

**No. 643,697.**

**Patented Feb. 20, 1900.**

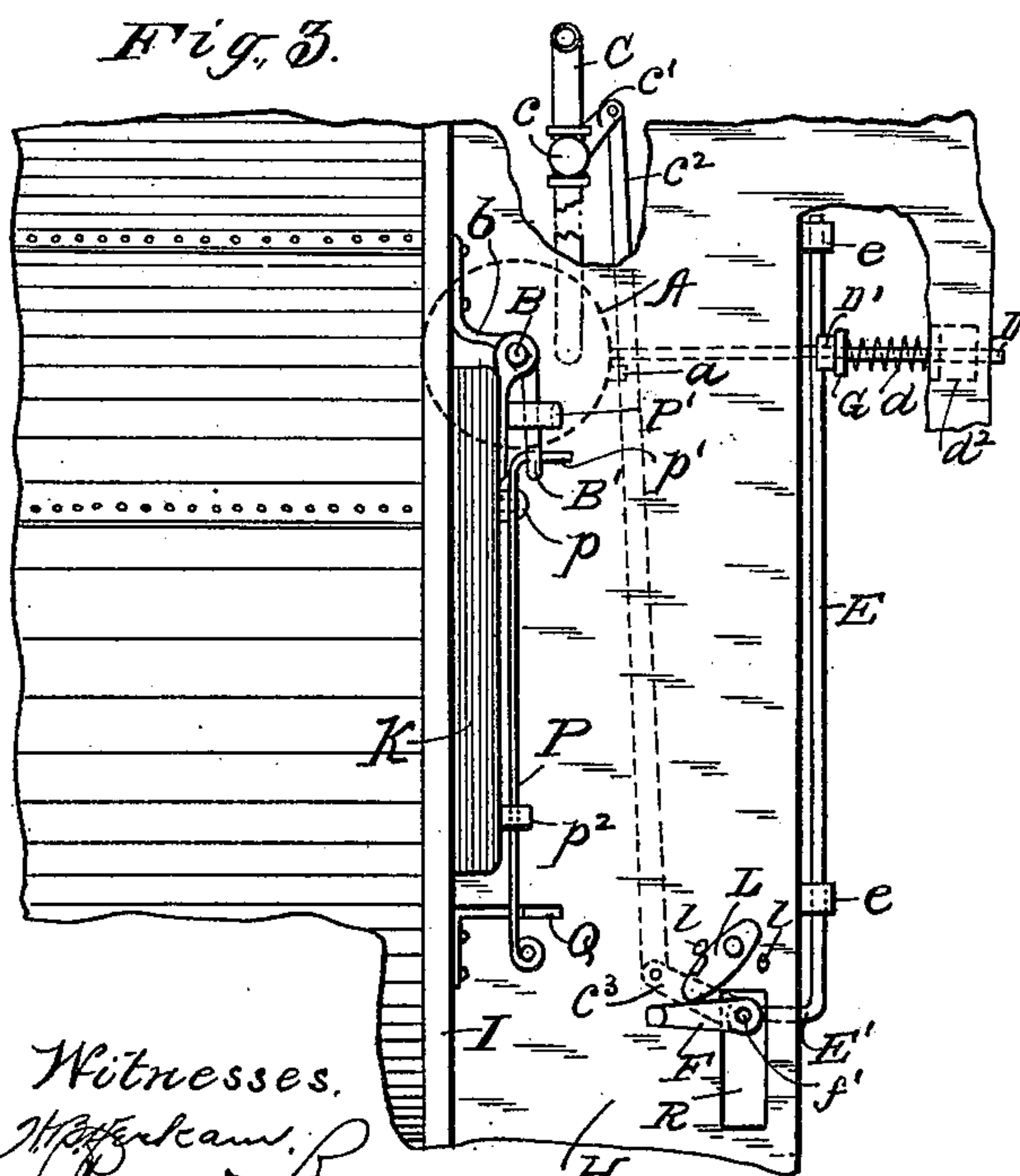
