No. 737,105. PATENTED AUG. 25, 1903.

J. HORVÁTH.

FURNACE DOOR.

APPLICATION FILED JUNE 12, 1902.

NO MODEL.

Fig. 1.

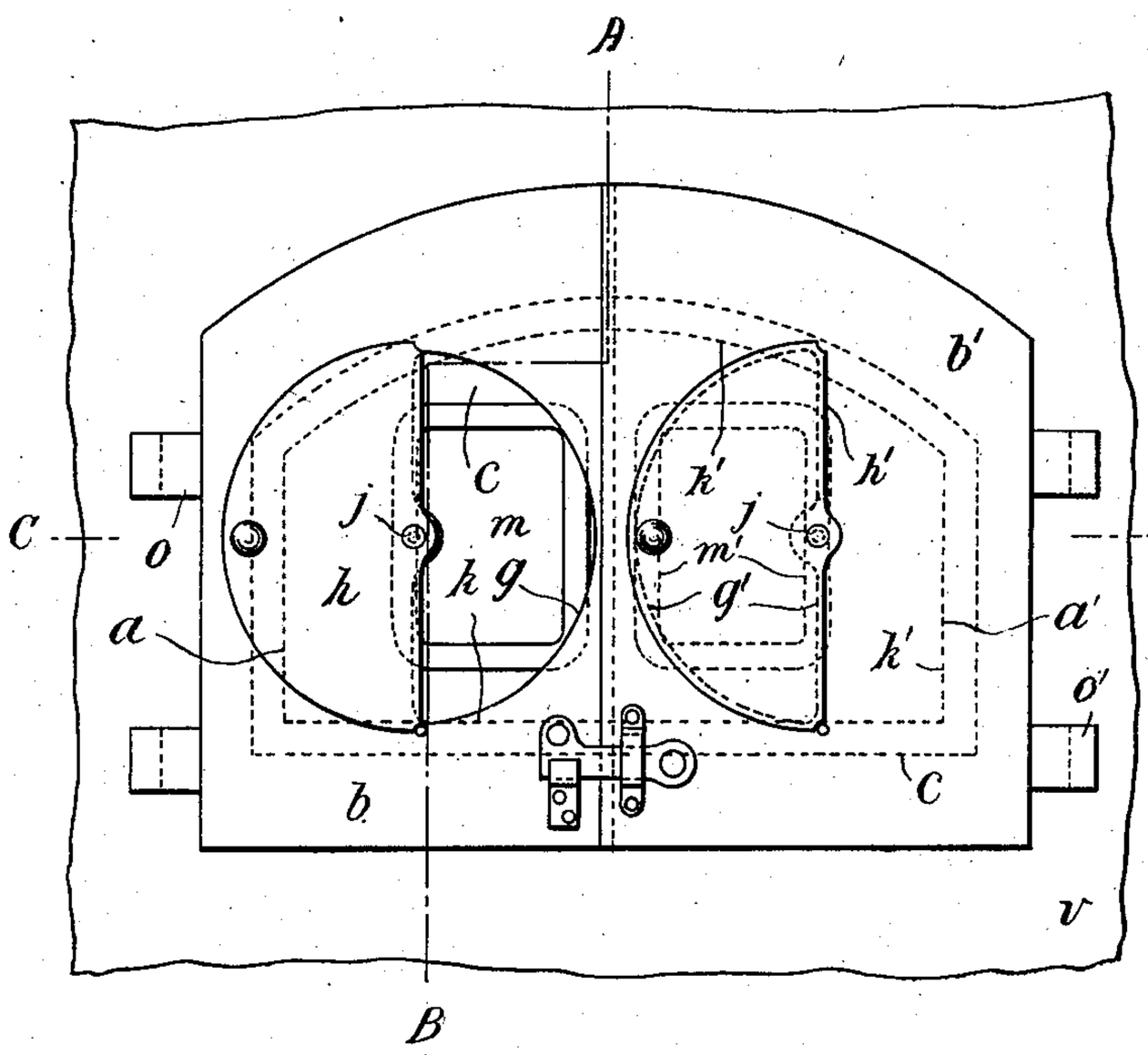
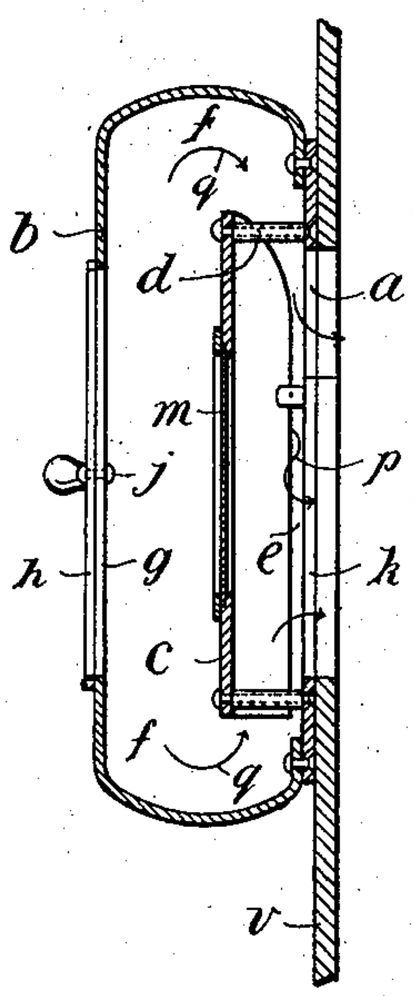


