E. W. SUMMERS.

DOOR OPERATING MECHANISM FOR DUMPING CARS.

APPLICATION FILED JULY 17, 1909.

1,095,241.

Patented May 5, 1914.

2 SHEETS—SHEET 1.

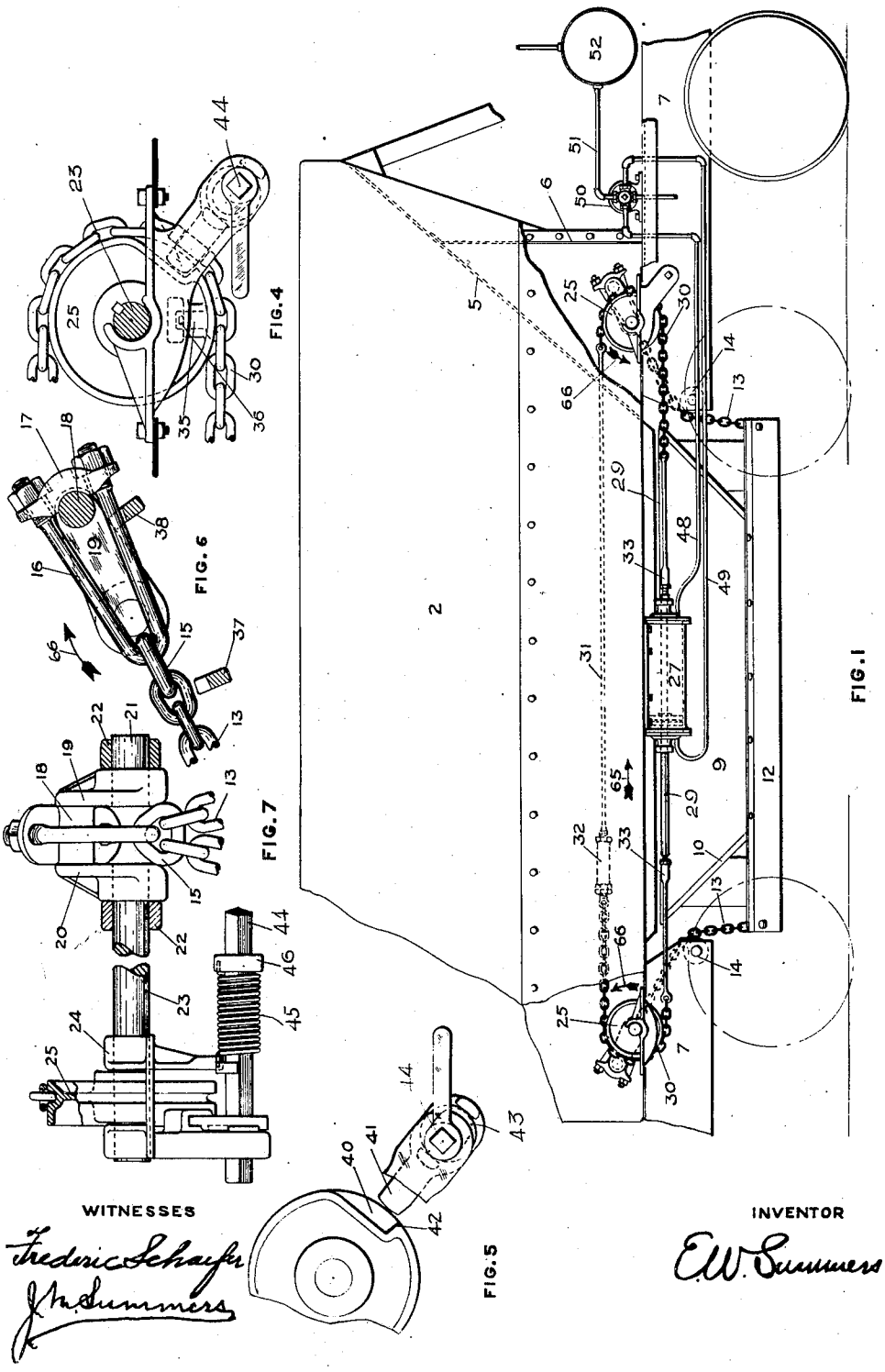


FIG. 1

FIG. 4

FIG. 6

FIG. 7

FIG. 5

WITNESSES

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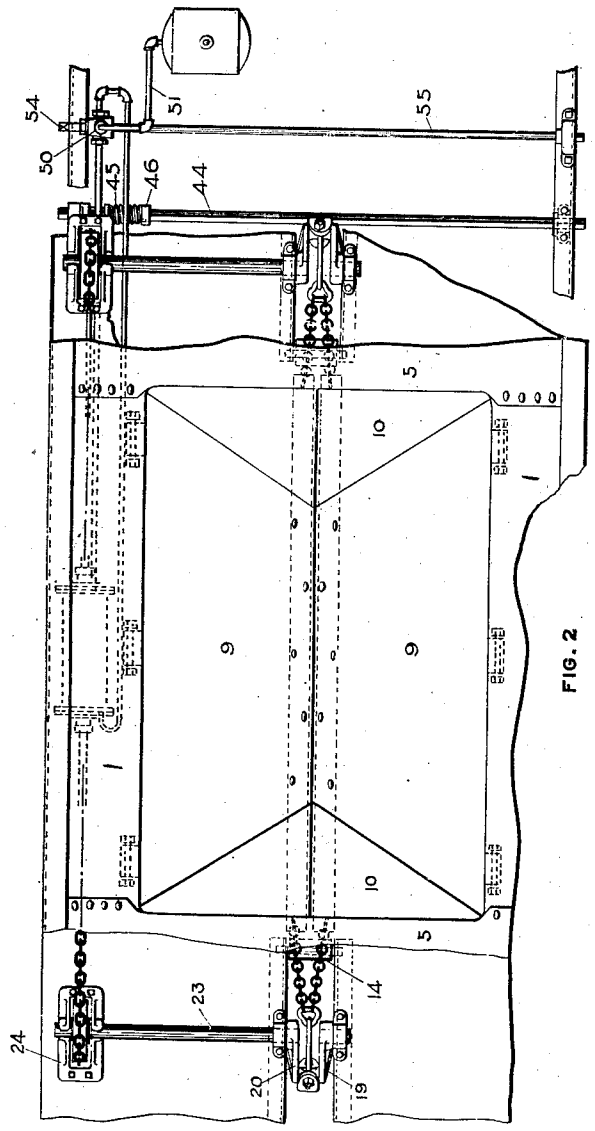


