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Patented June 26, 1900.

A. HYMAS.  
BOILER FURNACE.

(Application filed Mar. 8, 1900.)

(No Model.)

2 Sheets—Sheet 1.

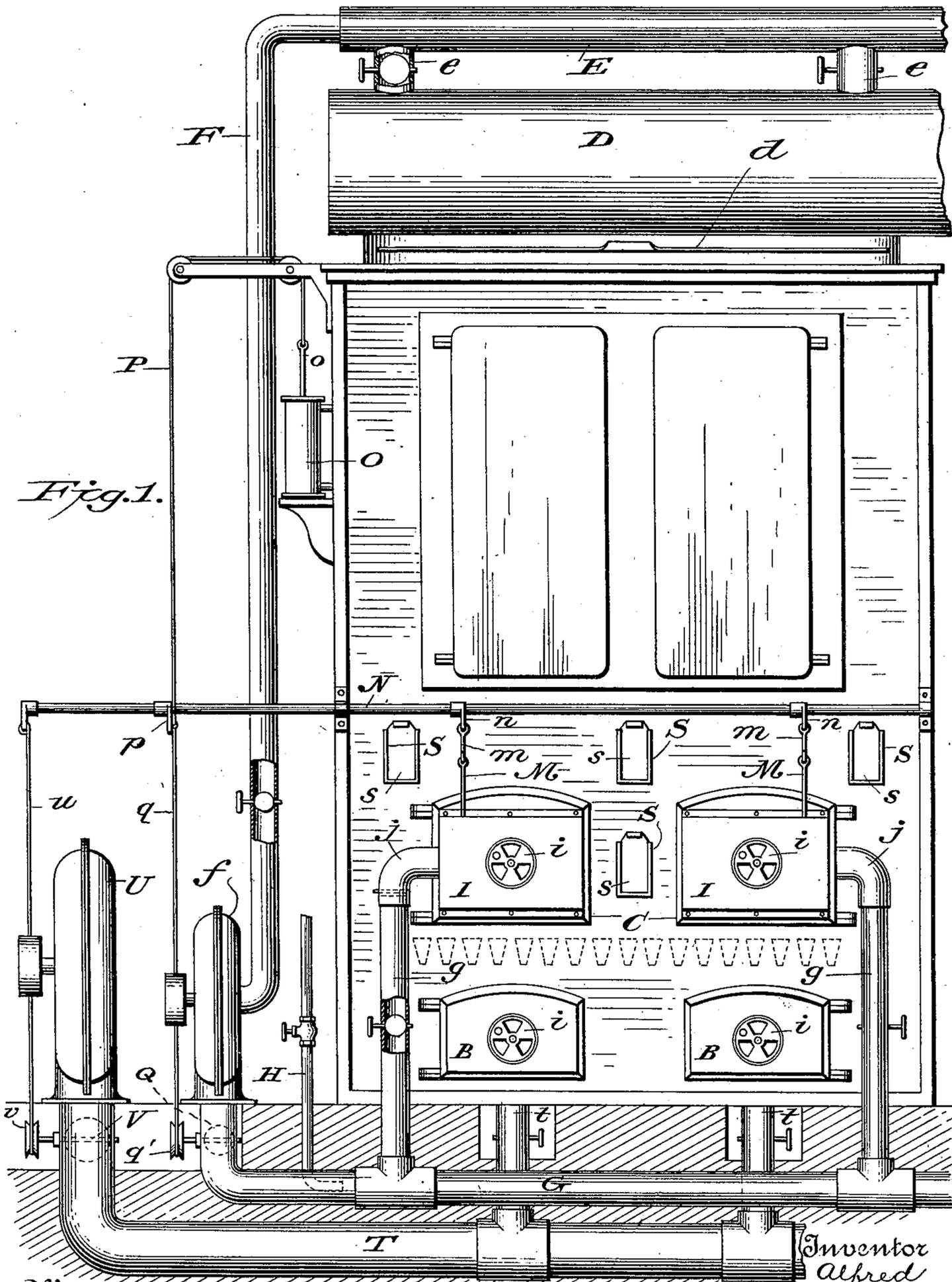


Fig. 1.

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2 Sheets—Sheet 2.

Fig. 2.

