

(No Model.)

3 Sheets—Sheet 1.

C. A. GRAS.
FURNACE APPARATUS.

No. 568,899.

Patented Oct. 6, 1896.

Fig. 1.

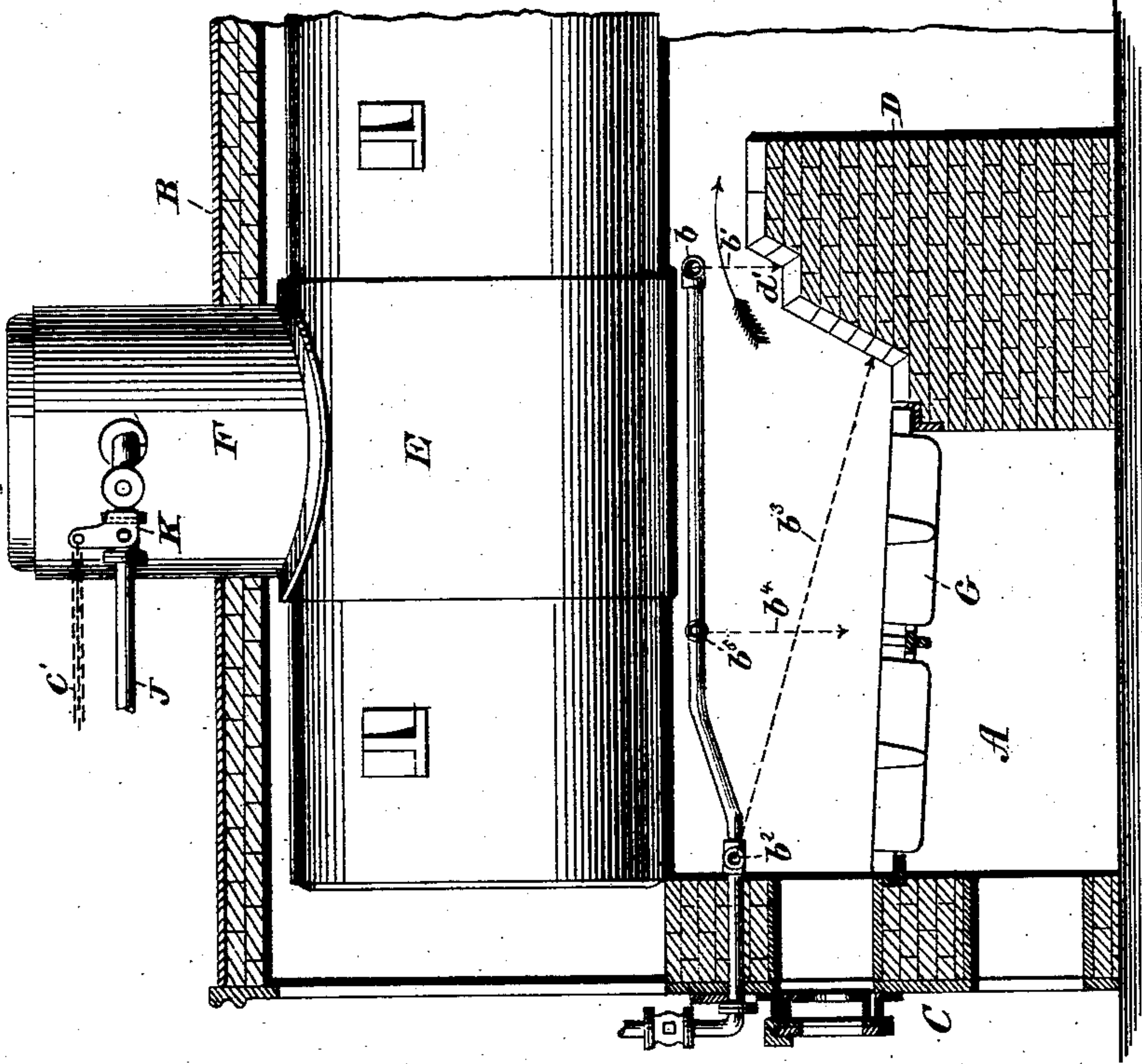
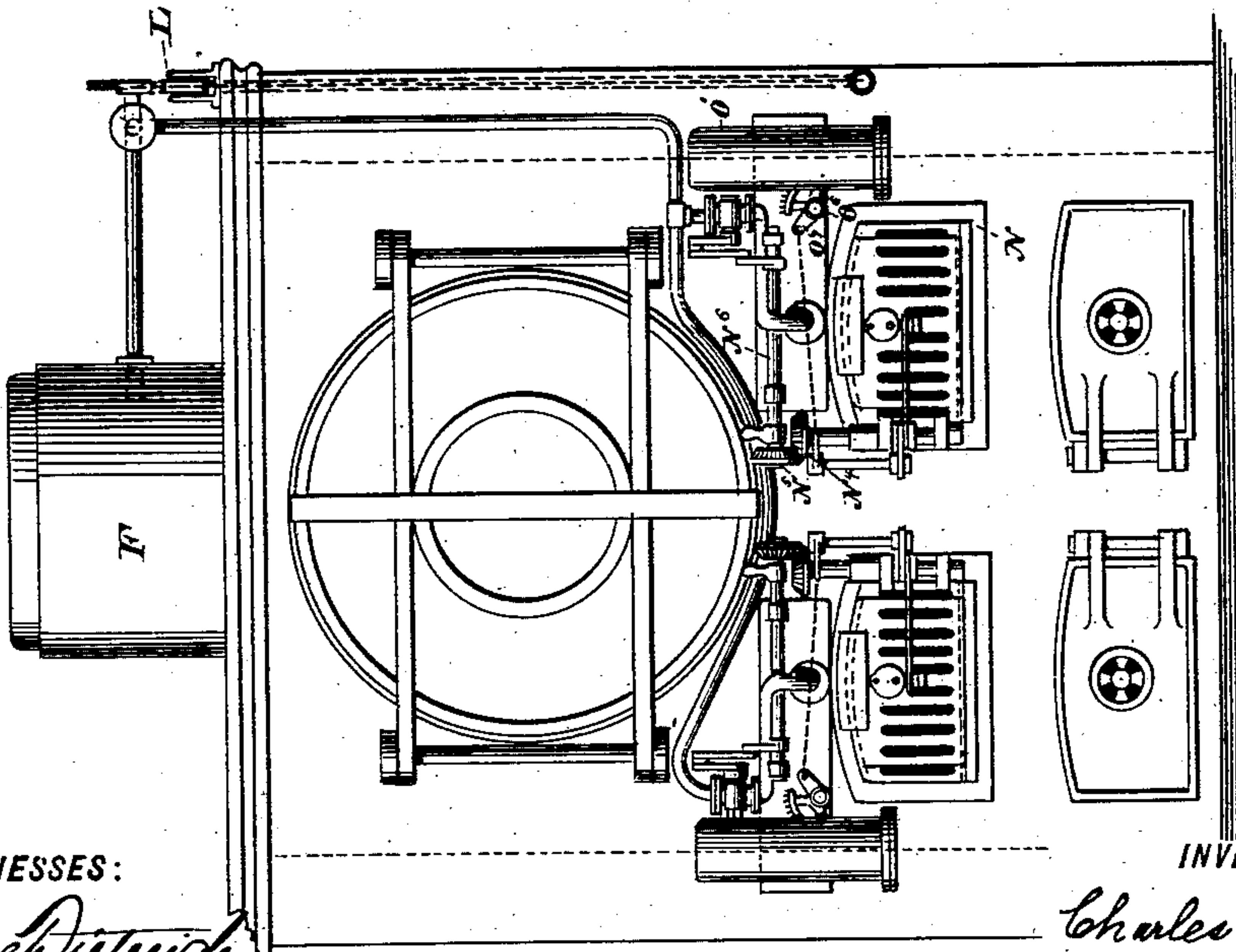