FIG. 2

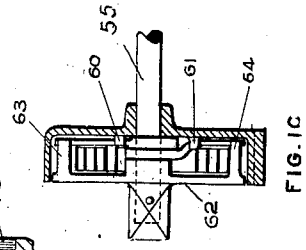


FIG. 1C

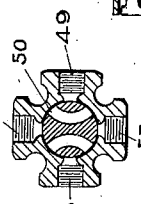


FIG. 8

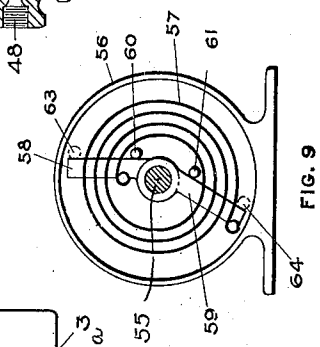


FIG. 9

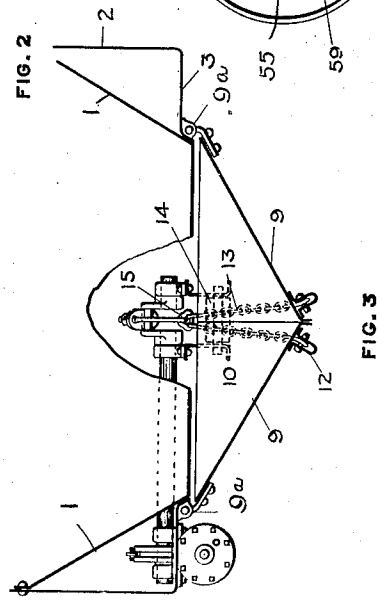


FIG. 3

WITNESSES

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UNITED STATES PATENT OFFICE.

