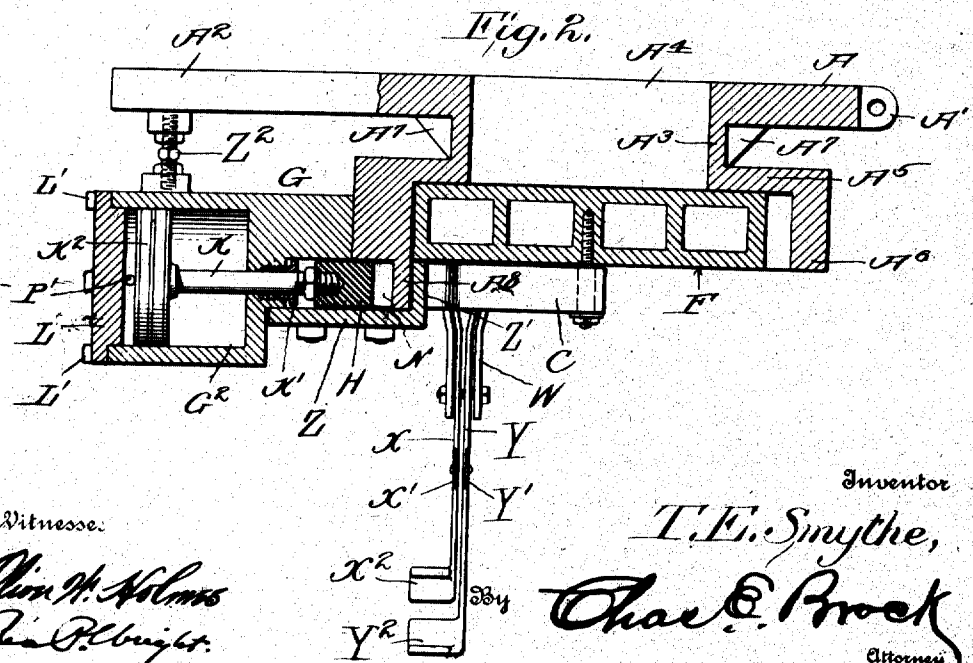
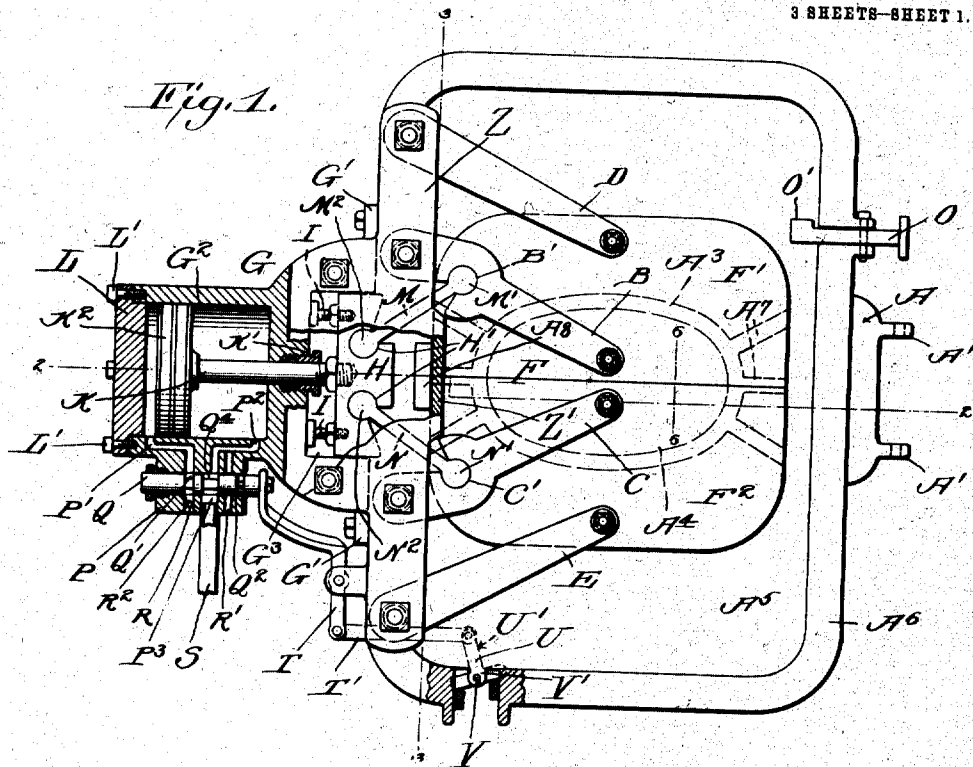


