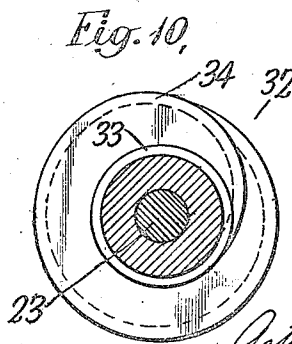
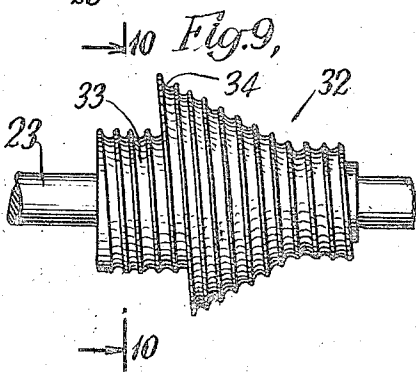
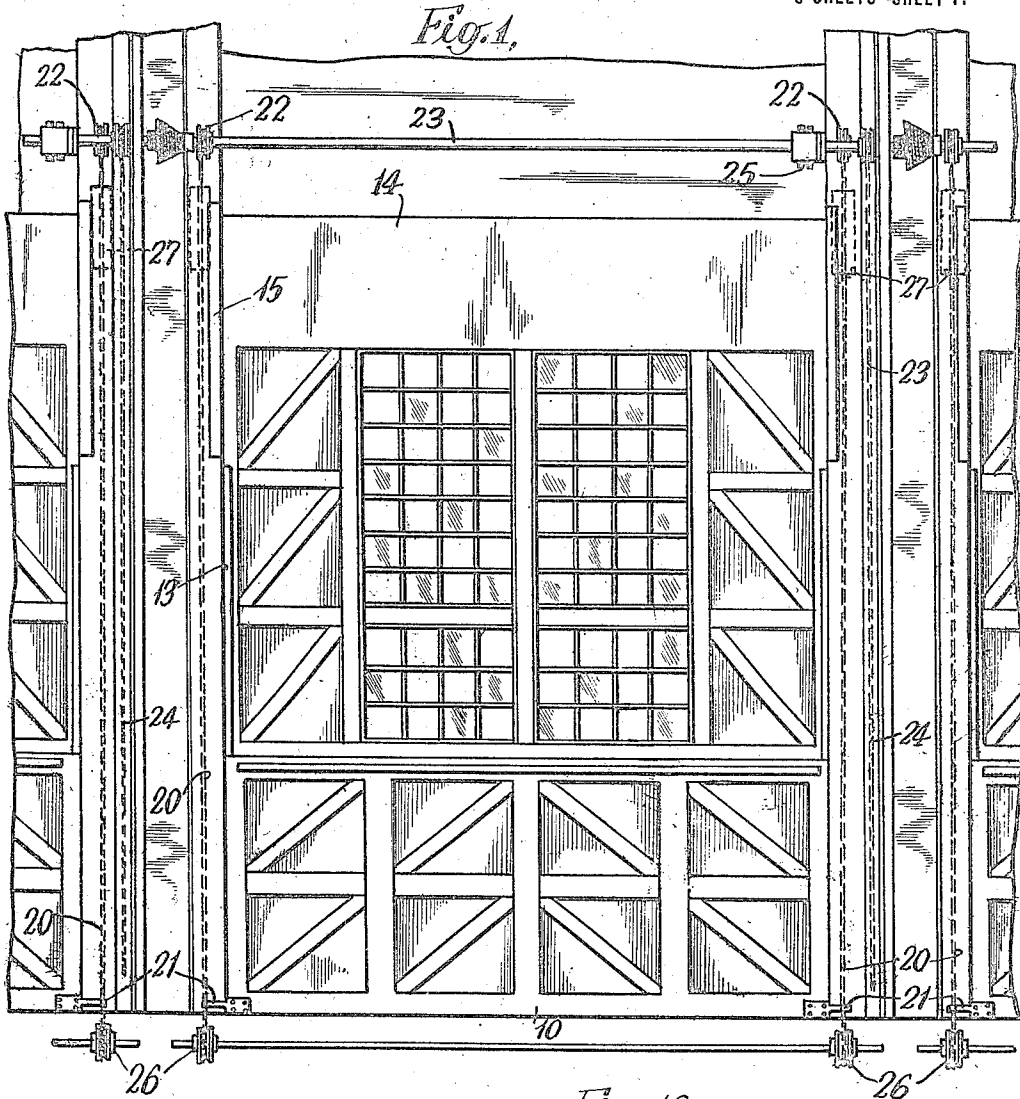


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VARIABLE COUNTERWEIGHTED DOOR.
APPLICATION FILED DEC. 15, 1915.