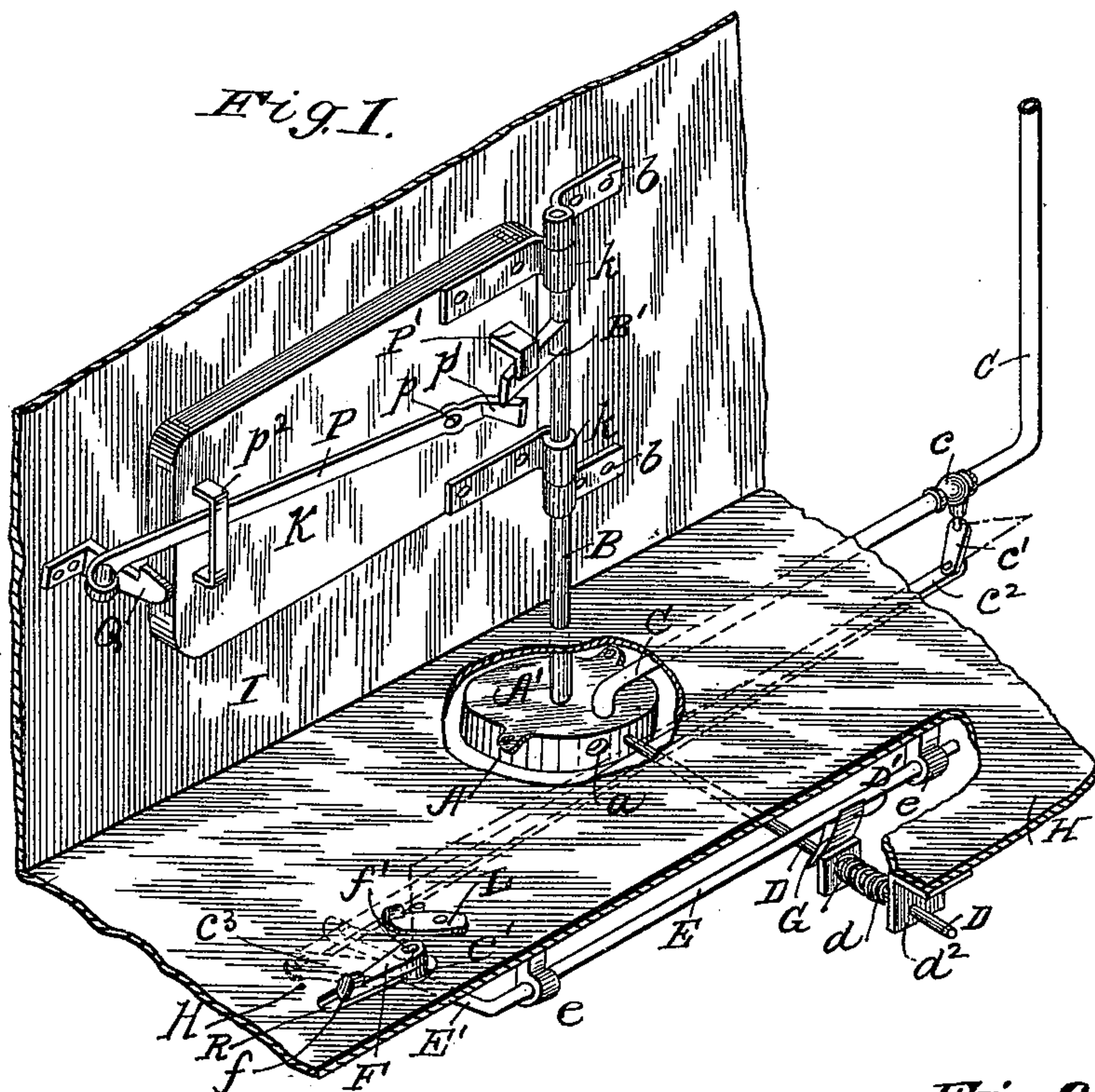
**H. H. THOELE & C. W. H. MOELLER.**