Fig. 2.



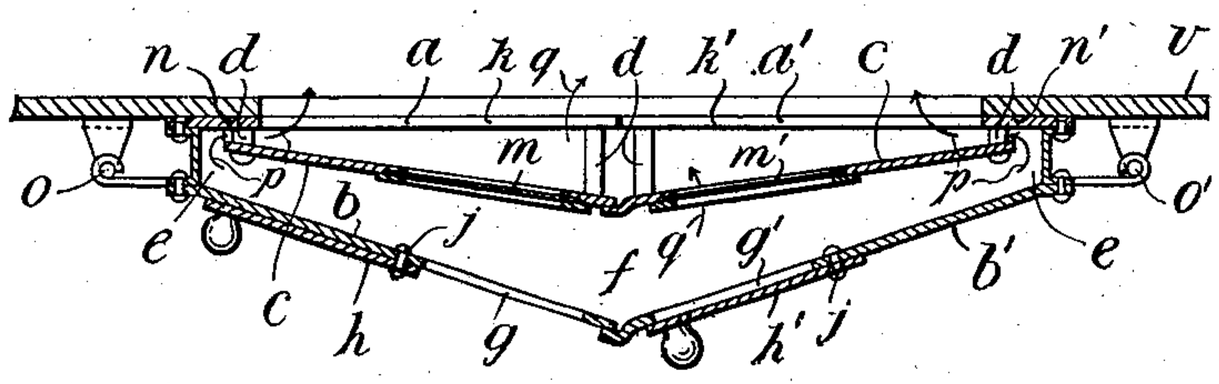


Fig. 3.

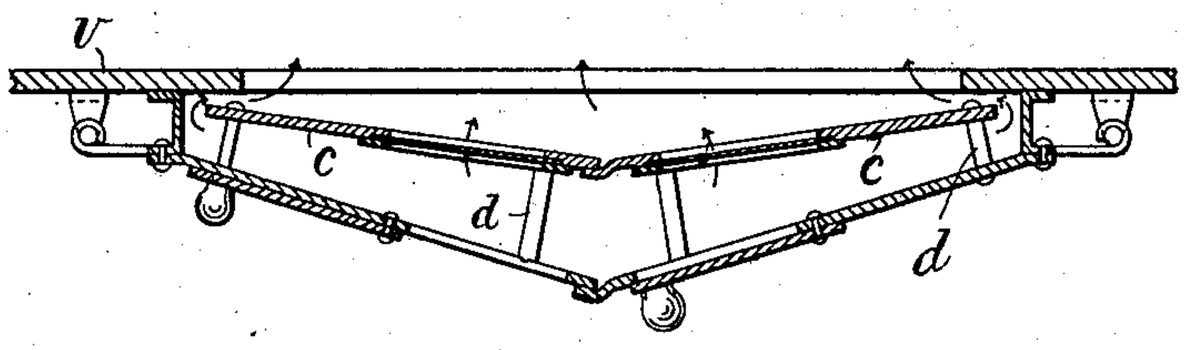


Fig. 4.

