

May 12, 1925.

1,537,300

E. P. HAINES

COUNTERBALANCING MECHANISM FOR SECTIONAL DOORS

Filed June 9, 1921

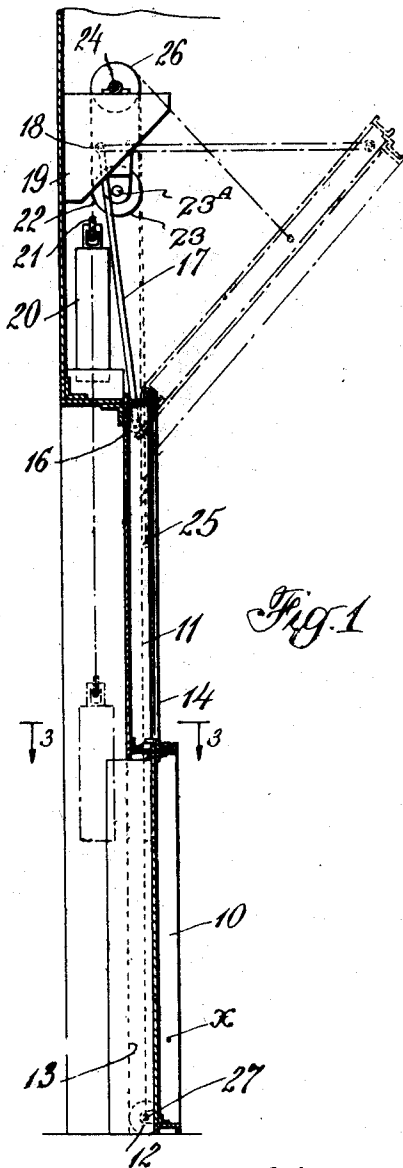


Fig. 1

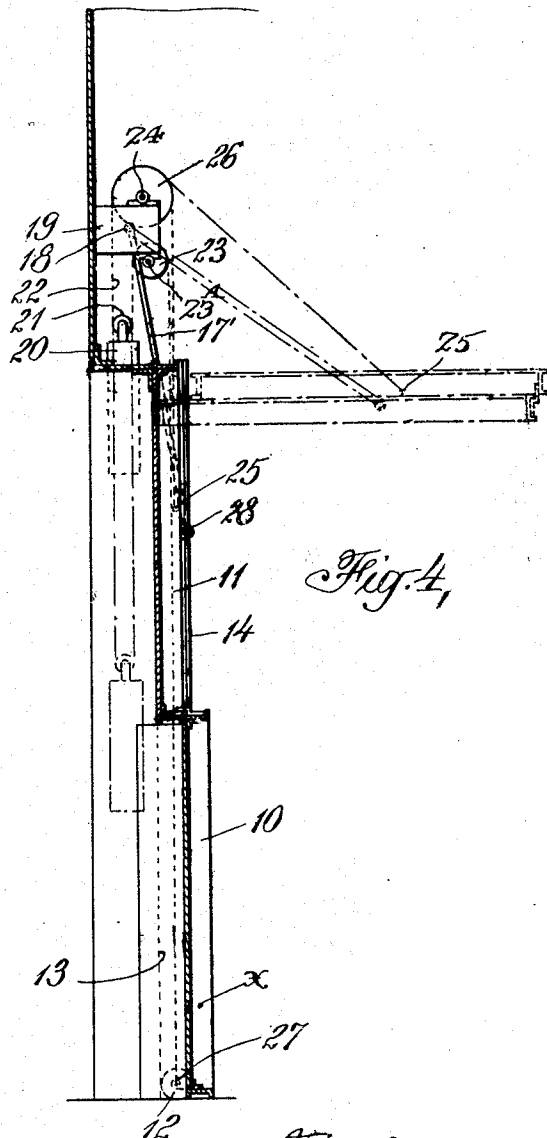


Fig. 4

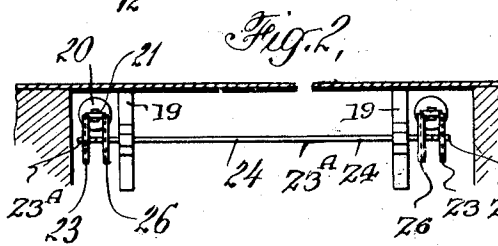


Fig. 2

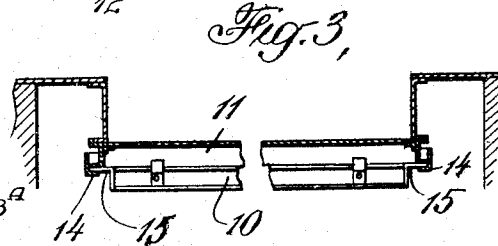


Fig. 3

Inventor

Edward P. Haines

By his Attorney

Cornelius S. Chet

Patented May 12, 1925.