## OPERATING FURNACE DOORS.

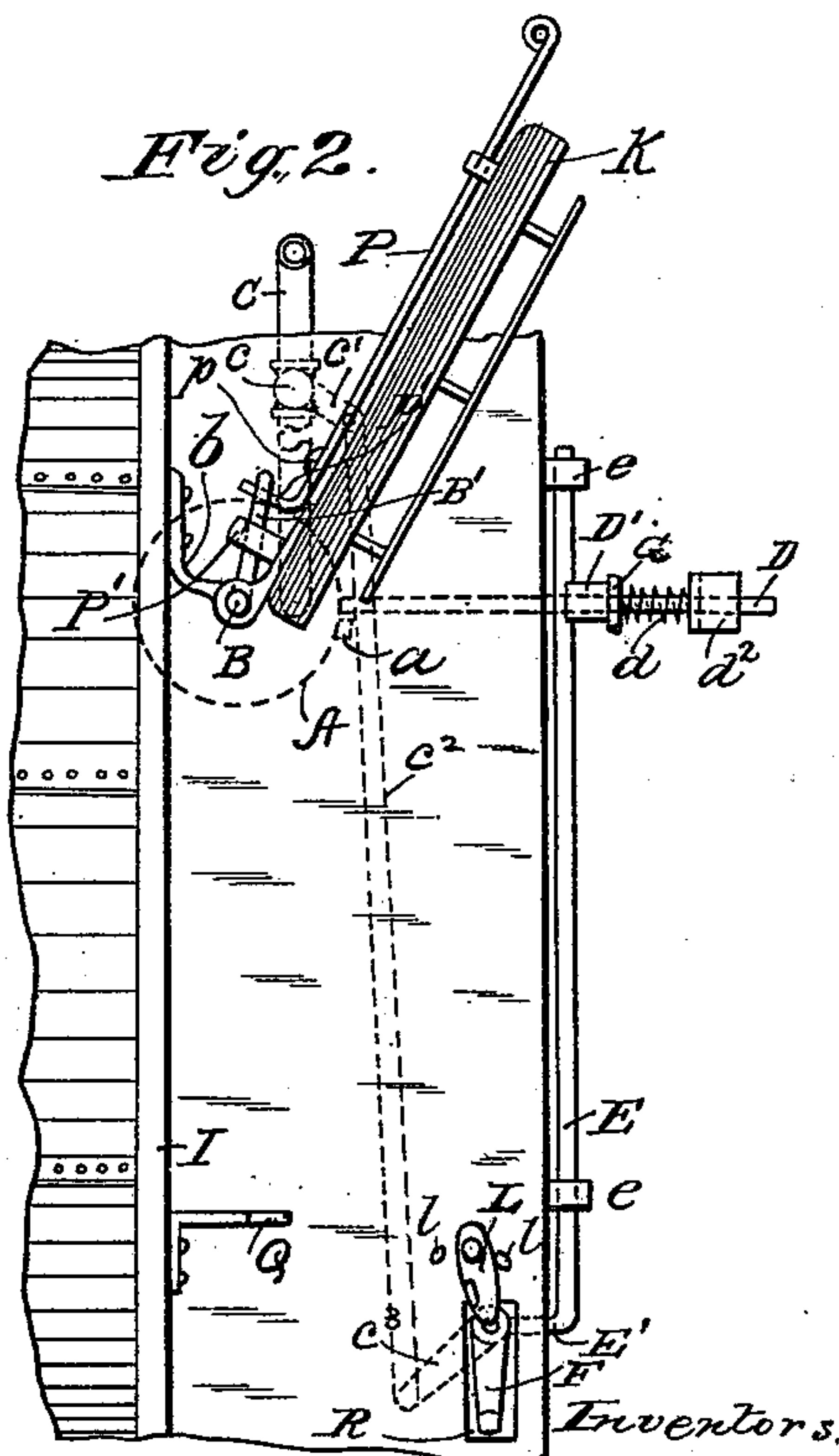
(Application filed Mar. 11, 1899.)

(No Model.)