T. E. SMYTHE.
FURNACE DOOR OPENER AND CLOSER.
APPLICATION FILED DEC. 23, 1909.

1,002,088.

Patented Aug. 29, 1911.

3 SHEETS-SHEET 1.



Witnesses:

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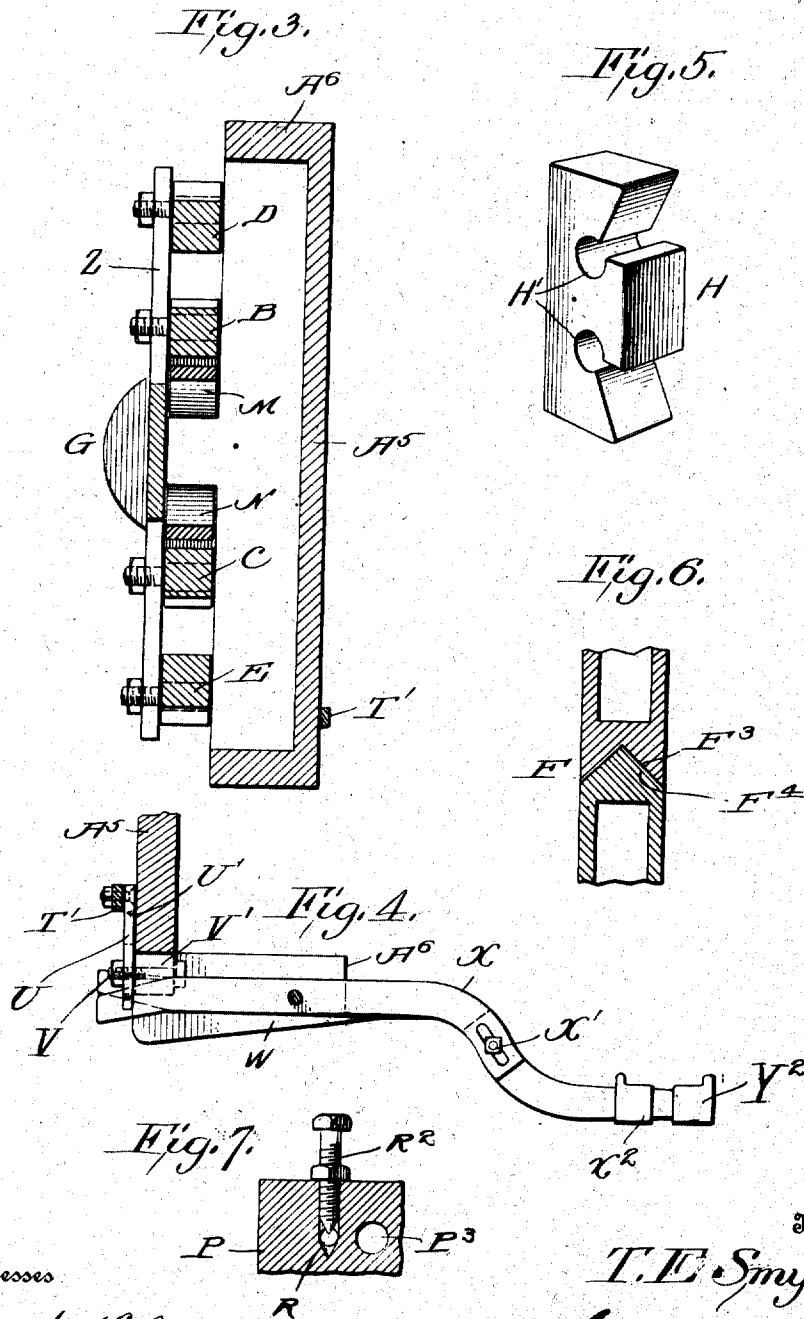
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3 SHEETS-SHEET 2.



