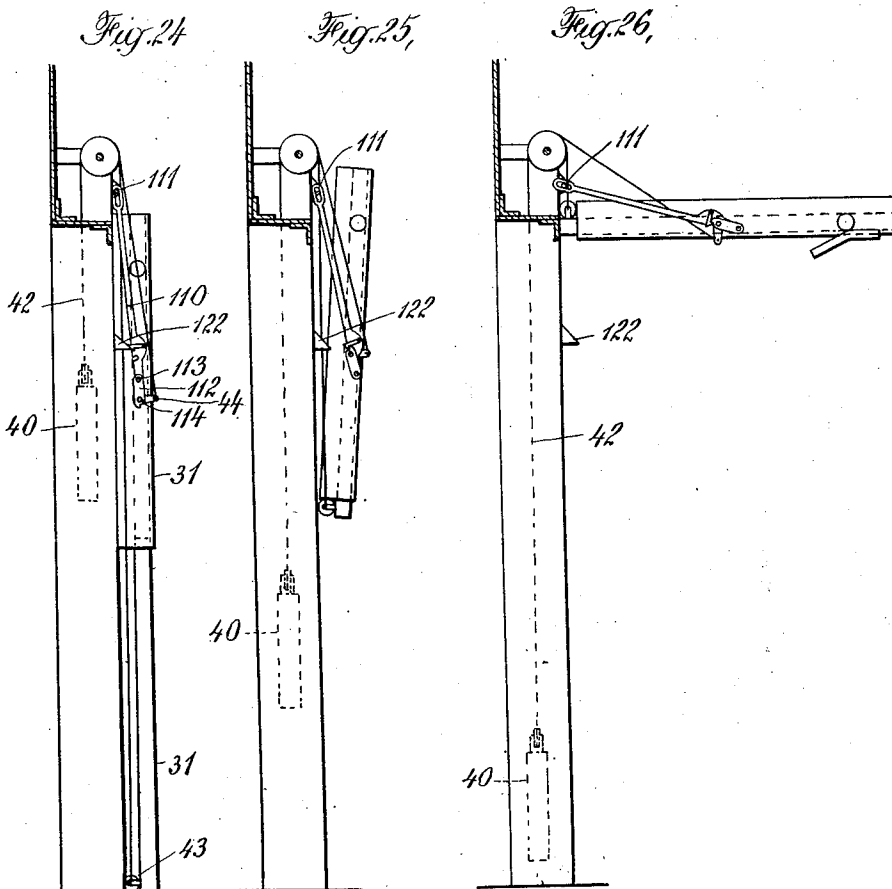
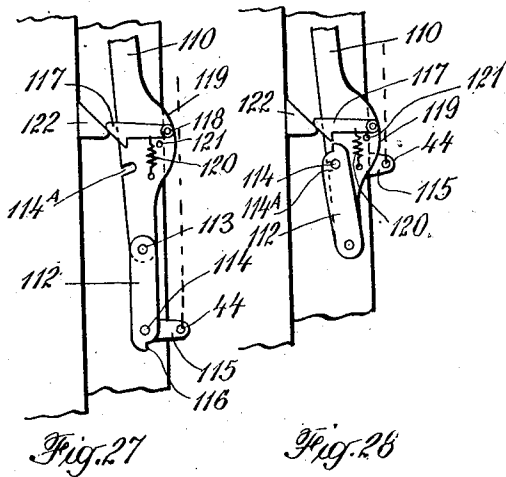
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C. C. TOMKINSON

DOOR MECHANISM

Filed Sept. 15, 1922

5 Sheets-Sheet 5



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1,646,432

UNITED STATES PATENT OFFICE.

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DOOR MECHANISM.

Application filed September 15, 1922. Serial No. 588,297.

This invention relates to doors such as are used for closing large openings in warehouses, pier sheds and like structures and more particularly to a common type of such doors which are mounted to raise and swing inwardly to inclined or horizontal position in order to conserve head room. Counterbalancing means is provided to facilitate the operation of the doors and one of the problems encountered in connection with doors of this character is the provision of correct counterbalance at all points in the cycle. Another problem is to secure the proper closing of the door and the retention of the door in closed position against severe external lateral pressures, such as wind pressures.

