Feb. 26, 1924. 1,484,634

C. H. FOSS

GRAIN DOOR STRUCTURE

Filed March 11, 1922 3 Sheets-Sheet 1

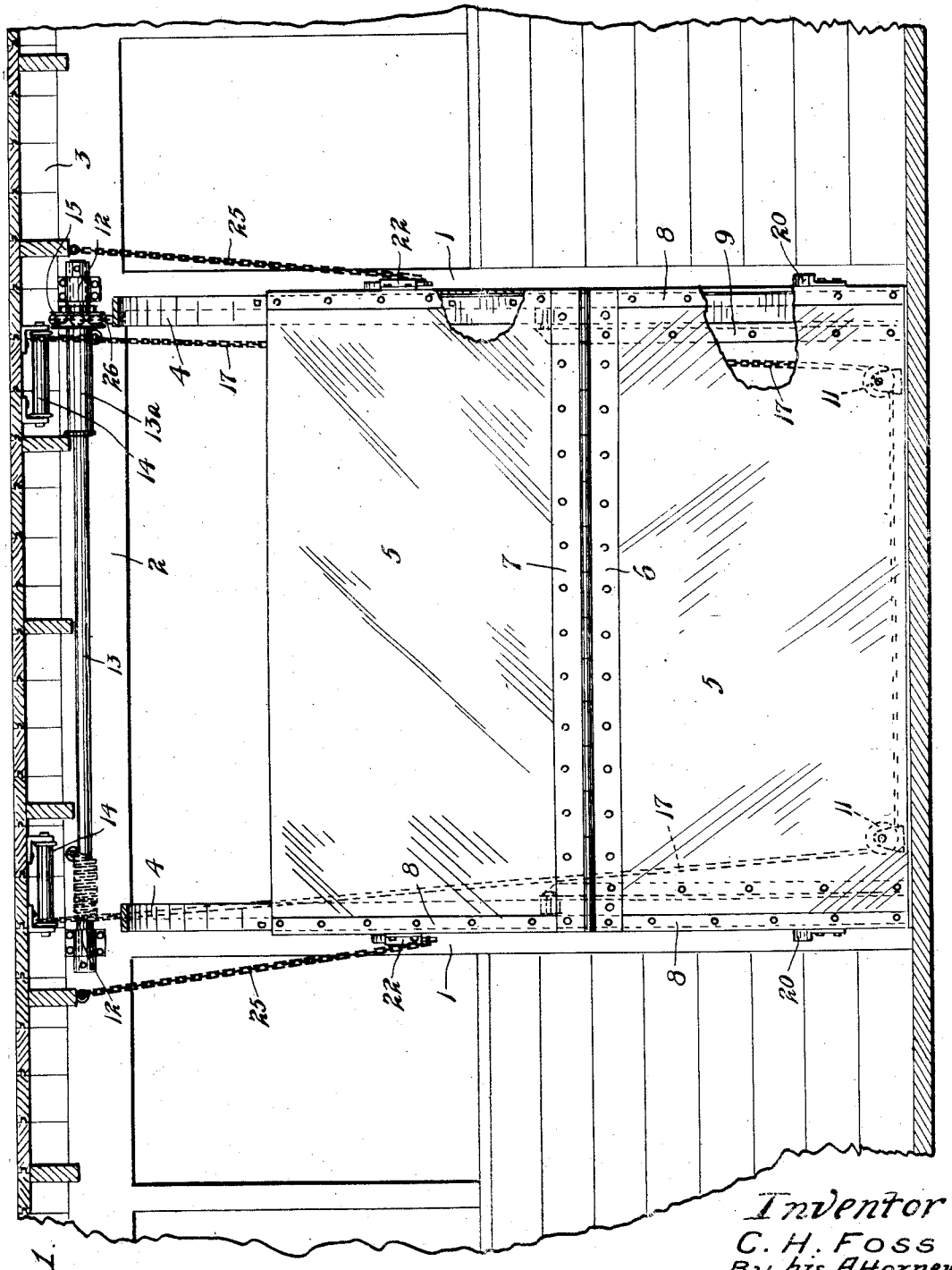


Fig. 1.

