No. 614,569. Patented Nov. 22, 1898.

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FURNACE.

(Application filed Aug. 31, 1896.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.

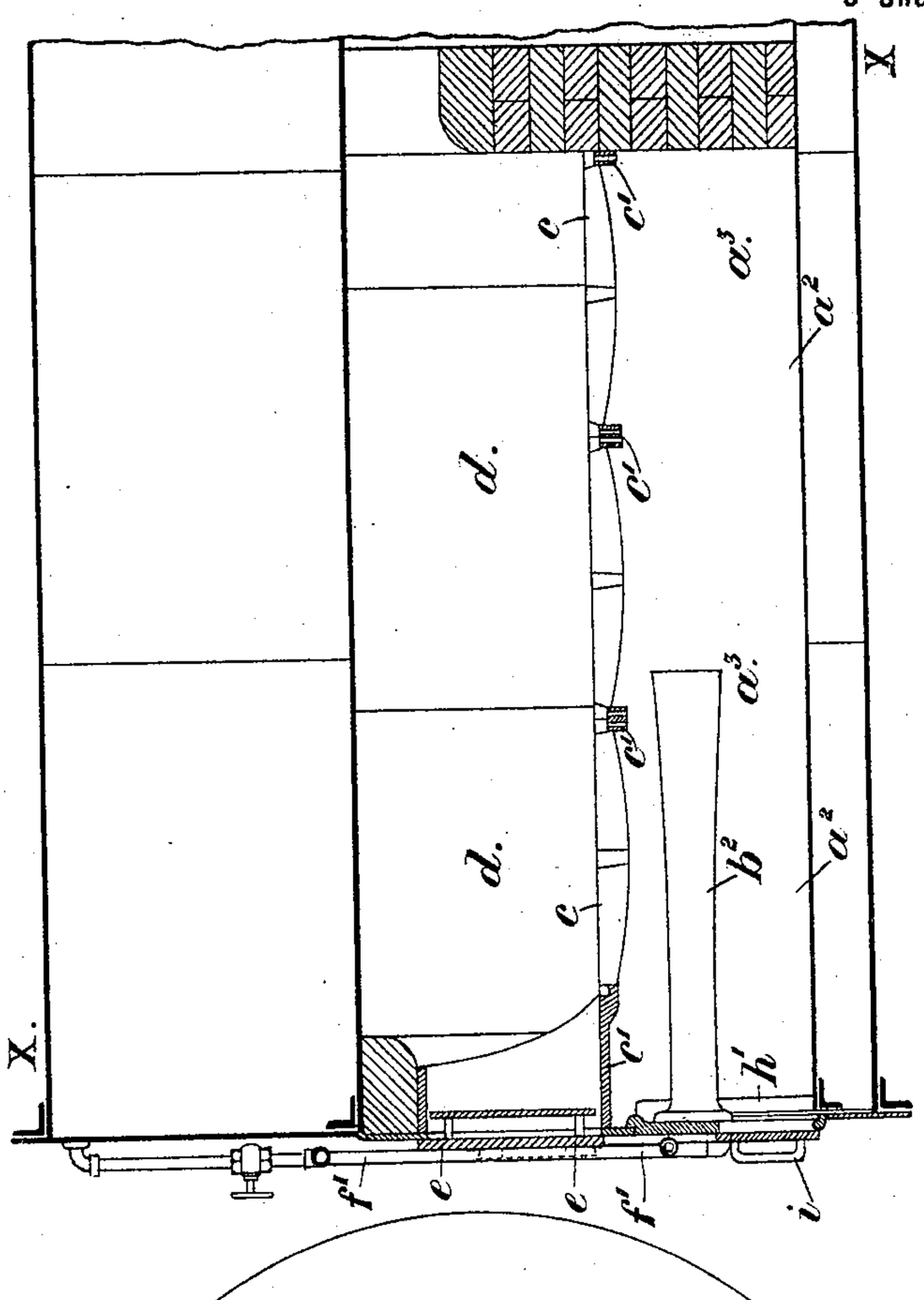
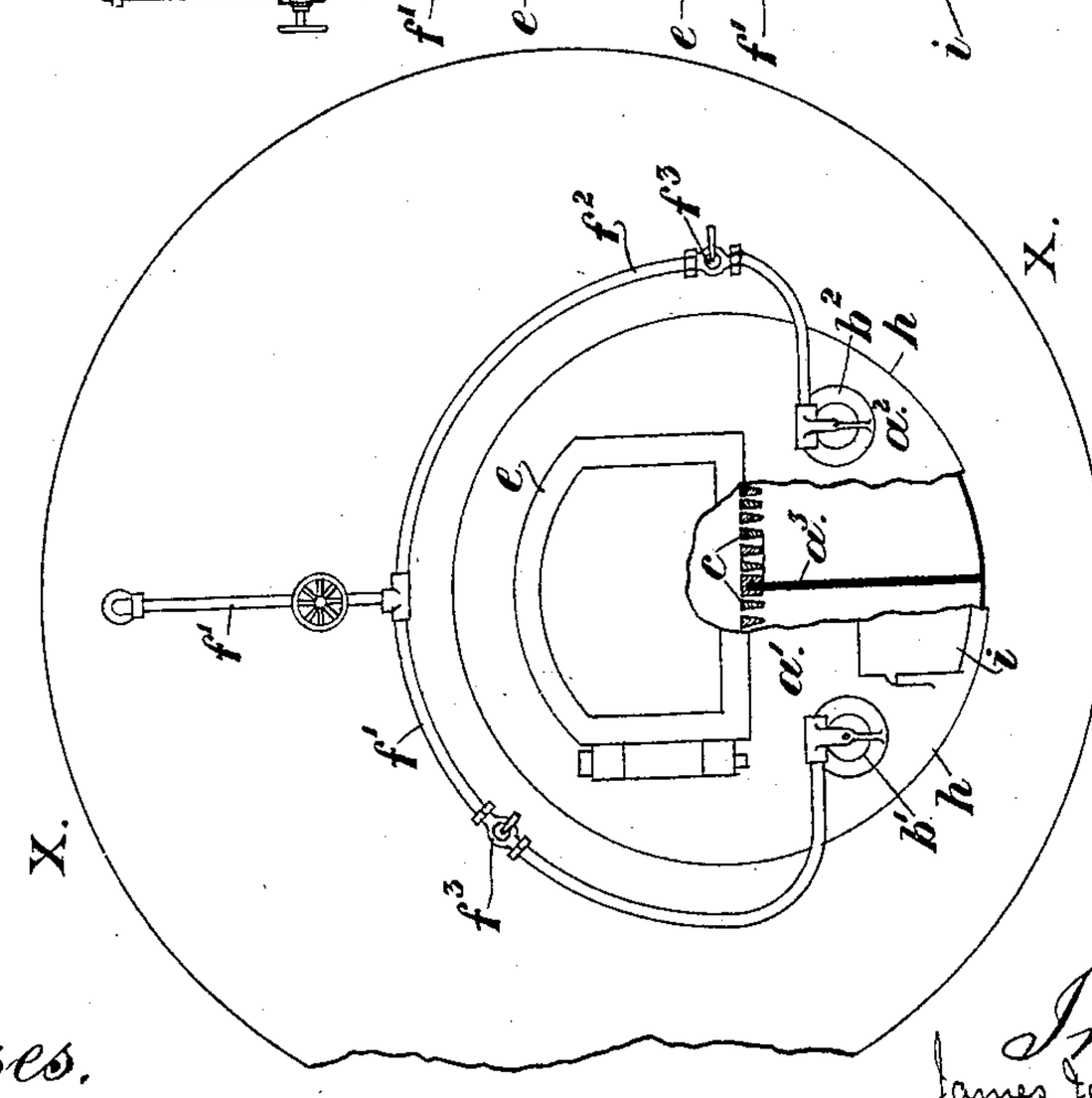