EDGAR WEBSTER SUMMERS, OF PITTSBURGH, PENNSYLVANIA, ASSIGNOR TO SUMMERS STEEL CAR COMPANY, OF PITTSBURGH, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

DOOR-OPERATING MECHANISM FOR DUMPING-CARS.

1,095,241. Specification of Letters Patent. Patented May 5, 1914.

Application filed July 17, 1909. Serial No. 508,203.

To all whom it may concern:

Be it known that I, EDGAR W. SUMMERS, a resident of Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Door-Operating Mechanism for Dumping-Cars, of which the following is a specification.

This invention relates to railway cars and more particularly to door operating mechanism for hopper bottom dumping cars.

The object of the invention is to provide power mechanism for closing the doors and initiating the opening thereof, which power mechanism is of strong and compact construction and which can be operated with a minimum amount of manipulating, and by means of which the doors can be very quickly closed and opened, in order to shorten the time of discharging the load and reduce the labor incident thereto.

The invention comprises the construction and arrangement of parts hereinafter described and claimed.

In the accompanying drawings, Figure 1 is a broken away side view of a portion of a hopper bottom car showing the invention applied thereto; Fig. 2 is a broken away plan view of a portion of the car showing the operating mechanism with the doors in closed position; Fig. 3 is a transverse section through the lower portion of the car showing the door operating mechanism with the doors in closed position; and Figs. 4, 5, 6, 7, 8, 9 and 10 are detail views of parts of the mechanism.

The invention has been shown applied to longitudinal drop doors on a hopper bottom ore car of the same general type as heretofore patented by me, to-wit, No. 918,098, April 13, 1909. The invention, however, can be adapted for operating the doors of various types of dump cars and is not limited to the particular form of car shown.

In the drawings, only part of the car body is shown. The parts of the car shown comprise the side hopper sheets 1, side plates 2 connected by horizontal plate 3 to the lower edge of the side hopper sheet, and end hopper plates 5. The body bolster is indicated generally at 6 and the draft beams at 7, said draft beams having their inner ends connected to the sloping end floor plates 5. The car body shown is provided in its bottom with a very large discharge opening, being adapted particularly for carrying ore which requires a large opening to quickly discharge the load and prevent the same from arching over the opening. The discharge opening is closed by means of longitudinal doors 9, hinged at 9^a to the car body just outside of the lower edges of the side hopper plates 1. When the doors are closed or in normal position, their inner edges abut at the center line of the car, and said doors are in inclined position as shown in Fig. 3. In opening, their inner edges swing downwardly and outwardly, as will be readily understood. The doors are of greater length than the distance between the inner track wheels, and in order to permit the doors to swing open wide, their ends are bent upwardly as shown at 10, and as described and claimed in my patent above referred to.

Each door is provided near its inner edge with a longitudinal beam 12, to the ends of which are connected the lifting chains 13, one chain to each end of each door. These lifting chains pass over guide rollers 14 mounted between the inner ends of the draft sills and have their ends connected to an equalizing link 15 connected to the inner end of a U bolt or link 16. Connected to the outer end of said U bolt or link, is a saddle piece 17 which rests against the wrist pin 18 of a crank having two crank arms 19 and 20 so as to form a support for both ends of the wrist pin. The crank arm 19 is carried by a shaft member 21 mounted in a bearing 22 secured to one of the draft sills. The other crank arm 20 is secured to a longer shaft 23 also mounted in bearing 22 on a draft sill and at its outer end mounted in bearing 24 secured to a suitable portion of the frame of the car. The shaft 23 near its outer end is provided with a chain wheel 25. The cranks 19 and 20, wrist pin 18, shafts 21 and 23 and chain wheel 25, may be formed in separate pieces, but in practice will preferably be made as a single casting.

