A. G. ELVIN.

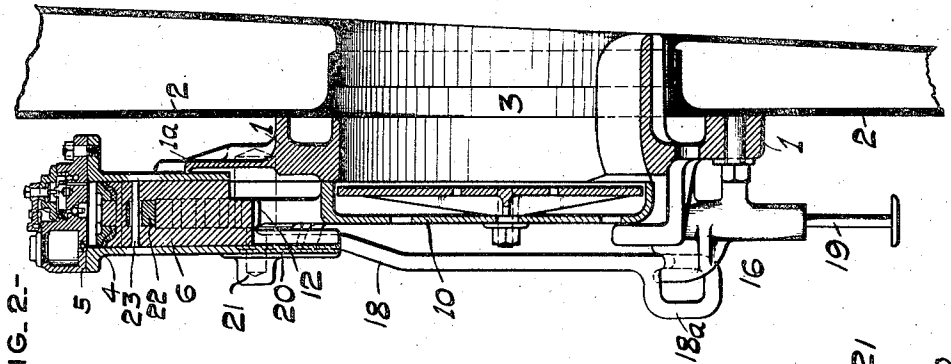
FIRE DOOR APPARATUS.

APPLICATION FILED JULY 30, 1913.

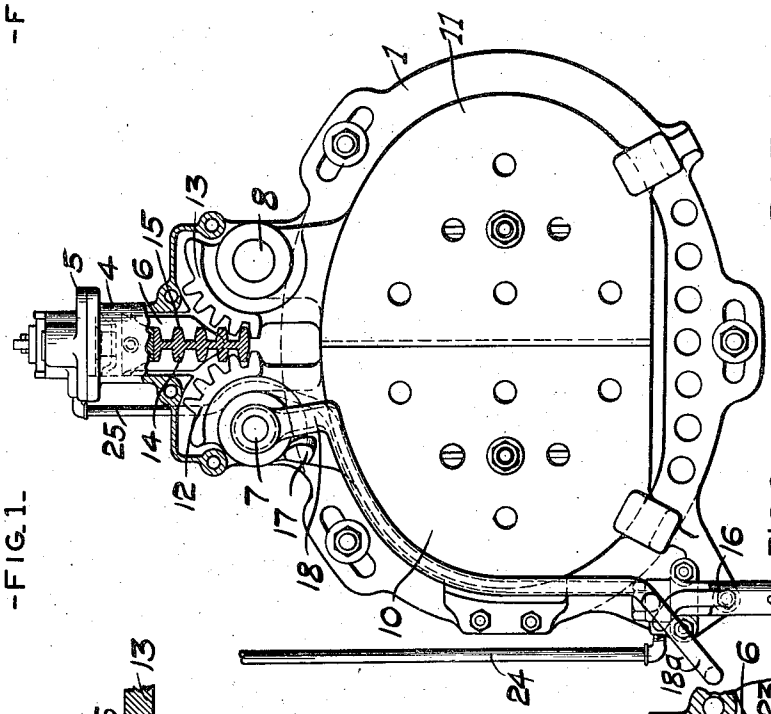
1,186,977.

Patented June 13, 1916.

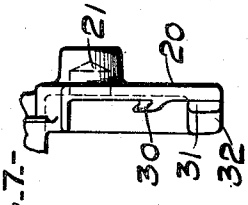
2 SHEETS—SHEET 1.