**2 Sheets—Sheet 1.**



Witnesses.  
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J. W. Linn



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Charles W. H. Moeller,  
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his attorney

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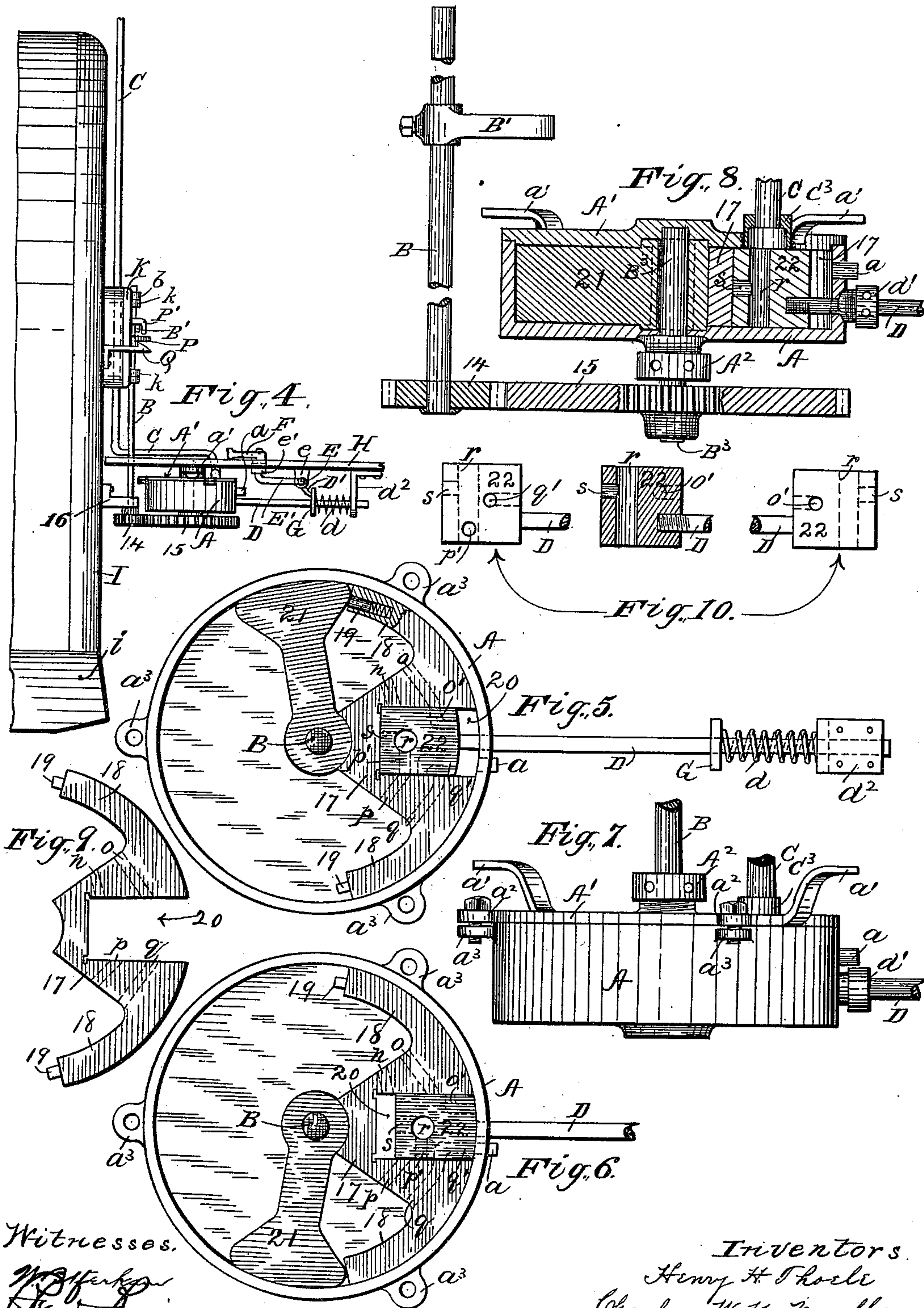
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OPERATING FURNACE DOORS.