Fig. 2.



Witnesses.

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Fig. 4.

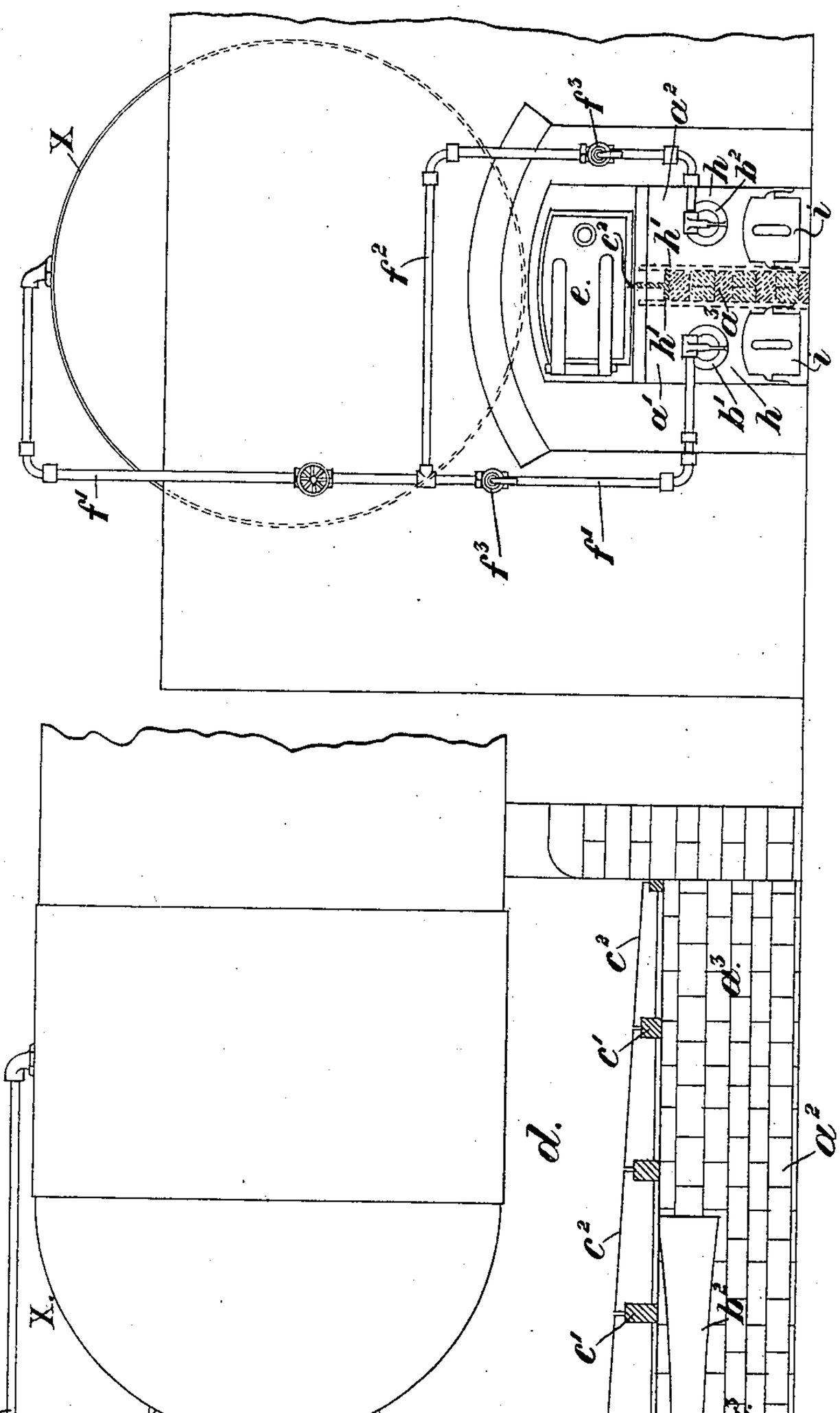

Fig. 3.