Witnesses

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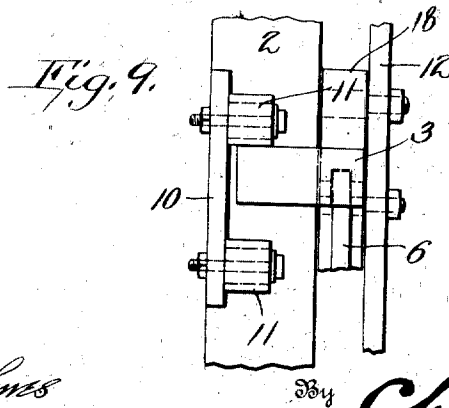
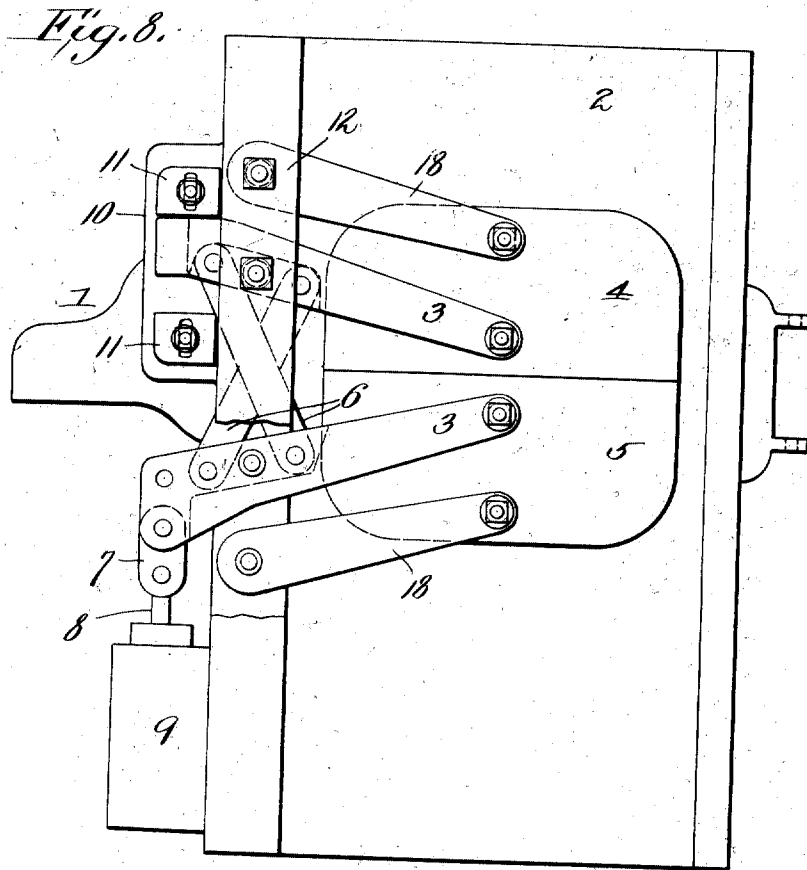
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3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

THOMAS E. SMYTHE, OF BELLEFONTAINE, OHIO.

FURNACE-DOOR OPENER AND CLOSER.

1,002,088.

Specification of Letters Patent. Patented Aug. 29, 1911.

Application filed December 23, 1909. Serial No. 534,601.

To all whom it may concern:

Be it known that I, THOMAS E. SMYTHE, a citizen of the United States, residing at Bellefontaine, in the county of Buchanan and State of Ohio, have invented a new and useful Improvement in Furnace-Door Openers and Closers, of which the following is a specification

This invention relates to certain new and useful improvements in door openers and closers, the object being to provide mechanism for opening and closing doors of steam boilers used in connection with locomotives, whereby said doors can be readily opened and closed by simply operating a foot lever.