These problems have been particularly worked out in connection with the link type of door in which the door is swung inwardly and supported by links as distinguished from those in which tracks perform this function.

One of the objects of the invention is to provide door counterbalancing mechanism constructed and arranged to furnish the necessary counterbalancing effect during the break out period of the door opening movement.

Another object of the invention is to provide a door mounting and counterbalancing mechanism and connections for the link type door so constructed and arranged as to permit a vertical movement of the door prior to or during the break out.

Another object of the invention is to provide a door mounting and counterbalancing mechanism and connections for a link type door so constructed and arranged as to permit a vertical movement of the door prior to or during the break out and to secure additional counterbalancing effect during this movement.

Another object of the invention is to provide a counterbalancing mechanism for link type doors so constructed and arranged as to provide a vertical component of the counterbalancing force during the vertical movement of the door or door sections prior to or during the break out.

Another object of the invention is to secure the proper closing and the retention in closed position of doors of the type described.

Another object of the invention is to

utilize the connections between the counterbalancing weight and door as a link for supporting and swinging the door.

Further objects of the invention will appear from the following description taken in connection with the drawings which form a part of this application and in which

Fig. 1 is an elevational view, somewhat diagrammatic showing a two section door, counterbalancing mechanism and the connections therebetween, the door being shown in closed position.

Fig. 2 is a view similar to Fig. 1 but showing the door sections in overlapping position and substantially at the upper limit of their vertical movement.

Fig. 3 is a view similar to Fig. 1 but showing the door sections in full open position.

Fig. 4 is an elevation on an enlarged scale of one of the sheaves and latching means therefor.

Fig. 5 is a top plan view of the fast and loose sheaves over which the counterbalancing cable or chain passes and of the latch cooperating with the loose sheave.

Fig. 6 is an elevation similar to Fig. 4 but showing another embodiment of the invention.

Fig. 7 is an elevational view showing the fast sheave and showing the latch in section and a portion of the cable or chain passing over the fast sheave.

Fig. 8 is an elevational view similar to Fig. 1 but showing another embodiment of the invention, the door sections being shown in closed position.

Fig. 9 is a view similar to Fig. 8 but showing the door sections in overlapping position.

Fig. 10 is a view similar to Fig. 8 but showing the door sections in wide open position.

Fig. 11 is an elevational view showing another embodiment of the invention, the door sections being shown in closed position.

Fig. 12 is an elevation of the construction shown in Fig. 11, the door sections being shown in overlapping position.

Fig. 13 is an elevational view of the construction shown in Figs. 11 and 12 but showing the door in wide open position.

Fig. 14 is a sectional elevation on an enlarged scale showing the mounting for the upper end of the link and the bracket or socket which cooperates with the upper door section during the break out and closing

movement of the structure shown in Figs. 11-13.

Fig. 15 is a sectional elevation of the link mounting shown in Fig. 14.

Fig. 16 is an elevational view showing another form of bracket or socket for performing the functions performed by the bracket shown in Figs. 11-14 inclusive.

Fig. 17 is an elevational view showing another form of device for guiding the door sections during the break out and closing movements.

Fig. 18 is an elevational view showing still another form of the invention, the door being shown in closed position.

Fig. 19 is a view similar to Fig. 18 but showing the door sections in overlapping position.

Fig. 20 is an elevation of the construction shown in Figs. 18 and 19 but showing the door sections in wide open position.

Fig. 21 is an elevational view showing a modification of the construction shown in Figs. 18-20 inclusive.

Fig. 22 is an elevational view showing another form of bracket for guiding and limiting the movement of the chain shown in Figs. 18-20 inclusive.

Fig. 23 is an elevation similar to Fig. 22 but showing another form of chain guiding and limiting means.

Fig. 24 is an elevational view showing another form of the invention, the door sections being shown in closed position.

Fig. 25 is a view similar to Fig. 24 showing the door sections in overlapping position.

Fig. 26 is a view similar to Figs. 24 and 25 but showing the door sections in wide open position.

Fig. 27 is a detail elevation on an enlarged scale showing a mechanism for permitting the vertical movement of the door sections, the parts being shown in the position taken when the sections are in closed position, and

Fig. 28 shows the mechanism illustrated in Fig. 27 with the parts in the position taken when the sections are in overlapping position.

