No. 608,376. Patented Aug. 2, 1898.

# J. HOWDEN.

## FURNACE FRONT FOR STEAM BOILERS.

(Application filed June 29, 1897.)

(No Model.) 2 Sheets—Sheet 1.

FIG. 1.

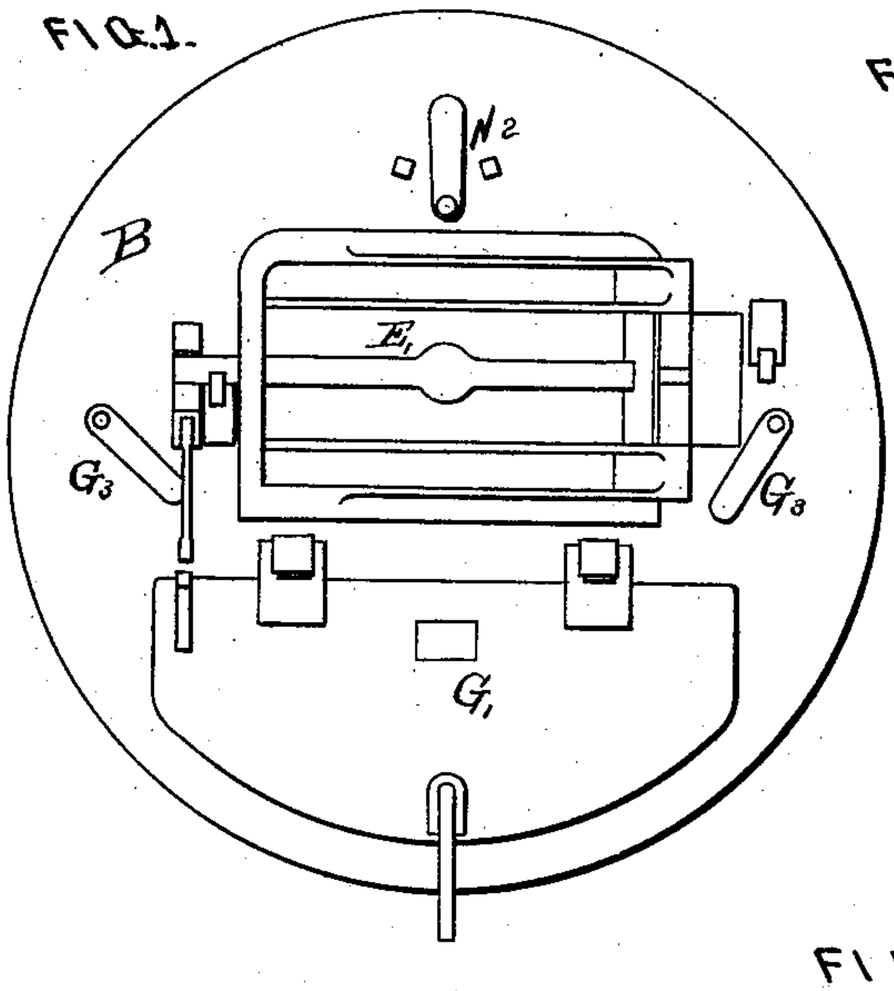



FIG. 2.