A further object of my invention is to provide a furnace door formed of two sections which are carried by levers in such a manner that the door sections will be swung open and closed when the levers are rocked in such a manner that all danger of the door sections binding in any way is prevented.

A further object of the invention is to provide a door formed of two sections, each section being carried by a pair of levers which are operated by a slidably mounted member controlled by a piston in such a manner that when air or steam is admitted in one end of the cylinder in which the piston is mounted the doors will be swung into a closed position and when admitted in the opposite end of the cylinder the door sections will be swung apart into an open position.

A still further object of my invention is to provide a novel form of levers for controlling the valve for admitting steam into the cylinder whereby said valve would be moved so as to admit steam into either end of the cylinder by simply pressing slightly on one of the levers.

Still another object of the invention is to provide means for adjusting the exhaust port of the cylinder whereby the slamming of the doors when forced together is prevented, as by regulating the size of the opening an air cushion can be formed so that the doors will close in such a manner that all danger of the doors becoming injured in any way is prevented.

A still further object of my invention is to provide a door which is so constructed

that the same can be readily attached to or detached from the ordinary furnace or boiler now in use, said door being carried by a frame similar in construction to the ordinary door now in use so that by detaching the door of a furnace and placing my improved door thereon, it is not necessary to change the construction or secure the door to the furnace in any way.

With these various objects in view, my invention consists in the novel features of construction, arrangement and combination of parts, all of which will be hereinafter fully described and pointed out in the claims.

In the drawings forming a part of this specification: Figure 1 is a side elevation of my improved furnace door partly in section. Fig. 2 is a horizontal section taken on the line 2-2 of Fig. 1. Fig. 3 is a vertical section taken on the line 3-3 of Fig. 1. Fig. 4 is a detail vertical section showing the manner of mounting the foot levers for controlling the valve. Fig. 5 is a perspective view of the sliding operating block detached. Fig. 6 is a detail vertical section taken on the line 6-6 of Fig. 1. Fig. 7 is a detail section through the steam chest of the cylinder showing the manner of regulating the size of the exhaust in order to form a cushion for the piston. Fig. 8 is a side elevation of a modified form of door, and Fig. 9 is a detail view of the same showing the manner of mounting the stop blocks for limiting the movement of the lever arms.

In carrying out my improved invention, I employ a door frame proper A which is constructed the same as an ordinary door used on furnaces and is provided with apertured hinge lugs A' which are adapted to co-act with the hinge lugs of the furnace so that by detaching the door now in use on a furnace my improved door can be readily placed in position thereon. The other end of the frame A is provided with the usual latch member A² which is adapted to co-act with the catch carried by the furnace in a similar manner to doors of this character now in use. The frame A is provided with an annular rib A³ surrounding the opening A⁴ which communicates with the interior of the furnace and said rib has formed in

tegral therewith a rectangular plate A⁵ which is also provided with an opening registering with the opening A⁴ and has an annular flange A⁶ at its edge. The annular rib A³ of the frame A is provided with web portions A⁷ for strengthening the same and it will be seen that the frame A is cast integral with the plate A⁵ in such a manner that a rigid connection is formed so that in case it is necessary to swing the frame on the hinge lugs the plate will be carried therewith.

One side flange of the plate A⁵ is provided with an upwardly projecting lug A⁸ to each side of which are pivotally mounted operating levers B and C and supporting or guiding links D and E which are pivotally connected at their outer ends to my improved door F which is formed of two hollow sections F¹, F² which are provided with internal ribs so as to form air spaces between the walls of the door sections in order to allow free ventilation and the lower edge of the upper section F¹ is provided with a V-shaped groove F³ and the upper edge of the section F² is provided with a V-shaped tongue F⁴ adapted to fit within the groove F³ when the door sections are brought together so as to form an exceedingly tight joint and it will be seen that by forming the lower section with a V-shaped tongue the dirt and dust or small particles of coal which drop on the same when the furnace is being fired will slide off.