1,183,402.

Patented May 16, 1916.

3 SHEETS—SHEET 1.

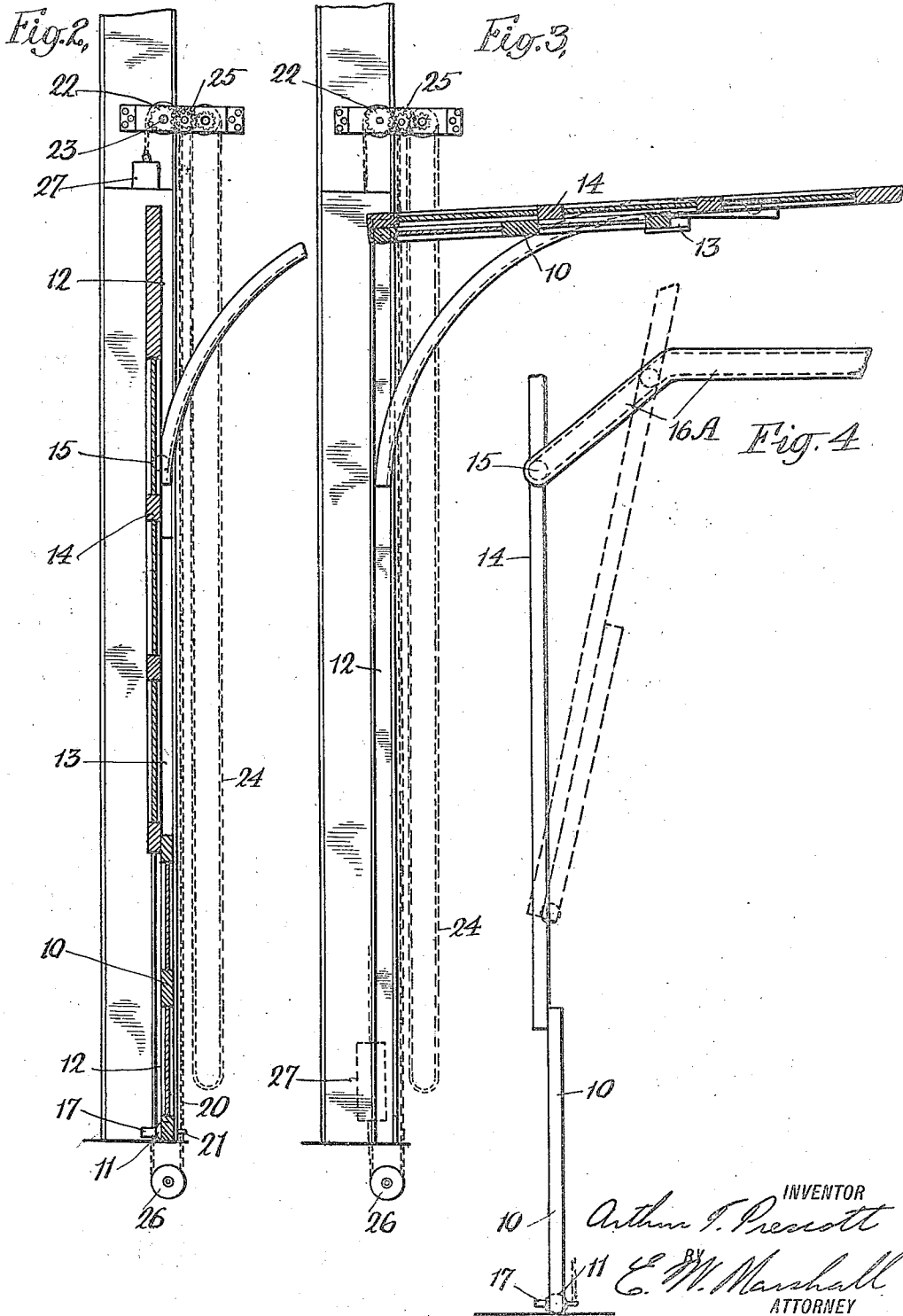


INVENTOR
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BY
E. M. Marshall
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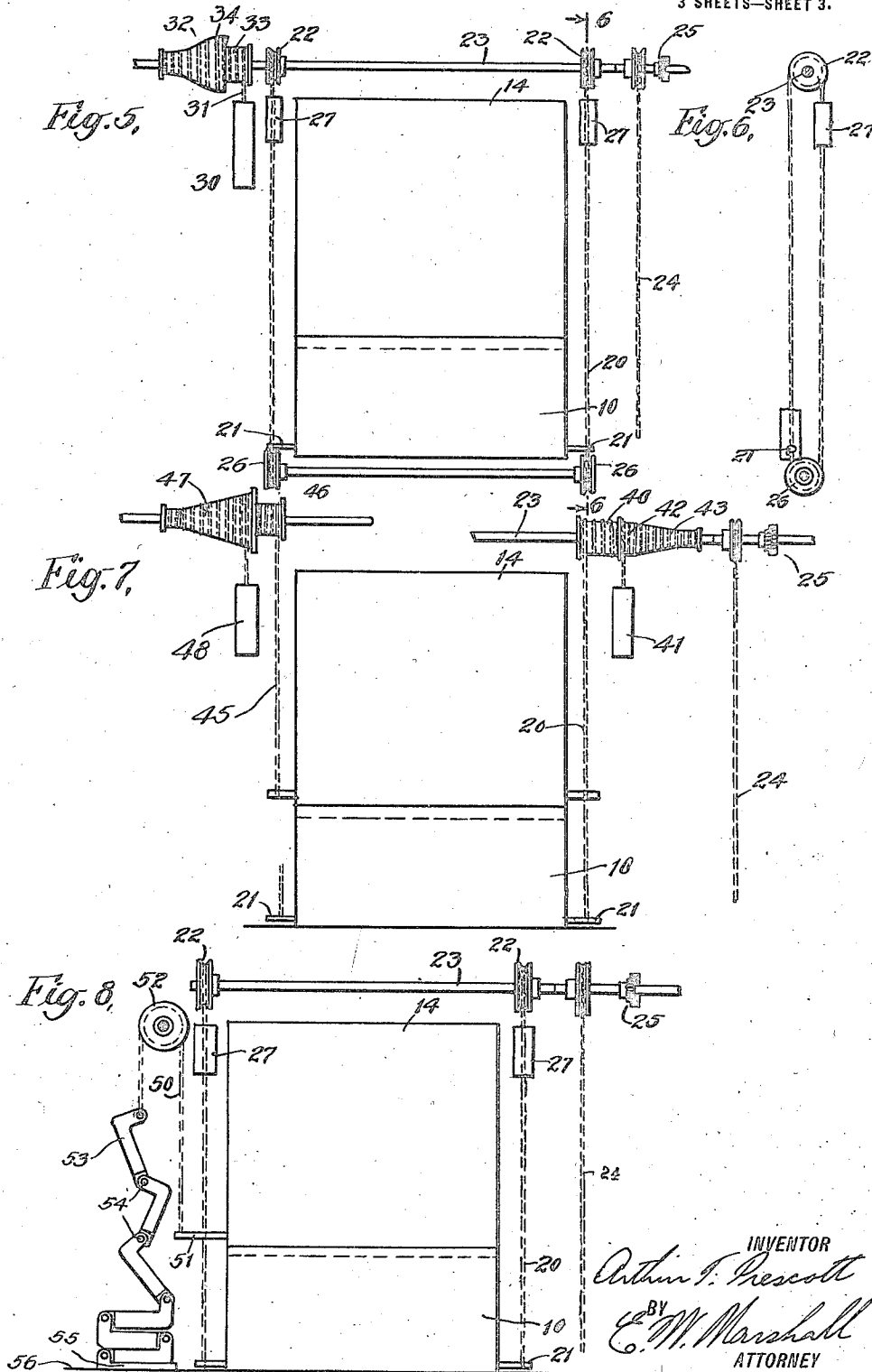
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UNITED STATES PATENT OFFICE.

ARTHUR T. PRESCOTT, OF EAST ORANGE, NEW JERSEY, ASSIGNOR TO GEORGE H. FROTHINGHAM COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

VARIABLE-COUNTERWEIGHTED DOOR.

1,183,402.

Specification of Letters Patent.

Patented May 16, 1916.

Application filed December 15, 1915. Serial No. 66,904.

To all whom it may concern:

Be it known that I, ARTHUR T. PRESCOTT, a citizen of the United States of America, and a resident of East Orange, Essex county, and State of New Jersey, have invented certain new and useful Improvements in Variable-Counterweighted Doors, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

My invention relates to improvements in doors of the type which are used to close large openings such as are on pier sheds, warehouses, and the like, and its object is to provide a simple, reliable and inexpensive means for effectively counterbalancing such doors and thus making them more easily operated and safer in use. This has always been a serious problem with doors of certain otherwise desirable types, because of the fact that the load to be counterbalanced varies materially and irregularly during their operation, and the fact that these doors are often massive has aggravated the difficulties to be overcome.