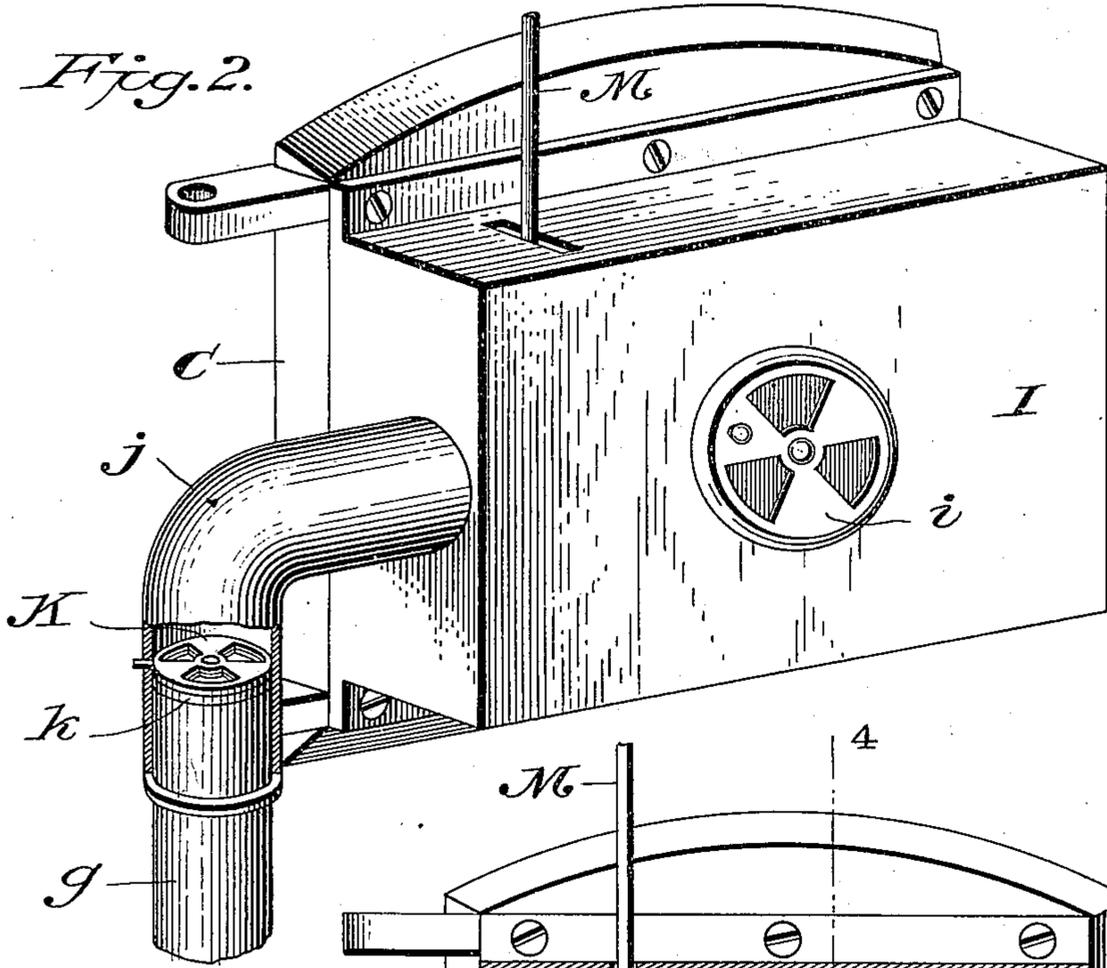


Fig. 3.