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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 737,105. Patented August 25, 1903.

UNITED STATES PATENT OFFICE.

JOSEF HORVÁTH, OF SZÉKESFEHÉRVAR, AUSTRIA-HUNGARY, ASSIGNOR OF THREE-FOURTHS TO JAMES GRUNHUT, OF LONDON, ENGLAND, AND FERDINAND TÓTH, OF SZÉKESFEHÉRVAR, AUSTRIA-HUNGARY.

FURNACE-DOOR.

SPECIFICATION forming part of Letters Patent No. 737,105, dated August 25, 1903.

Application filed June 12, 1902. Serial No. 111,274. (No model.)

To all whom it may concern:

Be it known that I, JOSEF HORVÁTH, engineer, of Székesfehérvar, Austria-Hungary, have invented certain new and useful Improvements in Means for Admitting Air to Furnaces, of which the following is a specification.

This invention relates to furnace-doors, and has for its object to provide an improved means for the admission of air to furnaces in order to secure improved combustion of fuel and the gases generated and the prevention of smoke and is specially suited for use in steam-boiler furnaces, although, as will be readily understood, it is applicable to other furnaces.

According to my invention I provide the furnace with means whereby air can be admitted thereto and directed or concentrated axially of the furnace, so that the flame is caused to pass around the air, which travels through a kind of tunnel of flame in the furnace. By this means the air thus admitted is so highly heated and is brought in contact under such favorable conditions with the flame that the smoke and gases are consumed and the efficiency of the furnace highly increased. To attain this object, I prefer to dispose the said means at one end of the furnace in such a manner that the air admitted thereby to the furnace is directed radially inward, so as to concentrate and direct the said air axially of the furnace, as before mentioned. For convenience and compactness said means are preferably combined with or carried by the fire-door itself.

In order to illustrate the invention, I will proceed to describe how it may be carried into effect in its most convenient form—namely, when the means for producing the axial concentration of air are combined with the fire-door itself. In thus carrying the invention into effect I construct the door as a casing open at the back and provided with an air-admission orifice or orifices at the front, and I arrange in this casing a diaphragm so disposed as to give passage around its top, bottom, and sides to the air admitted through the front of the casing. This diaphragm is sloped, shaped, or directed toward the rear from a central vertical line of the diaphragm in such manner as to provide triangular or segmental spaces between the top and bottom of the diaphragm and the rear wall of the casing (or it may be the furnace-front) of sufficient dimensions to permit the free inflow of the air to the furnace over and under the diaphragm at and toward the middle, these spaces being at their maximum at the middle of the diaphragm and contracting as the diaphragm approaches the rear of the casing. The sides of the diaphragm lie so close to the rear face of the casing (or it may be to the face of the furnace-front) that the spaces for the passage of air around the sides of the diaphragm are very narrow, being, in fact, mere slits. Thus while the air can pass freely and in considerable volume to the furnace at top and bottom of the diaphragm, at and toward the middle thereof, a great pressure of air is created at the sides owing to the restricted passages there. The result is that the air enters the furnace at great pressure and high velocity at the sides as compared with the weaker draft at top and bottom of the diaphragm, and the draft is thus kept central and directed axially of the furnace.

I find in practice that the best results are attained when the maximum opening at top and bottom of the diaphragm—that is to say, at the middle thereof—is from four to five centimeters wide, while the slits at the sides should preferably not exceed five millimeters in width. I find, further, that the axial concentration can be assisted by sloping, shaping, or directing the outer wall of the casing toward the rear from a vertical center line of the front of the door, this slope or direction of the outer wall being somewhat more pronounced than that of the diaphragm, so that funnel-like chambers or passages are formed between the diaphragm and the outer wall at each side of a vertical center line of the diaphragm, which chambers or passages concentrate the air upon the side slits of the diaphragm and increase the pressure of the air at these slits. I find, further, that the axial concentration of the draft can be also assisted by making the opening in the rear wall of the casing of such shape and dimensions with

respect to the peripheral contour of the diaphragm that the edge or rim of the said aperture constitutes a frame-like baffling-surface at the rear of the diaphragm, which assists in deflecting axially of the furnace the air which flows around the diaphragm.