Inventor
C. H. FOSS
By his Attorneys
James F. Williamson

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C. H. FOSS

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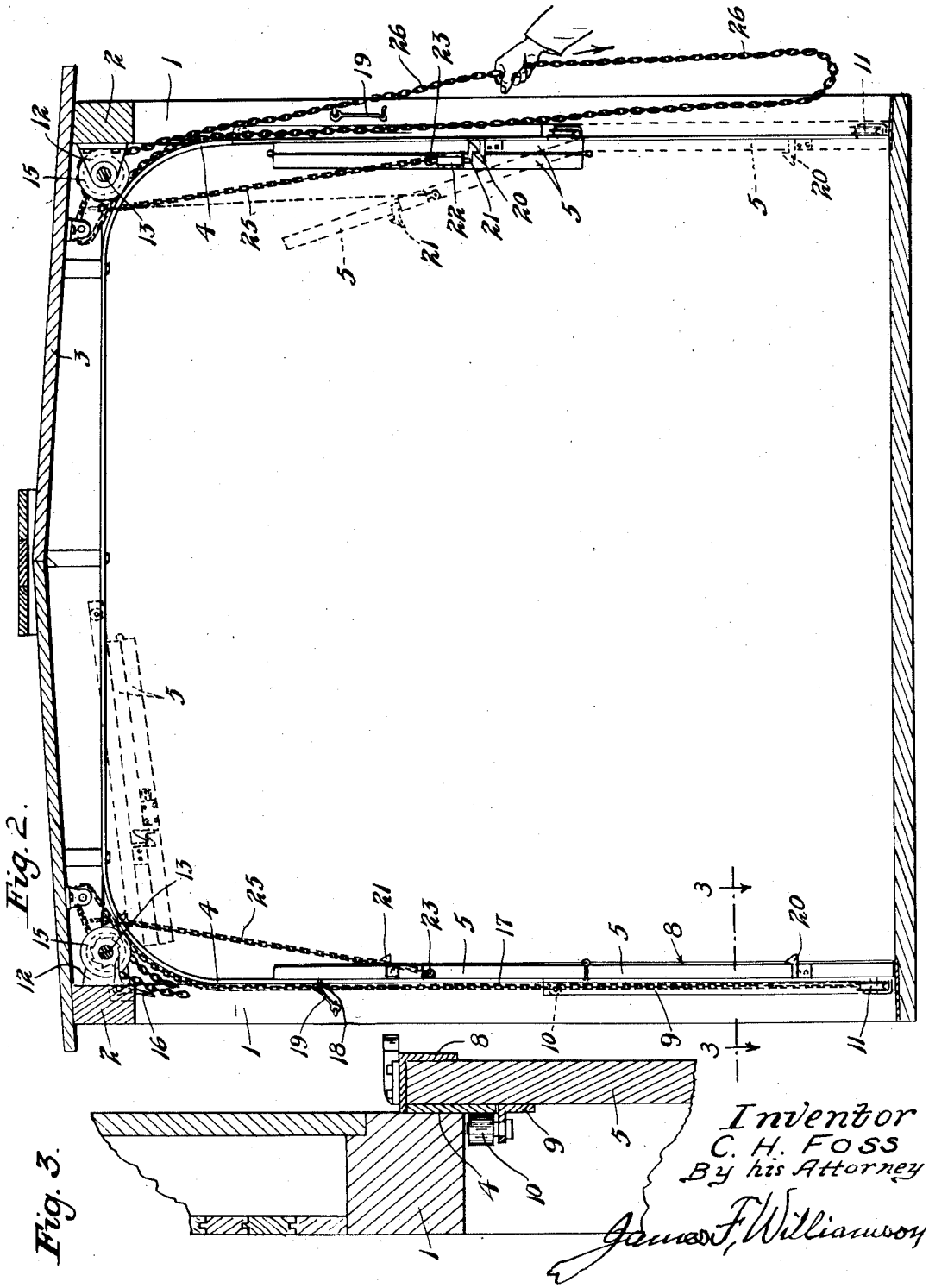


Fig. 2.

