

July 7, 1925.

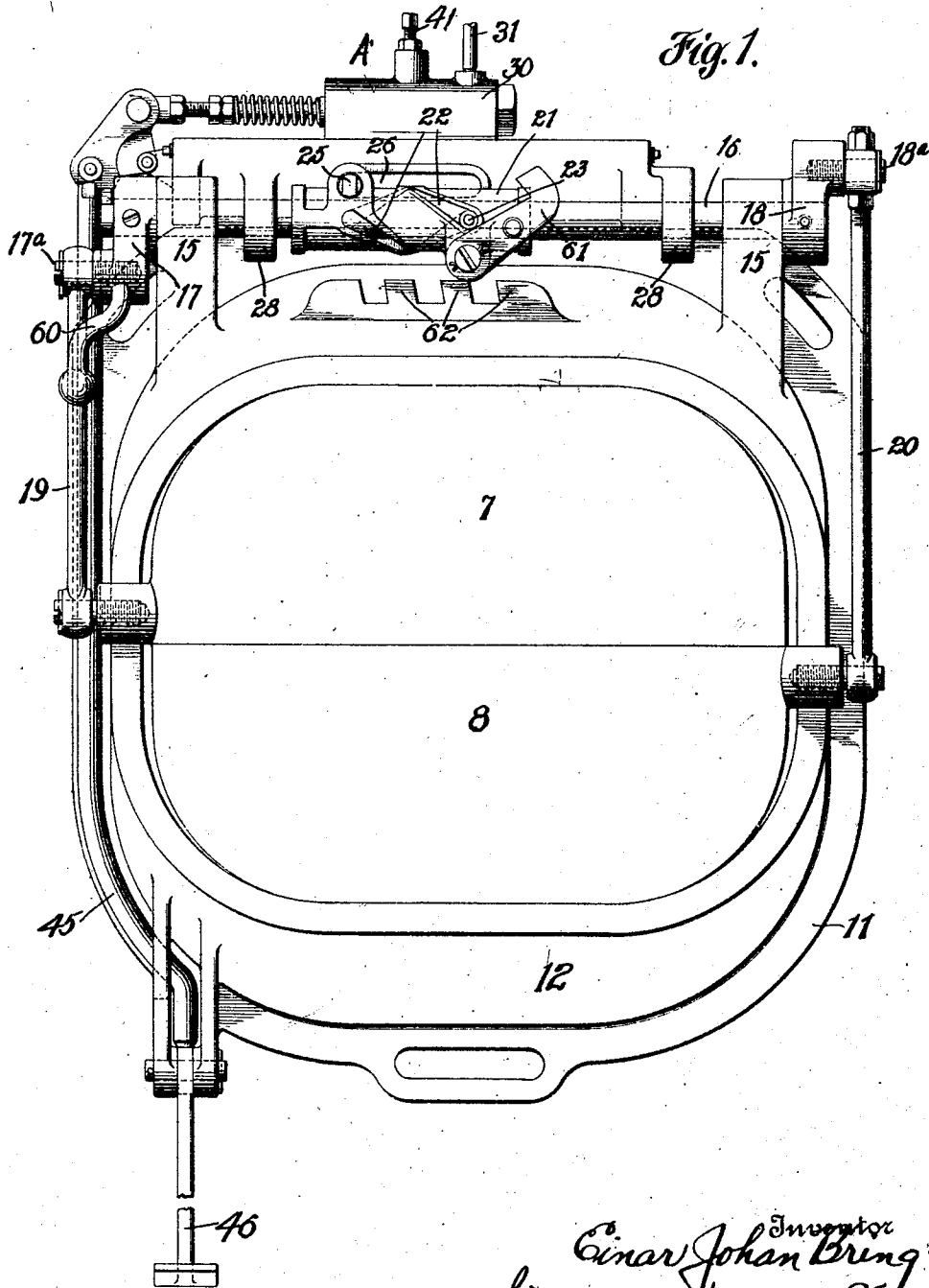
1,545,302

E. J. BRING

FIRE DOOR

Filed Aug. 22, 1921

4 Sheets-Sheet 1



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July 7, 1925:

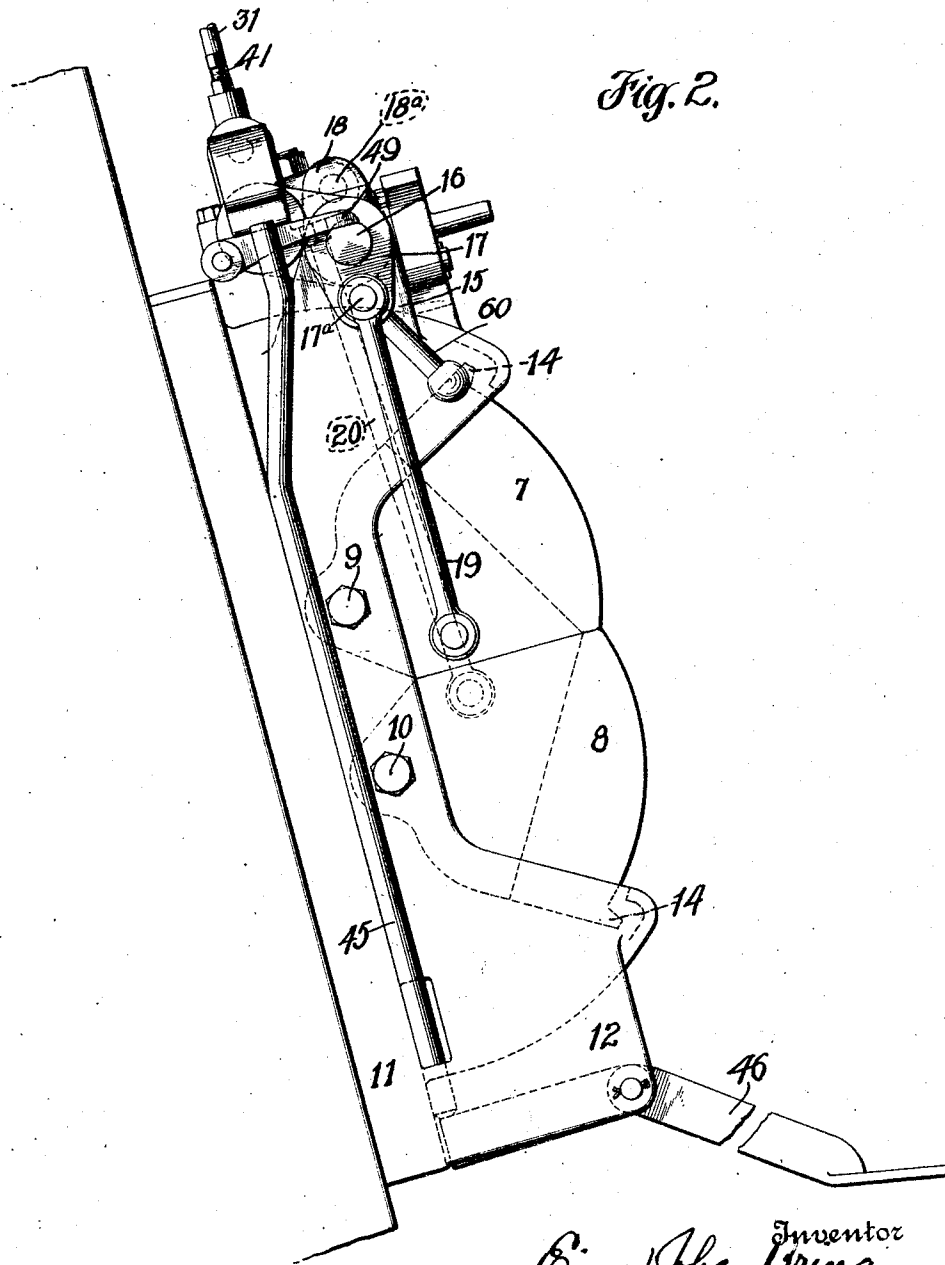
E. J. BRING

FIRE DOOR

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