Fig. 2.



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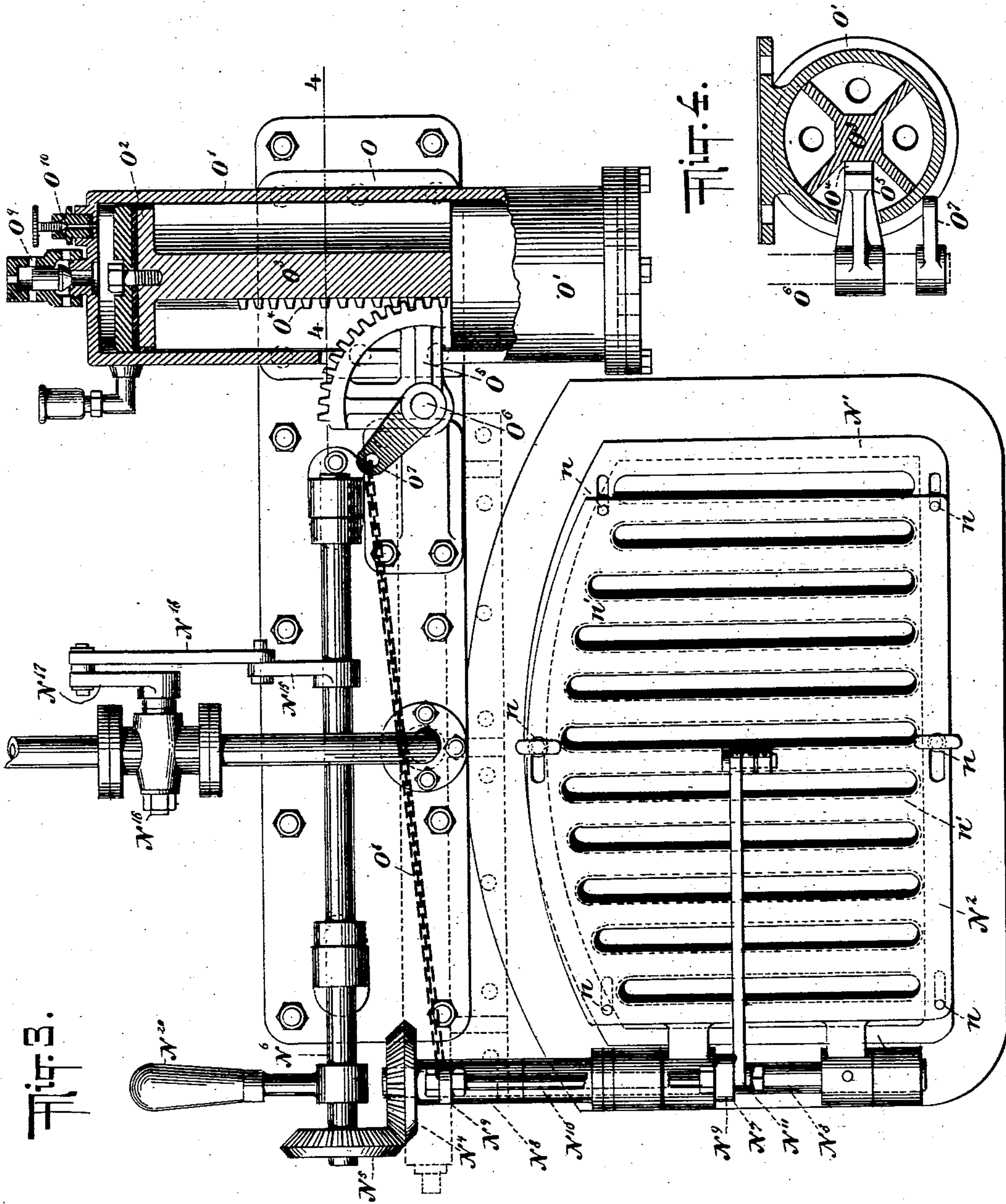
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C. A. GRAS.
FURNACE APPARATUS.

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Fig. 5.