(No Model.)

(Application filed Mar. 11, 1899.)

2 Sheets—Sheet 2.



Witnesses.

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# UNITED STATES PATENT OFFICE.

HENRY H. THOELE AND CHARLES W. H. MOELLER, OF FLORENCE, ALABAMA.

## OPERATING FURNACE-DOORS.

SPECIFICATION forming part of Letters Patent No. 643,697, dated February 20, 1900.

Application filed March 11, 1899. Serial No. 708,640. (No model.)

*To all whom it may concern:*

Be it known that we, HENRY H. THOELE and CHARLES W. H. MOELLER, citizens of the United States, residing at Florence, in the  
5 county of Lauderdale and State of Alabama, have invented certain new and useful Improvements in Operating Furnace-Doors; and we do hereby declare the following to be a full, clear, and exact description of the invention,  
10 such as will enable others skilled in the art to which it appertains to make and use the same.

Our invention has reference to improvements in devices for opening and closing doors  
15 for steam-boilers and furnaces; and it consists of certain novel features of construction, which will be hereinafter fully described in the specification and pointed out in the claims.

The object of the present invention is to produce an efficient and practical device for opening and closing furnace-doors without using the hands of the operator. Many devices have been invented for accomplishing these results, but they have been too cumbersome and  
25 took up too much room on the front of a steam-boiler to admit of their adoption.

The present improved device is so constructed and arranged that it is entirely out of sight, being concealed by the floor of a locomotive or hearth of a furnace and operated by the foot of a stoker by means of a projection extending through an opening in the floor. An ordinary knob or projection extending through the floor is liable to be depressed at any moment by the engineer or fireman when moving in the limited space of a locomotive-cab, thus opening and closing the furnace-door when not necessary to feed coal to the furnace. By this means the utility of an  
35 invention of this kind would be destroyed. Our device is so constructed that any amount of walking over or upon the projection extending above the floor will not operate the furnace-door except at the will of the stoker  
45 or fireman.

Our invention further consists in providing means for holding the door of a locomotive open at certain times when the fireman may be absent—for instance, during an accident,  
50 when the engine is stopped, or when the fires are banked for the night.

Our invention further consists in providing

means for operating a furnace-door through the medium of its pintle extending through the hinges and into a steam or air chamber  
55 located under the floor of an engine and operated by an arm within said chamber.

Our invention further consists in providing a block within a steam-chamber and having steam-ports entering the sides thereof and  
60 communicating with an opening in said block for the reception of a slide-valve also having ports to cooperate with the ports in the steam-block aforesaid.

Our invention further consists in having a  
65 valve-rod extending into a steam-chamber and secured to a slide-valve, the opposite end of the rod being provided with a guide and a spring-actuating device.

Our invention further consists in providing  
70 a rock-shaft under the floor of an engine and making connection with a valve-rod by means of a toe at one end, the opposite end being bent at right angles and extending through the floor of an engine and having secured  
75 thereon a pivoted lever.

Our invention further consists in providing an independent device for operating the steam or air supply cock through the medium of a connecting-bar, levers, and the pivoted lever  
80 secured to the end of the rock-shaft aforesaid.

It is obvious to those skilled in the art that the old method of opening a furnace-door by hand entails a considerable loss of caloric, and which is a great loss to railroad companies and which is also very inconvenient to the fireman on account of loss of time in opening the furnace-door, as the fireman has to deposit his shovel of coal on the floor, and, holding it with one hand, employs the other  
85 hand to open the furnace-door, and which must remain open until the shovel of coal is deposited within the furnace. With our improved device the operator holds his shovel of coal with both hands and presses the lever  
95 with his foot, when the door instantly flies open, and as soon as a shovelful of fuel is deposited into the furnace the fireman removes his foot from the lever, when the door instantly closes, thus saving about ten per cent. of the  
100 fuel by our improved device, which prevents the intensified heat from escaping from the furnace.