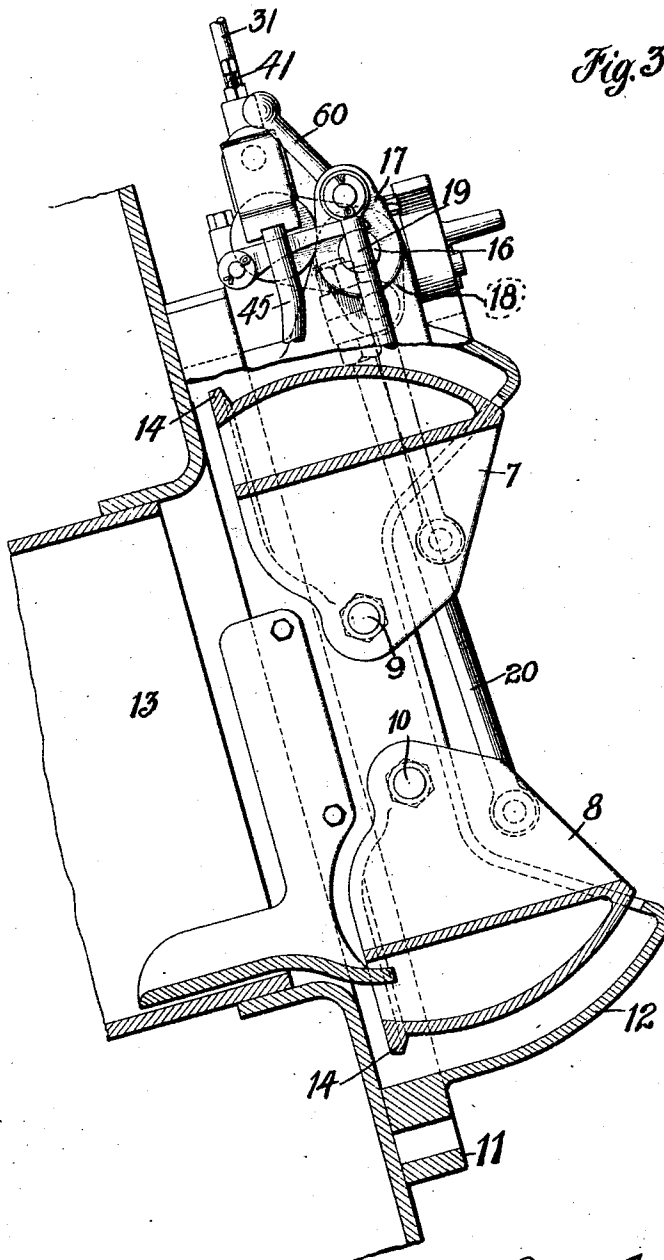
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Fig. 3.