Fig. 3.

Inventor
C. H. FOSS
By his Attorney
James F. Williamson

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C. H. FOSS

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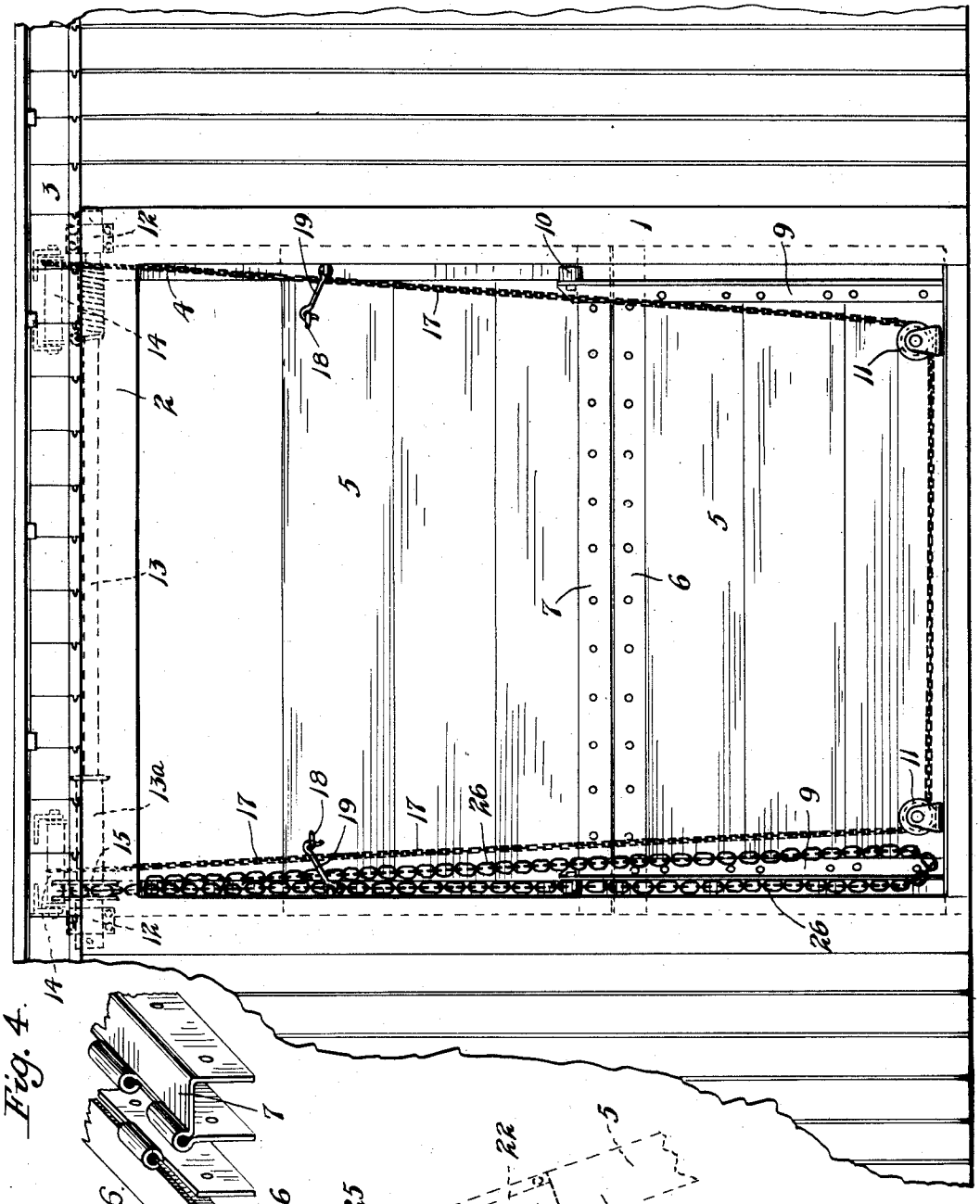


Fig. 4.

