C. J. F. JOHNSON.

FURNACE DOOR.

APPLICATION FILED JULY 29, 1911.

1,067,255.

Patented July 15, 1913.

2 SHEETS—SHEET 1.

Fig. 1

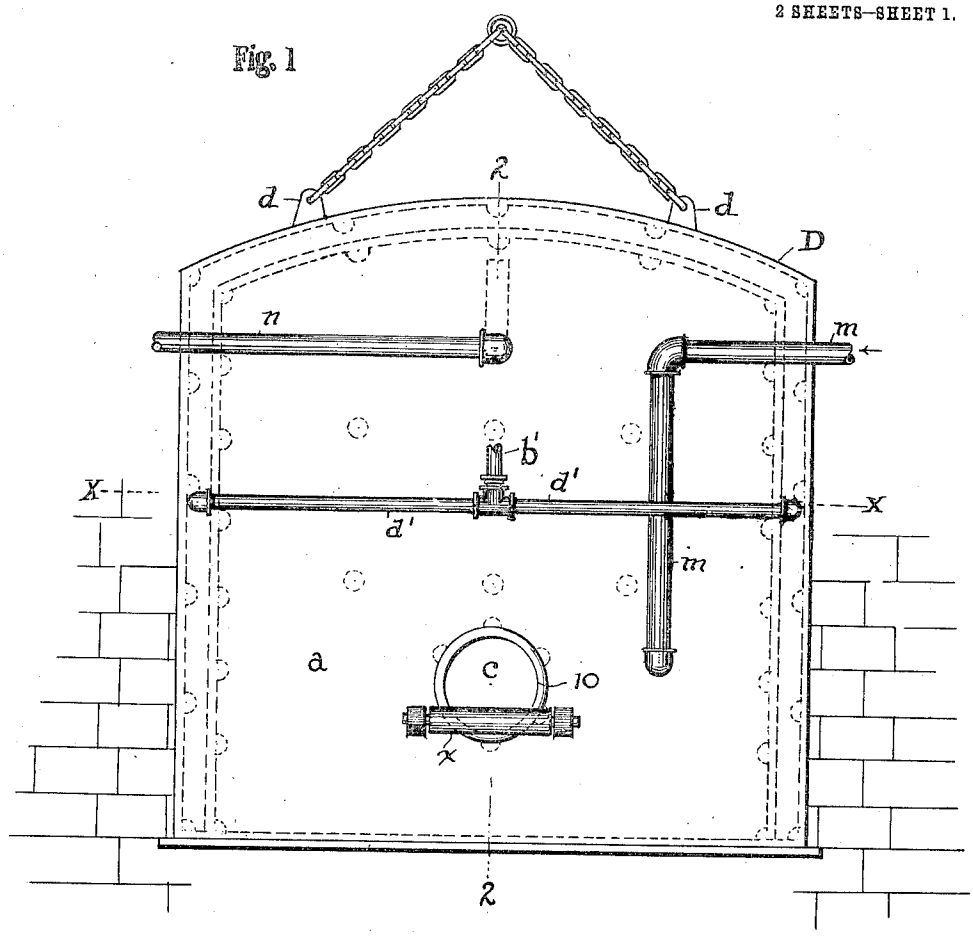
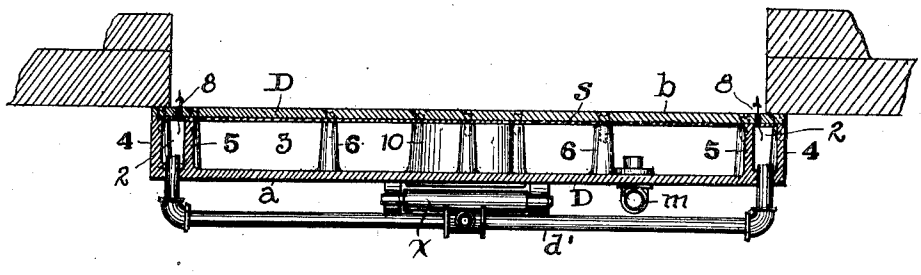


Fig. 2



ATTEST

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2 SHEETS—SHEET 2.