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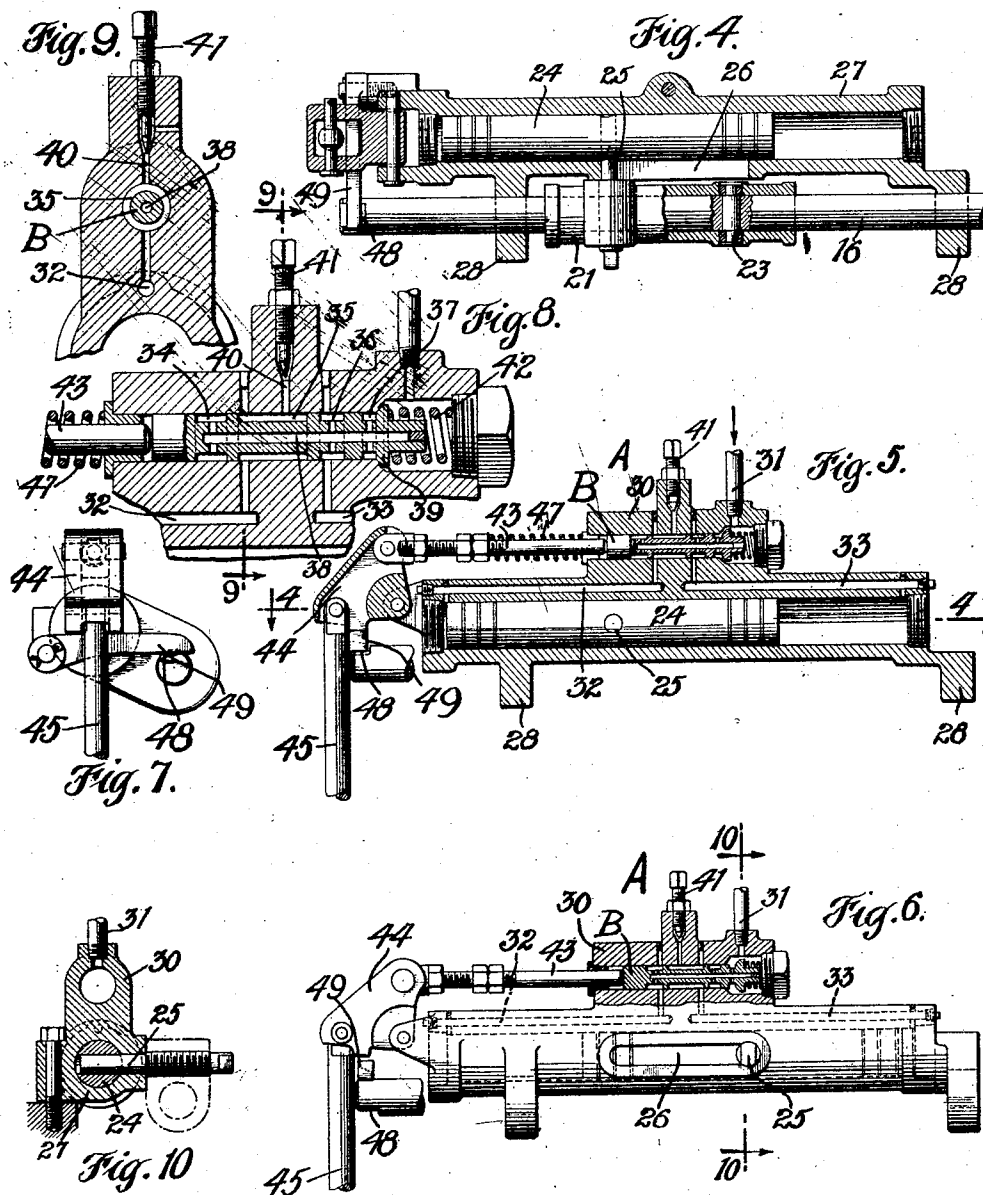
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FIRE DOOR

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4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE.

EINAR JOHAN BRING, OF FRANKLIN, PENNSYLVANIA, ASSIGNOR TO FRANKLIN RAILWAY SUPPLY COMPANY, A CORPORATION OF DELAWARE.

FIRE DOOR.

Application filed August 22, 1921. Serial No. 494,069.

To all whom it may concern:

Be it known that I, EINAR JOHAN BRING, a citizen of the United States, residing at Franklin, in the county of Venango and State of Pennsylvania, have invented certain new and useful Improvements in Fire Doors, of which the following is a specification.

This invention relates to fire doors such for example, as those used on locomotive fire boxes and one of the primary objects of the invention is the provision of a fire door which effectively meets all of the legislative requirements relating to such apparatus.

Among other objects of the invention is the provision of an improved door in which the door parts are operated simply and effectively and without material shock or "banging" whereby the life of the parts is extended; in which accidental or inadvertent operation of the door in either opening or closing is practically prevented; in which the door parts may be pressure operated in both opening and closing movement; and in which it is practically impossible for the door parts to accidentally or inadvertently assume an intermediate position.

