No. 706,332. Patented Aug. 5, 1902.

E. H. MESSITER.

FURNACE TWYER.

(Application filed Nov. 26, 1901.)

(No Model.)

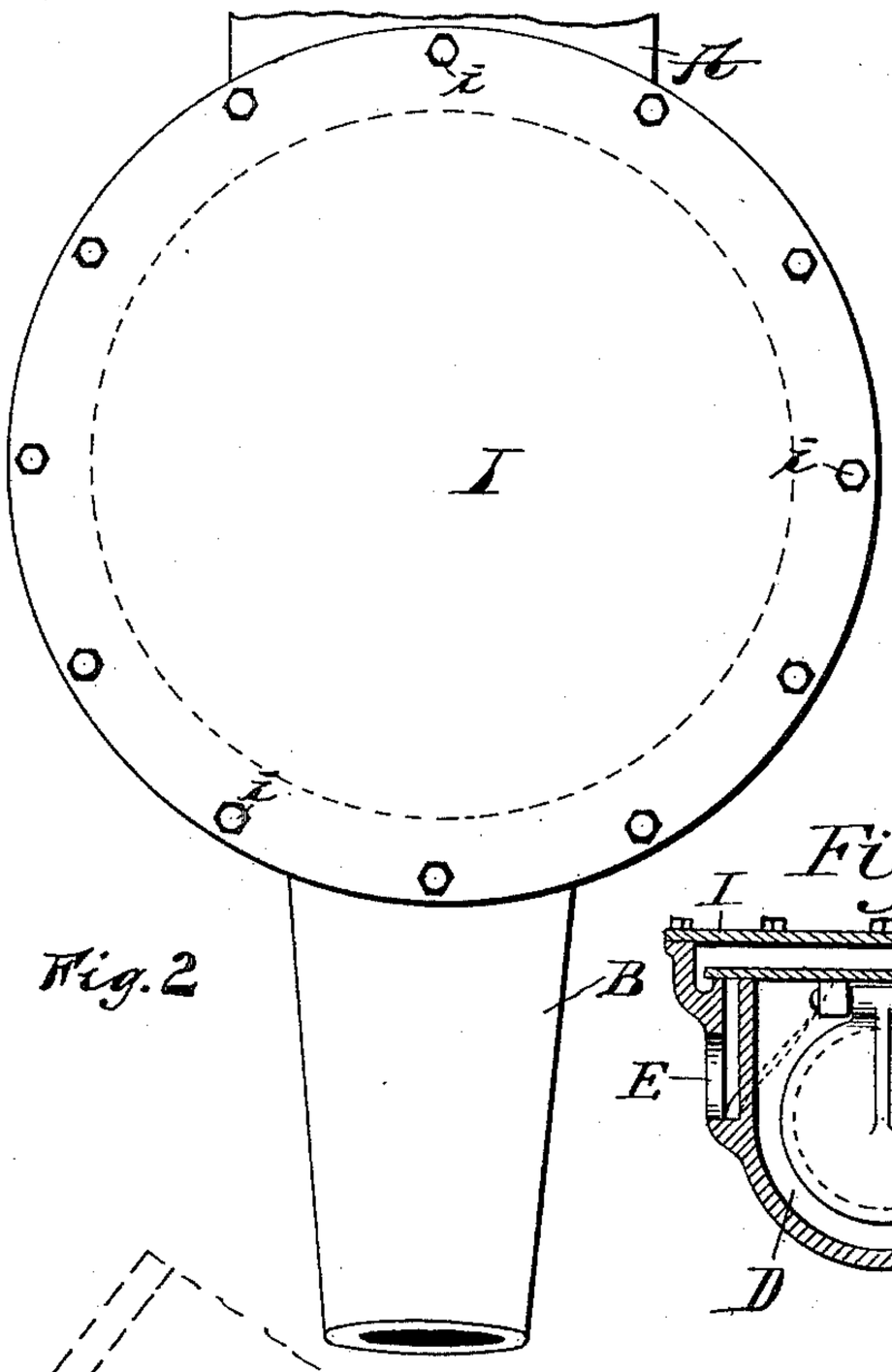


Fig. 2