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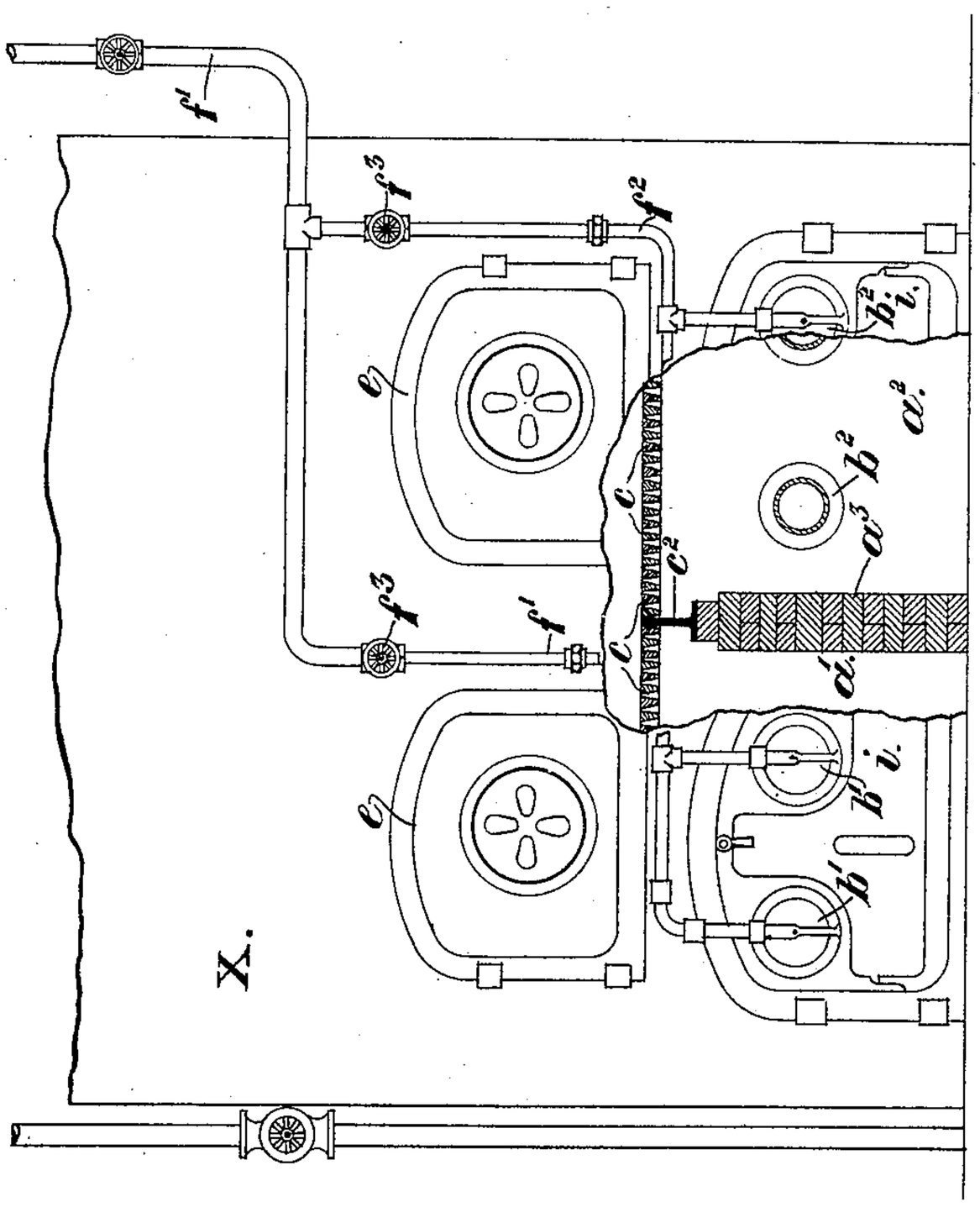

Fig. 5.

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UNITED STATES PATENT OFFICE.

JAMES JONES MELDRUM AND THOMAS F. MELDRUM, OF MANCHESTER, ENGLAND, AND WILLIAM THOMSON, OF GOVAN, SCOTLAND.

FURNACE.

SPECIFICATION forming part of Letters Patent No. 614,569, dated November 22, 1898.

Application filed August 31, 1896. Serial No. 604,416. (No model.)

To all whom it may concern:

Be it known that we, JAMES JONES MELDRUM and THOMAS FREDERICK MELDRUM, engineers, of Manchester, in the county of Lancaster, England, and WILLIAM THOMSON, engineer, of Govan, in the county of Lanark, Scotland, subjects of the Queen of Great Britain, have invented certain new and useful Improvements in Furnaces, of which the following is a specification.