The rear wall of the casing may in some cases be constituted by the front of the furnace, and in this case the baffling-rim just referred to will be likewise constituted by the front of the furnace. The improved door thus constituted may consist of one flap or it may be two flaps, hinged or otherwise suitably mounted on the furnace-front. When the door consists of two flaps, the casing and diaphragm will be divided into a corresponding number of sections so arranged and mounted that when the door is shut the flaps or sections close together to constitute the casing and its inclosed diaphragm. The diaphragm may conveniently be provided with one or more transparent panels of refractory material to enable the operation of the furnace to be inspected through the openings in the front of the casing without opening the door.

I will proceed with the aid of the accompanying drawings to describe in detail two forms of double-flap door embodying the invention.

In the drawings, Figure 1 is a front elevation, Fig. 2 a section on the line A B, Fig. 1, and Fig. 3 a horizontal section on line C D of Fig. 1, these three figures illustrating one form of door. Fig. 4 is a horizontal section corresponding to Fig. 3, but illustrating a modification in which the inner wall of the casing is constituted by the front of the furnace.

Referring first to Figs. 1 to 3, the door-casing and its inclosed diaphragm are composed of two hinged flaps. *a a'* indicate the members constituting the rear wall of the casing, and *b b'* those forming the outer wall. The members *a a'* may be connected to their respective members *b b'* in any suitable way or may be formed in one piece therewith. *c* is the diaphragm formed of two members or sections, these corresponding in shape in the closed position of the door to the mouth of the furnace. They are secured in the respective halves *a a' b b'* of the casing by rivets and collars *d d* in such manner as to leave a space or clearance on all sides between the diaphragm and the casing. The leaves *b b'* of the outer wall are provided with apertures *g g'*, adapted to be closed and opened by shutters *h h'*, mounted on pivots *j*. The halves *a a'* of the rear wall are cut away, as shown at *k k'*, so as when the door is closed to form an aperture similar in shape to the peripheral contour of the diaphragm *c*, but of slightly-smaller dimensions. *m m'* are panels, of mica or other refractory transparent material, disposed in the diaphragm-leaves in direct line between the apertures *g g'* and the aperture formed by *k k'* when the door is closed. The diaphragm-leaves are inclined toward the inner wall *a a'* from a central vertical line of the closed diaphragm, so that similar spaces *f f* for the free passage of air between the top and bottom of the diaphragm and the rear wall *a a'* are provided, these spaces being at their maximum, say, four to five centimeters wide at the middle of the diaphragm and contracting toward the sides. The side edges of the diaphragm-leaves lie so close to the respective halves of the inner wall *a a'* that restricted passages or slits *e e* are formed between the said side edges and the rear-wall sections *a a'*, these slits being preferably not more than five millimeters wide. The leaves *b b'* are also somewhat inclined to their respective diaphragm-leaves from a central vertical line of the door-front, so as to form a funnel-like chamber or passage for the air on each side of said center line and serving to concentrate the air on the side slits *e e*. The aperture *k k'* being of similar shape to the peripheral contour of the diaphragm *c*, but somewhat smaller, constitutes when the door is closed a baffle *n n'*, extending in a frame-like manner at the rear of the diaphragm *c* and which assists in deflecting the air which passes around the diaphragm radially inward toward the center of the furnace. The half-doors constituted by the leaves *a a'* and *b b'* and the leaves of the diaphragm *c* are mounted upon hinges *o o'* on the face of the furnace.