Connected to the side bar of the plate A⁵ carrying the levers is a casting G which is provided with apertured lug portions G¹ for securing the same thereto and said casting G comprises a cylinder portion G² and a housing portion G³ in which is slidably mounted an operating block H the forward movement of which is limited by the lug A⁸ and the rearward movement of the same is limited by bolts I carried thereby which are locked in adjusted position by lock nuts and said bolts are adapted to engage the rear wall of the housing G³ so as to limit the rearward movement of the block as will be hereinafter fully described. The bottom of the housing G³ is flush with the flange of the plate A⁵ so as to allow the block H to move freely over the same and connected to the block H at its rear end is a piston rod K which extends through a stuffing box K¹ formed on one end of the cylinder G² and said piston rod K carries a piston head K² having packing rings of any suitable construction so as to form a tight joint around the same. The outer end of the cylinder G² is closed by a cylinder head L which is secured therein by bolts L¹ as clearly shown so that the piston can be readily removed from the cylinder when it is desired to repack the head.

The operating levers B and C are pro-

vided with enlarged portions having sockets B¹, C¹ in which are mounted the cylindrical heads M¹, N¹ of operating links M and N which are provided with cylindrical head portions M², N² at their opposite ends which are seated in cylindrical sockets H¹ formed in the operating block H so that when the block H is moved forwardly by the piston the operating levers B and C will be swung on their pivots so as to swing the door sections apart, said sections being guided by the links D and E so that the strain on the levers B and C is reduced. It will be seen that as the block is moved forwardly the heads of the operating links M and N will move slightly in the cylindrical sockets of the head and levers in such a manner that the operating levers can move apart in order to carry the door sections apart and when the block H is drawn rearwardly the operating links will draw the levers together so as to carry the door sections together in order to close the door. For holding the sections in an open position so that all danger of the door sections closing when a boiler maker has entered the furnace to repair the same I provide the opposite side flange with a pivoted catch O provided with a V-shaped tongue portion O¹ adapted to fit within the V-shaped groove of the upper section F¹ of the door and it will be seen that by pressing on the outer end of the catch O so as to allow the door sections to pass under the same and then swinging the same back into its normal position the doors will be held in such a manner that it will be impossible for the doors to be accidentally closed.

Formed integral with the cylinder G² is a steam chest P which is provided with ports P¹, P² communicating respectively with the ends of the cylinder G² through which steam is adapted to pass and be exhausted for moving the piston in the cylinder. The steam chest P has a cylindrical valve Q mounted therein which extends through stuffing boxes at its ends for forming a tight joint and said valve Q is provided with annular grooves Q¹, Q² forming exhaust passages which are adapted to register with the passages P¹, P² so as to allow the exhaust steam to pass out of the cylinder, said exhaust passages communicating with outlets R and R¹, the outlet R being closed by a needle valve R² so that the size of the outlet can be regulated in order that an air cushion can be formed in the end of the cylinder so that when steam is admitted in the opposite end so as to drive the piston rearwardly by regulating the size of the opening the exhaust can be controlled so that the movement of the piston will be regulated in order to prevent the doors from being slammed together and being injured. Communicating with the steam chest P is an inlet port P³ to which a steam or air supply pipe S is adapted to be connected, said inlet

communicating with an enlarged annular passage Q^1 formed in the valve Q which is adapted to register with the ports P^1 , P^2 so that air or steam can be admitted in either end of the cylinder by operating the valve and it will be seen that when air is being admitted in one end of the cylinder the port at the other end will communicate with one of the exhaust passages of the valve so as to allow the exhaust to pass out of the same.