1,537,300

UNITED STATES PATENT OFFICE.

EDWARD P. HAINES, OF MOUNT AIRY, PENNSYLVANIA, ASSIGNOR TO THE PATENT APPLIANCE COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW JERSEY.

COUNTERBALANCING MECHANISM FOR SECTIONAL DOORS.

Application filed June 9, 1921. Serial No. 476,243.

To all whom it may concern:

Be it known that I, EDWARD P. HAINES, a citizen of the United States, and a resident of Mount Airy, county of Philadelphia, and State of Pennsylvania, have invented certain new and useful Improvements in Counterbalancing Mechanism for Sectional Doors, of which the following is a specification.

This invention relates to improvements in counterbalancing mechanism for door structures such as those in common use for closing large door openings found in pier sheds, warehouses and the like. Doors of this character usually comprise a plurality of door sections which in opening are moved vertically and then laterally to an inclined or horizontal position. By swinging the sections to such an inclined position head room in the warehouses or pier sheds is conserved and as all space in such places is very valuable such a conservation of room is very important.

One of the objects of my invention is to provide counterbalancing means for doors of the type described, so constructed and arranged as to maintain substantially perfect balance during all portions of the cycle of movement of the door sections.

Another object of the invention is to provide counterbalancing means that is simple and comprises few parts and will operate efficiently to perform the desired functions.

The objects of the invention are attained in the embodiments of the invention hereinafter described by providing an arrangement for guiding the door sections as they move vertically, and mechanism such as links for swinging the sections laterally through a predetermined part of their cycle of movement, and furthermore by so connecting a single counterbalancing weight to the door sections that the door will be practically perfectly balanced during the independent movement of its sections and during the movement of its sections in unison.

Referring to the drawings—

Fig. 1 is a sectional end elevation of a plurality of door sections having counterbalancing means connected thereto in accordance with my invention, the sections being shown in closed position in full lines and in open or inclined position in dotted lines.

Fig. 2 is a plan view of the construction shown in Fig. 1.

Fig. 3 is a sectional plan view showing the guiding means for the door sections, the section being taken on the line 3—3 of Fig. 1, and

Fig. 4 is an end elevation similar to Fig. 1, but illustrating a link mechanism connected to the door sections in a manner to cause them to be swung to horizontal position instead of to the inclined position shown in Fig. 1.

Like characters of reference designate corresponding parts throughout all the figures of the drawings.

In the drawings and particularly in Figs. 1-3 inclusive, I have shown a door comprising a lower section 10 and an upper section 11, the lower section being guided in its vertical movement by the engagement of rollers 12 carried by the lateral edges thereof with vertical tracks 13 and the lower section being further guided by means of flanges 14, carried by the upper section and overlapping laterally extending edges 15 of the lower section 10. Brackets 16 are secured to the upper edge of section 10 and are adapted to engage the upper frame member of section 11 when the section 10 overlies the section 11. The upper section 11 has pivoted thereon adjacent the upper ends of its lateral edges, as shown at 16, links 17. The opposite ends of these links are pivoted as shown at 18 to fixed brackets 19.

The counterbalancing means for the door sections comprises a single weight 20 which is connected to a sheave 21 under which passes a cable or rope 22. One portion of this cable 22 passes around a sheave 26 loosely mounted on a shaft 24 and is connected as shown at 25 to the upper door section 11 intermediate the upper and lower edges thereof. The opposite end of the cable or rope 22 passes over a sheave 23 which may be affixed to a shaft 23^A below shaft 24 and from this sheave passes downwardly and is connected as shown at 27 to the lower door section 10 adjacent the lower edge thereof.

The location of the points of connection 25 and 27 of the ends of the cable 22 to the door sections 10 and 11 respectively and the space between sheaves 23^A and 26 may be varied as desired and the location of these points determines largely the counterbalancing effect of the weight 20. For instance, the degree of perfection of balancing may be varied by changing the location of the

point 25 on the door section 11 with respect to the center of gravity and in the illustration of the structure in Fig. 1 this point is somewhat above the center of gravity. If
 5 desired also the point of connection 27 between the cable and the lower section 10 may be varied and this cable may be connected to the door at any suitable higher point as for instance, the point X shown in
 10 Fig. 1.

