J. E. OGDEN AND J. B. HOWELL.

DOOR.

APPLICATION FILED MAY 10, 1916.

1,431,174. Patented Oct. 10, 1922.

2 SHEETS—SHEET 1.

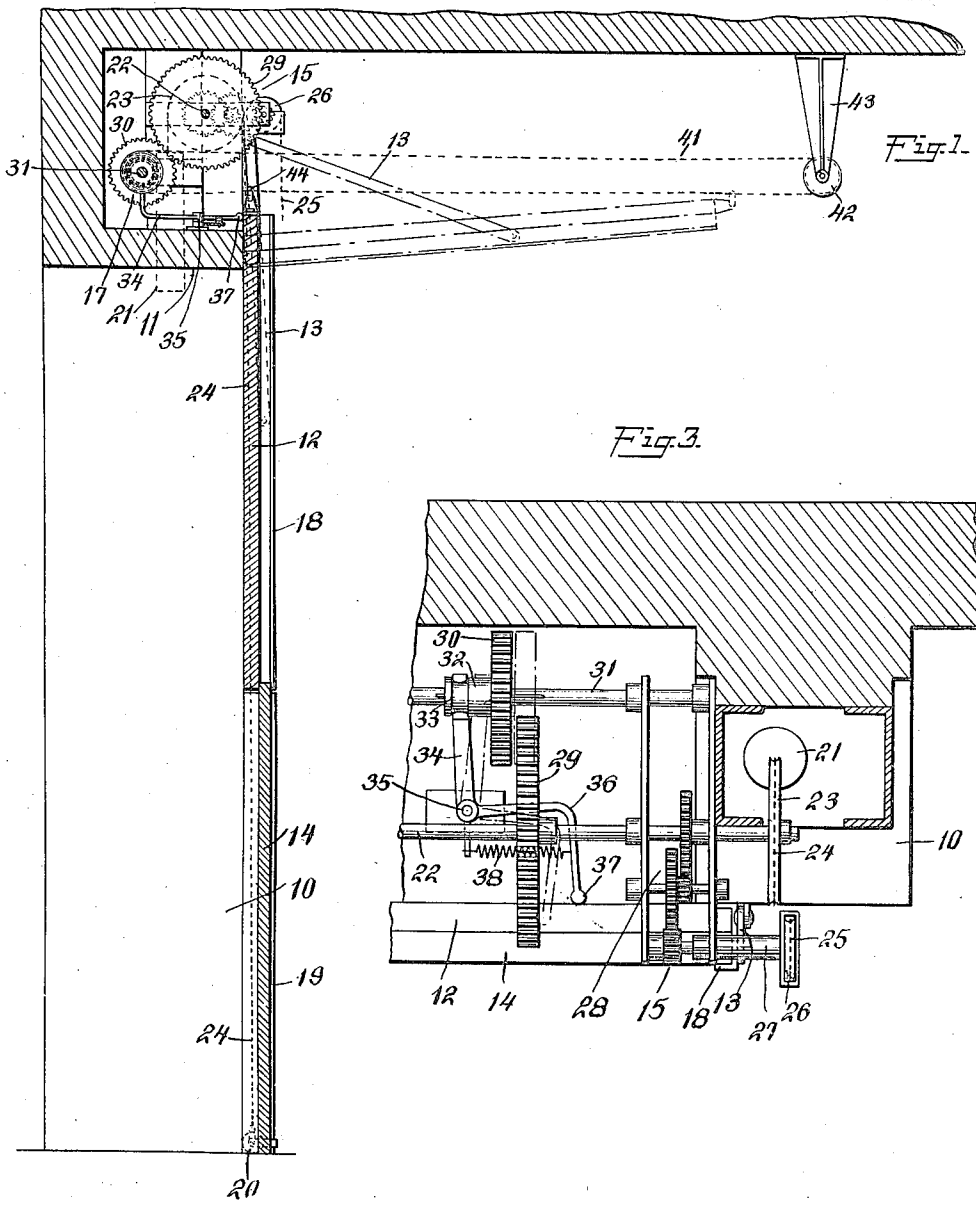


Fig. 1.

Fig. 3.

John Edward Ogden
& John B. Howell Inventors

By their Attorney

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2 SHEETS—SHEET 2.

Fig. 2.