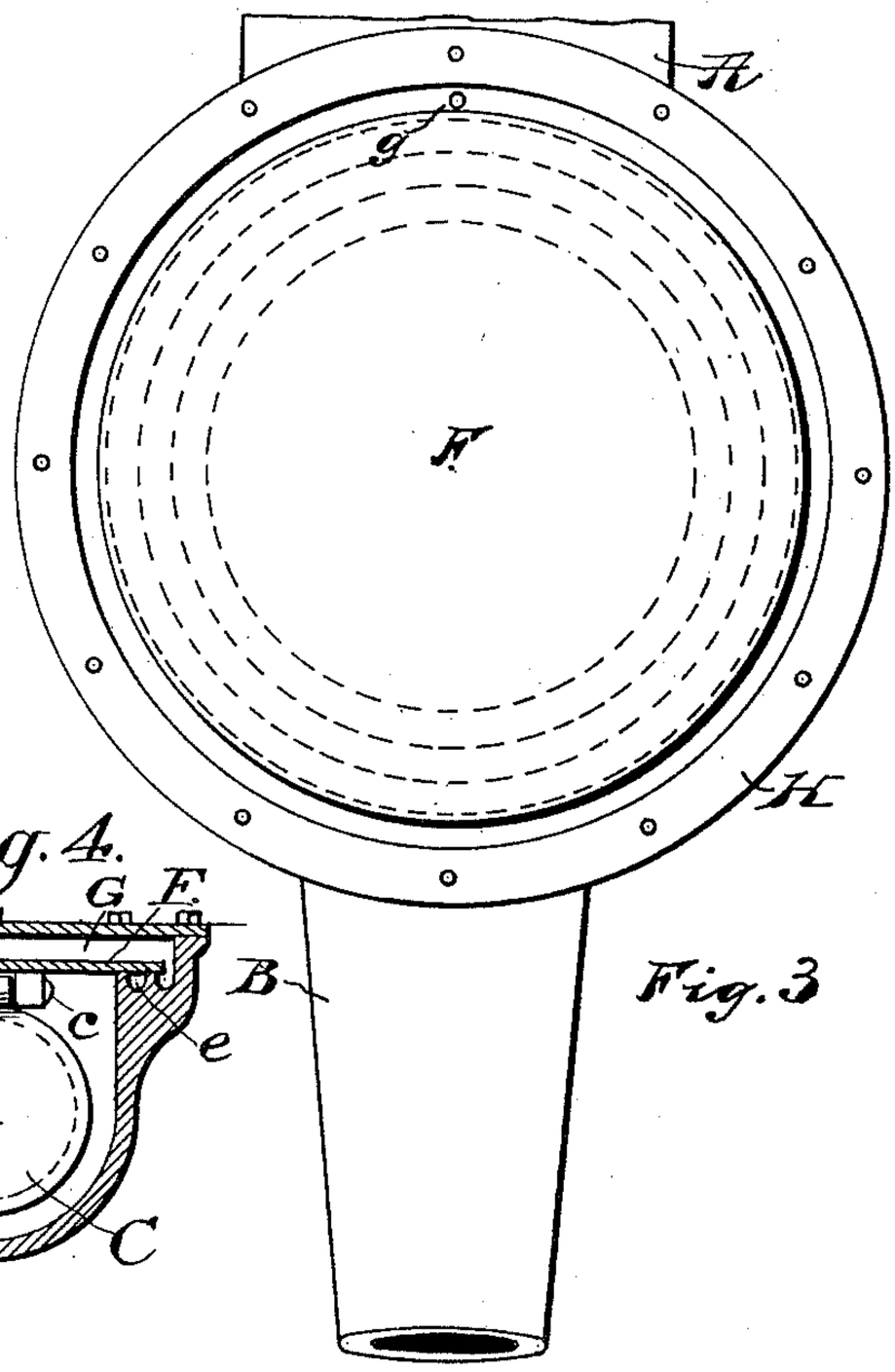
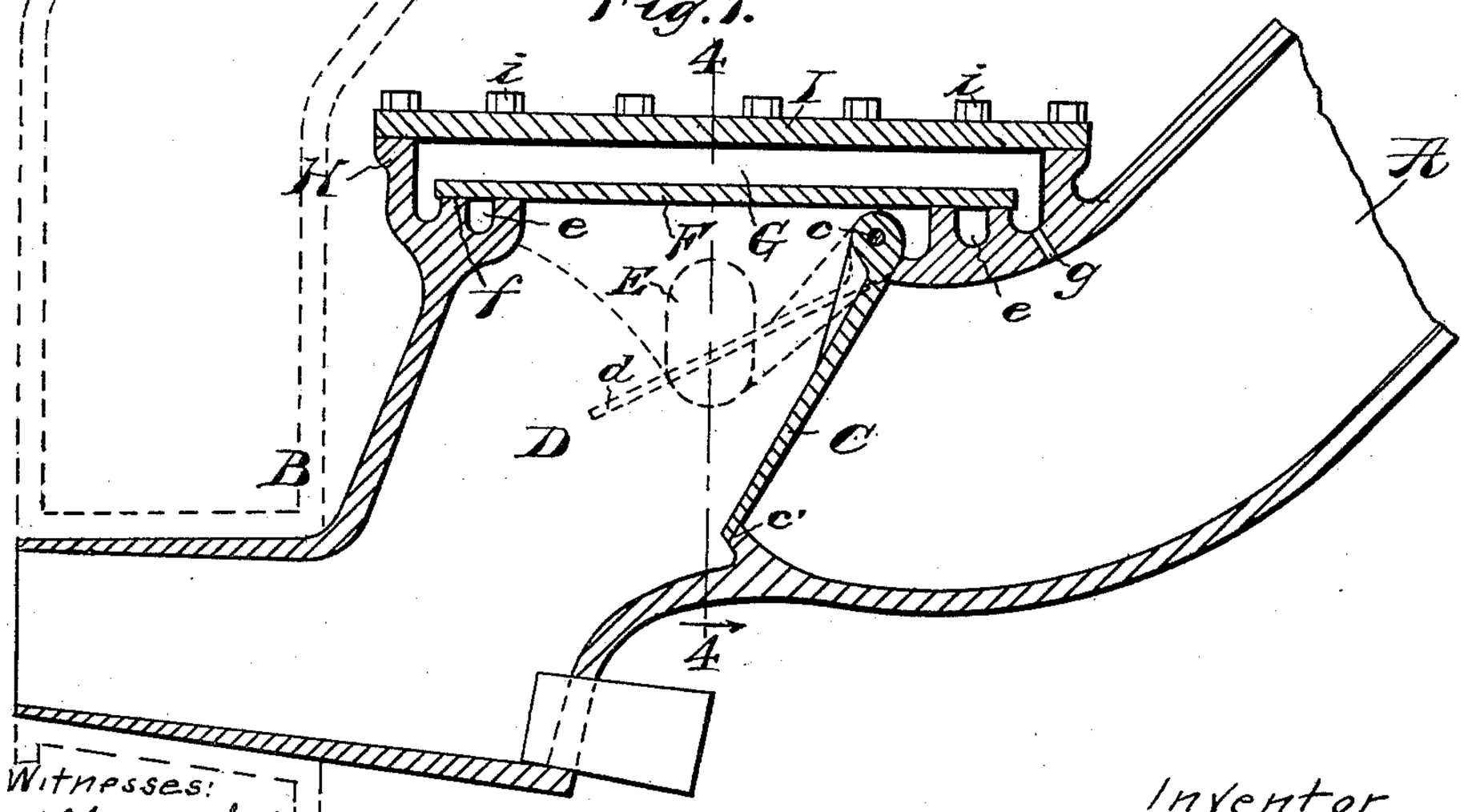