The construction shown in Figs. 1-3 inclusive operates as follows. When the doors are in their lowermost or closed positions as shown in full lines in Fig. 1, they may
 15 be opened by applying force to the shaft 23^A in any suitable manner whereupon the sheave 23 will be rotated. This rotation will cause the lower door section 10 to rise vertically until this section overlies the section
 20 11. When this point has been reached, further vertical movement of the lower edge of the lower door section will cause brackets 10' to engage the upper door section to move with it and the links 17 will swing the sections 10 and 11 in unison laterally to the
 25 inclined position shown in dotted lines in Fig. 1.

It will be evident that as one end of the cable 22 remains stationary during the lifting of the lower door section 10 the counterbalancing weight 20 will travel only half as
 30 fast as the door section. However, when the door sections begin to move in unison the counterweight will move downwardly as fast as the points of connection 25 and 27 rise and so the balancing effect of the weight will be doubled at the moment the lifted weight of the door sections is doubled. Consequently the counterweight 20 may have
 35 a weight approximately equal that of both door sections.

It is important to note that the counterbalancing effect of the weight may be very materially changed by changing the point
 45 of attachment of cable 22 to door section 11. By fixing this point above the lower edge of the door section, it will move laterally as the door is tilted and thus the vertical component of its movement will be decreased and will be less than the vertical
 50 movement of the lower edge of the door. By raising the point of attachment of the rope or cable 22 to door section 10 to the point X, for example, this point will also move laterally as the door is tilted and will decrease
 55 the vertical component of its movement. Therefore, by varying these points the counterbalancing action may be modified. The counterbalancing effect will be varied also by changing the relative vertical
 60 positions of the shafts 23^A and 24.

In Fig. 4 there is illustrated a door construction similar to that shown in Fig. 1. In this instance the links 17', pivoted at
 65 18 to the bracket 19, are connected to brackets

28 secured to the edges of the upper door section 11 approximately midway between the upper and lower edge thereof so that the door sections may be moved to a substantially horizontal position as shown in
 70 dotted lines in Fig. 4. In this case the sheaves 23 and 26 are spaced vertically, the sheave 23 being preferably fixed on a shaft 23^A as in the other construction and being driven in any suitable manner. By vertical-
 75 ly spacing the sheaves 23 and 26, it will be evident that the vertical and horizontal components of the forces acting on the door sections will be changed and if desired or necessary the points of attachment 25 and
 80 27 of the two ends of the cable 22 may be varied to take care of the different force components. In this case as in the former, the counterweight 20 is connected to a sheave 21 under which runs a cable or rope
 85 22 which is led over the sheaves 23 and 26 mounted in stationary bearings in the bracket 19. The portion of the cable 22 which runs over the sheave 23 is carried down to a point 27 near or above the lower
 90 end of the lower door section and the portion of the cable which runs over the sheave 26 is carried to a predetermined point 25 on the upper door section such as that shown between the link pivot on bracket 28 and
 95 the upper edge of the door section.

This construction shown in Fig. 4 operates in a manner similar to that outlined in connection with the former structure. The lower section 10 first moves vertically
 100 until it overlies the upper section 11 whereupon the two sections will be swung laterally in unison on the links 17' to the dotted line position.

In the showings of both forms of the construction the hoisting mechanism for the
 105 doors has been omitted but it will be understood that any suitable form of hoisting mechanism may be utilized and in both embodiments the sheave 23 is preferably positively
 110 driven.

From the foregoing description it will be seen that means has been provided for effecting a substantially perfect counterbalance for sectional doors in all positions of
 115 the movement thereof.

Although certain specific embodiments of the invention have been illustrated and described I do not intend to be limited to the particular structure shown and it should be
 120 understood that further changes in the construction and the arrangement of the various cooperating parts may be made without departing from the spirit or scope of the invention as set forth in the following
 125 claims.

What I claim is:

1. A door with horizontally opposite parts arranged to move vertically, and supporting means engaging the side edges of the door
 130

at points materially below its upper edge, arranged to swing the door as its vertically movable parts are raised, combined with a pair of counterweights, a sheave on each counterweight, a pair of vertically spaced stationary sheaves above the path of travel of each counterweight, and a counterweight rope running under each counterweight sheave, over the stationary sheaves, and attached to spaced points on the edges of the door.

2. A door with horizontally opposite parts thereof arranged to move vertically, and supporting links engaging the side edges of the door arranged to swing the door as its vertically movable parts are raised, combined with a pair of counterweights, a sheave on each counterweight, a pair of vertically spaced stationary sheaves above the path of travel of each counterweight, and a counterweight rope running under each counterweight sheave, over the stationary sheaves, and attached to spaced points on the edges of the door.