To overcome these difficulties especially as found in multiple section doors, is another purpose of this invention.

These and other objects of the invention will appear in the following specification, in which I will describe the invention, the novel features of which will be set forth in appended claims.

Referring to the drawings: Figure 1 is an elevation of a door of one of the types to which this invention is applicable, together with my novel counterweighting arrangement embodied therewith. Fig. 2 is a sectional side elevation of the door shown in Fig. 1, showing the door in its closed position, and Fig. 3 is a similar view of the same parts with the door open. Fig. 4 is an end elevation showing diagrammatically another of the many types of doors to which this invention may be applied. Fig. 5 is an elevation which diagrammatically shows such a door as is illustrated in the preceding figures, together with a counterweighting arrangement which embodies my invention. Fig. 6 is a sectional end elevation of a part of the mechanism shown in Fig. 5, the section being taken on the line 6-6 of the latter figure. Fig. 7 is a view similar to Fig. 5 and illustrates a modified construc-

tion which also embodies my invention. Fig. 8 is a similar view illustrating a still further modification of the invention. Figs. 9 and 10 are respectively an elevation and a sectional end view of a counterweight drum which is a detail of a construction used in the mechanism which is illustrated diagrammatically in Fig. 5.

Like characters of reference are designated by the same reference numerals in each of the figures.

10 designates the lower section of a door, the lower corners of which are guided to have a vertical movement equal to the height of the door opening. This may be accomplished by providing rollers 11 at the lower corners of this door section and vertical tracks 12 for the rollers to run in. This lower section is arranged to be moved up in guides 13 on the edges of an upper door section 14 on the edges of which are pivoted rollers 15 which are guided to run in a curved track such as 16 in Figs. 2 and 3, or in a track such as 16A in Fig. 4, with two connected straight portions one of which is inclined in relation to the other. Such doors are lifted by means of chains 20 attached to the lower corners of the lower door section at 21, which chains run over pocket sheaves 22 affixed to a shaft 23 which is arranged to be rotated by a hand chain 24 through suitable gearing 25. The chain 20 may be an endless chain running under a pulley 26 on a fixed pivot, and may carry a counterweight 27. It is obvious that the combined weights of the two counterweights 27 cannot be greater than the weight of the lower door section 10 or the latter will not remain closed.

I prefer to provide another counterweight 30 suspended from a chain 31 which is wound upon a drum 32 affixed to shaft 23. A portion 33 of this drum is cylindrical and the amount of chain 31 which is wound upon this portion corresponds in length with the length of the first movement of the lower door section 10 in opening the door. This first movement of the lower door section is that which occurs in moving it up back of door section 14 in guides 13. When the limit of this first movement has been reached, a shoulder 17 projecting from the lower edge of the lower door section 10 will engage the lower edge of the upper door

section 14 after which a further lift of the lower door section will carry the upper door section with it.

As the upper door section may be very much heavier than the lower door section, a greater effective counterweight is now needed. The drum 32 is so constructed that at the time the two door sections begin to move together, the chain 31 will reach a part 34 of the drum of greater diameter. This will increase the radius of leverage of the counterweight 30 on shaft 23 and effectively counterbalance the combined weights of the two door sections. From then on the lift of the door sections will cause the rollers 15 to run out on tracks 16 and to swing the door sections back until they gradually assume a horizontal position, as shown in Fig. 3. It is to be noted that more and more of the weight of the door becomes sustained by the tracks 16 during this part of the operation, so that there is a gradually decreasing amount of this weight that needs to be counterweighted. Consequently the diameter of the drum is gradually reduced as the chain is unwound from it spirally, to decrease gradually the counterweighting effect.

In closing the door the operation is reversed and so is the cycle of the counterweighting effect.

In connection with Figs. 5 and 6, attention may be called to the fact that if the hoisting chains 20 are made endless and run under pulleys 26, they need carry no counterweights 27 but that if counterweights 27 are used the counterweight 30 may be a lighter one. It may also be noted that if the counterweights 27 are sufficiently heavy to hold the chains 20 in engagement with the pocket sheaves 22, they need not be endless but may terminate at the points 21 and at the top of the counterweights 27. Such an arrangement is shown in Fig. 8.

In Fig. 7 the hoisting chains 20 are each arranged to be wound up on a portion 40 of a drum on shaft 23, and each of the chains from counterweights 41 is simultaneously unwound from another part 42 of the same drum. If the part 40 is cylindrical, the part 42 upon which the first part of the chain is wound is also cylindrical, this part of the chain being the part which is unwound while the lower door section 10 is moved up on to the upper door section. The part 43 of the drum from which the chain 41 is unwound is in the form of a decreasing cone which decreases the effect of the counterweight on the door as a part of its weight becomes supported by track 16.