Fig. 3

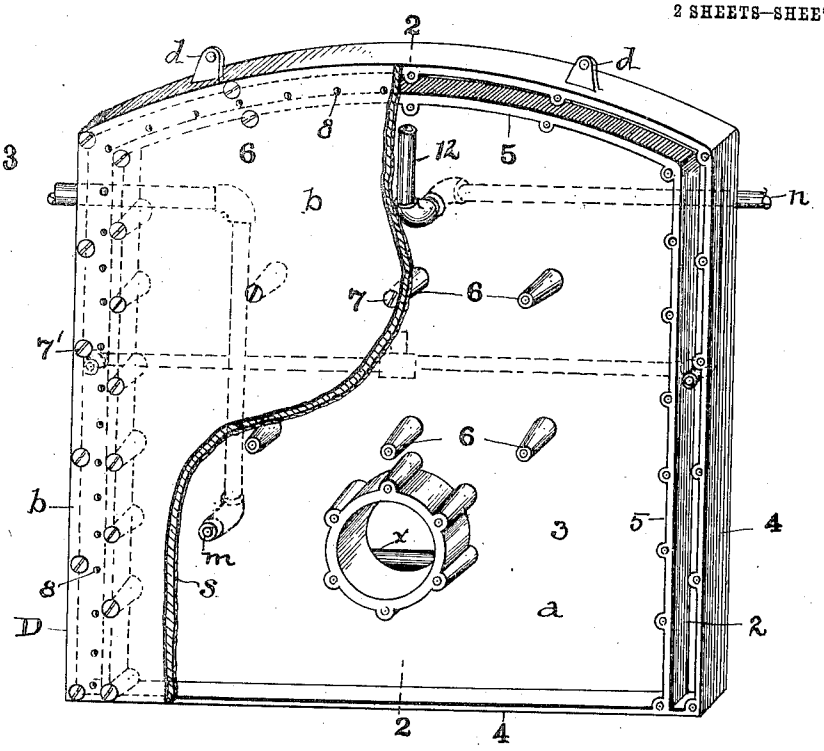
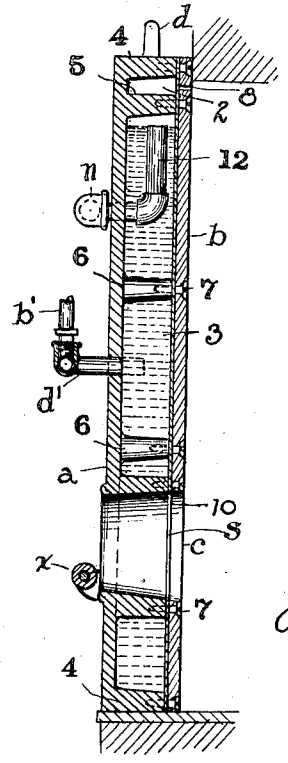


Fig. 4



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UNITED STATES PATENT OFFICE.

CARL J. F. JOHNSON, OF CLEVELAND, OHIO.

FURNACE-DOOR.

1,067,255. Specification of Letters Patent. Patented July 15, 1913.

Application filed July 29, 1911. Serial No. 641,323.

To all whom it may concern:

Be it known that I, CARL J. F. JOHNSON, citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Furnace-Doors, of which the following is a specification.

The invention relates to protected furnace doors, and comprises a form of metal door adapted to be used with reverberatory, open hearth and re-heating furnaces wherein fuel gas is employed and in which the temperature rises very high, so that if not protected the door is soon destroyed and ordinarily will not last over thirty to sixty days. The brick lining about the door-opening is also quickly affected by the high temperature and the edges of the opening will disintegrate in a very short time and crumble away leaving openings about the door through which the flaming gas will find an outlet, and the gas will escape in sufficient quantities to produce a constantly increasing waste and consequently increasing expense. To avoid these disadvantages the door is constructed with a water circulating chamber, and with air circulating passages about its margin by means of which the temperature of the door and the edges of the lining can be reduced below the point of injury thereto.

The invention is described in the following specification, illustrated in the accompanying drawings and specifically pointed out in the claims.

In the accompanying drawings Figure 1 is a front elevation of the door. Fig. 2 is a transverse section thereof on line *x*—*x* Fig. 1. Fig. 3 is a perspective view (from the rear) of the door with the inner plate broken partially away at the lower right-hand corner and showing the water-space or chamber in the middle portion of the door and the air chamber about the upper and side walls of the same, as hereinafter described. Fig. 4 is a vertical section on a line corresponding substantially to line 2—2, Figs. 1 and 3.

The door as thus shown is of the massive kind which has power connections to raise and lower it when operating and the ears or projections *d* at the top of the door represent means for making chain or cable connections therewith as is now a common and well known practice with doors of this general character. The body of said door, indicated as a whole by D, is formed of cast metal in suitable proportions for all purposes of strength and service and is suitably braced for the purpose of maintaining its shape when heated. The said door is formed of one main portion, consisting of the body *a* and the closure or plate *b* adapted to be placed over the back thereof.

In order to construct a door which is practically temperature proof and will endure the intense heat to which these doors are subjected, I make the door with a cast metal front and spaced marginal flanges, and a back wall. These parts inclose the central water chamber 3 and outer air passages 2.