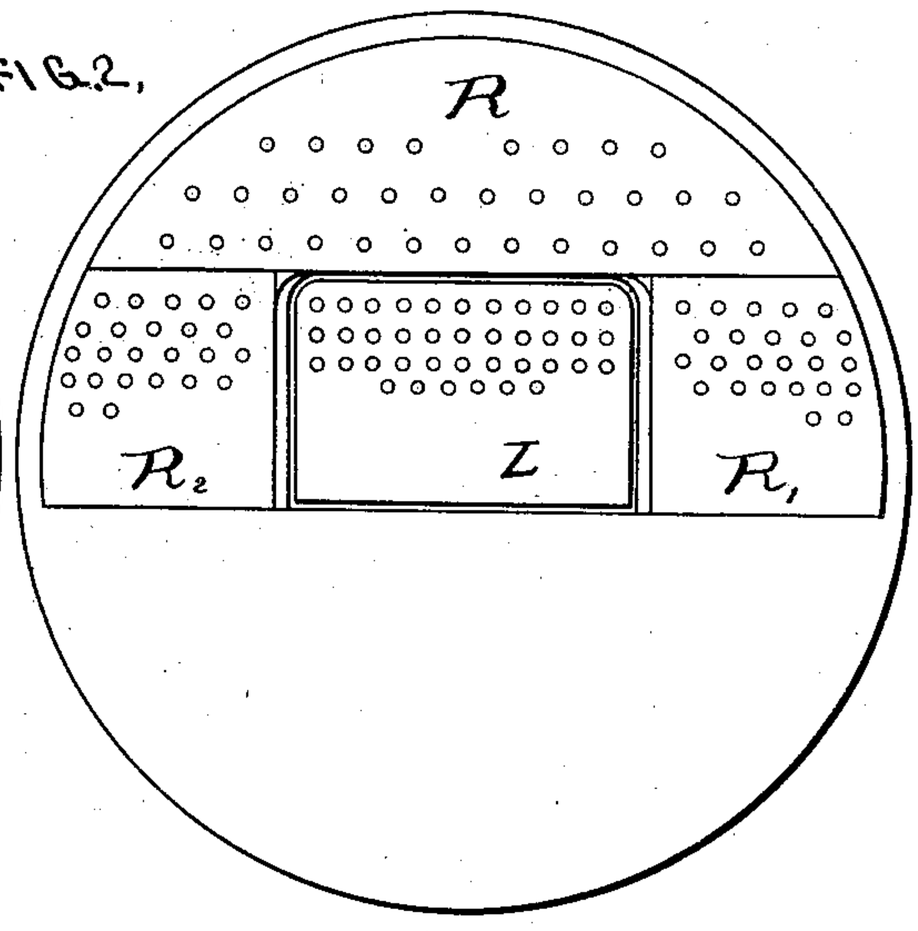



FIG. 3.

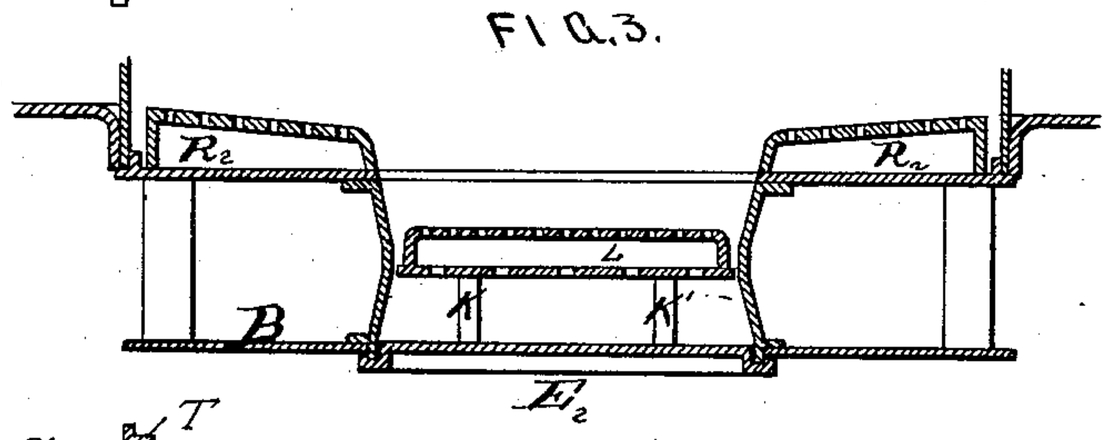



FIG. 4.