My invention further contemplates the provision of an improved door operating mechanism of simple and effective character and a novel disposition thereof; as well as a simplified controlling valve mechanism having the advantages hereinafter pointed out.

In general my invention is directed toward the provision of a fire door of inexpensive construction which utilizes a minimum of operating fluid and may be operated on comparatively much lower pressures than doors heretofore employed, particularly in railroad service.

The foregoing together with such other objects as may hereinafter appear, or are incident to my invention I obtain by means of a construction which I have illustrated in the accompanying drawings, wherein:

Fig. 1 is a front elevation of a door embodying my invention; Fig. 2 is a side elevation of Fig. 1; Fig. 3 is a vertical mid sec-

tion of the door with the parts in open position; Fig. 4 is a longitudinal section through the door operating motor, taken on the line 4—4 of Fig. 5; Fig. 5 is a longitudinal vertical mid section through said motor and its valve, with parts just approaching final door closing position; Fig. 6 is a side elevation in partial section of the motor with the parts indicated in full door opening position; Fig. 7 is an end view of Fig. 5; Fig. 8; is a sectional view on enlarged scale of the controlling valve; Fig. 9 is a section on the line 9—9 of Fig. 8; and Fig. 10 is a section on the line 10—10 of Fig. 6.

Referring now to the general construction of the door as illustrated in Figs. 1 to 3, it will be seen that the door proper consists of two segments 7 and 8,—somewhat similar to clam shell bucket sections—pivoted at 9 and 10, respectively, to an annular-like frame, comprising a base 11 slotted for attachment to the box and having an outwardly projecting and inwardly curving flange or annular lip 12, constituting a housing for the door segments when open and cooperating therewith when the latter are closed to cover the fire door opening 13 of the box, for which latter purpose the segments are provided with lips 14 at their rear edges.

At the top, the door frame it provided with two lugs 15 in which a rocker shaft 16 is mounted. Each end of the shaft carries a crank arm 17 and 18, respectively, the pin 17^a of the former being coupled to the upper door segment 7 by the connecting rod 19, and the pin 18^a of the latter being coupled to the lower segment 8 by the connecting rod 20. It will be noted that the cranks are oppositely disposed and that the parts are so connected as to be on dead center in both full open and full closed position. Rotary movement of the rocker shaft serves to open or close the segments.

This rotary motion is imparted to the rocker shaft by means of a sleeve 21, slidable longitudinally of the shaft and provided with a pair of helical slots 22 in which the ends of a pin 23 on the shaft fit. The connection between sleeve and shaft is thus

in the nature of a screw cam connection with large pitch. The sleeve is shifted by means of the piston 24 and the pin 25 which projects laterally through a longitudinal slot 26 in the cylinder 27 so as to engage the sleeve. The cylinder is secured to the door frame and also has ears 28 apertured to receive the rocker shaft.

The movement of the piston is controlled by the valve mechanism A. Pressure is supplied to the valve chest 30 by the pipe 31 and it reaches the opposite ends of the cylinder through the ports 32 and 33. The valve B is in general of the piston type and is turned down to provide annular grooves 34, 35, 36 and 37. It is also hollowed out by the bore 38 (see Fig. 8) the open end of which is plugged. The bore communicates with the grooves 34, 36 and 37. Admission of pressure to the bore and from thence to the ports is controlled by the end 39 of the valve which is adapted to take a seat as shown in Fig. 8. An exhaust port 40 opens from the chest and is adapted to always communicate with the space formed by the groove 35, the effective area of the port being controlled by the adjustable needle valve 41. The valve is normally held in closed position by the spring 42.

When the valve is in the full closed position of Fig. 8, port 32 is in communication with the groove 35 and, therefore, is open to exhaust; part 39 is seated; and port 33 is shut off from exhaust. When the valve is in the full open position of Fig. 6, port 32 is being supplied with pressure and port 33 is open to exhaust.

