(No Model.) 2 Sheets—Sheet 1.

# M. N. FORNEY.

## FURNACE DOOR.

No. 354,631. Patented Dec. 21, 1886.

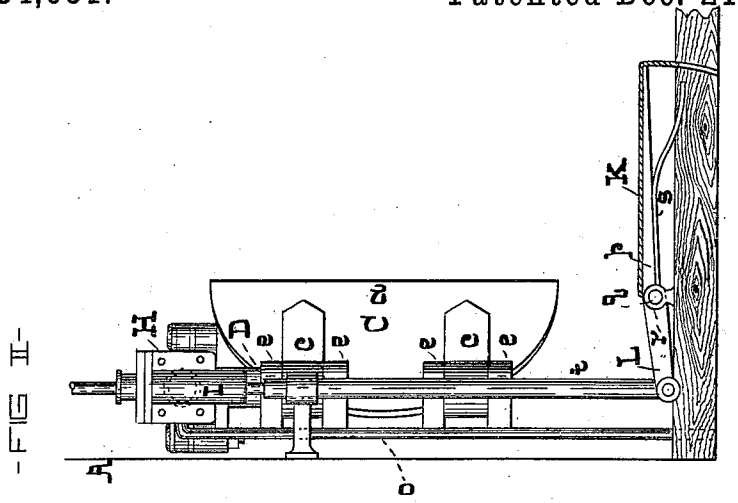


FIG II

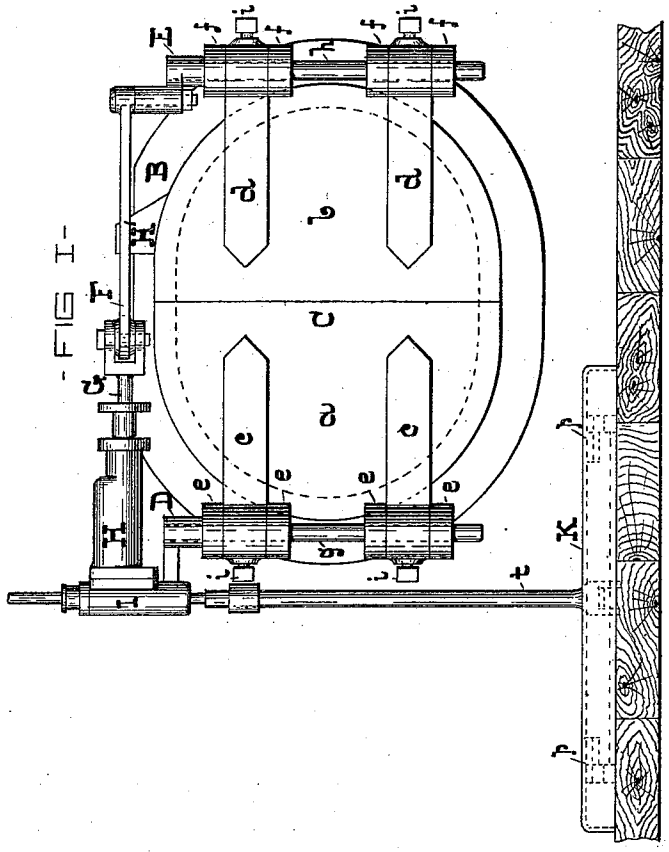


FIG I

WITNESSES

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(No Model.) 2 Sheets—Sheet 2.

# M. N. FORNEY.

## FURNACE DOOR.

No. 354,631. Patented Dec. 21, 1886.

FIG III.

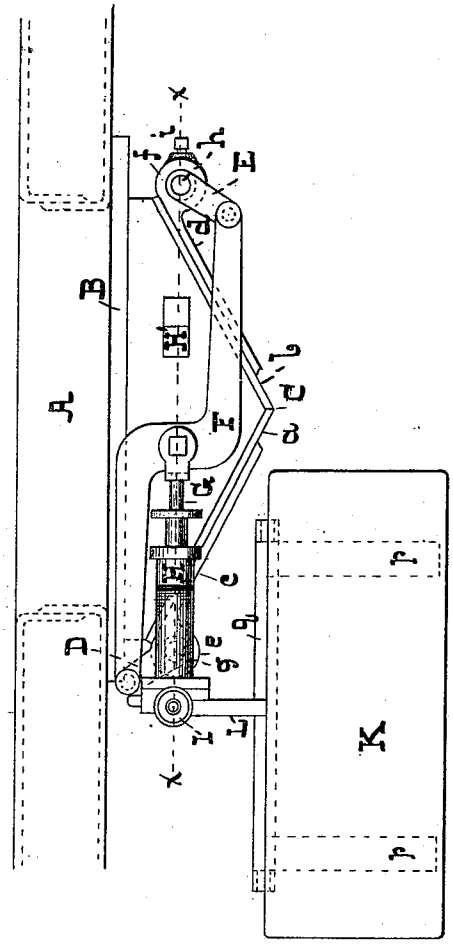



FIG V.