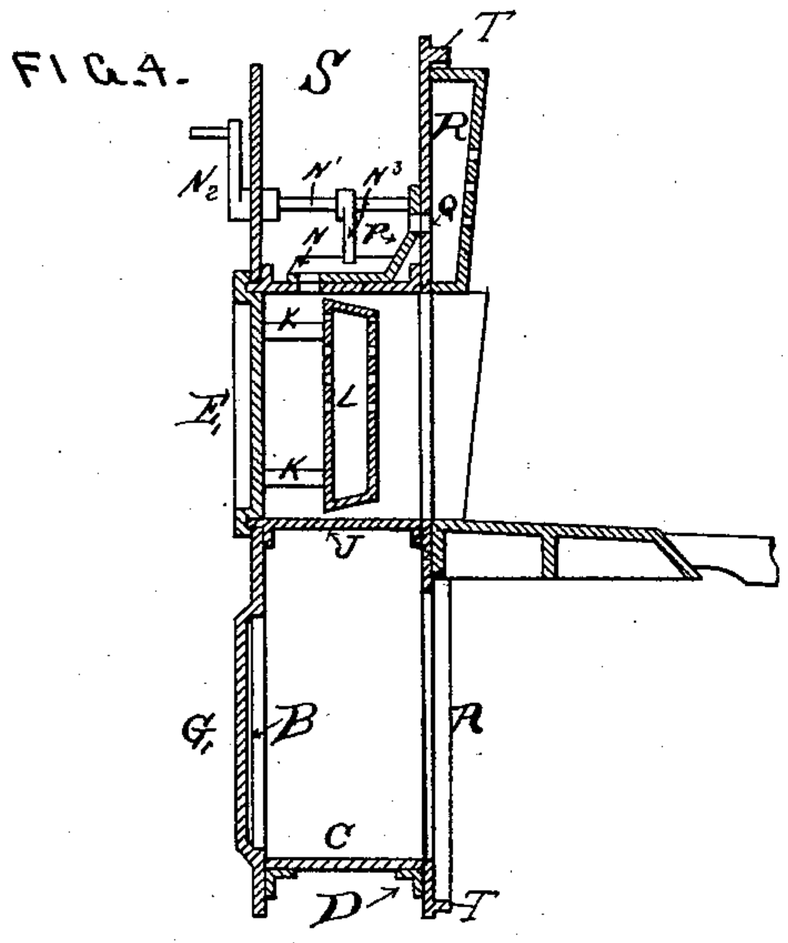
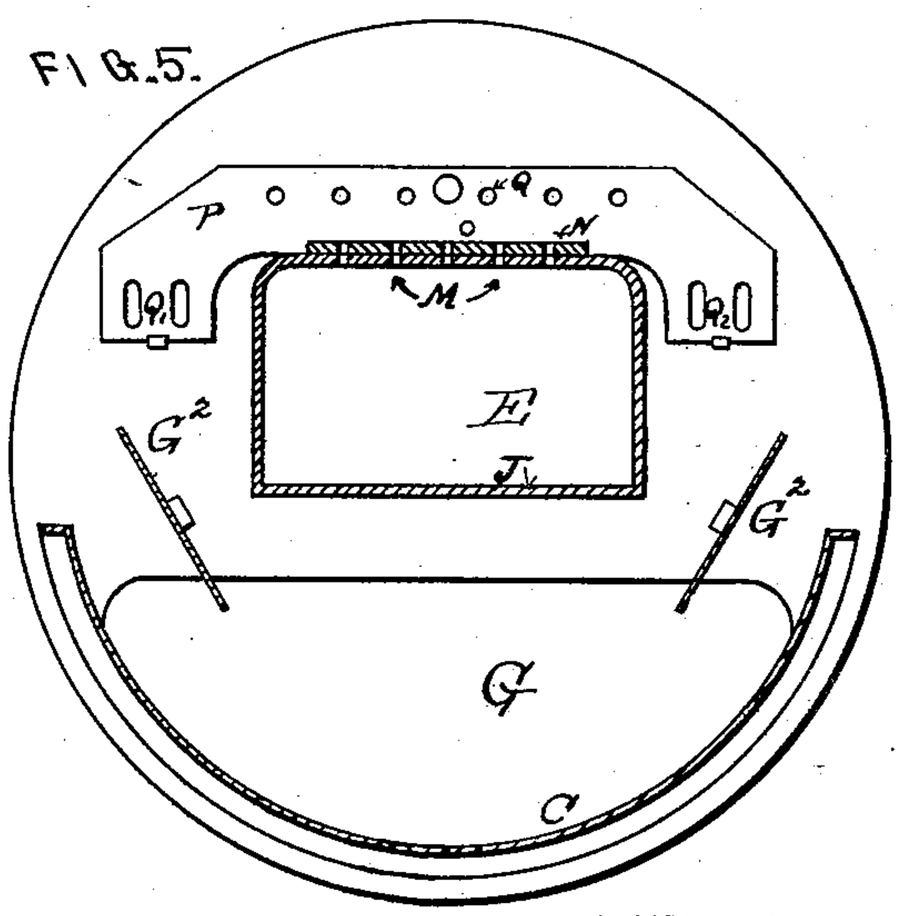



FIG. 5.