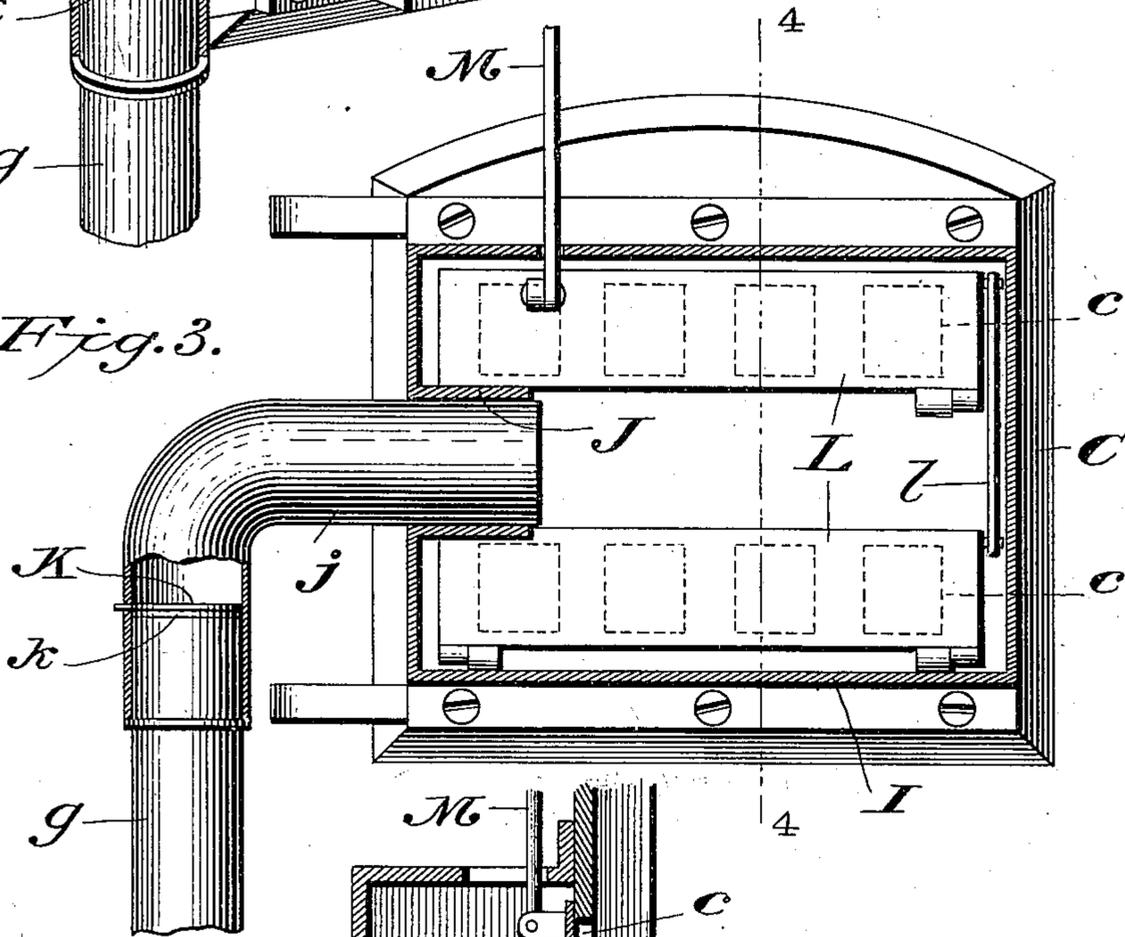
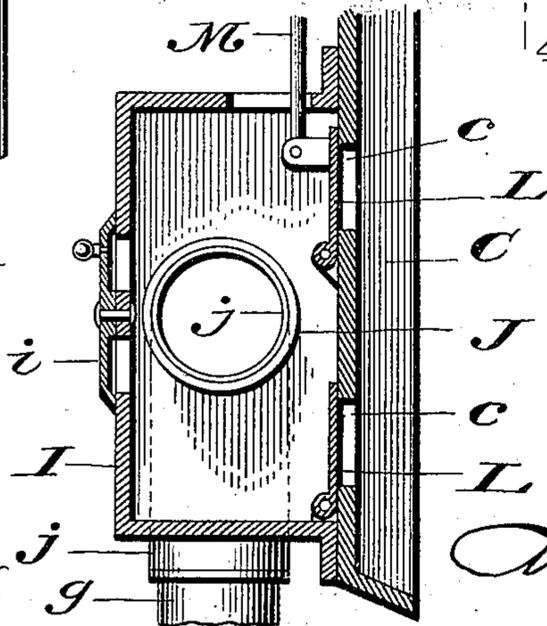


Fig. 4.



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# UNITED STATES PATENT OFFICE.

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## BOILER-FURNACE.

SPECIFICATION forming part of Letters Patent No. 652,618, dated June 26, 1900.

Application filed March 8, 1900. Serial No. 7,840. (No model.)

*To all whom it may concern:*

Be it known that I, ALFRED HYMAS, of Troy, in the county of Rensselaer and State of New York, have invented certain new and useful Improvements in Boiler-Furnaces; and I hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, which form part of this specification.

10 This invention is an improvement in boiler-furnaces; and its object is to reduce the expense of operating such furnaces by increasing the efficiency thereof, so that less fuel will be consumed in producing the necessary amount of heat to maintain the desired pressure of steam in the boiler.

20 The invention therefore consists in the novel construction of the apparatus for supplying the boiler with mixtures of heated air and gases, and has particular reference to the means for introducing the gaseous mixtures into the fire-chamber through the furnace-doors and in connection therewith novel regulating devices whereby the supply of air and gases will be automatically controlled, so that when the proper steam-pressure has been once obtained the proper supply of the gases and air to maintain same will be automatically regulated.