The central chamber may be described as a water cooling chamber, and the outer passages may be described as an air cooling jacket or passage. The said water space occupies the middle portion of the door and the air spaces the marginal portion thereof about the sides and top of the door and bordering said water space, except at the bottom of the door, where said water-space may extend to the bottom. Structurally the said door has an outer border flange 4 attached to the front wall *a* extending entirely around the same and constituting the outer wall of the air space or chamber, and an inner flange 5 which constitutes the inner wall of said air chamber or space and the outer wall of the water or cooling chamber. In addition, the said front wall has inwardly projecting studs 6 scattered over its inner portion which are bored or have threaded holes to receive bolts or screws 7 by which the inner plate *b* is secured to the said body over or across said flanges 4 and 5, thus closing the chambers 2 and 3. Screws 7 also engage in said flanges and studs 6 for fastening said plate, and a sheet *s* of asbestos or other packing can be laid between said plate and the said flanges and studs to make the said chambers fluid-tight and prevent communication one with the other.

The marginal chamber 2 is designed to receive air under pressure through air inlet pipes *d'* to be forced into the furnace through suitable holes or jets 8 in the margin of the back plate and into the furnace next to the wall of the opening therein, in such a manner as to play on the edges of the openings. The jets deliver the air also under suitable pressure and close to the side of said wall of the opening where combustion will be suitably supplied and stimulated by the ad-

mixture of air, but the flame will be driven away from the edges of the wall.

The water-cooling chamber 3 over the middle portion of the door is nearly coextensive in area with the door opening, so that this portion of the door having a water-jacket or space is directly exposed to the heat while the furnace wall comes opposite part of the said air chamber or space and partially protects it from direct heat radiation. Also whatever air passes through the marginal chamber absorbs the heat communicated thereto and heated or superheated air is thus supplied to the furnace to the manifest advantage of combustion. Suitable pipe connections with the said air and water spaces or chambers respectively are shown, the cross-pipe d' on the outside of the door having a flexible or hose connection b' to convey air under pressure or compressed air to the said air chamber for distribution, to serve as a cooling agent and for assisting combustion in the furnace as just described. However, any suitable air supply connection may be employed, and water may be delivered to the chamber 3 through circulating pipe m at or near the bottom thereof while the discharge or outlet is through the pipe n at the top of said chamber as the water becomes heated and rises, in order to establish a free circulation of the water and thus utilize the same to the best advantage for cooling purposes. Finally the said door is provided with a peep-hole c having a wall 10 about the same, which enables the person in attendance to look through into the furnace, as usual. This peep hole is more accessible owing to the absence of jets of flame about the door. A short elbow or extension 12 for the outlet pipe n is shown in the top of the water chamber 3, and reaches to the top of said chamber to prevent the formation of a steam pocket therein.

It will be seen that the depth of the body of the door is the full depth of the door less the comparatively thin plate b on its inside, and the frequent studs 6, their fastening screws 7 and the fastening of said plate at intervals by screws 7′ through the flanges 4 and 5 fixes said plate firmly in place.

X in the drawings is a roller on which a bar or other metal handling tool may rest while working the metal in the furnace.

What I claim is:

1. A furnace door comprising a water chamber and a marginal air chamber and means for supplying water circulation to the water chamber and air circulation to the air chamber, said air chamber having marginal outlets entering said furnace.

2. A door for highly heated furnaces adapted to be bodily raised and lowered and provided with a water-cooling chamber in its middle portion and a marginal air supply chamber, said chambers arranged in the same plane, and said air chamber provided with outlet openings entering said furnace.

3. A furnace door having a front plate provided with an inwardly projecting marginal flange extending entirely about the same at an angle thereto and a second flange spaced from said marginal flange at the sides and top of the said body, a rear plate extending over the rear side of said door and over said flanges and provided with marginal perforations communicating with the space between said flanges and with the said furnace, air supply pipes leading to said space between said flanges, and water conveying pipes communicating with the space within the inner of said flanges and adapted to cause circulation of water therein.

4. In combination, in a furnace door, detachable front and rear walls and spaced marginal walls, said spaced walls inclosing a central water chamber and a marginal air chamber, circulating water pipes for the water chamber and circulating air pipes for the air chamber, said rear wall provided with marginal openings for air outlets to said furnace, and communicating with said air chamber.

5. In combination, in a furnace door, a front and a rear wall and side walls and spaced marginal walls, said walls inclosing water and air chambers between them, means for circulating water and air in said chambers, said rear wall provided with outlet openings for air issuing into said furnace.

6. In a furnace door, in combination, a front wall, a rear wall, spaced marginal walls separating said front and rear walls to form separate chambers for air and water, said front and rear walls secured together to form water and air chambers, means for providing water and air circulation respectively through said chambers, said rear wall provided with air outlet openings from said air chamber into said furnace.

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

CARL J. F. JOHNSON.

Witnesses:
F. C. MUSSUN,
R. B. MOSER.