The valve is operated by the rod or stem 43, the bell crank 44, the rod 45 and the treadle mechanism 46, the stem being normally held in retracted position by the spring 47.

To open the door the treadle is pressed down, which operates to move the rod 45 upwardly and the upper end of the bell crank 44 inwardly toward the valve chest, which causes the stem to open the valve against the pressure of spring 42. In the first position of the opening movement, the valve admits pressure to port 33 and to the corresponding side of the piston 24 establishing a cushion. As the opening movement continues, port 32 is uncovered to pressure and port 33 to exhaust and pressure is now admitted through port 32 to the left-hand end of the cylinder and the right-hand end is open to exhaust, causing piston 24, and sleeve 21 to move to the right and turn the rocker shaft to open the segments. The pressure on the right-hand end of the piston escapes through the needle controlled exhaust port, in such manner as to retain the cushioning effect. As soon as the rocker shaft has turned appreciably, the flattened portion 48 is moved out of engagement with

the lever 49 interposed between the bell crank and shaft; and such lever rides on the rounded portion of the shaft, the effect of which is that the valve, once it has opened, is held in a partially open or intermediate position by the lever 49 until the parts have been pressure returned to full closed position.

To be more specific, because of the spring 42, the valve might be returned to full closed position as soon as the treadle was released in the absence of some such means, and the doors would not automatically close but would remain in full open position. By this arrangement, however, when the treadle is released, the valve is held in a partially open or rather the intermediate position in which port 32 is open to exhaust and port 33 open to pressure. Thus the doors automatically close by the return movement of the reciprocating parts; and furthermore, pressure is kept on until the full closing movement has taken place. This is made clear in Figs. 5 and 7, from inspection of which it is seen that the valve is held in intermediate position until the lever is lowered down onto the flattened portion 48 of the shaft.

It will also be seen that the initial effect incident to opening the valve is to admit air always on the closing side of the piston before admitting it to the opening side. In other words there is an initial short period of time during opening movement of the valve when closing air is admitted so that, if only a momentary or partial opening of the valve be accomplished for any reason or other, the parts will be urged to closed position rather than to a partially open one. Such a condition might occur, for instance, upon an accidental, momentary depression of the operating treadle.

By regulating the needle valve, the exhaust may be choked which has the effect of cushioning the movement of the piston 24 and therefore, of the operating parts.

Furthermore, it will be seen that the arrangement of the crank arms and connecting rods is such that the door segments cannot bang against one another. This follows from the fact that in full open or closed positions the crank pins are on dead center. Another result of the arrangement is that the parts are locked in full open and full closed position, and are pressure operated in both movements. Accidental operation by explosion or otherwise is thus prevented.

In addition, it will be observed that the door sections are balanced the one by the other and are substantial counterparts. In opening, the weight of the lower section balances the upper, and in closing, the upper balances the lower; as a result of which a minimum of pressure only is required to operate the doors, such pressure being many

times less than that required for standard doors. This balanced relation of the parts also prevents accidental movement of the doors from any position in which they are put. The mounting and arrangement of the operating mechanism is also such as not to interfere with the balancing of the doors which is an advantage heretofore not present in standard doors.

It will be noted, too, that the parts are simple and located in such a way as to afford minimum obstruction and interference; and the entire door mechanism is a self-contained structure. The parts are also readily assembled and taken apart, and wear is greatly reduced.

The doors may be manually operated by means of the arm 60 on crank 17 in the absence of pressure.

The doors may be locked in any one of a number of positions by the latch 61 pivoted to the sleeve 21 and adapted to engage the lugs 62 on the frame.

It should be noted that no claims for this type of door, per se, involving the use of the two members 7 and 8 as shown, are made herein since the broad idea of this type of door is covered in my copending earlier filed application No. 374,657, filed April 17th, 1920.