Fig. 3

Fig. 4.

Fig. 1.



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UNITED STATES PATENT OFFICE.

EDWIN H. MESSITER, OF SAN LUIS POTOSI, MEXICO.

FURNACE-TWYER.

SPECIFICATION forming part of Letters Patent No. 703,332, dated August 5, 1902.

Application filed November 26, 1901. Serial No. 83,773. (No model.)

To all whom it may concern:

Be it known that I, EDWIN H. MESSITER, a citizen of the United States, residing at San Luis Potosi, in the State of San Luis Potosi, Mexico, have invented certain new and useful Improvements in Furnace-Twyers, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to improvements in twyers and twyer-boxes for conducting air to furnaces of any of the several sorts which in smelting and kindred arts require that air be supplied thereto under more or less pressure.

The object is to permit the free and practically unobstructed introduction of the air to the furnace and at the same time prevent a backward flow of gases or air at any time through the blast-pipe and afford an instantaneous relief for such back pressure when there is a tendency toward reversal of current. There is great danger of explosion in the blast-pipe resulting from such backward flow or reversal of the current. Such backflow frequently occurs, as when the pressure is suddenly cut off either intentionally or in case of accident to the compressing or blowing mechanism or to the ducts through which the air is carried to the twyer. At the same time it is not only desirable, but under many circumstances absolutely necessary, to not only thus check the backflow of gases and air through the air-ducts, but also relieve the twyer part and the furnace entirely therefrom, this being demanded for several reasons, including the possibility of leakage past the valve or device used for normally checking the backflow, even though closed.

My invention can be embodied in either of several forms of device. I have selected for illustration one which presents the essential features of structure and the mode of operation, but wish it to be understood that I do not limit myself thereto, as there can be modification without departing from the invention.

Figure 1 is a vertical sectional view of a portion of a furnace sufficient to illustrate the manner of applying my invention thereto. Fig. 2 is a top view of the twyer and the end of the blast-pipe. Fig. 3 is a plan view with the top casing-plate removed. Fig. 4 is a sectional view on line IV, Fig 1.

In the drawings, A represents the blast pipe or duct through which the air is brought to the twyer, the latter being indicated by B. Between these there is placed the check-valve C, which may be of the ordinary or of any preferred construction, it being hinged at *c* and having a seat *c'*, against which it normally tends to press when relieved of pressure in the pipe A.

D is the chamber wherein the valve C swings when moving from and toward its seat, the dotted lines at *d* indicating the position occupied by it when air (under ordinary conditions as to pressure) is passing from the pipe A to the twyer B.

It has been customary heretofore to provide a device for checking the backflow of the gases which is normally held open by the static pressure of the air flowing through the twyer and which is closed when the static pressure is reduced below a certain amount, at the same time opening a relief-port to the atmosphere. When the blowing apparatus is gradually slowed down in the usual way, the static pressure in the twyers is reduced to a small amount by the gradual escape of the gases through the furnace before the flow of air through them toward the furnace is permitted to cease by the stopping of the blowing apparatus, and the devices heretofore used will act before the forward motion of the blast stops. It is in cases of sudden stoppage or disconnection of the source of pressure through accident or otherwise that the backflow of gases from the furnace occurs with the most serious results. In these cases the conditions are very different. The backflow is then instantaneous and precedes any material reduction in the static pressure in the twyers, and consequently precedes the action of the devices heretofore used. It is the object of my invention, therefore, to combine a device for preventing backflow of the gases which is closed when the dynamic pressure due to the impact of the blast against it is reduced, regardless of the static pressure, with a relief-port normally closed by a device which will open said port when the first-mentioned device is closed and an excess of pressure on the furnace side of it exists. In other words, the object is to provide a mechanism which will prevent backflow of gases under any and all conditions and which will afford relief for any back pressure which may exist.