A closing mechanism such as described is provided at each end of the car, being located underneath the sloping end floor plates 5. The shafts 23 at the two ends of the car are arranged to be simultaneously rotated from a power cylinder 27, which is secured at one side of the door opening, to the bottom of the triangular girder formed by the sloping side hopper sheet 1, side sheet 2 and horizontal connecting sheet 3. The cylin-

der is provided with a single piston connected to piston rod 29 projecting through both ends of the cylinder and having connected to each end a chain 30 which passes around the chain wheels 25, forming substantially a belt and having in its upper reach a connecting rod 31 with turn buckle 32 for adjustment. The ends of chains 30 also have adjustable connection shown at 33, with the ends of the piston rod 29. The chain is connected to the chain wheels by means of a special link provided with a projection 35 extending into a radial opening in the chain wheel and receiving through its inner end a transverse cotter 36 or the like. The chain and connecting rod described, together with the piston rod of the cylinder, form in effect an endless flexible belt passing around the chain wheels at the two ends of the car and serve to rotate both of said wheels and shafts connected thereto simultaneously, and produce coincident movement at both ends of the doors.

The doors are opened and closed by a revolution of the cranks through substantially 180 degrees. When the doors are open the cranks extend from their shafts substantially in a straight line to the periphery of guide rolls 14, the crank on the left of Fig. 1 resting against stationary stop 37, and when the doors are closed the cranks are substantially diametrically opposite thereto, that is, so that the U bolts or links and chain form substantially a straight line through the center of rotation of the cranks, or if anything, the cranks slightly beyond the center so that there is no tendency of the shafts to rotate backwardly under the stress of the load on the doors. Stop 38 secured to the draft sills limits the rotation of one of the cranks in the closing movement of the doors. Any wear caused by the crank striking stop 38 merely tends to further safety since it merely allows the cranks to pass further beyond the dead center. A safety lock is provided for engaging a notch or recess 40 in the chain wheel 25. This lock is in the form of a dog or bolt 41 arranged to enter the notch or recess in the chain wheel and project into the path of rotation of a shoulder 42 on said wheel. The opposite end of said bolt is provided with an opening in which works an eccentric 43 on a shaft 44 extending transversely of the car but to the sides thereof, and adapted to receive a wrench, crank or other operating means on each end. The shaft 44 is surrounded by a coiled spring 45 having one end secured to the shaft, such as a collar 46 thereon, and its other end secured to a stationary part, such as a bearing for the shaft. This spring is so arranged that it tends to rotate the shaft to the position in which eccentric 43 holds the bolt or dog 41 in locking position with reference to the chain wheel. To release said bolt or dog, the shaft 44 is rotated against the tension of the spring and in direction to cause the eccentric 43 to withdraw the bolt out of the recess 40 in the chain wheel. As soon as the chain wheel starts to rotate to open the doors, the shaft 44 can be released, and the spring 45 holds the end of the dog against the periphery of the chain wheel so that it will snap into the recess 40 therein, when the latter again comes opposite said bolt or dog. Since the cranks 19 and 20 are normally past dead center when the doors are closed there is no tendency for the crank shafts rotating backwardly. The lock 41 is therefore merely a safety device to prevent the opening of the doors in case of accidental tendency of the crank shafts to rotate backwardly, or in case of meddling with the air valve. In practice the locking dog 41 is not in contact with shoulder 42 on the chain wheel, but is in the path of rotation of said shoulder so as to engage therewith in case of unauthorized rotation thereof. Stops 37 and 38 and safety lock 41 are shown at one end only of the car, this being sufficient since the two crank shafts are always connected by the endless chain.

The power cylinder 27 is of the double acting type having a service pipe 48 connected to one end thereof and a similar pipe 49 connected to the opposite end thereof. These pipes lead to a four way valve 50 having connected thereto a supply pipe 51 coming from any suitable source of fluid pressure, such as a reservoir 52 for compressed air. The valve 50 is also provided with an exhaust port 53. This valve is an ordinary rotating four way cock and in normal position blanks all ports, as shown in Fig. 8, and when rotated in one direction connects supply pipe 51 with service pipe 48, and at the same time connects the service pipe 49 with the exhaust port 53 and thus supplies fluid pressure to one end of power cylinder 27, but while in the opposite position it connects supply pipe 51 with service pipe 49 and service pipe 48 with exhaust port 53. In this manner the piston in cylinder 27 can be moved in either direction.