Other chains such as 44 are connected to the lower corners of the upper door section and each of these is arranged to be wound up on a drum 46 rotatably supported near the top of the door opening. A part 47 of this drum is conical and on this conical part

is wound a chain from the free end of which is suspended a counterweight 48. The parts 43 and 47 are not necessarily true cones but are preferably so proportioned as to make the effect of the counterweights properly proportioned to the variable weights of the doors which they are designed to support.

In the embodiment of the invention which is shown in Fig. 8, the hoisting chains 20 run over pocket sheaves 22 on shaft 23 to counterweights 27 as before, but the upper door section is counterbalanced by means of chains such as 50 affixed to their lower corners as at 51 running up over sheaves such as 52 and down to a series of L-shaped weights 53 which are pivoted together as at 54, the lower one of which is pivoted to a bracket 55 which is fastened to the floor 56. When this door is opened the counterweights 27 have a uniform effect throughout the whole movement of the door. When the door section 14 is picked up the weights 53 which counterbalance it are lowered and one by one become supported by the floor. In other words they have a decreasing effect upon the door sections as the latter are moved from their vertical to their horizontal position.

I have illustrated several mechanisms which embody my invention to show that it is not limited to any specific form or construction and I intend no limitations other than those imposed by the claims.

What I claim is:

1. In combination with a multiple section lift door adapted during a part of its movement to be swung out of a vertical plane and having means for sustaining a part of the weight of the door when it is out of its vertical position, hoisting means for said door, variable counterweighting means for the door, and mechanism connecting said counterweighting means with the door, said mechanism comprising means actuated by the movement of the door for increasing the effect of said counterweighting means upon the door as the number of its sections moved is increased and for decreasing the effect of said counterweighting means upon the door as a part of the weight thereof is taken up by said sustaining means.

2. In combination with a multiple section lift door adapted during a part of its opening movement to be swung out of a vertical plane and having means for sustaining a part of the weight of the door when it is out of its vertical position, hoisting means for said door comprising a rotary shaft, a drum on said shaft of varying diameters, a flexible element wound around said drum, and a counterweight suspended from the free end of said flexible element, the diameters of said drum varying in relation to the different parts of the movement of the door to vary the effect of the counterweight on the

door to have its maximum effect during an intermediate part of the movement of the door and a gradually decreasing effect during the remainder of the movement of the door.

3. In combination with a multiple section lift door adapted during a part of its opening movement to be swung out of a vertical plane and having means for sustaining a part of the weight of the door when it is out of its vertical position, hoisting means for said door comprising a rotary shaft, a drum on said shaft, a flexible element wound around said drum, and a counterweight suspended from the free end of said flexible element, a portion of said drum being cylindrical, an adjacent portion thereof having a larger diameter than that of the cylindrical portion and the remainder of said drum being of cone-like form.

4. In combination with a lift door adapted during a part of its opening movement to be swung out of a vertical plane and having means for sustaining a part of the weight of the door when it is out of its vertical position, and hoisting means for said door; of counterweighting means for the door, and a mechanism connecting said counterweighting means with the door, said mechanism comprising means actuated by the movement of the door for irregularly varying the effect of said counterweighting means upon the door during different parts of the movement of the door.

5. In combination with a lift door adapted during a part of its opening movement to be swung out of a vertical plane and having means for sustaining a part of the weight of the door when it is out of its ver-

tical position, and hoisting means for said door; of counterweighting means for the door, and a mechanism connecting said counterweighting means with the door, said mechanism comprising means actuated by the movement of the door for irregularly varying the effect of said counterweighting means upon the door during different parts of the movement of the door to have its maximum effect during an intermediate part of the movement of the door and a gradually decreasing effect during the remainder of the movement of the door.

6. In combination with a two-section lift door adapted during a part of its opening movement to be swung out of a vertical plane and having means for sustaining a part of the weight of the door when it is out of its vertical position, and hoisting means for said door comprising a rotary shaft, lifting chains connecting the lower door section with said shaft, a chain drum on said shaft having a helical groove therein, a chain wound around said drum when the door is closed, and a counterweight suspended from the free end of said chain, the portion of said drum from which the counterweight chain is unwound during the independent movement of the lower door section being cylindrical, an adjacent portion of larger diameter corresponding to the part of the door movement during which the upper door section begins to move, and a cone-shaped portion decreasing to a diameter less than that of the cylindrical portion.

In witness whereof, I have hereunto set my hand this 14th day of December, 1915.

ARTHUR T. PRESCOTT.