The invention may be briefly described as consisting of a door comprising one or more sections and movable vertically and laterally to inclined or horizontal position and as further consisting of counterbalancing means so connected to the door or door sections as to facilitate the movement of the door to open position. Various forms of connections are shown for breaking out the door and for supporting and swinging the door to open position. In all of the forms of the invention, however, the door may be termed a link type door and the link connections are so constructed and connected to the door as to permit vertical movement of

the door or door sections prior to or during the break out. In certain forms of the invention the cables connected to the counterweight are utilized as links and in other forms the links are adapted to vary in length during the vertical movement and in order to permit this movement. Means is also provided for guiding the door during the break out and also for guiding the door during the closing movement and for retaining the door against lateral pressure in its closed position. Further details of the invention will be clear from the following description.

Referring first to the embodiment of the invention shown in Figs. 1-7 inclusive, the door illustrated comprises a lower section 30 and an upper section 31. The section 30 is provided at its lower end with rollers 32 disposed in vertical guideways 33 and the section 30 has also a bracket 34 adapted to engage, as shown in Fig. 2, the lower end 35 of the upper section when the two sections are in overlapping position. Suitable guides are also provided on the upper section for guiding the lower section with respect thereto.

The upper section 31 has mounted thereon, preferably at its lateral edges, rollers 36 disposed as shown in Figs. 1 and 2 in cams or guiding brackets 37 having vertical portions 38 and curved or break out portions 39.

Separate counterbalancing weights may be provided for each door section, if desired, or as shown in the drawings, a single counterbalancing weight 40 is provided. The weight 40 has a sheave 41 secured to its upper end and the counterbalancing cable 42 extends around this sheave and has its ends connected respectively at some point such as 43 to the lower section 30 and at some point intermediate the upper and lower edges of the upper section 31 as shown at 44. The chain or cable 42 extends intermediate the sheave 41 and the point 43 on the lower section 30 around a sheave 45 secured fast to a shaft 46. The other end of the cable intermediate the point 44 on the upper section 31 and the sheave 41 passes around a sheave 47 loosely mounted or mounted for rotation on the shaft 46. If chains are used as cables, the sheaves 45 and 47 will preferably be chain pocket sheaves.

The loose sheave 47 has formed thereon a projection or tooth 48 which extends outwardly from the periphery thereof. This tooth is adapted to be engaged by a hook 49 pivoted at 50 on a fixed pivot and the hook 49 has a lateral extension 51 disposed vertically over the fast sheave 45 (see Fig. 5). The portion of the cable 42 extending around the sheave 45 has secured thereto a lug 52 which in passing around the sheave 45 is adapted to engage the extension 51 on the hook 49 and lift the hook thereby releasing

the loose sheave 47 and permitting the rotation thereof in a clockwise direction.

The construction shown in Figs. 1-5 operates as follows. Upon the rotation of the shaft 46 by any suitable power means, the fast sheave 45 will be rotated thereby raising the lower door section 30 to a position overlapping the upper section 31. The two sections are then raised in unison vertically and during this movement the counterweight 40 will act on the upper section 31 as well as on the lower section thereby facilitating the vertical movement. During this action of the counterweight 40 on the upper door section, the loose sheave 47 will be rotated in an anti-clockwise direction to a position in which the lug or tooth 48 has passed beyond the hook 49. The hook will therefore drop down and prevent rotation of the sheave 47 in a clockwise direction beyond the point where the tooth 48 engages the hook 49 until the release of the hook. As the lower edges of the two sections continue to rise the rollers 36 will be guided by the curved portion 39 of the cam 37 and the sections will break out from the vertical. The action of the counterweight 40 on the upper section 31 may be continued through this break out of the sections from the vertical plane. When the sections, however, have been swung away from the vertical plane the engagement of the tooth 48 with the hook 49 will lock the sheave 47 from rotation and the portion of the cable between the sheave and the point 44 will thereupon act as a link in supporting and guiding the door sections to inclined or horizontal position. A shelf bracket 53 is provided for supporting the inner ends of the door in its wide open position. When the door sections are returned to their closed position the lug 52 will pass around the sheave 45 and in so doing will engage the extension 51 of the hook 49 thereby releasing the hook from engagement with the tooth 48 and again permitting the free rotation of the sheave 47.