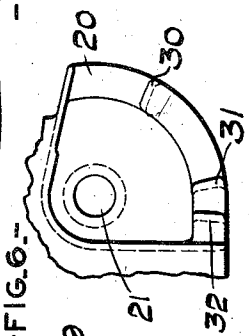
-FIG. 2.-



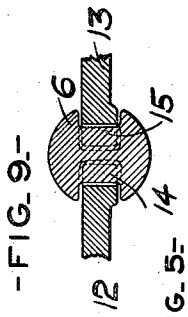
-FIG. 1.-



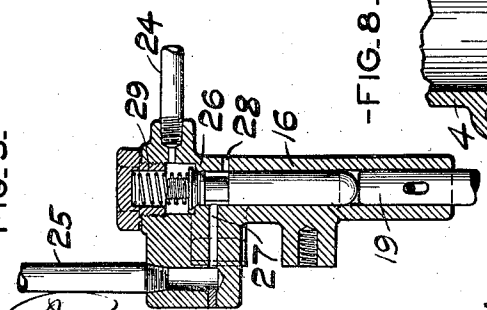
-FIG. 7.-



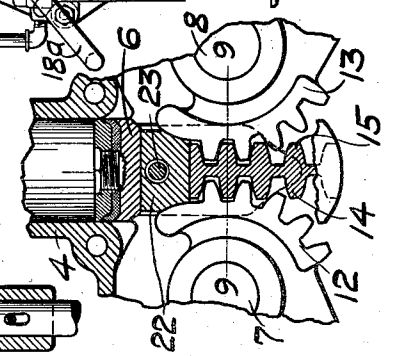
-FIG. 6.-



-FIG. 9.-



-FIG. 5.-



-FIG. 8.-

WITNESSES

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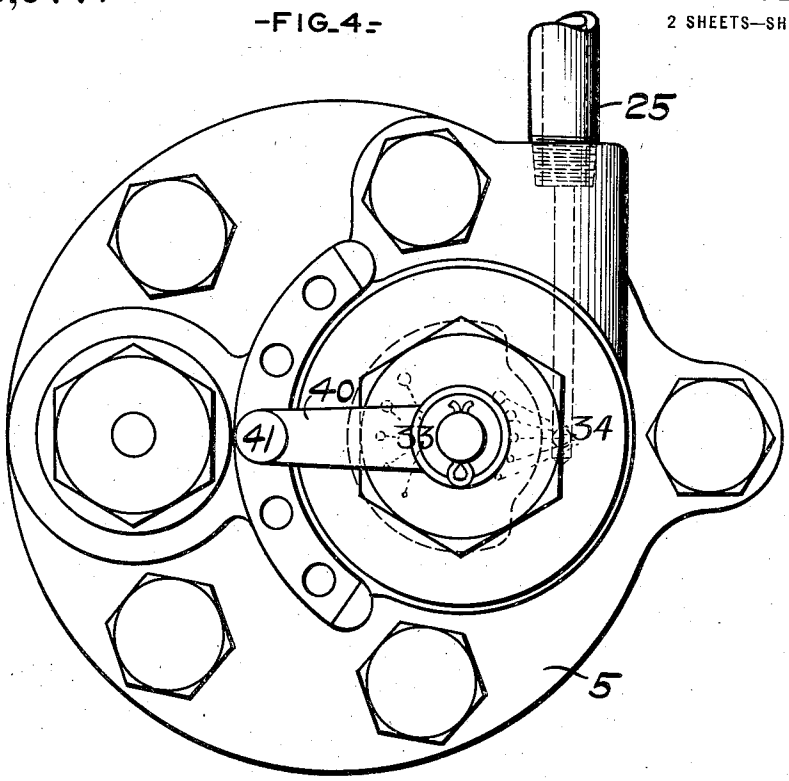
FIRE DOOR APPARATUS.

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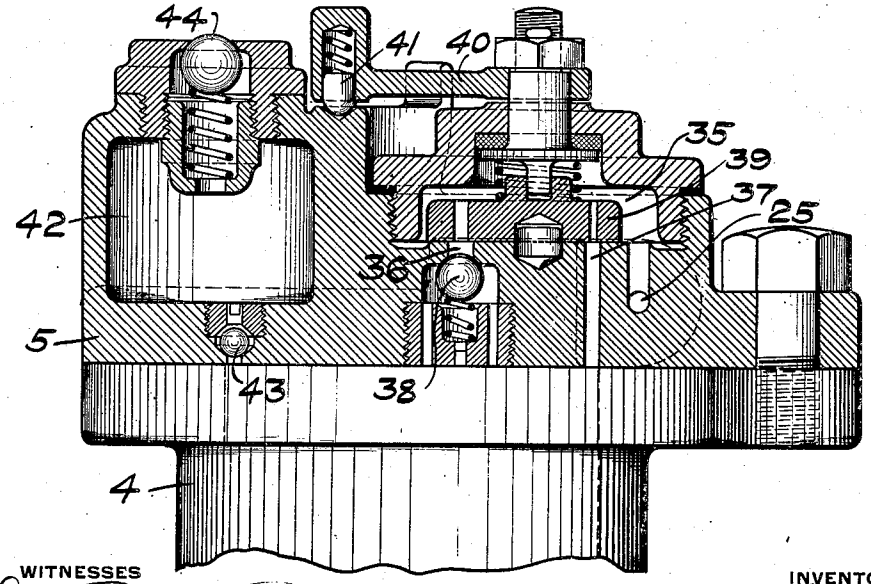
1,186,977. Patented June 13, 1916.