3. A door comprising a plurality of door sections slidably connected, with horizontally opposite parts of one of the door sections arranged to move vertically and supporting means engaging another of the door sections at points materially below its upper edge, arranged to swing the door sections, combined with a counterweight, a sheave on the counterweight, a pair of vertically spaced stationary sheaves above the path of travel of the counterweight, and a counterweight rope running under the counterweight sheave, over the stationary sheaves, and attached to different door sections.

4. A door comprising a plurality of door sections slidably connected, with horizontally opposite parts of one of the door sections arranged to move vertically and supporting means engaging another of the door sections at points materially below its upper edge, arranged to swing the door sections, combined with a counterweight, a sheave on the counterweight, a pair of vertically spaced stationary sheaves above the path of travel of the counterweight sheave and a counterweight rope running under the counterweight sheave over the stationary sheaves, and attached to different door sections at spaced points thereon, at least one of said points of connection being vertically removed from the part of one of the door sections movable in a vertical plane.

5. A door comprising a plurality of door sections slidably connected with horizontally opposite parts of the lower door section arranged to move vertically, and supporting means engaging the upper door section at points materially below its upper edge, arranged to swing the door sections, combined with a counterweight, a sheave on the counterweight, a pair of vertically

spaced stationary sheaves above the path of travel of the counterweight, and a counterweight rope running under the counterweight sheave, over the stationary sheaves, and attached to different door sections, at least one of said points of connection being vertically removed from the part of one of the door sections movable in a vertical plane.

6. A door comprising a plurality of door sections slidably connected with horizontally opposite parts of the lower door section arranged to move vertically, and supporting links engaging the side edges of the upper door section arranged to swing the door sections, combined with a pair of counterweights, a sheave on each counterweight, a pair of vertically spaced stationary sheaves above the path of travel of each counterweight, and a counterweight rope running under each counterweight sheave, over the stationary sheaves, and attached to different door sections at vertically spaced points thereon.

7. A door comprising a plurality of door sections slidably connected with horizontally opposite parts of the lower door section arranged to move vertically, and supporting links engaging the side edges of the upper door section arranged to swing the door sections, combined with a pair of counterweights, a sheave on each counterweight, a pair of vertically spaced stationary sheaves above the path of travel of each counterweight, and a counterweight rope running under each counterweight sheave, over the stationary sheaves, and attached to different door sections at spaced points thereon, at least one of said points of connection being vertically removed from the part of one of the door sections movable in a vertical plane.

8. A door comprising a plurality of door sections slidably connected, with horizontally opposite parts of one of the door sections arranged to move vertically, and links supported at stationary points near the upper corners of the upper door section and connected with the side edges of one of the door sections arranged to swing the door sections, combined with a pair of counterweights, a sheave on each counterweight, a pair of vertically spaced stationary sheaves above the path of travel of each counterweight, and a counterweight rope running under each counterweight sheave, over the stationary sheaves, and attached to different door sections at vertically spaced points thereon when the door sections overlap one another.

9. A door comprising a plurality of door sections slidably connected, with horizontally opposite parts of one of the door sections arranged to move vertically, and links supported at stationary points above the upper corners of the upper door section and

connected with the side edges of one of the door sections arranged to swing the door sections, combined with a pair of counterweights, a sheave on each counterweight, a pair of vertically spaced stationary sheaves above the path of travel of each counterweight, and a counterweight rope running under each counterweight sheave, over the stationary sheaves, and attached to different door sections, at least one of said points of connection being vertically removed from the part of one of the door sections movable in a vertical plane.

10. A door comprising a plurality of door sections slidably connected, vertical guides, means near the lower corners of the lower door section engaging said guides, and links pivoted at stationary points near the upper corners of the upper door section and to the side edges of the upper door section above the guided part of the lower door section when the door sections overlie one another, combined with a pair of counterweights, a sheave on each counterweight, a pair of vertically spaced stationary sheaves above the path of travel of each counterweight, and a counterweight rope running under each

counterweight sheave, over the stationary sheaves, and attached to different door sections at vertically spaced points thereon. 30

11. A door comprising a plurality of door sections slidably connected, vertical guides, means near the lower corners of the lower door section engaging said guides, and links pivoted at stationary points above the upper corners of the upper door section and to the side edges of the upper door section above the guided part of the lower door section when the door sections overlie one another, combined with a pair of counterweights, a sheave on each counterweight, a pair of vertically spaced stationary sheaves above the travel of each counterweight, and a counterweight rope running under each counterweight sheave, over the stationary sheaves, and attached to different door sections at spaced points thereon, at least one of said points of connection being removed from the vertically guided part of the lower door section. 40 45 50

In witness whereof, I have hereunto set my hand this 7th day of June, 1921.

EDWARD P. HAINES.