In Fig. 6 a modified form of the construction shown in Figs. 1-5 is illustrated and in these figures a link 55 is provided between the loose sheave 47^A and the upper door section. In this construction the counterweight cable 42^A is connected to the sheave 47^A as shown at 56. This construction operates in the same manner as that already described.

Another embodiment of the invention is shown in Figs. 8-10 inclusive. In this embodiment the door sections 30 and 31 are mounted in the same manner as those already described and are counterbalanced by a single counterbalancing weight 40 although a separate weight for each section may be used if desired. In this case, for convenience in illustration the fast pulley 65 is mounted above the loose pulley 67.

The cable or chain 62 is passed around the sheave 61 carried by the counterweight and one end portion 63, that running from the loose sheave 67, is connected at 64 to the upper door section 31 and the other end portion 66, that running from the fast sheave 65, is connected at 68 to the lower door section 30.

Means is provided for locking chain 62 when the door sections have moved a predetermined distance so that the portion 63 thereof between the loose sheave 67 and the point 64 may act as a link. This means comprises in the present instance a latch pivoted at 69 to the door casing and having a curved arm 70 and a stop portion or abutment 71. The parts 70 and 71 are disposed on opposite sides of the pivot 69 and constitute in effect a bell crank lever. A spring 72 engages the arm 70 and tends to pull the arm toward the upper door section and a stop 73 is provided in the path of this arm for limiting the movement thereof in an anticlockwise direction, viewing Figs. 8-10 inclusive. In the closed position of the door the arm 70 is engaged by a laterally extending projection or tripper 74 carried by the upper door section 31. This engagement as shown in Fig. 8, swings the latch laterally and moves the abutment 71 out of the path of a lug or block 75 carried by the portion of the cable 62 which extends over the loose sheave 67 and is attached to the upper door section. The parts are so constructed and arranged and the arm 70 is so curved that the initial vertical movement of the upper door section in conjunction with the lower door section, takes place and is assisted by the action of the counterweight 40 on the upper door section. When, however, this movement has taken place the block 75 is disposed below the abutment 71 and the latter is moved to the position shown in Fig. 9 and thereby retains the cable and block from further upward movement. The portion 63 of the cable or chain between the sheave 67 and the point of connection 64 to the upper door section thereafter acts as a link in supporting and swinging the door sections. In this connection it should be noted that in the construction shown in Figs. 1-7 and also in the construction shown in Figs. 8-10 and in the structures later described, as soon as the top of the door sections have ceased to have a vertical rise there is no further need for the additional counterbalancing effect and therefore the dispensing with this counterbalancing effect is not detrimental to the action of the door operating mechanism.

In Figs. 11-15 inclusive, another embodiment of the invention is shown. In this embodiment of the invention the door sections 30 and 31 are mounted for vertical and lateral movement in the same manner as that

already described. The single counterweight 40 is connected by the chain or cable 42 at 43 to the lower section and through link 80 to the upper section at 44, the end of the chain or cable being connected to the bracket 82. This chain or cable passes over a fast sheave 45 and a loose sheave 47, these sheaves being shown as vertically spaced for convenience in illustrating the structure.

In this case, however, links are provided for supporting and swinging the door inwardly and such links are preferably provided at each edge of the door. In order however, to permit vertical as well as lateral movement of the door sections in unison, the links 80 are pivoted at 81 to a bracket 82 and this bracket is slidably mounted in a guideway 83 formed in a fixed portion 84 of the wall of the building in which the door is mounted. The upper and lower limits of movement of the bracket are determined respectively by stops 85 and 86. The links are connected at their lower ends as shown at 87 to the upper door section intermediate the upper and lower edges thereof and if desired this connection may be a pin and slot connection as illustrated at 44.