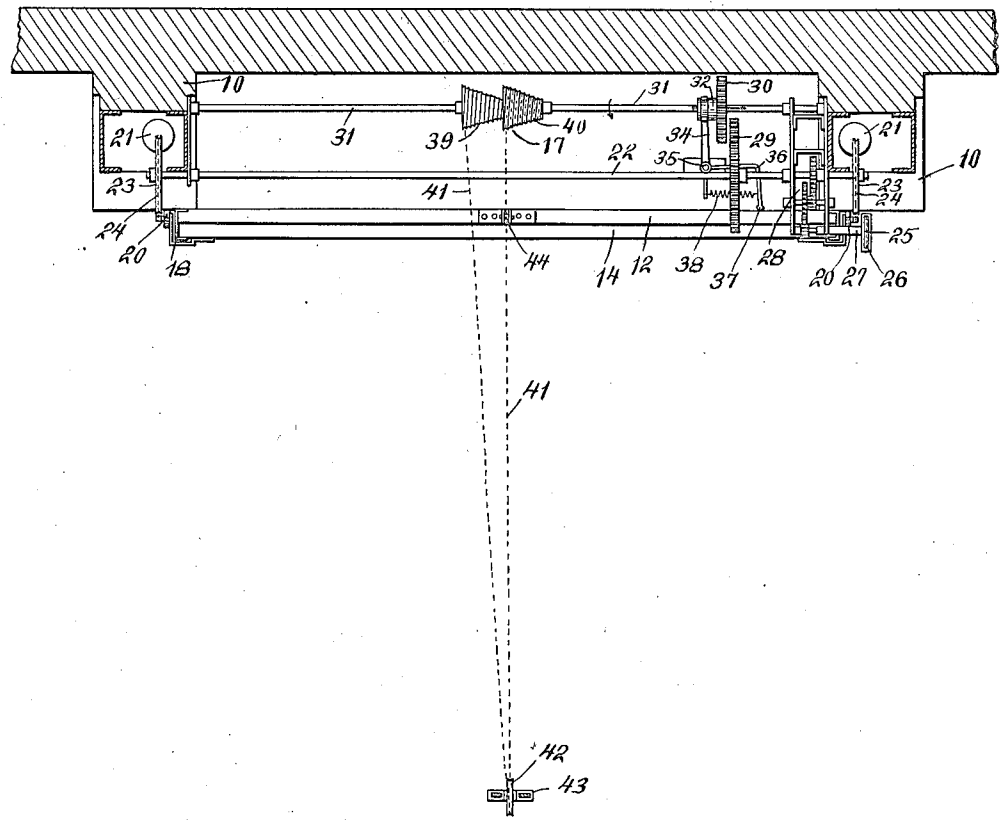
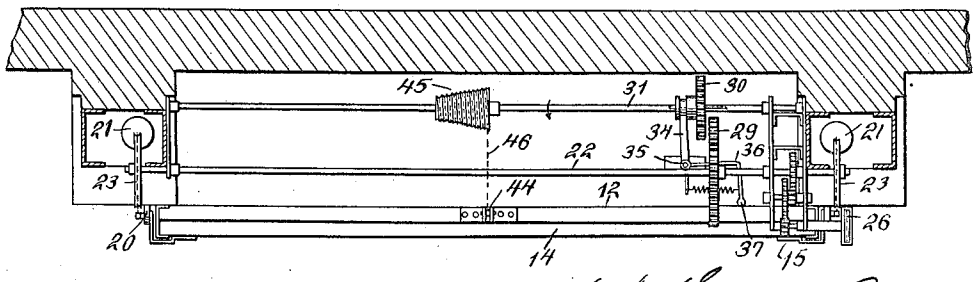


Fig. 4.



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Patented Oct. 10, 1922. 1,431,174

UNITED STATES PATENT OFFICE.

JOHN EDWARD OGDEN, OF MOUNTAINVILLE, AND JOHN B. HOWELL, OF NEW YORK, N. Y.; SAID HOWELL ASSIGNOR TO SAID OGDEN.

DOOR.

Application filed May 10, 1916. Serial No. 96,477.

To all whom it may concern:

Be it known that we, JOHN EDWARD OGDEN, a citizen of the United States, and a resident of Mountainville, county of Orange, and State of New York, and JOHN. B. HOWELL, a citizen of the United States, and a resident of New York, city, county, and State of New York, 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.