We will further elucidate our invention



through the medium of the drawings, in which—

Figure 1 represents in perspective view our improved device as it would appear when in a practical position with a portion of the floor and boiler or furnace front shown broken away. Fig. 2 represents in plan view our improved device with the furnace-door thrown fully open. Fig. 3 also represents in plan our device with the door closed. Fig. 4 represents a portion of a locomotive-boiler with our improved device under the floor and operating indirectly through gearing a furnace-door. Fig. 5 is a plan view of the steam-chamber with the cover removed, exhibiting the mechanism therein for operating a furnace-door. Fig. 6 is a similar view to Fig. 5 with the steam-arm and slide-valve in a changed position. Fig. 7 is a side elevation of the device. Fig. 8 is a central sectional view of the device with gearing secured thereto. Fig. 9 is a detail of the block removed from the steam-chamber. Fig. 10 represents in side elevation the opposite sides of the slide-valve, one view showing it in vertical section.

Our invention consists of a steam-chamber A, which is provided with a cover A', firmly bolted in place through the medium of ears  $a^2$  and  $a^3$ , respectively. Within said steam-chamber are a steam-arm 21, block 17, and a slide-valve 22. The steam-arm 21 is secured to a vertical shaft B and extends upwardly through a stuffing-box A<sup>2</sup> and forms the pintle for the hinges  $b$  and  $k$  of a furnace-door K. Secured to said shaft or pintle B is a projecting arm B', which performs three functions—viz., opening the door through the medium of the right-angled lug P', closing the door by contacting the same, and raising the latch P by means of its tail end  $p'$ , which is inclined and at right angles to the latch proper. Secured to and extending from the cover A' of steam-chamber A is a pipe C, which supplies the motive power for operating the steam-arm 21 through the medium of slide-valve 22 and block 17. (See Fig. 1 for all the above description.) It is obvious that the motive power for operating the arm 21 can be any of the known gases or liquids—such as steam, air, water, or other operating fluids—according to the location and requirements of the case.

Secured to slide-valve 22 is a valve-rod D, which passes through a stuffing-box  $d'$  and is provided with a fixed plate G for holding a spiral spring  $d$  firmly against a bracket  $d^2$ , which is secured to floor H of an engine. A toe-piece D' engages the aforesaid plate G through the medium of a rock-shaft E, which is held in position under the floor by hangers  $e$ . Said rock-shaft is bent at right angles at E' and has secured thereon a lug  $e'$ , and to which is pivotally secured by a pin  $f'$  a lever F, which is on a level with the top of the floor H, but which is depressed through an opening R in the floor H when operating the rock-shaft E, respectively. Located under

floor H is a lever  $c^3$ , which is pivoted under lug  $e'$  by pin  $f'$  and operating a bar  $c^2$ , which has connection with a crank  $c'$  for operating a valve  $c$ , secured to the steam or air supply pipe C, respectively.

In reference to steam-chamber A, which is made perfectly true on the inside and steam-tight in reference to working arm 21, block 17, and slide-valve 22, hereinbefore mentioned, block 17 is provided with two integral extensions 18, so as to limit the throw of arm 21. The extreme ends of said extensions 18 are provided with spring-buffers 19, which receive the impact of the arm 21 and allow said arm 21 to contact slowly the extreme ends of extensions 18 through the medium of the steam or air pressure operating said arm 21. Block 17 is also provided with steam-ports  $n$  and  $p$  and exhaust-ports  $o$  and  $q$  and also an opening 20 for the reception of a slide-valve 22. Said valve is also provided with steam-ports  $p'$  and  $s$  and exhaust-ports  $o'$  and  $q'$ . Said valve is also provided with a vertical steam-port  $r$  for distributing steam to the ports  $p'$  and  $s$ , previously referred to. Immediately over steam-port  $r$  is a steam or air supply pipe C, which is secured to the cover A' through a fitting or connection C<sup>3</sup>, whose area is as great as the travel of valve 22, so as to supply air or steam to said port  $r$  in its extreme positions.