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## FURNACE FRONT FOR STEAM BOILERS.

(Application filed June 29, 1897.)

(No Model.) 2 Sheets—Sheet 2.

FIG. 6.

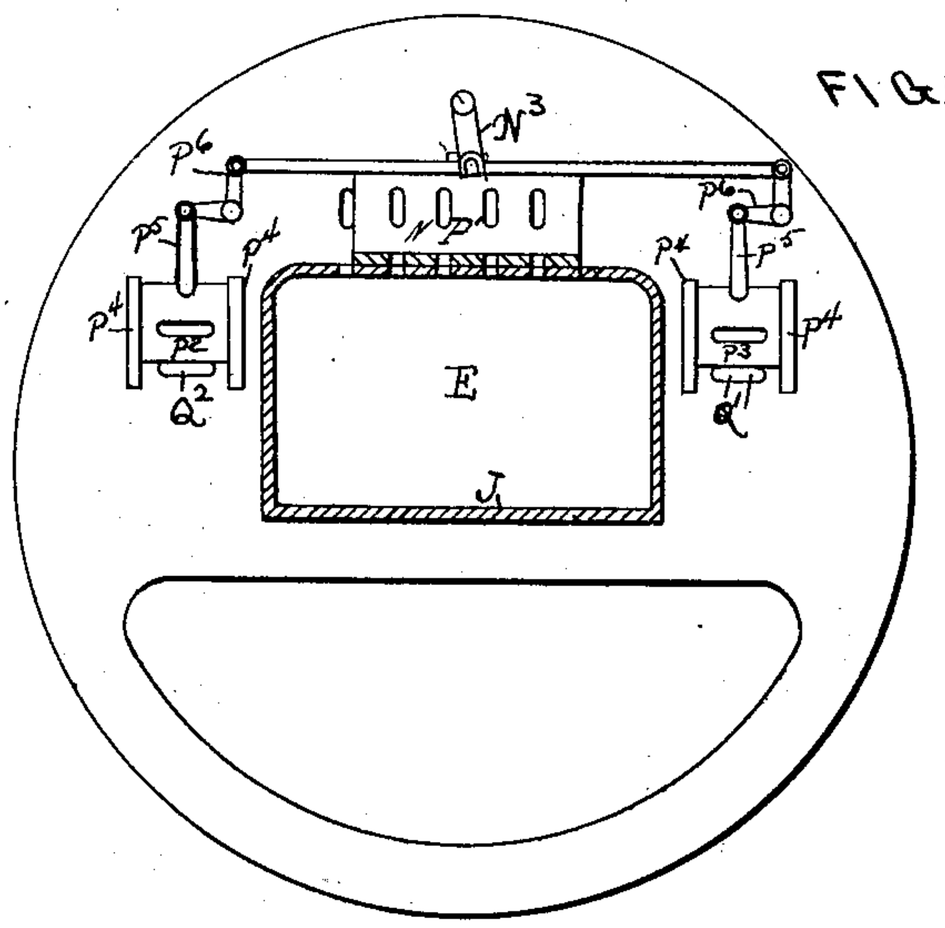



FIG. 7.