For operating the valve Q I provide a pivoted lever T which is mounted between suitable lugs carried by the flange of the plate A^5 , one end of said lever being loosely connected to the end of the valve Q and the other end of said lever has a link T' pivotally connected thereto which extends to the rear of the plate A^5 and is connected to the end of the stem U of a T-shaped member U' which is pivotally mounted on a bolt V carried by a lug V' depending from a cut away portion of the flange of the plate A^5 . Formed integral with the flange at the cut away portion is a housing W which extends outwardly and between which are mounted a pair of foot levers X and Y which are provided with oppositely bent inner ends adapted to co-act with the cross bar of the stem of the T-shaped member U' so as to swing said T-shaped member on its pivot in order to operate the lever T through the link T' so as to slide the valve Q . The foot levers X and Y are formed of two sections adjustably connected together at X' , Y' and the outer ends of said levers are provided with foot pieces X^2 , Y^2 adapted to receive the foot of the fireman so that by simply pressing on one of said foot pieces the valve can be moved longitudinally within the steam chest in order to allow steam to enter one end of the cylinder and by moving the foot so as to compress the other lever the valve will be moved so as to admit steam into the opposite end.

For inclosing the housing and the levers so as to prevent the dirt and dust from injuring the same in any way I provide a covering plate Z which fits over the same snugly and is provided with openings through which the reduced ends of the pivot pins of the levers extend, said plates resting on the shoulders formed by reducing the ends of said pivot pins and is secured thereon by nuts. The plate is provided with a depending lip portion Z' which extends down between the operating levers so as to prevent the dust and dirt from entering the space between the levers when the doors are thrown open and coal is being placed in the furnace and it will be seen that by this construction the operating block, links and levers are held in their proper positions by the plate Z in such a manner that all danger of the parts becoming detached is prevented and it will also be seen that when it

is desired to remove any of the parts, it is only necessary to detach the plate. The casting G is supported by a bolt Z^2 so as to prevent the same from moving in any direction when the doors are operated and said bolt has one of its ends seated in a threaded boss formed in a lug secured in the side of the cylinder G^2 and has its other end seated in a threaded bore formed in a lug carried by the latch end of the frame A , said bolt being secured in its adjusted position by said nuts so that the same can be readily tightened and it will be seen that by connecting the casting to the frame A in the manner shown all danger of the same working loose is prevented.

In the modification shown in Figs. 8 and 9 I form a frame 1 similar to the frame in my preferred form and said frame is provided with an integral plate 2 having an annular flange on which are pivotally mounted operating levers 3 which carry door sections 4 and 5 at their free ends, said levers being connected together by cross links 6 and connected to one of the operating levers 3 is a link 7 to which is connected a piston rod 8 of a piston mounted within a cylinder 9 and connected to the plate 2 by any suitable means and it will be seen that when the piston is operated by steam or air the operating levers 3 will be swung on their pivots so as to open and close the door sections in a similar manner to the preferred form. The door sections are guided by guide links 18 pivotally mounted on the frame so as to relieve the strain of the weight of the door sections from the operating levers so that the door sections will have double support and swing freely on the same, and it will be seen that as the operating lever is swung on its pivot by the piston the door sections will be swung away from each other or together so as to close or open the opening in the plate. The meeting edges of the door sections are preferably formed so as to interlock by forming one of the sections with a tongue and the other with a groove. The plate 2 is provided with a flanged portion 10 on which are adjustably mounted blocks 11 which are adapted to engage a lug formed on the adjacent operating lever so as to limit the movement of the lever in order to prevent the door sections from being brought together with too much force, and said blocks are preferably slotted as clearly shown through which bolts extend for locking the same in their adjusted positions. It will be seen that by this construction the movement of the operating levers can be easily and quickly adjusted in order to prevent the door sections from slamming together when the operating levers are moved by the piston. The levers are preferably covered by a plate 12 similar in construction to the plate shown in Figs. 1, 2, 3 and

4 so as to protect the same from coal dust and small particles of coal and this plate is secured over the levers in a similar manner to the plate used in connection with my preferred form.