In use when the furnace is lighted the doors are shut and the apertures *g g'* closed. Then when the fuel is in full combustion the shutters *h h'* are turned back, so as to open the apertures *g g'*. The air then flows in through these apertures and around the diaphragm to the furnace in the direction of the arrows *p* laterally and in the direction of the arrows *q* at top and bottom. The air-current passes freely around the top and bottom of the diaphragm, this freedom being greatest at the middle; but owing to the restricted nature of the passages *e* at the sides a great pressure is created at the sides, so that the air enters the furnace at the sides at high pressure. The result is that the draft is directed radially inward and concentrated axially in the furnace, a whirl or vortex of air and smoke being formed, whereby complete combustion of the smoke and gases is effected. This axial concentration is assisted by the funnel-like concentrating passages between the diaphragm *c* and outer wall *a a'* and by the baffling rim or surface *n n'*. By means of the panels *m m'* the stoker can inspect the action of the furnace through the apertures *g g'* without having to open the door. In the case of furnaces which are stoked only at comparatively long intervals the shutters *h h'* will be closed after the smoke produced by each stoking operation has been consumed, while in the case of furnaces which are stoked at frequent intervals the shutters will be always or practically always open. In some cases a separately pro-

vided inner wall may be dispensed with for the casing, the face of the furnace serving the same purpose. Fig. 4 illustrates such a construction. The arrangement of the door shown in this figure will be readily understood without further description, corresponding letters of reference being employed to indicate corresponding parts. It will be seen that the baffle $n\ n'$ is constituted by the face of the furnace v.

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

1. In combination with a furnace, a door having a diaphragm, and an inner wall having an aperture smaller than the diaphragm and in position to direct the air without substantial obstruction radially inward so as to concentrate and direct the air axially of the furnace, whereby the flame is caused to pass around the air.

2. In combination with a furnace, a door having a diaphragm, and an inner wall having an aperture smaller than the diaphragm, said diaphragm being inclined to the inner wall, and said diaphragm and wall being in position to direct the air without substantial obstruction radially inward so as to concentrate and direct the air axially of the furnace, whereby the flame is caused to pass around the air.

3. The improved furnace-door comprising a casing having inner and outer walls, a diaphragm disposed therein and attached thereto, the inner wall of said casing having an aperture smaller than the diaphragm, the outer wall of said casing having an aperture adapted to be opened and closed, said diaphragm being inclined to the inner wall and provided with a transparent panel.

4. In combination with a furnace, a door comprising a casing having an aperture on its side next the furnace, a diaphragm smaller than said casing and larger than said aperture, said aperture being surrounded by a flange extended inward beyond the edges of the diaphragm, said parts adapted to direct the air radially inward without substantial obstruction, so as to concentrate and direct the air axially of the furnace, whereby the flame is caused to pass around the air.

5. A furnace-door comprising a casing open at back and adapted to admit air at the front, a transverse diaphragm disposed in said casing, spaces around the top, bottom and sides of said diaphragm for the passage to the furnace of the air admitted through the front of the casing, the spaces around the top and bottom of the diaphragm permitting free inflow of the air at and toward the middle of the diaphragm and the spaces at the sides of the diaphragm being restricted whereby air is admitted to the furnace at high pressure at the sides, for the purpose specified.

6. A furnace-door comprising a casing open at back and adapted to admit air at the front, a transverse diaphragm disposed in said casing, spaces around the top, bottom and sides of said diaphragm for the passage to the furnace of the air admitted through the front of the casing, the spaces around the top and bottom of the diaphragm permitting free inflow of the air at and toward the middle of the diaphragm, and the spaces at the sides of the diaphragm being restricted, the outer wall of said casing being directed rearwardly on each side and forming funnel-like chambers between said outer wall and the diaphragm on each side, said chambers contracting toward the sides whereby the air admitted is concentrated upon the said restricted side spaces for the purposes specified.

7. A furnace-door comprising a casing open at back and adapted to admit air at the front, a transverse diaphragm disposed in said casing, spaces around the top, bottom and sides of said diaphragm for the passage to the furnace of the air admitted through the front of the casing, the spaces around the top and bottom of the diaphragm permitting free inflow of the air at and toward the middle of the diaphragm and the spaces at the sides of the diaphragm being restricted, the outer wall of said casing being directed rearwardly on each side and forming funnel-like chambers between said outer wall and the diaphragm on each side, said chambers contracting toward the sides whereby the air admitted is concentrated upon the said restricted side spaces for the purposes specified.