I provide a separate outlet for the reacting

gases—that is to say, an outlet cut off from the blast-pipe A and through which the back-flowing gases can escape to a region of low pressure, either an inclosed compartment or to the open atmosphere, preferably the latter, and with such outlet combine means which hold it closed under normal working conditions, but which instantly open it when from any cause the pressure on the twyer side of the check-valve becomes greater than it is on the inlet side. The device which I have illustrated for attaining this part of the invention consists of the outlet-passage *e*, adapted to communicate with the chamber D of the twyer and also with the orifice E, which in the construction shown leads to the open atmosphere. This outlet-duct *e* is shown as being a groove or channel formed in the metal at the upper part of the valve-chamber D. F is a valve or closing device for this outlet-duct. It may be normally held to its seat and in its closed position by any suitable device or agency, so that it be capable of yielding if the pressure on the inner side of the check-valve should at any time become too great for safety in relation to the pressure in the blast-pipe A. For holding this valve F to its seat I prefer to follow the plan herein illustrated. I provide a closed chamber G for the valve, wherein it is permitted to have sufficient movement to accomplish its purposes. This chamber can be provided by forming a flange H of ring-like character above the valve-chamber D and closing the space encircled by it by means of a plate I and bolting it to the flange, as shown at *i*. The chamber G communicates with the blast-pipe A by one or more ports *g*, which are reduced in cross-area in such way that they will maintain in the chamber G a pressure equal to that in the blast-pipe A, but will not permit a backflow of air from the chamber G except very slowly. The valve or plate F will be held down on its seat by an excess of pressure on its upper or outer side, such excess arising from the fact that part of the surface of its under or inner side is exposed to a relatively low pressure—as, for instance, that of the atmosphere. Being tight on its seat at *f*, this valve or plate will permit no leakage from the twyer, and under normal conditions when the device is in operation it will act simply as a check-valve. If now the flow of air from the inlet side to the outlet side of the valve C ceases from any cause or if there should be a sufficient drop in the pressure, this valve will close under the action of gravity, and if there should be any tendency to a backward flow of gases—that is, a flow from the outlet side to the inlet side—the pressure on the inlet side becomes less than that on the outlet side, and if this reversal of the pressure increases to an appreciable extent the supplemental valve or plate F will move from its seat and communication will be opened between the twyer-mouth or the chamber D and the duct E and escape-outlet *e*. The gases under pressure in the furnace will then be allowed to escape to the open air or other region of relatively low pressure, and the pressure in the twyer-chamber—that is, the pressure on the outlet side of the check-valve C—will be reduced practically to that of the atmosphere. The orifice *g* being, as aforesaid, relatively small in area in comparison with the area of the duct E and the outlet *e*, the reacting gases from the furnace will escape through said duct and orifice and not through the passage at *g*. When the normal working conditions are restored by forcing the air again through the inlet part of the twyer, the valves C and the plate or valve F will resume their positions for operation.

What I claim is—

1. In a furnace blast apparatus an air-introducing mechanism having a furnace outlet-duct, a blast inlet-duct, an escape-duct communicating with the atmosphere, a passage-way connecting the blast inlet-duct and the furnace outlet-duct and the closing devices simultaneously closing said passage-way and the escape outlet-duct, substantially as set forth.

2. In a furnace blast apparatus an air-introducing mechanism having a furnace outlet-duct, an inlet-duct, means for checking the backflow of gas from the furnace-duct to the inlet-duct, a duct communicating with a region of pressure lower than that in either of the aforesaid ducts and a closing device for said low-pressure duct independent of the said gas-check means, substantially as set forth.

3. In a furnace blast mechanism an air-introducing mechanism having a furnace-duct, a blast-duct communicating therewith, a check-valve between the furnace-duct and the blast-duct, an atmosphere-duct adapted to communicate with the furnace-duct, a valve for the atmosphere-duct movable independently of the first aforesaid valve and adapted to be closed when the first said valve is closed, substantially as set forth.

4. The combination of the twyer duct or outlet B, the blast or inlet duct A, the automatically-acting means for closing the duct A against backflow of gases, the escape-passage E adapted to communicate with the twyer to connect the latter with an exterior space and a second closing device for closing the escape-passage, the two said closing devices being adapted to be closed simultaneously and to be opened independently of each other, substantially as set forth.

5. In a furnace blast mechanism an air-introducing device having a main check-valve, a duct on the outside of said valve, a furnace-duct on the inner side of said valve, a supplemental escape-duct relatively on the inner side of said valve adapted to connect the furnace-duct with a region of relatively low pres-

sure and a supplemental valve movable independently of the main check-valve for closing the escape-duct, substantially as set forth.

6. In a furnace blast mechanism an air-introducing device having a check-valve, an inlet-duct on the outer side of said valve, an outlet-duct on the inner side of said valve, an escape-duct adapted to connect said inlet-duct with a region of relatively low pressure, a supplemental valve held closed by the pressure in the inlet-duct and interposed between the outlet-duct and the escape-duct, substantially as set forth.