2 SHEETS—SHEET 2.

-FIG_4-




-FIG_3-




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# UNITED STATES PATENT OFFICE.

ALBERT G. ELVIN, OF SOMERVILLE, NEW JERSEY.

## FIRE-DOOR APPARATUS.

1,186,977. Specification of Letters Patent. Patented June 13, 1916.

Application filed July 30, 1913. Serial No. 781,943.

*To all whom it may concern:*

Be it known that I, ALBERT G. ELVIN, a citizen of the United States, and a resident of Somerville, in the county of Somerset and State of New Jersey, have invented a certain new and useful Improvement in Fire-Door Apparatus, of which improvement the following is a specification.

This invention relates to fluid pressure operated apparatus for fire doors of locomotive boilers or other furnaces, and has for one of its objects to provide an improved apparatus of this character in which the furnace doors are pivoted to swing laterally upward in the opening movement and to close by gravity.

Another object is to provide means for regulating the ports for admission and exhaust of fluid to and from the motor to produce the desired rate of movement, and prevent slamming of the doors under different degrees of fluid pressure.

Another object is to provide improved means for operating the doors by hand whenever desired. And a still further object is to provide improved means for lubricating the cylinder of the door motor.

The improvement claimed is hereinafter fully set forth.

In the accompanying drawings, Figure 1 is a front elevation of a fire door apparatus embodying my improvement, a part being indicated in section to show the gearing for operating the doors; Fig. 2, a central transverse section of the same applied to the fire door opening of a locomotive boiler; Fig. 3, a vertical central section of the door motor cylinder head showing the regulating valve for adjusting the admission and exhaust ports; Fig. 4, a plan or top view of the same; Fig. 5, a detail view in section, showing the controlling valve for the door motor; Fig. 6, a detail view showing the rear face of the notched plate for engaging the hand lever; Fig. 7, a side view of the same; Fig. 8, a vertical section of a portion of the motor cylinder and piston, with the gears in elevation, the parts being in the open position; and, Fig. 9, a horizontal section taken on the line 9—9 of Fig. 8.

According to the construction shown in the drawings, my invention is exemplified as applied to a locomotive boiler having a door frame, 1, suitably mounted upon the rear sheet, 2, of the fire box, and surrounding the fire door opening, 3. The door frame is provided with an extension, $1^a$, to which is bolted the cylinder, 4, of the door motor, preferably located vertically and directly above the middle of the fire door opening. The opening is covered by the pair of doors, 10 and 11, which meet together upon the vertical center line of the opening, and are pivoted to swing laterally and vertically upon the respective pins, 7 and 8, which are journaled in recesses in the frame extension, $1^a$, at the back, and are mounted to turn in hollow bosses, 21, of the plate, 20, at the front, which plate may be formed as an integral extension of the cylinder casting, 6.

The pivoted arms or portions of the doors, 10 and 11, are provided with the respective gear segments, 12 and 13, which mesh with the teeth of the racks, 14 and 15, formed in recesses upon opposite sides of the plunger or piston, 6, in the cylinder, 4, the arrangement being such that the downward movement of the piston operates through the gear segments to swing the doors laterally upward in opposite directions to the open position, as shown in Fig. 8 of the drawings.