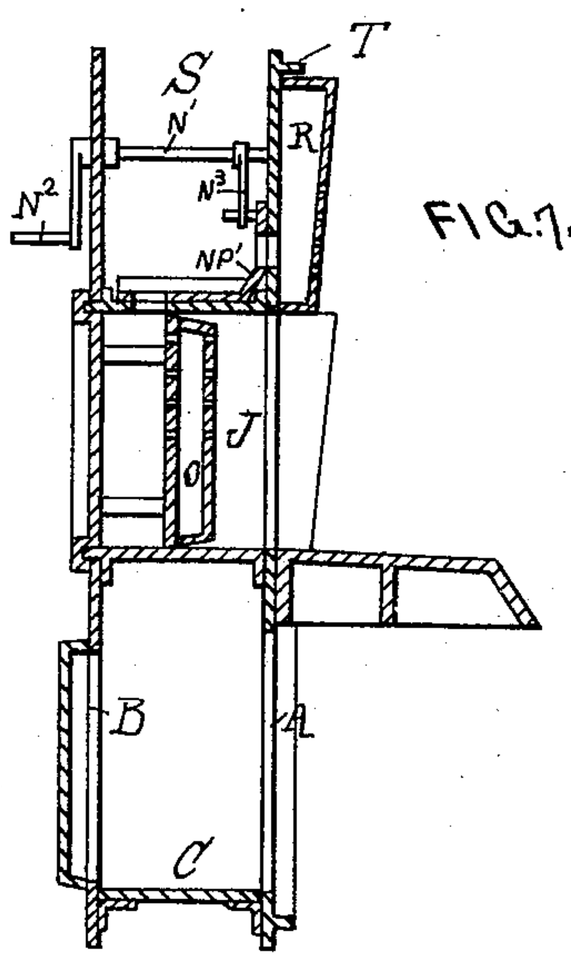



FIG. 8.

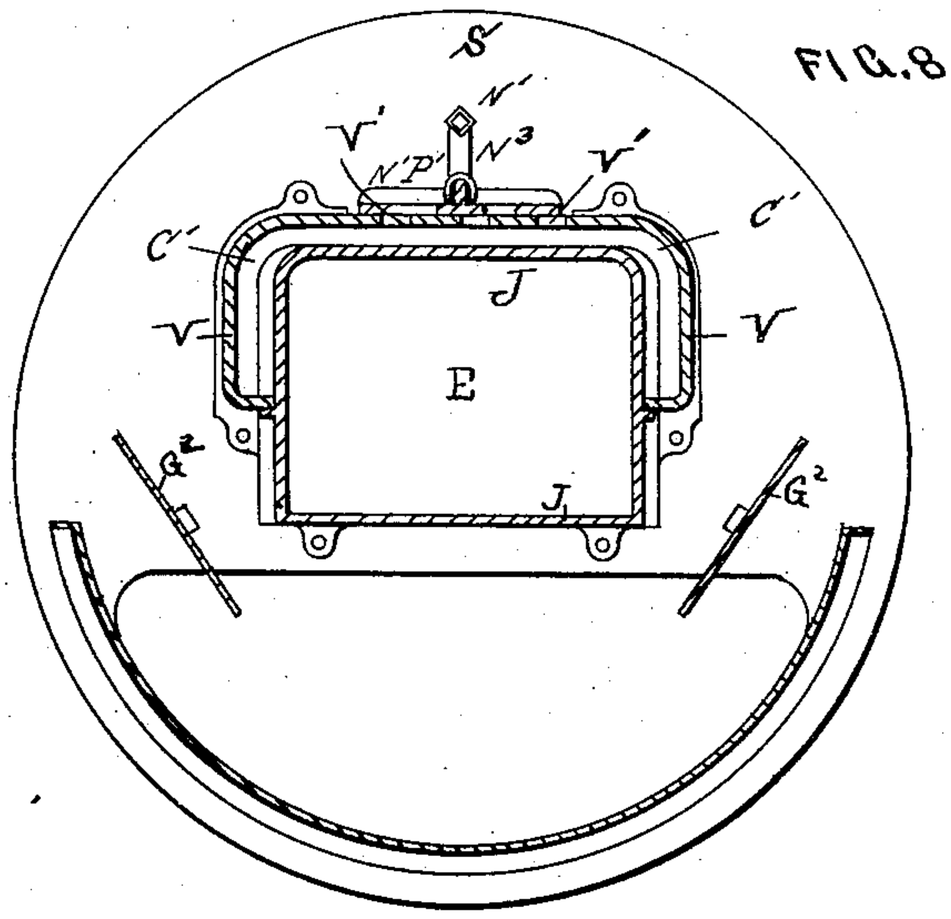
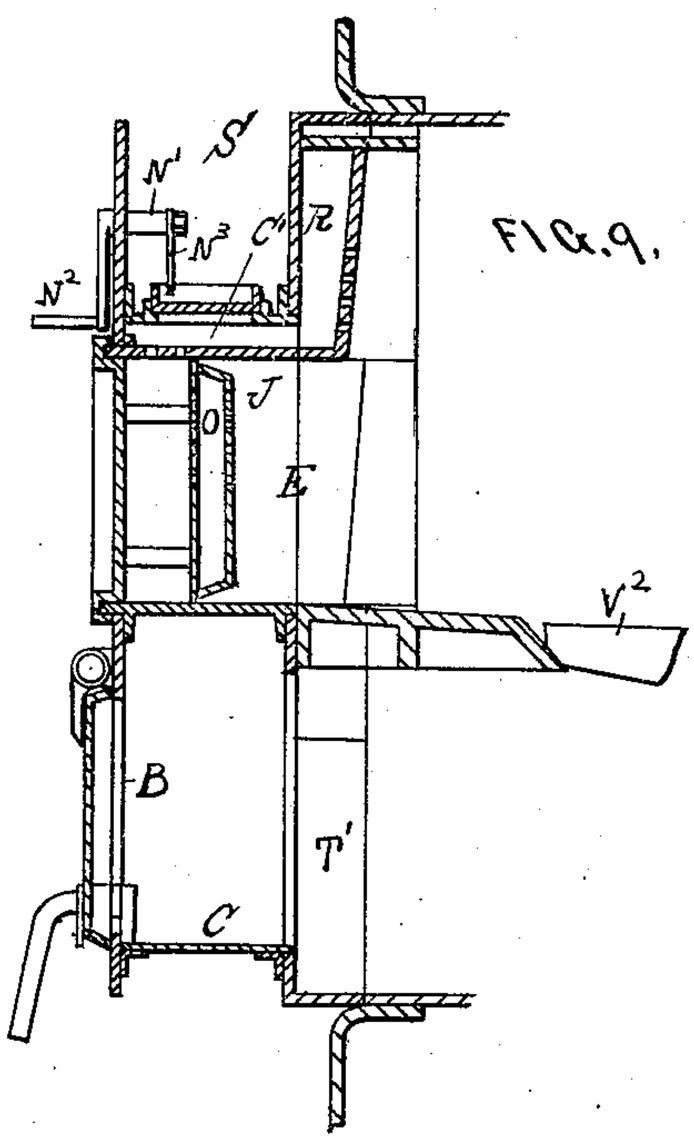