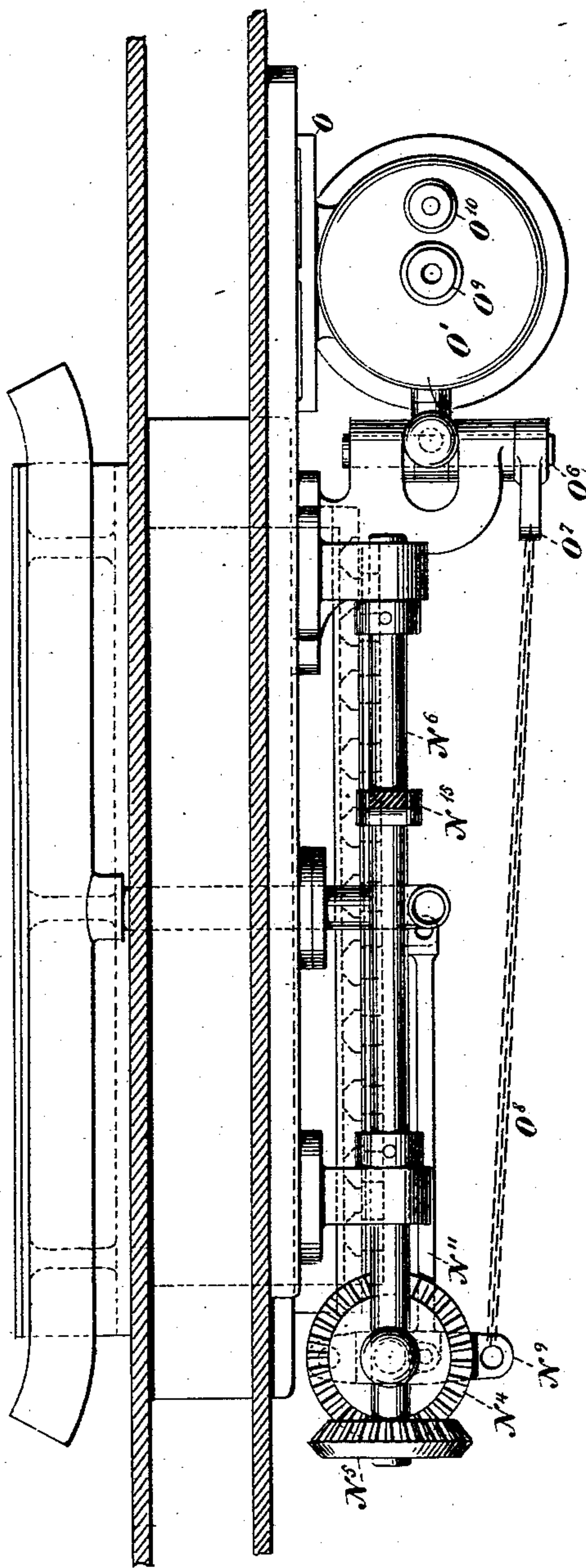
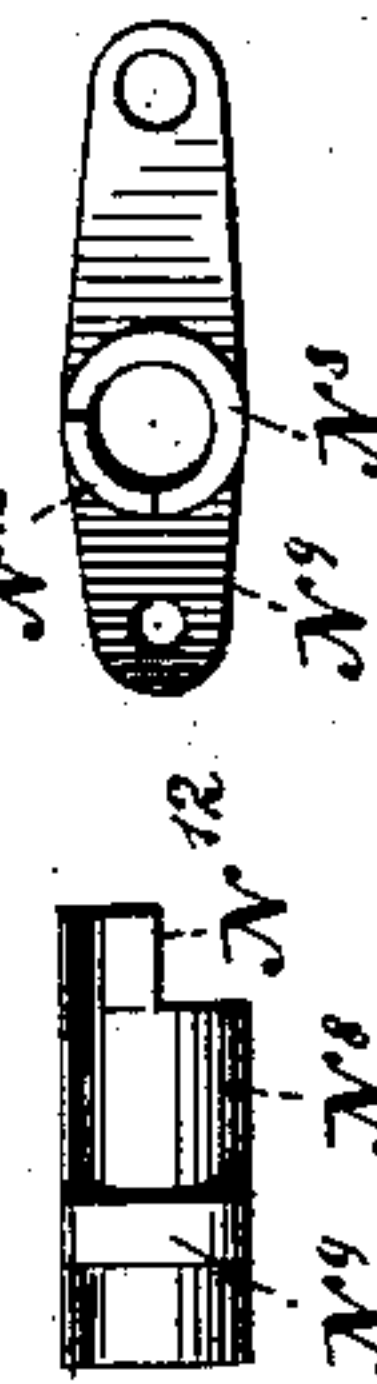


Fig. 8. Fig. 9.



Fig. 6. Fig. 7.



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UNITED STATES PATENT OFFICE.

CHARLES A. GRAS, OF NEW YORK, N. Y., ASSIGNOR TO FRANCIS DEIMEL,
OF SAME PLACE.

FURNACE APPARATUS.

SPECIFICATION forming part of Letters Patent No. 568,899, dated October 6, 1896.

Application filed February 24, 1896. Serial No. 580,410. (No model.)