Fig. 6.

Fig. 5.

Inventor
C. H. FOSS
By his Attorney
James F. Williamson

Patented Feb. 26, 1924. 1,484,634

UNITED STATES PATENT OFFICE.

CLARENCE H. FOSS, OF MINOT, NORTH DAKOTA.

GRAIN-DOOR STRUCTURE.

Application filed March 11, 1922. Serial No. 542,857.

To all whom it may concern:

Be it known that I, CLARENCE H. Foss, a citizen of the United States, residing at Minot, in the county of Ward and State of North Dakota, have invented certain new and useful Improvements in Grain-Door Structures; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to a car door closure particularly designed as a grain door. It is well known that when the car is loaded with grain there is a great pressure against the door and it is most difficult to give the initial opening movement thereto.

It is, therefore, an object of the present invention to construct a grain door mounted for guided vertical movement and to provide means for giving increased leverage to raise the door through its initial opening movement.

It is a further object of the invention to provide a grain door adapted to be guided for vertical movement and to be moved into an inoperative position above the door.

It is a still further object of the invention to provide a grain door comprising a plurality of hinged sections, which sections are adapted to be folded into substantially parallel relation and to provide means for holding the doors in such folded position.

It is another object of the invention to provide a means by which the means holding the door in folded position will be released when the door is lowered a certain distance toward closing position.

These and other objects and advantages of the invention will be fully set forth in the following description made in connection with the accompanying drawings in which like reference characters refer to the same parts throughout the different views, and in which,

Fig. 1 is a view in elevation of the inside of the door and the means for operating the same;

Fig. 2 is a transverse vertical section of the car, the door being shown in end elevation;

Fig. 3 is a partial horizontal section taken on the line 3—3 of Fig. 2, as indicated by the arrows, a portion of the guiding roller being also shown;

Fig. 4 is a view in elevation of a portion of the car and door;

Fig. 5 is a partial end view of the door in folded position, showing another position of the same in dotted lines; and

Fig. 6 is a perspective view of the hinge connecting the door sections.

Referring to the drawings, the side of a box car is indicated, of which it will only be necessary to consider the door posts 1, the lintels or supports 2 at the top of the door, and the roofing structure 3. The sides and other portions of the car structure shown are thoroughly apparent and a detailed description thereof is unnecessary.

Secured to the inside of the posts and projecting inwardly of the door therefrom is a guiding plate 4. This plate extends upwardly along the posts and is bent into curved form and secured in spaced relation to the roofing of the car, as clearly shown in Fig. 2.

The door proper comprises a plurality of hinged sections 5 which, in the embodiment illustrated, are two in number of substantially equal widths and are connected by a plate hinge of a common construction, comprising the members 6 and 7 shown in Fig. 6 and the usual hinge pintle. The members 6 and 7 are folded or fitted about the adjacent edges of the door sections, as shown in Fig. 5. The outer sides of the door sections 5 have angle members 8 suitably secured thereto, one edge of which overlaps the edge of the plate 4. To the outer side of the lower door section are secured vertical angle strips 9, adjacent the top of which is journaled a roller 10 projecting from one side of the angle strip and bearing with its flat surface against the outer side of the plate 4. The plate 4, angle members 8 and 9 and roller 10 thus form a guiding means for controlling the movement of the door to closed and open positions.