The four way valve 50 is located near one side of the car and its rotary plug has a square outer end 54 adapted to receive a crank or wrench for rotating the same. To the inner end of said plug is connected a shaft 55 extending to the opposite side of the car and also having a squared end for receiving a wrench or crank, so that said valve can be operated from either side of the car. The plug valve is arranged to be automatically brought back to lap position, that is, the position in which the ports are blanked, and this irrespective of the direction in which valve is rotated. This is accomplished by extending the shaft 55

through a spring case 56 in which there is a spiral spring 57 having its ends connected respectively to arms 58 and 59 loosely mounted on the shaft, and arranged to be held against movement in one direction by abutting against stops 60 and 61 respectively carried by the spring case 56. The shaft 55 is provided with a cross arm 62 carrying pins 63 and 64 arranged to engage respectively with the arms 58 and 59. When the shaft is rotated in one direction the pin 63 on the shaft picks up the arm 58 to which the inner end of the spring 57 is connected, and when the shaft is rotated in the opposition direction, pin 64 on the shaft picks up the arm 59 to which the outer end of said spring is connected. In either case, the rotation of the shaft puts the spring 57 in tension so that when said shaft is released the spring brings the shaft and four way valve back to normal position.

The operation of the mechanism is as follows: We will assume that the doors are open and are to be closed. In this position the crank on shaft 23 on the left of Fig. 1 rests against stop 37. The four way valve 50 is rotated to admit the fluid pressure into one end of the cylinder 27 and move the piston rod therein in the direction of the arrow 65. This rotates the chain wheels 25 and shafts 23 in the direction of arrows 66, swinging the cranks on shafts 23 through substantially 180 degrees until the same are in line with or slightly beyond the dead center, thereby drawing on the chains 13 to tightly close the doors. The cranks can be so proportioned that this movement brings the doors fully to the closed position. In this position the locking bolt or dog 41 projects into the path of the shoulder 42 on one of the chain wheels and serves as a safety device to keep the doors in closed position. As soon as the doors are fully closed, the four way valve is released and is immediately returned by spring 57 to normal or lap position so cutting off the supply of fluid pressure to the cylinder 27. When the doors are to be opened the shaft 44 is turned to disengage the lock 41 from chain wheel 25 and the four way valve 50 is rotated in the opposite direction to admit fluid pressure into the opposite end of the cylinder 27, and move the piston in the reverse direction, and thereby reversely rotate the chain wheels 25 and shaft 23. As soon as the chain wheel starts to rotate the shaft 44 can be released, the spring 45 holding the dog against the periphery of the wheel, as heretofore described. After a slight rotation of the cranks, the weight of the load on the doors will complete the opening thereof, so that fluid pressure need be admitted to the cylinder 27 only momentarily for opening the doors.

It will be observed that the mechanism described positively closes the doors, and that the doors are held in closed position by the cranks passing the dead center. Consequently, only a limited amount of fluid pressure is required, said fluid pressure being active only when closing the doors and initiating the opening thereof, and inactive at all other times. Any fluid pressure, such as steam, but preferably compressed air, can be employed. The power cylinder constantly acts on a constant lever arm, namely, the radius of the chain wheels 25, while the cranks 19 and 20 act on a lever arm which decreases in length as the doors approach the closed position and which lever arm is zero when the doors are fully closed. Hence the power cylinder exerts a very powerful action at the time of final closing of the doors and when initiating the opening thereof. As a consequence a small power cylinder will suffice and is economical in fluid pressure medium. The doors can be opened very quickly as the operator need only rotate the shaft 44 to release the locking dog from the chain wheel, and momentarily open the four way valve to initiate the opening movement, while the completion of the opening of the doors is accomplished by gravity. Consequently, a single workman can dump the loads of a very much larger number of cars than by any dumping mechanism now in use. This is particularly advantageous in handling ore, where the trains of cars are run onto a dock, and the workman can dump the loads of a train almost as rapidly as he can walk along the same. The mechanism is of a simple, compact and strong construction and cannot readily break or be injured by an ignorant workman or get out of repair.

What I claim is:

1. In a dumping car, the combination with a movable door, of a rotatable member, power cylinder mechanism arranged to rotate said member in opposite directions, a flexible connection between said member and said door, and means for limiting rotating movement of said member in one direction to occupy a position where said door is held closed.