30 The invention will be sufficiently understood from the following description in connection with the accompanying drawings, in which—

35 Figure 1 is a front elevation of a boiler-furnace provided with my improved automatic air and gas supplying and regulating devices. Fig. 2 is a perspective view of one of the doors. Fig. 3 is a longitudinal section through Fig. 2. Fig. 4 is a vertical section on line 4 4, Fig. 3.

40 A designates a boiler-furnace of any preferred construction, B the doors leading to the ash-pit, and C the doors leading to the fire-chamber above the grate.

45 D is a smoke-flue from the furnace, the escape of the products of combustion thereto being regulated by a sliding damper *d*.

50 E is a gas-return pipe located above the smoke-flue D and communicating therewith by short pipes *e*, which may be provided with

dampers, as shown, and this pipe E communicates by a valved pipe F with a pump *f*, which is adapted to suck the products of combustion from pipe D through pipes E and F and discharge the same through pipes G and *g* into the fire-chamber of the furnace. The pump *f* is also adapted to draw in air and force the same, commingled with the gases drawn from flue D, into the fire-chamber, the mixture of air and gas forced into the fire-chamber by fan *f* ordinarily having a temperature of about 140°. If desired, steam may also be admitted into the pipe G from a pipe H, connected therewith between the fan and the fire-chamber, as indicated in Fig. 1. Said pipe may receive steam from the exhaust or take live steam direct from the boiler. It is not necessary to show the particular connection thereof, such being well understood.

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Preferably the doors C are provided with an exterior hood or casing I, which forms a chamber on said doors, which chamber is provided with a short pipe J, telescoping with the upper arm of an elbow-pipe *j*, the lower arm of which is connected to a pipe *g*, as indicated in Fig. 2, so as to rotate thereon, and on the upper end of pipe *g* is preferably fixed one member *k* of a circular valve, the other member K of which is fixed to pipe *j*. By reason of the telescopic connection of pipe *j* with pipe J and its rotatable connection with pipe *g* the door C can be swung open as needed without breaking the connection between casing I and pipe *g*, but when so swung open the valve K will be automatically closed, so that the gaseous mixture will not be blown into the room or into the face of the fireman, but upon the closing of door C the valve K will be opened. The doors C are also provided with apertures *c*, communicating with the fire-chamber, which apertures may be closed by suitable valves L, which valves may be connected by a rod *l*, so as to operate together, and the upper valve may be loosely connected by a rod M to a link *m*, which is in turn connected to a crank *n* on a rock-shaft N, which is journaled in suitable bearings on the front of the furnace above doors C, this connection between the shaft N and

the dampers being such as to permit the doors C to be readily opened, and yet when closed will allow the dampers to be operated properly by the rock-shaft N.

5 Shaft N is controlled by an automatic regulator O, of any suitable construction. Preferably a steam-regulator may be used, such as is indicated in the drawings, which is connected to the steam-space as usual, and the  
10 piston *o* of this regulator may be connected by a rope P, running over suitable sheaves to a crank *p* on shaft N. The particular construction of the regulator and the connection thereof to the shaft is immaterial, the essential feature being that the shaft N shall be  
15 automatically rocked, so as to open or close the dampers L, according to the pressure of steam. In addition the supply of air and gases may be further controlled by means of  
20 a valve Q in pipe G, which is connected to crank *p*, (by means of a cord *q*, operated on a pulley *q'* or other suitable means,) so that valve Q will be closed simultaneously with the closing of dampers L. In the front of the  
25 furnace and communicating with the fire-chamber is a number of air-inlet openings S, which may be closed by suitable slides *s*. If desired, the casings I may be provided with damper-valves *i*, so that atmospheric air can  
30 be admitted directly through the doors C when desired.

Atmospheric air is supplied directly to the ash-pits of the furnace by means of valved pipes *t*, communicating directly with the air-  
35 supply pipe T, leading from an air-pump U. The pipe T may be provided with a valve V, which may be operated by suitable connections (such as a cord and pulley *v*) from the shaft N, as shown in Fig. 1. This second air-  
40 forcing apparatus is used to maintain a sufficient draft of fresh air under the grate to prevent deadening of the fire.