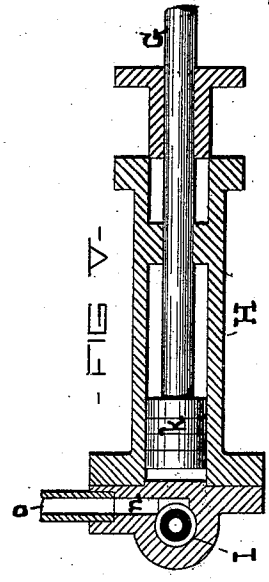
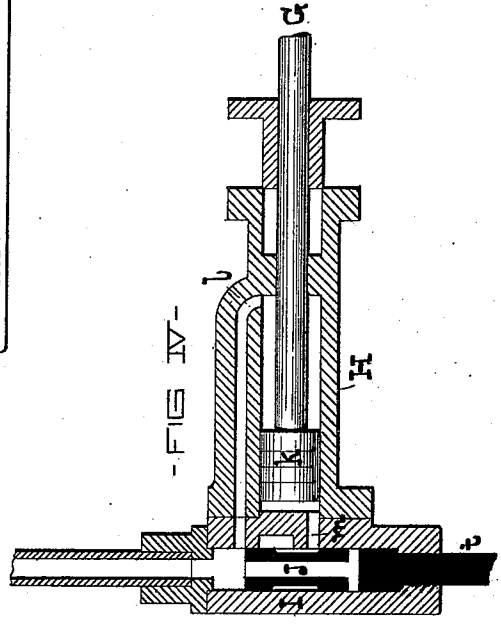



FIG IV.




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# UNITED STATES PATENT OFFICE.

MATTHIAS NACE FORNEY, OF NEW YORK, N. Y.

## FURNACE-DOOR.

SPECIFICATION forming part of Letters Patent No. 354,631, dated December 21, 1886.

Application filed June 7, 1886. Serial No. 204,323. (No model.)

*To all whom it may concern:*

Be it known that I, MATTHIAS NACE FORNEY, of the city, county, and State of New York, have invented certain Improvements in Fire-Box or Furnace Doors, of which the following is a specification.

This invention relates to improved means for applying the pressure of steam, air, or other fluid to furnace-doors for the purpose of opening and closing the same, as will hereinafter fully appear.

In the description of the said invention which follows reference is made to the accompanying drawings, forming a part hereof, and in which—

Figures I and II are, respectively, a front and an edge view of a locomotive-furnace door provided with my improvements. Fig. III is a plan of Fig. I, with a part of the front of the boiler. Figs. IV and V are respectively a side section and a sectional plan of certain parts of the invention on an enlarged scale.

In the said drawings, A is a part of the boiler, and B the door-frame secured to the boiler in the usual manner.

C is the furnace-door, formed in two parts or sections, denoted by *a* and *b*, hinged to the frame B. The hinges employed consist of the brackets *c* and *d*, attached, respectively, to the sections *a* and *b* of the door, the lugs *e* and *f*, on the frame B, and the bolts *g* and *h*. These bolts pass loosely through the lugs *e* and *f*, and are fastened to the brackets, preferably, by means of set-screws *i*.

D and E are arms rigidly attached to the upper ends of the bolts *g* and *h*, and they project in opposite directions from a dotted line, *x x*, in Fig. III, which extends through the center of the bolts *g* and *h*, in order that when they are moved in the same direction the bolts *g* and *h* are swung around in opposite directions, and the sections *a* and *b* of the door C are jointly opened or closed. The arms D and E are coupled together by means of an offset-bar, F, to the middle of which is pivoted the piston-rod G of a steam-cylinder, H, hereinafter described.

As the ends of the coupling-bar F move in arcs of circles curved in opposite directions, the path of the middle point of the bar is a straight line, therefore the piston-rod G can be connected directly to the bar at this point without the intervention of guides or connecting-rods to maintain the rectilineal movement of the end of the rod.

H′ is a stop to arrest the movement of the piston when the doors are opened wide enough. The cylinder is supported in any suitable manner, but preferably from the front of the boiler, and it is provided with a piston, *k*, which is at the inner end of the piston-rod G.