FIG. 9.

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# UNITED STATES PATENT OFFICE.

JAMES HOWDEN, OF GLASGOW, SCOTLAND.

## FURNACE-FRONT FOR STEAM-BOILERS.

SPECIFICATION forming part of Letters Patent No. 608,376, dated August 2, 1898.

Application filed June 29, 1897. Serial No. 642,857. (No model.) Patented in England March 16, 1896, No. 5,806.

*To all whom it may concern:*

Be it known that I, JAMES HOWDEN, a subject of the Queen of Great Britain and Ireland, and a resident of Glasgow, Scotland, have invented Improvements in Furnace-Fronts for Steam-Boilers, (for which I have obtained British Patent, No. 5,806, dated March 16, 1896,) of which the following is a specification.

My invention has for its object to improve the construction of furnace-fronts and of parts connected therewith for steam-boilers, the improvements being designed principally for application with either forced or suction draft and with arrangements for heating the air—such, for instance, as illustrated in my Letters Patent, No. 288,437, dated November 13, 1883, and No. 518,455, dated April 17, 1894.

In carrying out my invention I employ a hollow furnace-front having openings for the fire-door and ash-pit and communicating with the casing or casings in which the air to be forced or sucked into the furnace is heated. The air enters the fire-door passage, the space in the furnace above the bars, and the ash-pit through ports controlled by valves, and for its better distribution in the fire-door passage and in the space in the furnace above the bars perforated air-boxes are placed there through which the air must pass.

In the accompanying drawings, Figure 1 is a front elevation of one construction of my improved furnace-fronts. Fig. 2 is an inside elevation of the furnace-front. Fig. 3 is a horizontal section on the line 3 3, Figs. 1, 2, and 4. Fig. 4 is a transverse vertical section on the line 4 4, Figs. 2 and 5. Fig. 5 is a longitudinal vertical section of the same on the line 5 5, Fig. 1. Figs. 6 and 7 are respectively a transverse vertical section and a longitudinal vertical section of a modification of my improved furnace-front. Figs. 8 and 9 are respectively a transverse vertical section and a longitudinal vertical section of another modification of my improved furnace-front.