To all whom it may concern:

Be it known that I, CHARLES A. GRAS, a resident of the city, county, and State of New York, have invented certain new and useful Improvements in Furnace Apparatus, of which the following is a full, clear, and exact description.

My invention relates to furnace apparatus, and has for its object to produce an apparatus for facilitating the quick burning of the fuel, which is specially applicable to a furnace forming the subject-matter of a companion application filed by me on the 24th day of February, 1896, Serial No. 580,411.

To this end my invention consists in the construction hereinafter set forth and claimed.

My invention will be understood by referring to the accompanying drawings, in which—

Figure 1 is a longitudinal section through a furnace forming the subject-matter of a companion application and to which the present invention is especially applicable, the same being introduced to illustrate the construction of the said furnace. Fig. 2 is a front elevation of a furnace apparatus embodying my present invention as well. Fig. 3 is an enlarged detail view of a door of the furnace and its connected apparatus, part of the apparatus being in section. Fig. 4 is a section on line 4 4 of Fig. 3. Fig. 5 is a plan view of the parts shown in Fig. 3. Figs. 6 and 7 are side and plan views, respectively, of a part of the apparatus hereinafter referred to; and Figs. 8 and 9 are similar views of another part of the apparatus hereinafter referred to.

Referring particularly to Fig. 1, A is the side wall of the furnace; B, the top wall; C, the front wall, and D the back wall or fire-bridge. E is the boiler, which has a steam-dome F, from which a steam-pipe J leads, which pipe is controlled by a suitable valve K, situated near to the steam-dome and having an operating chain or cord c' , (or other suitable operating device,) which extends over a sheave L and down in front of the furnace. This steam-pipe extends into the furnace and is provided with jet-forming means b , which project an end jet or jets b' downward, preferably against a step d' of the back wall d , and with jet-forming means b^2 , which project an inclined jet or series of jets b^3 ,

which form a curtain over the grate G, and with jet-forming means b^5 , which project side jets b^4 . By this means the smoke and heavier products of combustion are caused to circulate over the coals and be burned, the lighter products of combustion escaping through the steam-curtain. My improvement upon this structure is mainly directed to devices for facilitating the prompt and efficient combustion of the fuel.

By referring to Fig. 2 it will be noted that the furnace-doors N are composite and each consists of a slotted section N' , which is covered by a similarly-slotted section N^2 , which is carried upon pins or balls n , so that when the slots in the sections register with one another air will be admitted to the furnace through the door, and when the solid portions n' of the section N^2 cover the slots in the section N' air will be prevented from passing to the furnace through the door. It will be obvious that between these extreme positions the amount of air entering through the doors will be proportional to the amount of slot left uncovered, all of which will be readily understood.

Referring now particularly to Fig. 3, wherein the mechanism is shown in enlarged detail, it will be observed that the door N is hung upon a shaft N^3 , with which it turns, the shaft being provided with a bevel-pinion N^4 , which meshes with another bevel-pinion N^5 , carried upon a shaft N^6 on the front wall of the furnace. Carried also upon shaft N^3 and freely moving thereon are sleeves N^7 N^8 , from which lugs or ears N^9 project, which lugs or ears are joined by a rod N^{10} . The lower ear N^9 is pivotally connected by a link N^{11} with the sliding member N^2 of the furnace-door. Mounted also upon the front wall of the furnace or some other place adjacent to the furnace-door is a slide-moving device O, (shown in the present instance as a cylinder O'), within which a piston O^2 works, which piston has a rod O^3 , which carries a rack O^4 . The side of the cylinder is slotted for the passage of the toothed segment O^5 , which meshes with the rack O^4 and is carried upon the shaft O^6 . An arm O^7 is likewise provided upon the shaft O^6 and is connected by a flexible connection O^8 with one of the lugs N^9 . This lug N^9 is preferably

the one carried upon the sleeve N⁸, which sleeve has a downwardly-projecting lug N¹², (shown clearly in Figs. 3 and 6,) which engages with an upwardly-projecting lug N¹³ on a sleeve N¹⁴, which is rigidly carried upon the shaft N³ below the sleeve N⁸. The cylinder O' is provided with a relief or escape valve O⁹ and a regulable air-inlet valve O¹⁰. The shaft N⁶ may be provided with an arm N¹⁵, which may operate the valve N¹⁶ in the pipe J to regulate the admission of steam to the furnace. Suitable mechanism may intervene between the arm N¹⁵ and the valve N¹⁶, such, for instance, as the arm N¹⁷, which is connected with the arm N¹⁵ by the link N¹⁸. The mechanism which has just been described is duplicated upon the other door of the furnace, the pipe J forking, as shown clearly in Fig. 2, for the purpose of regulating the inlet of steam to the fuel nearest the door operated.