The upper end of the cylinder is provided with a cap, 5, and the piston may be operated by fluid pressure admitted through pipe, 25, through the controlling valve device, 16, from any suitable source represented by the supply pipe, 24. Any suitable or preferred form of controlling valve device may be employed, that shown in Fig. 5 comprising a valve, 26, normally held seated by the spring, 29, and the fluid pressure from the supply pipe, 24, while the cylinder is open to the exhaust through pipe, 25, and ports, 27 and 28. When the valve, 26, is raised by the manually operated rod, 19, the exhaust port, 28, is closed by the stem of the valve, while fluid under pressure from the pipe, 24, flows around the valve, 26, through port, 27, and pipe, 25, to the cylinder, where it acts upon the piston, 6, forcing the same to the bottom of the cylinder and opening the doors as before described. The fluid pressure continues to act upon the piston and holds the doors open as long as the valve, 26, is maintained in its raised position by the rod, 19, but as soon as this rod is released, the valve, 26, is closed by the fluid pressure and the spring acting on the valve, and the fluid is then released from

the cylinder through exhaust port, 28, whereupon the doors are immediately closed by gravity.

In order to limit the travel of the piston and doors in the opening movement, and at the same time relieve the piston from any strain or blow which might produce leakage, I provide a floating block or stop, 22, mounted to have a lateral sliding movement through a slot in the piston, and having its opposite ends adapted to engage the end portions of the segments, 12 and 13, respectively, as shown in Fig. 8 of the drawing. The block may be retained by the pin, 23, passing through a slot or elongated hole in the block for permitting a limited lateral movement of the same so that if one segment should strike the stop slightly in advance of the other, the block would move laterally until struck by the other segment in the opposite direction, thus serving to stop the piston and segments without shock to the piston. In this way the piston maintains its true position in the cylinder and objectionable leakage is prevented.

As the fluid used for operating the apparatus may be subject to some variation in pressure, I provide means for adjusting the rate of admission of fluid to and its exhaust from the cylinder in order to produce a uniform action of the device under different degrees of pressure and prevent slamming of the doors. For this purpose separate admission and exhaust ports may be employed, having means for adjusting the capacity of the same. As shown more particularly in Figs. 3 and 4, the inlet pipe, 25, communicates with a chamber, 35, formed in the cylinder head, 5, and having a valve seat with two ports, 36 and 37, leading into the cylinder. A check valve, 38, is mounted in one of said ports to prevent back flow or exhaust of fluid from the cylinder, but to permit the admission of fluid to the cylinder. A rotary valve, 39, is mounted on said seat, and has a series of ports, 33, adapted to register with admission port, 36, and another series of ports, 34, adapted to register with the exhaust port, 37, as the valve is turned to its different positions. The ports of each series vary in size in inverse directions, so that when the smallest of the first series registers with port, 36, the largest port of the second series registers with the exhaust port, 37, and vice versa. The rotary valve, 39, is provided with a handle, 40, and an impositive stop, 41, outside the cylinder head for setting the valve to any one of its positions as desired to suit different degrees of fluid pressure.

When the fluid pressure is low, the regulating valve is set to a position in which a large port in said valve registers with the inlet port, 36, in the seat, and a small port of the second series registers with the exhaust port, 37. Then when the controlling valve is opened for operating the door, a comparatively large amount of fluid will be admitted to the cylinder through the combined capacity of said ports, but the release will be restricted to the capacity of the small exhaust port as the check valve, 38, prevents the exhaust of fluid through port, 36. This prevents the slamming of the doors during the closing movement when operating with a low degree of fluid pressure.

When the fluid pressure is high, the regulating valve is adjusted to a position in the opposite direction in which a large exhaust port registers with port, 37, so that the door shall not be too slow in closing. In this way the capacity of the ports may be adjusted by the regulating valve to suit different conditions and degrees of fluid pressure so as to give a substantially uniform action of the apparatus at all times.

For the purpose of operating the doors by hand whenever desired, I provide a hand lever, 18, which is pivoted loosely on the pin, 7, of the door, 10, and is adapted to engage a boss or lug, 17, formed on said door in such a manner as to swing the door up to its open position when the lever is pulled up by the handle, 18a. This movement is also transmitted through the geared segments and interposed rack to move the piston down and open the other door, 11, at the same time. In order to hold the door open in different positions, the plate, 20, may be provided on its rear face with a number of notches located at desired points, such as 31 clined surface engaging the lever, 18, in and hold the same in such position. The lug, 17, is preferably formed with an inclined surface engaging the lever, 18, in such a manner as to tend to deflect the same outward toward the notches on the rear of the plate when the lever is pulled upward by the handle, the looseness of the bearing of the lever upon the pin readily allowing for such deflection. One of the notches, 31, is located so as to latch the door open slightly for draft purposes and preventing the formation of smoke when the locomotive is standing at a station, while another notch, 30, is located at or near the end of the movement of the lever in order to latch the door fully open when desired. If the door should be standing latched by the hand lever in its partly open or draft position, when the controlling valve is opened for operating the fluid pressure motor, the piston acting through the rack and segment swings the door away from the hand lever to its wide open position, the hand lever at the same time dropping out of said notch swings back by gravity to its stop, 32, at its normal closed position. Then upon releasing the controlling valve, the door closes in