8. A furnace-door comprising a casing open at back and adapted to admit air at the front, a transverse diaphragm disposed in said casing, spaces around the top, bottom and sides of said diaphragm for the passage to the furnace of the air admitted through the front of the casing, the spaces around the top and bottom of the diaphragm permitting free inflow of the air at and toward the middle of the diaphragm and the spaces at the sides of the diaphragm being restricted the outer wall of said casing being directed rearwardly on each side and forming funnel-like chambers between said outer wall and the diaphragm on each side, said chambers contracting toward the sides whereby the air admitted is concentrated upon the said restricted side spaces, and a frame-like baffling rim or surface at the rear of the diaphragm said rim or surface being concentric with the diaphragm and extending radially inward beyond the periphery thereof, for the purposes specified.

9. A furnace-door comprising a casing open at back and adapted to admit air at the front, a transverse diaphragm disposed in said casing, spaces around the top, bottom and sides of said diaphragm for the passage to the furnace of the air admitted through the front of the casing, the spaces around the top and bottom of the diaphragm permitting free inflow of the air at and toward the middle of the diaphragm, and the spaces at the sides of the diaphragm being restricted the front of the furnace forming a rear wall to the casing for the purposes specified.

10. A furnace-door comprising a casing open at back and adapted to admit air at the

front, a transverse diaphragm disposed in said casing, spaces around the top, bottom and sides of said diaphragm for the passage to the furnace of the air admitted through the front of the casing, the spaces around the top and bottom of the diaphragm permitting free inflow of the air at and toward the middle of the diaphragm and the spaces at the sides of the diaphragm being restricted said casing and diaphragm being formed in two sections, the diaphragm-sections being secured to the respective casing-sections and the casing-sections hinged on the furnace-front the respective diaphragm-sections and casing-sections closing together to form the casing and transverse diaphragm in the closed position of the door for the purpose specified.

11. A furnace-door comprising a casing open at back and adapted to admit air at the front, a transverse diaphragm disposed in said casing, spaces around the top, bottom and sides of said diaphragm for the passage to the furnace of the air admitted through the front of the casing, the spaces around the top and bottom of the diaphragm permitting free inflow of the air at and toward the middle of the diaphragm and the spaces at the sides of the diaphragm being restricted the outer wall of said casing being directed rearwardly on each side and forming funnel-like chambers between said outer wall and the diaphragm on each side, said chambers contracting toward the sides whereby the air admitted is concentrated upon the said restricted side spaces, said casing and diaphragm being formed in two sections, the diaphragm-sections being secured to the respective casing-sections and the casing-sections hinged on the furnace-front the respective diaphragm-sections and casing-sections closing together to form the casing and transverse diaphragm in the closed position of the door, the inner edge of the rear wall of the casing-sections extending radially inward beyond the periphery of the diaphragm and forming a frame-like baffling rim or surface at the rear thereof and concentric therewith when the casing-sections are closed together, for the purposes specified.

12. A furnace-door comprising a casing open at back and adapted to admit air at the front, a transverse diaphragm disposed in said casing, spaces around the top, bottom and sides of said diaphragm for the passage to the furnace of the air admitted through the front of the casing, the spaces around the top and bottom of the diaphragm permitting free inflow of the air at and toward the middle of the diaphragm and the spaces at the sides of the diaphragm being restricted and means for opening and closing the air admission through the front of the casing, for the purposes specified.

13. A furnace-door comprising a casing open at back and having air-admission openings in front, a transverse diaphragm disposed in said casing, spaces around the top, bottom and sides of said diaphragm for the passage to the furnace of the air admitted through said front openings, the spaces around the top and bottom of the diaphragm permitting free inflow of air at and toward the middle of the diaphragm, and the spaces at the sides of the diaphragm being restricted the outer wall of said casing being directed rearwardly on each side and forming funnel-like chambers between said outer wall and the diaphragm on each side, said chambers contracting toward the sides, whereby the air admitted is concentrated upon said restricted side spaces, shutters adapted to close said front air-admission openings, and refractory transparent panels in said diaphragm at the rear of said front air-admission openings, for the purposes specified.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

JOSEF HORVÁTH.

Witnesses:
REGINALD EATON ELLIS,
ROBERT MILTON SPEARPOINT.