What I claim is:—

1. A device of the kind described comprising a frame having means for securing the same to the hinge lugs of a furnace, said frame having an integral apertured plate, operating levers mounted on said plate, door sections carried by the free ends of said levers, guide links connected to said door sections above and below said operating levers, links carried by said operating levers and a fluid operated slidably mounted block connected to said last mentioned links.
2. The combination with a pivotally mounted frame having an integral apertured plate provided with a flanged edge, of levers mounted on one of the side flanges of said plate, door sections pivotally carried by the free ends of said levers, a slidably mounted operating block provided with sockets, links pivotally mounted in said sockets connected to said levers and a fluid operated piston connected to said operating block.
3. A door opener and closer comprising a frame having an integral apertured plate provided with a flanged edge, of operating levers mounted on the flange of said plate provided with sockets, door sections carried by the free ends of said operating levers, a slidably mounted block provided with sockets, links provided with heads mounted in the sockets of said block and said levers, means for adjusting the movement of said block, together with means for reciprocating the same.
4. A door opener and closer comprising a frame having hinge lugs adapted to be mounted on the hinged lugs of a furnace, said frame being provided with an integral apertured plate having a flanged edge, a casting secured to one side flange of said plate provided with a housing and a cylinder, levers pivotally mounted on said flange, door sections carried by said levers, a block slidably mounted in said housing, links connecting said block to said operating levers, a piston mounted in said cylinder connected to said block and means for admitting fluid into the opposite ends of said cylinder for operating said piston.
5. A door opener and closer comprising a frame having an integral apertured plate provided with a flanged edge, said plate being provided with an opening communicating with the opening of the frame, a door formed of two sections mounted on said plate between said flanges and adapted to close said opening, operating levers pivotally mounted on said frame having their free ends connected to said door sections, a

slidably mounted block, links connecting said block to said operating levers, a cylinder carrying a piston having a piston rod connected to said operating block, a valve for controlling the flow of fluid into said cylinder and a pair of foot levers for operating said valve.

6. A door opener and closer comprising a frame having an integral apertured plate provided with an annular flange, operating levers mounted on said flange, door sections connected to the free ends of said operating levers, guiding links mounted above and below said operating levers having their free ends connected to said door sections, an operating block, links carried by said block connected to said operating levers, a piston connected to said operating block, means for limiting the movement of said operating block and a valve for controlling the flow of fluid into said cylinder, said valve being controlled by a pair of foot levers through the medium of links and levers.

7. In a door opener and closer the combination with a frame, having hinge lugs connecting the same to the hinge lugs of a furnace, said frame being provided with an integral apertured plate having an annular flange, levers pivotally mounted on one of the side flanges of said plate, door sections carried by said levers, a casting connected to said plate having a cylinder portion and a housing, an operating block mounted in the housing, links connecting said operating block to said levers, a piston mounted in said cylinder having a piston rod connected to said operating block, a steam chest formed integral with said cylinder, a valve slidably mounted within said steam chest and a pair of levers for operating said valve through the medium of links and levers.

8. A door opener and closer comprising a frame having means for securing the same to a furnace, said frame being provided with an integral apertured plate having an opening, a pair of door sections for closing said opening, pivotally mounted levers having their free ends connected to said door sections, guide links connected to said door sections, a housing connected to said plate, a block slidably mounted in said housing, links connecting said block to said operating levers, a plate for covering said housing and levers and a fluid operated piston connected to said operating block.

9. In a door opener and closer, the combination with a frame, of an apertured plate carried by the frame, a pair of operating levers mounted on said plate, door sections carried by said levers, pivoted guide links connected to said door sections, an operating block, links connecting said block to the operating levers, means for limiting the movement of said operating block, a fluid operated piston connected to said operating

block, a valve for controlling the flow of fluid to said piston, and foot levers for controlling the movement of said valve.

10 In a device of the kind described, a frame adapted to be secured to the hinge lugs of a furnace, an apertured plate carried by said frame, operating levers mounted on said plate, door sections carried by the free end portions of said levers, guide links connected to the door sections and to the plate

above and below the operating levers, respectively, operating links connected to said levers, and fluid actuated means carried by the plate adapted to actuate said last mentioned links.

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Witnesses:

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