To the outside of the door adjacent the bottom edge thereof are secured sheave brackets carrying small sheaves 11 disposed adjacent the sides of the door. To the lintels or cross members 2 are secured bearing brackets 12 in which is journaled a shaft 13 extending parallel to the door above the door opening, this shaft being held in position by suitable collars pinned to the ends thereof outside of said bearing. The shaft has a portion 13^a of increased diameter ad-

jacent one of the bearings, which portion is provided at its inner end with a flange or collar. Secured to the sides of the roof of the car at some distance inward from the shaft 13 adjacent the ends thereof and slightly thereabove are angle brackets carrying sheaves or rollers 14 having their axes arranged parallel with the shaft 13. The shaft 13 has a sheave 15 at one end adjacent the portion 13^a and the sheave is provided at its outer portion with a ratchet wheel co-operating with which is a pivoted pawl 16. A flexible member illustrated as a chain 17 has one end secured to the outer end of the portion 13^a of the shaft 13 by a suitable eye bolt and the member passes over the pulley 14 above the shaft 13 and then downward around the sheaves 11, and upward over the other pulley 14 and thence downward to the shaft 13 to which its other end is secured. When the door is in closed position, as shown in Fig. 4, the chain 17 is wound through a plurality of convolutions about the shaft 13 at its smaller end. An endless chain or other flexible member 26 passes over the sheave 15 and downwardly along the side of the car. In this closed position of the door, staples 18 provided therein are in position to be engaged by hooks 19 secured to the door posts to hold the door against lifting movement.

The sections of the door are adapted to be swung into folded substantially parallel relation and the upper section 5 is adapted to swing downwardly toward the lower section. The lower section is provided at some distance from its lower edge with latch members 20 and the upper section is provided with similar spring pressed latches 21. When the doors are swung into parallel relation, as illustrated in Fig. 5, the latches 20 and 21 will be engaged. As shown in Fig. 5, each latch 21 has a stem projecting into a housing 22. This stem has projecting therefrom or secured thereto a bolt 23 extending through the other end of the housing and having an eye thereon. A spring 24 surrounds this bolt in the housing and tends to maintain the latch pressed downwardly away from the housing. When the upper section is folded down on the lower section, as shown in Fig. 5, the latches, as stated, will be engaged and the springs 24 will maintain said latches in their engaged positions. A flexible member shown as a chain 25 is attached to the eye of bolt 23 and has its other end attached to a cross member in the roof structure. When the door is folded and raised vertically to inoperative position, the chain 25 will merely fold on top of the same. When the door is lowered to a certain position, as shown at the right of Fig. 2, the chain 25 will be drawn taut and will pull on the bolt 23, thus drawing the latch 21 upwardly and releasing the same from the latch 20. The lower section of the door can then swing down. The upper section of the door can then swing upwardly and the door be lowered to its entirely closed position. The end of the chain 25 will merely swing about in the eye on bolt 23.

In operation, assuming the door to be in its closed position, as shown in Figs. 1 and 4, the hooks 19 will be released and the chain 26 will be pulled downwardly to rotate the sheave 15 and shaft 13. As the shaft is rotated, one end of the chain 17 will be wound upon the enlarged portion 13^a thereof and the other end of the chain will be unwound from the other end of the shaft which is of smaller diameter than the portion 13^a. There will thus be more length of chain wound up than is unwound and a differential action will be produced which will tend to lift the pulleys 11 and the door will thus be moved vertically. After the chain is unwound from the smaller end of the shaft 13 it will begin to wind up on said smaller end in the same direction as it is wound on the portion 13^a. The door will then be lifted at much greater speed. It will thus be seen that for the initial lifting movement, a greater leverage will be exerted upon the door than for the subsequent movement. It is well known that when the car is full of grain there is a great pressure against the door and it is much more difficult to give the initial movement to the door than to give a subsequent movement. After the door has been raised a certain extent, the upper section 5 can be swung downwardly into the position shown in Fig. 5 and the latches 21 will engage the latches 20. The door, at this time, is sufficiently high for the chain 25 to permit this movement. The door will continue to move upwardly in its folded position guided by the rollers 10 and will eventually swing into the position shown in dotted lines in Fig. 2 at the top of the car. As the sheave 15 is turned by chain 26, the same, together with the shaft 13 will be held in its successive positions by the pawl 16 engaging its co-operating ratchet wheel. When it is desired to lower the door, the pawl 16 can be disengaged from the ratchet and the door will move down readily by gravity. The speed of descent of the door can be regulated by holding the chain 26 and letting the same move over the sheave 15 at the desired speed. As already described, when the door reaches a certain position, the chain 25 will disengage the latches 20 and 21 and the upper section can then swing to its vertical position. When the door is closed it can be held against movement in its closed position by the hooks 19 engaging the staples 18.