the usual way. If, however, the door is latched by the hand lever, in its wide open position at the time that the controlling valve is opened, there will be no movement of the door as the piston is at the bottom of its stroke and the latch cannot be released by the fluid pressure.

Any suitable or preferred manually operated device may be employed for actuating the rod, 19, for instance a pedal device operated by the foot of the fireman.

In order to lubricate the door motor cylinder, an oil chamber, 42, may be formed in the cylinder head, 5, and have a double seated reciprocating valve, 43, located in a small chamber communicating with the oil chamber and with the cylinder. The oil may be introduced into the chamber, 42, through an opening normally closed by a spring seated valve, 44. The ball valve, 43, normally engages its lower seat, and closes communication through the passage into the cylinder but permits oil from the chamber, 42, to flow into the small chamber around said valve. Then when pressure is admitted to the cylinder, the valve, 43, is forced against its upper seat, preventing the fluid pressure from escaping into the oil chamber, but allowing the small quantity of oil which accumulated in the small chamber to flow down into the cylinder. In this way, the ball valve is caused to reciprocate between its upper and lower seats each time that fluid pressure is admitted to and released from the motor cylinder, and a small quantity of oil is fed into the cylinder at each stroke of the piston, whereby the cylinder is effectually lubricated.

Having now described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In a fire door apparatus, the combination of a pair of doors, each pivoted to swing laterally and vertically, a vertical cylinder located above said doors, a piston in said cylinder for operating said doors, and a floating stop carried by the piston for arresting the doors at the full open position.

2. In a fire door apparatus, the combination of a pair of doors pivoted to swing laterally and vertically and each having a segmental gear, a fluid pressure cylinder, a piston therein, and a floating stop carried by the piston for engaging the ends of said segments.

3. In a fire door apparatus, the combination of a door, a pivot pin above said door on which it is mounted to swing laterally and vertically, a hand operated lever loosely mounted on said pin and extending down around the side of the door, a projecting lug on said door and having an inclined surface for deflecting the lever outward, and a plate in front of said lever and having notches on its under side for holding the lever in different positions.

4. In a fire door apparatus, the combination of a pair of doors pivoted to swing laterally and vertically and each having a segmental gear, a projecting lug on one of said doors, and a hand operated lever mounted on one of said pivots and adapted to engage said lug, the engaging surfaces between the lever and said lug being formed to deflect the lever outward, and a plate having notches for holding the lever in different positions.

5. In a fire door apparatus, the combination of a pair of doors pivoted to swing laterally and vertically and each having a segmental gear, a fluid pressure cylinder, a piston therein having rack teeth engaging said gears, a projecting lug on one of said doors and having an inclined surface, a hand operated lever mounted on one of said pivots and adapted to engage said inclined surface, and a plate in front of said lever and having notches on its under side for holding said lever in its different positions.

6. In a fire door apparatus, the combination with a vertically movable door, of a fluid pressure cylinder and piston for operating the same, a regulating valve for adjusting the capacity of the exhaust port from said cylinder, a separate admission port containing a check valve, and a valve for controlling the admission of fluid to and its release from said cylinder.

7. In a fire door apparatus, the combination with a vertically movable door, of a fluid pressure cylinder and piston for operating the same, said cylinder having an exhaust port and a separate check valve controlled admission port, a regulating valve device for adjusting the capacity of the admission and exhaust ports, and a control valve for admitting fluid to and releasing the same from said cylinder.

In testimony whereof I have hereunto set my hand.

ALBERT G. ELVIN.

Witnesses:
F. W. MARTIN,
A. I. DENNELLEY.