I is the steam-valve chest at the rear end of the cylinder H, connected with the interior of the said cylinder by means of the front and rear steam-ports, *l* and *m*. The exhaust-port is denoted by *n*, and the exhaust-pipe leading therefrom by *o*.

J is the steam-valve, which is shown as of the piston form, adapted to slide within the valve-chest I. This valve operates to control the admission of steam to the cylinder in substantially the same manner as that of a slide-valve engine, and it is moved from a hinged foot-plate, K, by mechanism substantially as follows: The foot-plate is secured to two arms, *p p*, on a vibratory shaft, *q*, supported in bearings *r* on the foot-board and yieldingly supported by means of a spring, *s*. L is a third arm, also attached to the shaft *q*, which projects in an opposite direction to the ones *p*. To the arm L is connected a rod, *t*, the upper end of which is just below the bottom of the valve-chest. The valve has a projection which extends downward and outside of the valve-chest and bears on the upper end of the rod *t*.

When the fireman desires to open the furnace-door, he depresses the plate K with his foot, when the steam-valve I is raised through the medium of the arms *p p* and L and the rod *t*, before described, and steam is admitted to the port *m*, and thence to the rear end of the piston *k*. The piston is thus driven forward, and its movement transmitted to the two sections of the furnace-door through the medium of the piston-rod G, offset-rod F, arms D and E, and the bolts *g* and *h*, to which the said arms are rigidly attached. In the depression of the foot-plate the supporting-spring *s* is forced down; consequently its resilient action as the foot is removed raises the plate K and arms *p p* and depresses the end of the arm L and rod *t*. The pressure of the steam above the valve then forces it down into the position shown in Fig. IV, which permits the steam be-

low the piston to be exhausted and live steam to enter the cylinder in front, which forces the piston back into the position shown in Fig. IV, thus closing the doors.

It will be understood that, with some slight modifications, the invention as described may be adapted for furnace-doors of land and marine boilers, and to single as well as to double door, as shown; and while I have described the mechanism which I believe best adapted to effect the movement of the steam-valve and transmit the motion of the steam-piston to the doors I do not wish to be limited to the exact construction shown, as the said devices can be considerably changed without departing from the spirit of the invention.

I do not claim, broadly, the application of steam-power to furnace-doors, as I am aware that doors of metallurgic furnaces have been lifted by means of a steam-actuated piston, the closing of the said doors being effected by their own weight; but I am not aware that before my invention a piston actuated by steam has been used to open and close a furnace-door.

I therefore claim as my invention—

1. In combination with the door of a boiler-furnace, a steam-cylinder having a steam-port leading to either end thereof, a valve to control the admission of steam to either of the said ports, a piston within the said cylinder having a rod united to the door by means of suitable connections, and actuating devices, whereby movement of the hand or foot may be applied to the steam-valve to open or close the door, substantially as and for the purpose specified.

2. In combination with a door-frame adapted for attachment to a boiler-furnace, a door hinged to the said frame, a steam-cylinder having a steam-port leading to either end thereof, a valve to control the admission of steam to either of the said ports, a piston within the cylinder having a rod united to the door by means of suitable connections, and actuating devices, whereby movement of the hand or foot may be applied to the steam-valve to open or close the door, substantially as and for the purpose specified.

3. In combination with a door-frame adapted for attachment to a boiler-furnace, a door in two parts or sections which are hinged to the said frame, and provided with arms which are coupled together by means of a bar, a steam-cylinder having a steam-port leading to either end thereof, a steam-valve to control the admission of steam to either of the said ports, a piston in the cylinder, having a rod connected to the said coupling-bar, and actuating devices, whereby movement may be communicated to the said valve to change its position, and thereby open or close the two sections of the door, substantially as and for the purpose specified.

4. In combination with a furnace-door in two hinged sections, having arms rigidly attached to the bolts of the said hinges, which bolts are fastened to the portions of the hinges which form parts of the door, a bar to unite the said arms, a steam-cylinder having a piston and rod connected to the said coupling-bar, a steam-valve to control the admission of steam to and from the said cylinder, and means, substantially as described, to effect the movement of the said steam-valve, substantially as specified.

5. In a mechanism for operating a furnace-door by steam, constructed substantially as described, the combination of the steam-valve J, rod *t*, arms L and *p p*, supported shaft *q*, and yieldingly-sustained foot-plate K, substantially as and for the purpose specified.

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Witnesses:

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