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

One object of our invention is to provide an improved door of the aforesaid class having two or more sections, hereinafter referred to as a multi-section door, which is opened by first elevating one of the lower sections upon the section above and then swinging the overlapping sections away from the plane of the door opening at the top.

A further object is to provide simple and improved means for exerting not only a lifting or hoisting force substantially in the plane of the door opening, but also a force in a plane at an angle to the door opening acting upon the top of the door to swing it from and back to its closed position.

Other objects and advantages of our invention will be set forth hereinafter, and in order that our invention may be thoroughly understood we 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 a transverse sectional elevation of a two-section door arranged and constructed in accordance with our invention and equipped with an actuating mechanism which constitutes an embodiment thereof.

Figure 2 is a sectional plan view of the door and its actuating mechanism, and

Figure 3 is a view corresponding to one end of Figure 2 showing the hoisting and clutch mechanisms drawn to a larger scale.

Figure 4 is a view corresponding to Figure 2, of a modified arrangement which also embodies my invention.

Still other modifications are shown in Figures 5 and 6 which correspond to Figures 2 and 4.

Referring to Figures 1 to 3 inclusive,—10 designates one of the door posts, 11 the lintel of the doorway, 12 the upper door section which is pivotally suspended by links 13, a bottom section 14, a hoisting mechanism 15, and a compensating or fusee pulley mechanism 17.

The upper section 12 has guideways 18 which are adapted to receive the lower section 14 as it is raised and overlaps the upper section.

Secured to the door posts 10 are stationary guideways 19 which hold the lower section in place when it is below the guideways 18 of the upper section. Rollers 20 are preferably mounted at the lower corners of the bottom section and cooperate with the door posts.

The hoisting mechanism comprises a pair of counterweights 21 which may conveniently be disposed in the door posts which are made hollow to receive them. The mechanism further comprises a head shaft 22 to which is secured near its opposite ends, a pair of pocket sheaves 23. Chains 24 are connected to the counterweights, extend over the pocket sheaves 23 and at their opposite ends are secured to the bottom door section near its lower corners. A hand chain 25 is suspended from a sheave 26 on a countershaft 27 which is connected by a train of gearing 28 to the head shaft 22, the arrangement of parts being such that when the hand chain is actuated in one direction or the other, it turns the head shaft in a well known manner to raise or lower the door.

Mounted on the head shaft is a gear wheel 29 which is adapted to mesh with a sliding gear 30 on a shaft 31 which is substantially parallel to the head shaft and carries the compensating or double fusee pulley.

The gear wheel 30 is splined or otherwise mounted to slide on the shaft 31, and is adapted to drive the shaft when in mesh with the gear wheel 29. It has a hub 32 which is provided with an annular slot or groove 33, as clearly shown in Figure 3. An actuating lever 34 is pivotally mounted at 35 and has a bifurcated arm which engages the groove 33 on opposite sides of the shaft 31. The opposite end of the lever is preferably bent at right angles as indicated at 36 and

terminates in a spherical or rounded end 37. A spring 38 exerts a pull on the lever, tending to throw the gear wheel 30 into mesh with the gear wheel 29, but the parts are so arranged that when the upper door section is closed against the casing it engages the spherical end 37 of the lever and holds the lever in opposition to the spring 38 in position to release the gear wheel 30 from the gear wheel 29, as shown in full lines in Figure 3.

The fusee pulley 17 comprises a pair of frusto-conical sections 39 and 40 on which the respective ends of a chain or cable 41 are wound. The chain extends over a stationary sheave 42 which is located at a material distance from the plane of the door opening and is supported by a hanger 43. The chain 41 is connected at a point 44 to the top of the upper door section 12. These parts are so arranged that when the shaft 31 is driven in one direction or the other, one chain or cable 41 is unwound from one frusto-conical pulley section and is gathered in on the other.

The operation of this door is as follows: Assuming that the door is closed as shown in the drawings, the gear wheel 30 being out of mesh with the gear wheel 29, if the hand chain 25 is actuated in one direction, the lower door section 14 is hoisted and overlaps the upper section 12. This independent movement of the lower section is limited in any suitable manner so that the two doors are obliged to move together after they are overlapped.