Chamber A is secured under the floor of an engine or furnace by suitable lugs A', or it can be upon the top of an engine-floor and make indirect connection to the pintle B of a furnace-door through suitable gearing. In Fig. 4 it will be observed that the radius of the steam-chamber is greater than the distance from the front of the locomotive-boiler I to the vertical shaft B. Consequently said steam or air chamber A would extend into the front water-leg of said boiler I, as said boiler extends in the same vertical line to its accompanying ash-pan  $i$ . Consequently gearing is employed, as indicated, the shaft B being held in a vertical position by bracket 16 for operating the door K through the medium of gears 14 and 15, respectively. (See Figs. 4 and 8, in which Fig. 4 has a short shaft B<sup>3</sup> and its stuffing-box A<sup>2</sup> under the steam or air chamber.) In ordinary furnaces and steam-boilers the steam-chamber can be employed, as indicated in Figs. 1, 2, and 3, as the boiler proper terminates close to the furnace-door. The supply-pipe C can be located under the steam-chamber if necessary, as it is immaterial whether the supply-pipe is under or above the steam-chamber, which is only a matter of convenience in mounting the same. The valve  $c$  and the devices for operating the same can be dispensed with when air or steam is employed, and the steam-chamber can hold the steam similar to a steam-chest on an ordinary steam-engine, the operation of the slide-valve regulating the flow of steam or air on either side of the arm 21 at the option of the operator.



When water is employed or steam of very high pressure, it is well to employ valve *c* and the means for operating it, which is obvious to engineers.

5 On the engine-floor is a turn-button *L*, which is designed to push over the lever *F* by the foot of the fireman and hold it down when it is necessary to keep open the fire-door *K*, as many instances occur when it is necessary  
10 to have the door open, such as cooling off the furnace when a long stop is made or when banking the fire for the night or on account of an accident. In such cases the turn-button serves a very important purpose.

15 When gearing is employed to open the door, the operation of the arm 21 is reversed, unless an intermediate gear is employed, when the operation is normal.

Operation of the device: When necessary  
20 to charge a furnace, the engineer uses his foot to push the lever *F* from its position over the solid engine-floor to the position shown in Figs. 1 and 2 over the opening *R* in the floor, when he gets his shovel of coal, and as he  
25 swings himself around from the tender he faces the fire-door *K* and with his left foot presses upon lever *F*, which immediately operates the rock-shaft *E*, with its accompanying toe-piece *D'* impinging upon the plate *G*,  
30 the latter actuating valve-rod *D*, which moves valve 22 forward, thus allowing the steam or air to pass from pipe *C* into the steam-port *r*, thence into the port *s* to the opening 20 in  
35 block 17, and from thence through port *n* in block 17, when the steam or air impinges against the arm 21, moving it to the opposite side of the steam-chamber *A*. As arm 21 begins to move the shaft or pintle *B*, which is rigidly secured to arm 21, moves also, and at  
40 the first stage of its movement it swings around arm *B'*, (which may be adjustably secured to pintle *B*,) which engages the incline *p'* on latch *P*, thus tilting the latch on its fulcrum-pin *p* and releasing said latch  
45 from its catch *Q*, and as the operation is so quickly performed the staple *p<sup>2</sup>* is provided to prevent the latch rising too far (see Fig. 1) for the raised position of the latch. By the time that the latch is fully released from its  
50 catch *Q* the arm *B'* contacts the right-angled lug *P'*, secured to the door *K*, when the door is immediately opened as the arm 21 aforesaid moves to the left. When the fireman deposits his shovel of coal into the furnace  
55 and as soon as his shovel is removed from the furnace-door, his foot is removed from the lever *F*, when the spring *d* on valve-rod *D* shifts the valve 22 to its normal position, thus allowing the confined steam in cham-  
60 ber *A* to escape through the exhaust-ports *o*, *o'*, and *a*, respectively, and the valve being shifted the door-closing ports *p'* and *p* close the door in a similar manner to opening the fire-door. This operation is repeated when-  
65 ever coal is required in the furnace.