In operation part of the products of combustion are sucked back from the flue D  
45 through the pipes E F by the pump *f* and mingled with the air and forced through the pipes G *g* to and through the doors C above the grate, while a supply of atmospheric air is forced under the grate through the pipes  
50 T *t*. If the steam-pressure rises above the desired point, the shaft N will be rocked by connections with the regulator O, so as to more or less close the valves V and Q and dampers L until the temperature and pressure are lowered to the desired point. If the pressure  
55 falls, the valves and dampers will be opened, so as to give a full supply of air and gases to the furnace, which will rapidly promote combustion and quickly raise the steam to the desired  
60 pressure.

What I claim as new is—

1. In a boiler-furnace, the combination of a pipe for withdrawing gases from the smoke-flue, a pump for sucking the gases through  
65 said pipe, pipes connecting the pump with the doors of the furnace, said doors being provided with chambers into which the gases are

admitted, and with openings leading into the furnace, means for regulating these openings  
70 automatically, and connections between said chambered doors and the pipes whereby the doors may be opened without destroying the connection.

2. The combination in a boiler-furnace, of a pipe for withdrawing gases from the smoke-flue, a pump for sucking the gases through  
75 said pipe, pipes for connecting the fan or pump with the doors of the furnace, said doors being provided with chambers into which the gases are admitted, and with openings lead-  
80 ing into the furnace, provided with dampers, an automatic regulator and connections between said regulator and the dampers in the doors whereby the latter may be regulated au-  
85 tomatically, and a valve in the air-pipe adapted to be automatically closed when the doors are opened.

3. The combination in a boiler-furnace, an air pump and pipes for forcing air into the ash-pit of the furnace, an air pump and pipes  
90 for forcing air into the fire-chamber of the furnace, a pipe connecting the latter pump with the smoke-flue for drawing gases therefrom and returning same to the fire-chamber, and a series of openings in the walls of the  
95 furnace leading to the fire-chamber, and slides covering said openings; with an automatic regulator and connections between said regulator and the valves in the said pipes, whereby the supply of the air to the ash-pit and the  
100 supply of mixed air and gas to the fire-chamber are automatically regulated.

4. The combination of the furnace-door, the casing attached thereto, a pipe telescoping  
105 into said casing and having a swinging connection with an air-supply pipe whereby the door may be opened without destroying the connection between the air-pipe and casing and a valve in the hinge-joint of said pipes whereby the air will be shut off when the door  
110 is opened.

5. The combination of the furnace-door provided with apertures, the casing attached thereto, a pipe and pump for withdrawing  
115 products of combustion from the smoke-flue, a pipe connected to said casing having a connection with said smoke-withdrawing pipe such that the door may be opened without destroying the connection between the air-pipe and casing, dampers for closing the apertures  
120 in said door for admitting air to the furnace, an automatic regulator, and connections between said dampers and regulator whereby the latter are controlled by said regulator, for the purpose and substantially as described.  
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6. The combination of the furnace-door provided with apertures, the casing attached thereto, a pipe telescoping into said casing  
130 and having a hinged connection with an air-supply pipe whereby the door may be opened without destroying the connection between the air-pipe and casing, and a valve in the hinge-joint of said pipe whereby the air will be shut off when the door is opened, dampers

for closing the apertures in said door for admitting air to the furnace, an automatic regulator, and connections between said regulator and the said dampers whereby the latter are opened or closed by said regulator, for the purpose and substantially as described.

7. The combination of the furnace-door, the casing attached thereto, a pipe telescoping into said casing and having a hinged connection with an air-supply pipe, whereby the door may be opened without destroying the connection between the air-pipe and casing, and a valve in the hinged joint of said pipe whereby the air will be shut off when the door is opened; with a pump and pipe for withdrawing gases from the smoke-flue, a pipe leading from said pump to said furnace-doors, an air pump and pipe for supplying air to the ash-pit of the furnace, and means whereby the supply of air and gas is automatically controlled, all substantially as and for the purpose described.

8. The combination of the furnace-door provided with apertures, the casing attached thereto, a pipe connected to said casing and having a hinged connection with an air-sup-

ply pipe whereby the door may be opened without destroying the connection between the air-pipe and casing, dampers for closing the apertures in said door for admitting air to the furnace, an automatic regulator, a rock-shaft operated thereby and connections between said rock-shaft and the said dampers whereby the latter are opened or closed by said regulator; with a pump and pipe for withdrawing gases from the smoke-flue, and a pipe leading from said pump to said furnace-doors; an air pump and pipe for supplying air to the ash-pit of the furnace, valves in said air and gas pipe, and connections between said valve and said rock-shaft whereby the supply of air and gas is automatically controlled by said regulator, all substantially as and for the purpose described.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

ALFRED HYMAS.

Witnesses:

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T. H. ALEXANDER.