Further upward movement of the hoisting chains will raise the lower edges of the door sections vertically and during this further upward movement of the lower edges, the other parts of the door sections will swing inwardly.

As soon as the top of the upper section swings inwardly away from the door casing, the lever 36 is released and the spring 38 moves the gears 29 and 30 into mesh. A connection is now established from the head shaft 22 which is driven in response to the hand chain, to the shaft 31 on which the double fusee pulley is mounted. As the actuation of the hand chain is continued, the chain 41 exerts an inward puh on the top of the door tending to move it inwardly and thus assist in the opening of the door.

On the other hand, when the hand chain is operated in the reverse direction, the chain 41 pulls back on the top of the door and the head shaft 22 is so turned as to move the counterweights and close the door. This action continues until the upper section again engages the door casing and forces the lever 36 inwardly whereupon the gear 30 is again released from the gear 29 and the shaft 31 allowed to remain at rest. A continued actuation of the hand chain in the same direction serves to further raise the counterweights and permit the bottom section to descend to its closed position.

In Figure 4, we have shown a modified structure which corresponds to that of the previous figures, except for the fusee pulley 17 and the guide sheave 42 is omitted, a chain 46 being attached at one end to the top of the upper door section and wound upon the sheave 45.

In operation there is of course no pull exerted upon the door tending to open it at the top but the chain 46 is paid out so that it does not retard the opening movement of the door. When the door is closed however, the pulley 45 gathers in the chain 46 and exerts a positive pull which materially assists in closing the door and pulling the upper section against the casing.

The shape of the pulley sections in both modifications is such as to compensate for the varying speed of movement of the top of the upper door section relative to the bottom of the same.

During the first part of the upward movement of the lower edge of this section the outward movement of its upper edge is at a greater rate than that of such upward movement, but this ratio gradually changes so that during the latter part of the upward movement of the lower edge the outward movement of the upper edge is at a lower rate than that of such upward movement.

As shown in Figure 2, the chain 41 is paid off from the part of the pulley section 40 of largest diameter and around upon a corresponding part of pulley section 39 during such first movement of the section and gradually reaches the parts of the pulley sections of smaller diameter during the opening movement of this upper door section.

What we claim is:

1. The combination with a door adapted to move upwardly in the plane of the door opening and then swing away from the door opening at the top, of hoisting means for the door, means for exerting forces tending to swing the door away from or toward the door opening, an operative connection between said means, and means dependent upon the position of the door for releasing said operative connection.

2. The combination with a door adapted to move upwardly in the plane of the door opening and then swing away from the door opening at the top, of hoisting means applied to the door at the bottom, means for exerting forces applied to the top of the door tending to swing it away from or toward the door opening, an operative connection between said means, and means, dependent upon the position of the door, for releasing said operative connection.

3. The combination with a multi-section door having an upper section pivotally suspended from above, a bottom section adapted to slide upwardly on the upper section and to swing with the upper section away from the door opening at the top, of hoisting means for the door, means tending to swing the top of the door away from or toward the opening, gearing for connecting the aforesaid means, and a clutch operating to release one of said means when the upper door section is in its closed position.

4. The combination with a multisection door having an upper section pivotally suspended from above, a bottom section adapted to slide upwardly on the upper section and to swing with the upper section away from the door opening at the top, of hoisting means connected to the bottom of the lower section and acting substantially in the plane of the door opening, means for exerting a pull at an angle to the plane of the door opening, tending to swing the top of the door away from or toward the opening, gearing for connecting the aforesaid means, and a clutch operating to release one of said means when the upper door section is in its closed position.

5. The combination with a multi-section door having an upper section pivotally suspended from above and a bottom section adapted to slide upwardly on the upper section and to swing with the upper section away from the door opening at the top, of hoisting means for the door, means for exerting forces to swing the door away from or toward the door opening, an operative connection between said means and means dependent upon the position of the door for releasing said operative connection.

6. The combination with a door comprising an upper section pivotally suspended from above, a bottom section adapted to slide on the upper section, means for guiding the bottom section at its lower end, a hoisting mechanism comprising chains connected to the lower corners of the bottom section, a chain connected to the top of the upper section for moving said section transversely of the door opening, a driving pulley for the chain, means for connecting the driving pulley to the hoisting mechanism, and means dependent upon the position of the door for interrupting said connection.