In this form of the invention the break out of the door from the vertical is assisted by means of brackets 88 mounted preferably in the door casing at the side edges of the upper door section. These brackets have a cam portion 89 adapted to be engaged by rollers or studs 90 carried by the upper door section and the brackets also have formed therein sockets 91 adapted to receive these rollers or studs when the upper door section is in its closed position. It will be noted that the bracket is so formed that a straight vertical movement of the door is permitted by the elongation of the sockets 91 and that the studs or rollers 90 move from their seats in the lower ends of the sockets to the upper end of the sockets and onto the break out cams 89 as the link 80 moves from its lower position in which the pivoted bracket 82 engages the stop 86, to the position in which the bracket engages the stop 85. During this movement of the links and door sections the counterbalancing weight 40 is effective on the door section 31 as well as on the door section 30. After the members 90 engage the break out cams the door sections are swung to the inner position in the usual manner and in the wide open position the studs or rollers 90 engage and by their engagement support the inner end of the door on shelf brackets 90^A. It will be understood that the counterbalancing weight 40 also acts on the upper door section during its seating or movement to closed position, and in the closed position the engagement of the studs or rollers 90 in the sockets 91 effectively secures the door against lateral pressure such as wind pressure.

In Fig. 16 a slightly different form of bracket 88^A is illustrated and in this form the break out cam 89^A is made slightly longer and the rollers or studs 90 will start to tilt the door before the vertical component of the pull of the counterweight 40 on the upper door section has ceased. This component, therefore, assists in the break out movement of the door.

In Fig. 17 is illustrated another form of device for guiding the door sections during the break out movement and for returning the sections to their closed position. This device consists of a hook 92 pivoted at 93 in a bracket 94 fixed to the door casing. A spring 95 engages the hook and tends to move the hook in a clockwise direction and a stop 96 is carried by the bracket 94 and limits the clockwise movement of the hook. The hook 92 is engaged by the studs or rollers 90 carried by the upper door section when the door is closed and during the break out movement the hook will follow these studs due to the action of the spring 92 and will determine the path of movement of the studs and therefore of the door sections during the break out of the door and during its return to the vertical.

Still another and simple form of the invention is shown in Figs. 18-20 inclusive. In this case the cable 42 from the counterweight 40 is connected at 43 and 44 to the lower and upper door sections respectively. This cable passes over the fast sheave 45 to the lower door section and over the loose sheave 47 to the upper door section. Intermediate the sheave 47 and the connection 44 to the upper door section the cable has secured thereto a block 100. This block is disposed under an inclined cam portion 101 of a downwardly opening bracket 102 and is adapted to move during the break out movement of the door sections from the position shown in Fig. 18 to the position shown in Fig. 19 and in this latter position it is disposed in a closed loop or socket 103 in the bracket 102. During this movement of the block 100 the door sections will have moved laterally to the position shown in Fig. 19 and will have passed over the start of the break out movement. During this movement also the counterweight 40 is effective in its action on the upper door section 31 as well as on the lower door section until the block 100 has moved to the position shown in Fig. 19 after which the portion of the chain or cable between the block and the point 44 will remain of constant length and therefore this portion will act as a link through the succeeding lateral and inward movement of the door sections. In Fig. 20 the sections are shown in their innermost or wide open position with their inner ends resting on the shelf bracket 104 and in this position the link portion of the

cable may be slacked as the weight is entirely supported by the shelf bracket and by the cable connection to the lower door section.

5 Although no means has been shown in Figs. 18-20 for breaking out the top of the door it will be understood that brackets similar to those shown in Figs. 11, 12 and 13 may be used if desired.

10 A slight modification of the invention shown in Figs. 18-20 is illustrated in Fig. 21 and in this latter figure a link 105 is substituted for the portion of the cable between the block 100 and the point of connection 44^a to the upper door section 31. A pin and slot connection is shown at the point 44^a to permit lateral movement of the door on the shelf bracket 104 if such movement is desired.

20 In Figs. 22 and 23 are shown other devices for guiding the block 100 in its movement. Fig. 22 illustrates a bracket 106 in which the path of movement of the block 100 is entirely enclosed. Fig. 23 shows a cam 107 and illustrates a pair of rollers 108 instead of a block 100, carried by the cable which is connected to the upper door section, these rollers being disposed on opposite sides of the cam 107 and determining the path of movement of the cable.