A slight recapitulation is necessary to elucidate an auxiliary feature of this invention.

When the engineer pushes the lever *F* to the position shown in Figs. 1 and 2 immediately over the opening in the floor *R*, said lever *F* 70 through its fulcrum-pin *f'* also operates the lever *c<sup>3</sup>* under the engine-floor, which in turn operates the bar *c<sup>2</sup>* and crank *c'*, thus opening the valve *c* for supplying steam or air through the supply-pipe *C* to the steam or air 75 chamber, and as soon as the fire-door is closed the fireman with his foot returns lever *F* to the position on the floor it at first occupied, thus shutting off the valve *c*. As the lever *F* is resting upon the solid floor it cannot oper- 80 ate the rock-shaft *E*, as it would otherwise do if it were maintained over the opening *R* in the floor. The under side of lever *F* is slightly rounded at *f*, so as to facilitate in pushing it around when slightly depressed in 85 the opening *R* aforesaid.

Having thus described our invention, that which we desire to claim by Letters Patent of the United States is—

1. In combination with a motor for opening 90 and closing the door of a locomotive, or furnace, a spring-actuating valve-rod, a plate on said rod, a toe-piece to engage said plate, a rock-shaft connected to the toe-piece, and a lever above the floor of a locomotive-cab, 95 pivotally connected with the rock-shaft, and with a lever connected to a bar adapted to operate the steam or air supply valve for the purpose as specified.

2. In combination with a motor for opening 100 and closing a furnace-door, a vertical shaft passing through the hinges of said door, a lug on said vertical shaft adjacent to said door, a latch on said door with an inclined tailpiece for raising said latch through the 105 medium of the aforesaid lug on the vertical shaft referred to, of a right-angled lug on said door for opening said door by means of the lug on said vertical shaft contacting the same for the purpose as specified. 110

3. In combination with a motor for opening and closing a furnace-door, a vertical shaft extending from the motor and passing through the hinges of said door, a right-angled lug on 115 said door, a lug on said vertical shaft adjacent to said door, which extends under said right-angled lug, but not contacting said lug when said door is closed, a latch on said door having an inclined tailpiece thereon for raising said latch through the medium of the 120 aforesaid lug on the vertical shaft referred to for the purpose as specified.

4. In combination with a motor for opening and closing the door of a locomotive or furnace, a spring-actuating valve-rod, a toe-piece 125 to engage a plate on said valve-rod through the medium of a rock-shaft, and a pivoted lever above the floor of a locomotive-cab, and adapted to be operated through an opening in said floor for the purpose as specified. 130

5. In combination with a motor for opening and closing a locomotive-door, a spring-actuating valve-rod, a toe-piece to engage a plate on said valve-rod, through the medium of a



rock-shaft under the floor of a locomotive and a pivoted lever for operating said rock-shaft and the means for holding said pivoted lever in a depressed position when the foot  
5 of the operator is removed.

6. In combination with a motor for opening and closing a locomotive-door, a valve-rod for operating a valve in said motor through the medium of a rock-shaft, a pivoted lever  
10 mounted on the end of said rock-shaft, and the means for opening and closing a steam or air supply valve when operating said pivoted lever as specified.

7. In combination with a motor for opening  
15 and closing a furnace-door, a vertical shaft or pintle extending through the hinges of said door and terminating in an actuating-arm within said motor, of a block within said motor for the reception of a slide-valve, and

ports for admitting the motive power, and 20  
the means for resisting the impact of the actuating-arm, when contacting the extensions of the block, referred to, a valve-rod connecting to said valve, a spring secured to said rod by a plate, a bracket on the floor for re- 25  
ceiving the thrust of said spring, a toe-piece mounted on a rock-shaft, a pivoted lever for operating said rock-shaft, and the means for preventing the depression of said pivoted lever for the purpose, substantially as specified. 30

In testimony whereof we affix our signatures in presence of two witnesses.

HENRY H. THOELE.  
CHARLES W. H. MOELLER.

Witnesses:

C. E. JORDAN,  
W. R. CHISHOLM.