Having described the door mechanism, I will now proceed to define clearly some of its uses, purposes, and its mode of operation.

It has been found essential in furnaces to heighten combustion by giving the air access to the coal immediately after the furnace has received a firing, that is to say, as soon as a few shovels of coal have been thrown on an already-burning fire it has been found advantageous to permit access of the air to the coal to insure its prompt ignition. It has likewise been found that the generality of firemen are unreliable in this respect, so that some mechanical substitute for human fallibility has been found desirable. This I accomplish by my mechanism for opening the fire-door and closing the door and causing or permitting the sections of the fire-door to close together slowly, so that for a few seconds after the fire-door is closed air will still be admitted and will be slowly shut off. To that end the handle N²⁰ turns the shaft N⁶, communicating motion through the medium of bevel-gears N⁵ N⁴ to the shaft N³, thereby swinging open the furnace-door, and the lug N¹³, bearing against the lug N¹², will cause the sleeve N⁸ and its connected sleeve N⁷ to turn therewith. The furnace may now be fed or fired with coal. When now it is desired to close the door, the handle N²⁰ is given a motion reverse to its former motion, which will have the effect of closing the door to, but the sleeve N⁸, being freely revoluble on the shaft N³, will not follow the motion of the shaft N³, because there is considerable room for lost motion between the lugs N¹³ and N¹². Operating the lever N²⁰ to open the door had also the effect of shutting off the steam from the furnace by operating the valve N¹⁶, and the movement of the door likewise effected the raising of the piston O² by the chain O⁸ and segment O⁵, the air escaping through the relief or escape valve O⁹ as the piston rose. The parts in Fig. 3 are shown in the position which they have assumed just as the furnace-door is closed, the slots in the section N² of

the furnace-door registering with the slots of the section N' of the furnace-door, so that there is an inrush of air through the grating so far; but at this moment air beginning to enter the cylinder O' through the inlet-valve O¹⁰ and the piston being supported it will begin to descend slowly, its rate of descent depending upon the adjustment of the adjustable inlet-valve O¹⁰, and as the piston descends its swings the segment O⁵ and its shaft O⁶, thereby pulling upon the flexible connection O⁸ and swinging the sleeves N⁹ N⁷ to slide the door-section N² across the face of the door-section N', which movement will continue as the piston descends, thereby gradually covering the slots in the section N', so that air will be gradually shut out of the furnace.

It will be obvious that this apparatus is capable of modification without departing from my invention.

What I claim, and desire to secure by Letters Patent, is—

1. In a furnace apparatus, the combination of a slotted furnace-door combined with door-operating means, a slotted slide carried upon the furnace-door, a piston provided with a rack, a pivoted toothed arc coöperating with the rack, and a connection between the arc and the slotted slide.
2. In a furnace apparatus, the combination of a slotted furnace-door combined with door-operating means, a slotted slide carried upon the furnace-door, a piston provided with a rack, a pivoted toothed arc coöperating with the rack, and a flexible connection intervening between the arc and the slotted slide, substantially as described.
3. A swinging slotted furnace-door, a vertical shaft connected thereto, a horizontal shaft geared to the vertical shaft, the said two shafts comprising the furnace-door-opening mechanism, a piston provided with a toothed rack, a pivoted toothed arc meshing with the rack, a slotted slide carried upon the furnace-door, and a connection between the slide and the arc comprising in its structure a lost-motion device such as the sleeves N⁸ N¹⁴ and their lugs, substantially as described.
4. A horizontally-swinging vertically-slotted furnace-door combined with operating mechanism therefor, a steam-supply over the furnace-door having a valve therein, the said valve being rigidly connected to the said furnace-door-operating mechanism, a piston carrying a rack, a toothed arc meshing with the said rack, a slotted slide carried upon the furnace-door, and a connection between the arc and the slide whereby the slotted slide will be slowly moved to close the slots in the furnace-door when the door has been closed.

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