2. In a dumping car, the combination with a movable door, of a rotatable shaft, a crank thereon, a non-rigid flexible connecting member extending from the crank to the door, and power cylinder mechanism arranged to rotate said shaft in one direction to open said door and in the other direction to close the same.

3. In a dumping car, the combination with a drop door, of power cylinder mechanism, an endless flexible member operated thereby and movable in opposite directions, and connections therefrom to both ends of

the door arranged to both open and close the door and secure coincident movement of both ends of the door.

4. In a dumping car, the combination with a door, of a lifting member connected to each end thereof, power cylinder mechanism, and an endless flexible connection therefrom to both of said lifting members arranged to operate both lifting members simultaneously and to both open and close the door.

5. In a dumping car, the combination with a door, of rotary lifting members, a connecting member from each end of the door to one of said rotating lifting members, an endless belt connecting said rotating lifting members and power mechanism connected to said belt for rotating said lifting members simultaneously and in both directions.

6. In a dumping car, the combination with a door, of a rotating door closing member, connections therefrom to the door, mechanism arranged to rotate said door closing member, an endwise movable locking bolt arranged to engage said rotating member, and an operating rod directly engaging said bolt and arranged to release the same from said rotating member.

7. In a dumping car, the combination with a door, of a rotary door closing member, connections therefrom to the door, mechanism arranged to rotate said door closing member, a lock arranged to engage said member, a cam for releasing said lock from said member, and a spring arranged to automatically engage said lock with said member.

8. In a dumping car, the combination with a door, of a rotary door closing member, connections therefrom to said door, mechanism arranged to rotate said member, a lock arranged to engage said member, a cam shaft arranged to release said lock from said member, and a spring acting on said cam shaft and arranged to automatically engage said lock with said rotating member.

9. In a dumping car, the combination with a door, of a door closing member, a power cylinder arranged to actuate said door closing member, a valve controlling the admission and exhaust to said power cylinder, and means for automatically returning said valve to neutral position.

10. In a dumping car, the combination with door, of a door actuating member, a double acting power cylinder connected to said member, connections to both ends of said cylinder, a valve arranged to admit fluid pressure through either of said connections, and means for automatically returning said valve to neutral position.

11. In a dumping car, the combination of a door, lifting mechanism connected to each end of the door and including rotary lifting members, a power cylinder, and an endless operating member connected to the two ends of the power cylinder piston and extending around both said rotary members and arranged to rotate the same in both directions, said lifting mechanism being so arranged that said power mechanism simultaneously moves both ends of the door in the same direction.

12. In a dumping car, the combination of a door, a crank connected to each end of the door, power cylinder mechanism arranged to both open and close the door, and connections therefrom to the cranks arranged to rotate the same to a dead center to hold the door closed when the power mechanism is released.

13. In a dumping car, the combination of a door, a crank connected to each end of the door, power cylinder mechanism arranged to both open and close the door, and an endless belt actuated by the power cylinder mechanism and connected to the cranks and arranged to rotate the same to a dead center.

14. In a hopper bottom dumping car having inclined end and side floor plates, the combination of longitudinally arranged bottom drop doors, operating shafts located at the ends of said doors beneath the inclined end floor plates, a double acting power cylinder located beneath the inclined side floor plates, and connections therefrom to both operating shafts, whereby said shafts are rotated in both directions to both open and close said doors.

15. In a hopper bottom dumping car, the combination with longitudinal doors, transverse door closing shafts at the ends of said doors located underneath the end floor plates, a lock for one of said shafts, actuating means for the lock, a power cylinder, and connections therefrom to both of said transverse shafts.

16. In a dumping car, the combination with a door, a power cylinder connected to operate said door, a valve for controlling said cylinder, and a valve operating rod extending to both sides of the car.

17. In a dumping car, the combination with a door, a power cylinder connected to operate said door, a valve for controlling said cylinder, a valve operating rod extending to both sides of the car, a safety lock, and an actuating rod therefor extending to both sides of the car.

In testimony whereof, I have hereunto set my hand.

EDGAR WEBSTER SUMMERS.

Witnesses:

F. W. WINTER,

JAS. L. WELDON.