In the construction shown in Figs. 1, 2, 3, 4, and 5 of the drawings the hollow front is constructed with a vertical inner disk-like plate A and a vertical outer disk-like plate B, of steel or wrought-iron, which are connected partly by a curved segmental shell-plate C, extending around the lower part and bolted or riveted to the plates A and B by means of angle-irons D, or it might be by flanges. Openings E and G are cut or formed in the vertical plates A and B for the fire-door E′ and the ash-pit door G′. A fire-door passage is formed by a shell J, of steel or iron, fixed between the vertical plates A and B, and the outer door has fixed to it by studs K an inner perforated air-box L.

The air enters the door-passage through ports M in its top, over which ports is fitted a sliding valve-plate N, and this valve-plate N is made with or has in connection with it vertical ports P, sliding against the inner vertical plate A and controlling the openings Q Q′ $Q^2$ in that plate into boxes R R′ $R^2$, fixed on the inside of the plate. These boxes, of which one, R, occupies the upper part of the furnace-front, and the other two, R′ and $R^2$, are on opposite sides of the fire-door E′, Fig. 2, have perforated inner sides, and they receive and distribute the entering air. The valve-plate N P is moved by means of a spindle N′ and crank-handle $N^2$, the spindle having on it an arm $N^3$, engaging with a projection $N^4$ on the valve. The spindle N′ turns in bearings in the plates A and B, and the handle $N^2$ is outside the outer one.

The upper part of the furnace-front is in communication with the casing or casings S, which contains the heated air. The passage of air to the lower part of the furnace-front and thence into the ash-pit is controlled by valves $G^2$, Fig. 4, one at each side of the fire-door passage, these valves being moved by means of crank-handles $G^3$, Fig. 1, outside of the outer plate B.

An annular flanged piece or ring T, of steel or iron, cast or wrought, is riveted or otherwise fixed to the inner vertical plate A to facilitate the adapting and fixing of the furnace-front to the furnace-mouth, or a casting, such as T′, Fig. 9, may be substituted for more or less of the inner vertical plate A or of parts connecting the inner vertical plate to the outer vertical plate B, or the entire furnace-front may be built up of separate plates or parts, all or some of which may be cast or rolled.

The improved arrangement of the air-inlet valves and boxes hereinbefore described is

applicable with a furnace-front entirely of cast-iron or with one built up in any suitable manner.

In the construction shown in Figs. 6 and 7 the ports M, Q, Q′, and $Q^2$ are controlled by three separate valves N P′, $P^2$, and $P^3$ instead of one valve-piece, as in the construction previously described. The valve-piece N P′ is moved horizontally, and the valve-pieces $P^2$ and $P^3$ are moved vertically between guides $P^4$ by links $P^5$ and bell-cranks $P^6$, moved by means of an arm $N^3$ on a spindle N′, provided with a crank-handle $N^2$. Thus one operating-spindle controls all the valves, as before. Parts of this modification which are not described are constructed and arranged similarly to the corresponding parts of the construction previously described.

In the modification shown in Figs. 8 and 9 a small auxiliary chamber C is formed between the plates A and B by a flanged piece V, which partly encircles the fire-passage shell J and the ports leading into the air-boxes R R′ $R^2$. This auxiliary chamber has openings V′ on its top, communicating with the air-casing S, and these openings are controlled by a valve N P′, moved by means of a spindle N′, an arm $N^3$, and a crank-handle $N^2$. Air enters by the top openings V′ into the chamber C, and passes thence through the boxes R R′ $R^2$ to the spaces above the fire-bars B $V^2$. Parts of this modification which are not described are constructed and arranged similarly to the corresponding parts of the construction first described.

I claim as my invention—

1. A built-up furnace-front, comprising separate inner and outer disk-like plates, a segmental shell-like plate C connecting the disk-like plates at the lower part and a shell connecting the upright plates toward their upper part to form the fire-door passage, and means for securing the said parts together, substantially as described.

2. A built-up furnace-front, comprising separate inner and outer disk-like plates, a segmental shell-like plate C connecting the disk-like plates at the lower part and a shell connecting the upright plates toward their upper part to form the fire-door passage, means for securing the said parts together, and valves at the opposite sides of the fire-door shell to admit hot air to the ash-pit.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JAMES HOWDEN.

Witnesses:

ALEXANDER JAMES HUME,

JAMES HOWDEN HUME.