7. In a furnace blast apparatus an air-introducing mechanism having a furnace outlet-duct, a blast inlet-duct, two passage-ways from the inlet-duct to the furnace outlet-duct, two closing devices, one for each of said passage-ways, and a supplemental outlet-duct adapted to communicate with the furnace outlet-duct, said supplemental outlet being closed by one of said closing devices, substantially as set forth.

8. In a furnace blast apparatus an air-introducing mechanism having a furnace outlet-duct, a blast inlet-duct, two passage-ways from the inlet-duct to the furnace outlet-duct, two closing devices, one for each of said passage-ways, and a supplemental outlet-duct adapted to communicate both with the aforesaid outlet-duct and with the inlet-duct, said supplemental outlet-duct being closed by one of the said closing devices, substantially as set forth.

9. In a furnace blast apparatus the air-introducing mechanism having a chamber D, three ducts adapted to communicate with said chamber, the first duct also communicating with an air-forcing mechanism, the second duct communicating with the interior of a furnace, and the third duct communicating with the open atmosphere, and two independent valves, one interposed between said chamber and the open atmosphere-duct, and one interposed between the said chamber and the blast-duct, and one being held open and the other held closed independently of each other by the air-blast, substantially as set forth.

10. In a furnace blast mechanism an air-introducing device having an inlet, a furnace-outlet, a check-valve between the inlet and the outlet, a supplemental outlet connecting the furnace-outlet with a region of pressure lower than that of the air-blast, a valve between said two outlets and a duct supplemental to the check-valve passage to carry air from the inlet to the second valve to hold it closed.

11. In a furnace blast mechanism an air-introducing device having a check-valve, a duct on the outer side of the valve, a furnace-duct on the inner side of the valve, a duct adapted to connect the furnace-duct with the open atmosphere, a valve for said duct supplemental to and independent of the check-valve, a pressure-chamber on the outer side of the supplemental valve and a duct adapted to connect said pressure-chamber with a region of relatively high pressure, substantially as set forth.

12. In a furnace blast mechanism an air-introducing device having a check-valve, an inlet-duct on the outer side of said valve, a furnace-duct on the inner side of said valve, an escape-duct adapted to connect the furnace-duct with the open atmosphere, a valve supplemental to the check-valve for closing said escape-duct, a pressure-chamber for the supplemental valve and a reduced port connecting said pressure-chamber with the first aforesaid duct on the outer side of the check-valve, substantially as set forth.

13. In a furnace blast apparatus the air-introducing mechanism having a chamber as at D, three ducts, the first adapted to communicate with said chamber, the second being a furnace-duct permanently communicating therewith, and the third being an atmosphere-duct intermittently communicating therewith, a gravity-valve introduced between the first duct and said chamber D and adapted to be opened by the air-blast, a gravity-valve interposed between the said chamber and the atmosphere-duct and normally held closed by the blast, substantially as set forth.

14. The combination of the twyer, the blast-duct, an automatically-operative check-valve between the same, a relief device communicating with the twyer, and means whereby the operation of said relief device is determined by a difference of pressure in said blast-duct and twyer when cut off from each other by said check-valve.

15. The combination of the twyer, the blast-duct, an escape-duct from the twyer, means whereby said escape-duct is closed by the pressure of the blast, and an automatically-acting check-valve between the twyer and blast-duct.

16. The combination of the twyer, the blast-duct, an automatically-acting check-valve between the same, an escape-duct, passages from each side of the check-valve communicating with said escape-duct, and a supplemental valve acting to close the passage from the twyer and from the blast-duct to the escape-duct.

17. The combination of the twyer, the blast-duct, an automatically-acting check-valve between the same, an escape-passage from the twyer to an outer region of relatively low pressure, a supplemental valve controlling said escape-passage, and means whereby the pressure in the blast-duct acts on said supplemental valve in the direction in which the same closes.

In testimony whereof I affix my signature in presence of two witnesses.

EDWIN H. MESSITER.

Witnesses:
RAMONA VELÁZQUEZ,
CHARLES ASHBY VAUGHAN.