30 Figs. 24-28 inclusive illustrate still further means for securing a vertical movement of the door sections. In this construction the cable 42 from the counterweight 40 is connected to the upper and lower door sections in the manner already described. The vertical movement of the door sections is in this instance, however, obtained through a link connection. This link connection comprises a link 110 pivoted at 111 to a fixed point preferably by a slot and pin arrangement and having a second link 112 pivotally connected to its lower end as shown at 113. The link 112 is pivoted at 114 to a bracket 45 115 extending laterally from the door section 31 and has formed on its lower end a projection 116 adapted to engage a latch 117, hereinafter described, when the door sections are in their open position. When 50 the lower section is raised into overlapping position with the upper section the two sections are raised vertically in unison and during this movement the link 112 is swung inwardly about the pivot 113 to the position shown in Figs. 25 and 28 in which the projection 116 at the pivoted end of the link 112 is disposed directly below the latch 117 pivoted at 118 to a laterally extending portion 119 formed on the link 110. The pivot 60 pin 114 also extends laterally from link 112 and seats in a notch 114^a formed in link 110 when the link 112 is folded. A spring 120 tends to pull the latch downwardly and a stop 121 limits its downward movement. 65 The latch, however, is normally retained in

inoperative or raised position when the door is closed by means of a lug 122 formed on the door casing. When, however, the door sections break out and start their inward or lateral movement the latch 117 is freed from 70 the lug 122 by the movement of the link and door sections and engages over the projection 116 thereby retaining the links 110 and 112 in folded position. On the reverse movement of the parts or upon the move- 75 ment of the door to closed position the latch 117 will again be engaged by the lug 122 thereby releasing the link 112 whereupon the parts will return to the position shown in Fig. 24. In this form of the invention, 80 therefore, it will be seen that vertical movement of the door is permitted prior to the break out and during this movement the counterweight 40 acts on the upper as well as the lower door section. This action may 85 be continued if desired through the initial break out.

From the foregoing specification it will be clear that in each embodiment of the invention means has been provided for permitting 90 a vertical movement of the door sections prior to or during the break out and that during this movement the counterweight mechanism is effective on both door sections. Furthermore the vertical movement of the 95 door in closing is utilized in connection with the brackets or sockets to insure the proper closing action and the retention of the door in closed position against lateral pressures such as wind pressures. 100

Although certain specific embodiments of the invention have been illustrated and described, it will be understood that the invention is capable of further modification and that further changes in the construction and in the arrangement of the various cooperating parts may be made without departing from the spirit or scope of the invention as expressed in the following claims. 105

What I claim is:— 110

1. A door arranged to move vertically and laterally and mechanism for supporting and swinging the door, said mechanism including means connected with the door arranged 115 to have its effective length varied during the part of the movement of the door when the top of the door has a vertical component of movement and fixed during the remainder of the lateral door movement.

2. A door arranged to move vertically and laterally, and mechanism for supporting and swinging the door and including movable link means connected with the door, said link means being movable longitudinally 120 during the vertical rise of the top of the door and being locked against longitudinal movement during the remainder of the movement of the door.

3. A door arranged to move vertically and laterally and mechanism for supporting and 125

swinging the door, said mechanism including means connected to the door intermediate its upper and lower edges, freely movable longitudinally during the vertical rise of the top of the door and locked against longitudinal movement during the remainder of the movement of the door.

4. A door arranged to move vertically and laterally and mechanism including means connected to the door intermediate its upper and lower edges for supporting and swinging the door, said means being variable in length during the vertical rise of the top of the door and fixed in length during the remainder of the door movement.

5. A door arranged to move vertically and laterally and mechanism for supporting and swinging the door, said mechanism including means connected with the door arranged to have its effective length varied during the part of the movement of the door when the top of the door has a vertical component of movement and fixed during the remainder of the lateral door movement, and stationary means engaging the upper part of the door for guiding that part of the door during the part of the movement of the door when the top of the door has a vertical component of movement.

6. A door arranged to move vertically and laterally, and mechanism including flexible means connected to the door intermediate its upper and lower edges for supporting and swinging the door, arranged to have its effective length varied during the part of the movement of the door when the top of the door has a vertical component of movement and fixed during the remainder of the lateral door movement.

7. A door arranged for vertical and lateral movement, mechanism for supporting and swinging the door, said mechanism comprising a cable connected to the door intermediate the upper and lower edges thereof, counterbalancing means connected to said cable and operative during the vertical rise of the top of the door and means for holding said cable against longitudinal movement during the swinging of the door.