I claim:

1. In a furnace fire door mechanism, the combination of a pivoted door member, an operating crank, and a connecting rod pivoted to the door member in such manner as to be on dead center when the door member is in open or in closed position.

2. In a furnace fire door mechanism, the combination of a frame, a pair of clam shell door segments pivoted therein, a rocker shaft, a pair of oppositely arranged crank arms, and a connecting rod from each crank arm to a respective door segment adapted to be on dead center when the segments are open or closed.

3. In a furnace fire door mechanism, the combination of a pivoted door member, a rocker shaft for operating said door member, and a member connected with the shaft adapted to impart rotary movement thereto when such member is moved in a direction longitudinally of the shaft.

4. In a furnace fire door mechanism, the combination of a pivoted door member, a rocker shaft for operating said door member, and a member having a helical cam connection with the shaft adapted to impart rotary movement to the latter on longitudinal movement of said member.

5. In a furnace fire door mechanism, the combination of a pivoted door member, a rocker shaft for operating said door member, a pressure operated piston movable in a direction substantially longitudinally of the shaft, and a connection between piston

and shaft adapted to translate the movement of the former into a rotary movement of the latter.

6. In a furnace fire door mechanism, a door operating means, consisting of a rotatable member and a non rotating reciprocating member movable in a direction substantially parallel the axis of rotation of the rotatable member and adapted to translate its movement into a rotary movement of the rotatable member.

7. In a furnace fire door mechanism, a door operating means including a rocker shaft, a movable sleeve therefor having a helical slot, means on the shaft fitting in said slot, and means for moving the sleeve relative to the shaft.

8. In a furnace fire door mechanism, a door operating means including a rocker shaft, a movable sleeve therefor having a helical slot, means on the shaft fitting in said slot, and means for moving the sleeve relative to the shaft comprising a cylinder and a piston connected with the sleeve.

9. In a furnace fire door mechanism, a door operating means, consisting of a rotatable member and a non rotating reciprocating member movable in a direction substantially parallel the axis of rotation of the rotatable member and adapted to translate its movement into a rotary movement of the rotatable member, together with means for locking the reciprocating member.

10. In a furnace fire door mechanism, the combination of a door member, and means for operating said door member including a cylinder, a piston, a valve adapted to admit pressure for the opening and closing movements of the piston, and means whereby the valve when once shifted to admit pressure for opening is maintained in a position admitting air for closing until the closing has been completed.

11. In a furnace fire door mechanism, the combination of a door member, and means for operating said door member including a cylinder, a piston, a source of pressure, a controlling valve adapted when in closed position to cut off the air supply, when in full open position to admit pressure to one end of the piston, and when in a third position to admit pressure to the other end of the piston, and means for holding the valve in the third position until the piston has reached the limit of its travel in the respective direction.

12. In a furnace fire door mechanism, the combination of a door member, a shaft, a cylinder, a piston, a controlling valve normally held in closed position, and means operated by said shaft to hold the valve open until the door has closed.

13. In a furnace fire door mechanism, the combination of a door member, a shaft, a cylinder, a piston, a controlling valve nor-

mally held in closed position, and means for manually shifting the valve, said means being automatically held in a position holding the valve in a pressure admitting position by the shaft until the closing is completed.

14. In a furnace fire door mechanism, the combination of a door member, a flattened shaft, a cylinder, a piston, a controlling valve normally held in closed position, and a valve operating member adapted to be engaged by the shaft effective when abutting the round portion of the shaft and ineffective when abutting the flattened portion thereof.

15. In a furnace fire door mechanism, a

pair of pivoted door members, a rotatable operating shaft, and a crank on said shaft for each door member, said cranks projecting in opposite directions.

16. In a furnace fire door mechanism the combination of a door member, fluid actuated operating means therefor, and a controlling valve for the fluid which, when moved to cause opening of the door, will momentarily admit closing pressure before admitting opening pressure.

In testimony whereof I have hereunto signed my name.

EINAR JOHAN BRING.