7. The combination with a door pivotally suspended from above, means for guiding the lower corners of the door vertically and permitting the upper part of the door in the opening movement to swing away from the door opening, hoisting mechanism, means for positively drawing the upper end of the door away from and toward the door opening embodying connections flexibly engaged with the upper part of the door and means for actuating said last mentioned means from the hoisting mechanism at variable rates proportioned to variations in movement between the top and bottom of the door.

8. The combination with a door comprising an upper section pivotally suspended from above, a bottom section adapted to slide on the upper section, means for guiding the bottom section at its lower end, a hoisting mechanism comprising chains connected to the lower corners of the bottom section, a cable or chain connected to the top of the upper section for moving said section transversely of the door opening, a driving pulley for the cable or chain, means for connecting the driving pulley to the hoisting mechanism, and means dependent upon the closing of the upper door section for releasing the connection to permit independent movement of the bottom section.

9. The combination with a door comprising an upper section having guideways, suspension links for supporting the upper section, a lower section adapted to slide in the guideways of the upper section, means for guiding the lower end of the bottom section in the plane of the opening, hoisting mechanism adapted to act upon the lower end of the bottom section, a pair of spaced pulleys on opposite sides of the plane of the door opening, a flexible member on said pulleys, secured to the top of the upper section for moving said section transversely of the door opening, and means for connecting one of said pulleys to the hoisting mechanism.

10. The combination with a door comprising an upper section having guideways, suspension links for supporting the upper section, a lower section adapted to slide in the guideways of the upper section, means for guiding the lower end of the bottom section in the plane of the opening, hoisting mechanism adapted to act upon the lower end of the bottom section, a pair of spaced pulleys on opposite sides of the plane of the door opening, a flexible member on said pulleys, secured to the top of the upper section for moving said section transversely of the door opening, and means for connecting one of said pulleys to the hoisting mechanism, and means dependent upon the position of the door for interrupting said connection.

11. The combination with a door comprising an upper section having guideways, suspension links for supporting the upper section, a lower section adapted to slide in the guideways of the upper section, means for guiding the lower end of the bottom section in the plane of the opening, hoisting mechanism adapted to act upon the lower end of the bottom section, a pair of spaced pulleys on opposite sides of the plane of the door opening, a flexible member on said pulleys, secured to the top of the upper section for

moving said section transversely of the door opening, a slip gear adapted to be driven by the hoisting mechanism in one position, a lever for shifting the position of the gear and a spring tending to hold the gear in mesh, said lever being adapted to be actuated by the upper door section in its closed position to release said connection and permit independent movement of the lower section.

12. The combination with a door adapted to swing away from the door opening at the top, a hoisting mechanism, flexible elements connecting said hoisting mechanism with the lower corners of the door, a shaft operatively connected with the hoisting mechanism, a two-section fusee pulley on the shaft, guide means opposite said pulley and on the opposite side of the door opening, and a flexible member with its ends affixed to the unlike portions of said pulley and extending from one part of said fusee pulley to the other part thereof over said guide means, and a connection between the top of the door and said flexible member, whereby the top of the door may be moved away from or drawn toward the plane of the door opening.

13. The combination with a door adapted to swing inwardly above the door opening, of hoisting means acting on the door in one plane, means acting at an angle to the hoisting means tending to swing the top of the door away from and toward the door opening, and means dependent upon the position of the door for establishing an operative connection between said means.

14. The combination with a door adapted to swing inwardly above the door opening, of hoisting means for the door, and means adapted to be operatively connected to the hoisting means and acting at an angle to the hoisting forces for swinging the top of the door away from and toward the door opening, and means dependent upon the position of the door for releasing the connection to permit the hoisting means to act independently.

15. The combination with a door arranged to swing out of a vertical closed position to a non-vertical open position above the door opening of a door hoisting connection acting in the plane of the door opening, a connection for moving the top of the door from and towards the plane of the opening, said connections having different rates of movement and including drums so proportioned as to compensate for the difference in movement of the connections, and means for actuating said connections.

In witness whereof, we have hereunto set our hands, this 8th day of May, 1916.

JOHN EDWARD ODGEN.
JOHN B. HOWELL.

Witness:
J. B. MOORE.