From the above description it is seen that applicant has provided a simple and efficient door for a grain car. The door can be quickly and easily opened and the mecha-

nism thereof is disposed where it will not interfere with the normal operations about the car. The parts of the structure are comparatively few and the structure can be made quite rugged and when once assembled will have no tendency to become disarranged or get out of repair.

It will, of course, be understood that various changes may be made in the form, details and arrangement of the device without departing from the scope of applicant's invention, which, generally stated, consists in the matter shown and described and set forth in the appended claims.

What is claimed is:

1. A grain door structure having in combination a door comprising hinged sections, a guideway for guiding said door in its opening movement, a flexible member attached to said door and a rotatable differentially operating means comprising a shaft of different diameters to which the ends of said flexible member are secured for moving said flexible means to raise said door, said flexible member, when the door is closed, being wound about the smaller end of said shaft.

2. The combination with a car door mounted for vertical movement, of a lifting device comprising a rotatable shaft disposed above the top of said door having a larger diameter at one end than the other, a flexible member having its ends secured to the ends of said shaft and normally wound about the smaller end thereof in a direction opposite to that in which the shaft is turned to raise said door, and spaced pulleys secured to the door adjacent the bottom thereof over which the flexible member runs.

3. The combination with a car structure having a door opening therein, of a door comprising hinged sections guided for vertical movement, spaced pulleys on the lower section, a flexible member adapted to move over said pulleys, and rotating means adjacent the top of the door opening to which the ends of said flexible member are secured, said means being adapted initially to wind up one end of said flexible member at one speed and unwind the other end at a less speed.

4. The structure set forth in claim 3, said rotating means comprising a member having a small diameter at one end on which the flexible member is partially wound in one direction when the door is in closed position and having a large diameter at its other end for winding up a flexible member in the opposite direction to raise the door, the chain being adapted to unwind from the smaller end during such raising movement.

5. The combination with a car structure having a door opening therein, of a door comprising two hinged sections, a latch adjacent the bottom of the lower section, a latch adjacent the top of the top section, the top section being adapted to swing down substantially parallel to the lower section and automatically engage the said latches.

6. The structure set forth in claim 5, said folded sections in latched relation being adapted to be moved into position above the door opening, and means secured to said latches and to the car above said door opening for automatically disengaging said latches when the door is moved downward a certain distance.

7. The combination with a car having a door opening therein, of a door guided for vertical movement and for movement into position over the door opening, a lifting mechanism for said door comprising a rotatable shaft over said door having portions of different diameters, spaced pulleys secured adjacent the bottom of said door, and a chain having its ends respectively secured to the said portions of said shaft and wound thereabout and passing down and under said pulleys on the door.

8. The structure set forth in claim 7, said door comprising sections hinged on a horizontal axis and adapted to fold together when opened, said pulleys being carried by the lowermost section.

9. The structure set forth in claim 7, and sheaves rotatably mounted above said shaft adjacent each end thereof over which said chain passes before passing down to said pulleys on the door.

In testimony whereof I affix my signature.

CLARENCE H. FOSS.