8. A door arranged for vertical and lateral movement, a flexible cable connected to the door intermediate the upper and lower edges thereof, counterbalancing means connected to said cable and means for retaining a part of said cable against longitudinal movement during a portion of the movement of the door.

9. A door arranged for vertical and lateral movement, a flexible cable connected to the door intermediate the upper and lower edges thereof, counterbalancing means connected to said cable and operative during the initial portion of the door opening movement and means for retaining the portion of said cable between the counterweight and

the door against longitudinal movement during the remaining portion of its opening movement.

10. A door arranged for vertical and lateral movement, a cable connected to the door, a counterweight, a sheave for the cable intermediate the counterweight and door and means for securing a part of the cable against longitudinal movement at a predetermined point in the opening movement of the door.

11. A door comprising upper and lower sections, a counterweight, a sheave carried thereby, a pair of sheaves mounted above the door, a cable passing under the counterweight sheave and over the pair of sheaves, one end of the cable being secured to one door section and the other end being connected to the other section, and means for securing one end portion of the cable against longitudinal movement at a predetermined point in the door opening movement.

12. A door comprising upper and lower sections, a counterweight, a sheave carried thereby, a pair of sheaves mounted above the door, a cable passing under the counterweight sheave and over the pair of sheaves, one end of the cable being secured to one door section and the other end being connected to the other section, and means for securing the portion of the cable between one sheave and the point of attachment to the upper door section against longitudinal movement at a predetermined point in the door opening movement.

13. A door comprising upper and lower sections, a counterweight, a sheave carried thereby, a pair of sheaves mounted above the door, a cable passing under the counterweight sheave and over the pair of sheaves, one end of the cable being secured to one door section and the other end being connected to the other section and means for securing one of said pair of sheaves against movement at a predetermined point in the door opening movement.

14. A door arranged for vertical and lateral movement, a counterweight associated therewith, a cable connecting the counterweight to the door and means engageable with the cable operative at a predetermined point in the door opening movement for securing a part of said cable against longitudinal movement.

15. A door arranged for vertical and lateral movement, means connected with the door for guiding the door laterally and counterbalancing means connected with the door through said connected means and arranged to operate on the door through said means during the vertical door movement only.

16. A door arranged for vertical and lateral movement, means connected with the door for guiding the door laterally and

counterbalancing means connected with the door through said connected means and arranged to exert a lifting force on the door through said connected means during a portion only of the door opening movement.

17. A door arranged for vertical and lateral movement, means connected and movable with the door for guiding the door laterally and counterbalancing means connected with the door through said connected means and arranged to exert a lifting force on the door through said connected means during the portion of the door movement when the top of the door has a vertical component of movement.

18. A door arranged for vertical and lateral movement, means connected and movable with the door for guiding the door laterally and counterbalancing means connected with the door through said connected means and arranged to exert a lifting force on the door through said connected means during the portion of the door movement when the top of the door has a vertical component of movement, and stationary means engaging the upper part of the door for guiding that part of the door during the part of the movement of the door when the top of the door has a vertical component of movement.

19. A door arranged for vertical and lateral movement, a sheave mounted above the path of travel of the door, a counterweight, a cable connecting the counterweight

and door and passing over said sheave and means including an inclined socket and a member carried by the cable between the sheave and door for limiting the upward movement of a portion of the cable at a predetermined point in the door opening movement.

20. A door arranged to move vertically and laterally, a counterweight, a connection between the counterweight and a point intermediate the upper and lower edges of the door arranged to transmit movement of the door to the counterweight and means for arresting the movement of the connection after the door has made a predetermined part of its movement and so holding said connection as to cause it to act as a supporting link for the door during a continuance of the door movement.

21. A door comprising upper and lower sections arranged to move together vertically and laterally, a counterbalancing mechanism comprising a counterweight, a connection between the counterweight and the upper door section arranged to produce an upward pull on the upper door section, and means for arresting the movement of said connection at a predetermined part of the movement of the two door sections.

In witness whereof, I have hereunto set my hand this 7th day of September, 1922.

CHARLES C. TOMKINSON.