The invention has been patented in England, No. 20,622, dated November 27, 1891.

This invention has reference to furnaces in connection with which forced draft is employed; and it has mainly for its object to construct or provide means, in connection with the furnaces, whereby they can be worked—that is, fired—with greater effect and efficiency at all times, including such times when the fires are cleaned and when the door or doors is or are of necessity opened.

In the drawings which serve to illustrate our invention we show its application to some different examples of furnaces.

In the examples, Figure 1 is a sectional elevation of an internal furnace, and Fig. 2 is an end view of same with part of the plate inclosing the ash-pits broken away. Fig. 3 is a sectional elevation, and Fig. 4 an end view, of an "under-fired" or "externally-fired" steam-generator provided with our improvements. Fig. 5 is an end view showing another arrangement of furnace and parts.

In all of these arrangements and applications there is provided, in connection with each separate ash-pit, a steam-jet blower or blowers, and such blowers are in every case disposed horizontally and mainly within said ash-pit; but this arrangement is not essential.

Referring now to the drawings, X is the shell of the steam-generator.

a' a^2 are the two separate ash-pits in each case, and a^3 the partition separating said ash-pits.

b' b^2 are the blowers for the ash-pits a' and a^2, respectively.

c are the fire-bars forming the grate.

d is the common furnace-space or combustion-space above the grate.

e is or are the fire door or doors, as the case may be.

f' f^2 are the steam-pipes, having each a regulating-cock f^3 thereon.

h is the plate or plates, as the case may be, inclosing the ash-pits a' a^2 and in and by which the blowers are fixed and supported.

i is or are the door or doors by which access to the ash-pits a' and a^2 is had for any desired purpose.

c' are the bearers, which support the fire-bars c.

In operating according to this invention in some cases it is preferred to use such a pressure in the ash-pits as will cause the pressure above the grate to be about equal to that of the atmosphere, so that when the door e is open the flames will not blow out.

In furnaces constructed as described it will be seen that while the grate formed by the fire-bars c is a single one each of the ash-pits a' a^2 is entirely separate, and the delivery to and maintenance of air under pressure in them is separately performed by separate air-forcing means, and the furnace-space d is, as the grate, common to these two ash-pits, and thus while that part of the operation of combustion of the fuel connected with the parts of the apparatus below the grate is separately and distinctly performed in the separate ash-pits the actions taking place above the fuel over the whole of the grate are common and unrestrained in all ways, and consequently the gases and flames generated are free to intermingle and become naturally intermixed.

The operation of effecting combustion of the fuel is carried on as follows: The feeding and burning of the fuel on the different parts of the grate are carried on in an alternating method, so that on one side of the grate, above one ash-pit, green fuel will exist after stoking and on the other coke only or fuel in a full state of combustion, and with the fuel thus in different stages of combustion the heat and flames of the one in a full state of combustion insures the combustion of the fresh or green gases being distilled from the fresh coal on the other side, as by the forced draft—viz., the air under pressure in the ash-pits—the flames and gases from all parts of the fuel naturally become intermixed, whereby the combustion of all such gases is effected and the discharge of smoke pre-

vented. Moreover, the supply of air to the separate ash-pits being under separate control—that is, by adjusting the steam-supply to the steam-jet blowers—the rate of combustion and the regulation of the furnace at the opposite sides are entirely under control, whereby a continuous or substantially continuous and constant temperature of the combined gases given off from the fuel in a single furnace is effected and an improved efficiency obtained. Furthermore, when the one side of the grate or furnace is being cleaned the air-supply to the ash-pit below that side is cut off by the cock f^3 on the steam-pipe connected with that side, the other ash-pit working under normal conditions. Thereby in a single or common furnace proper a means of cleaning alternately the different sides of the grate without interfering with the maintenance of the required temperature, working, and effect is provided.

The application of the invention shown in Figs. 1 and 2 is to an internally-fired steam-generator—that is, a steam-generator having a circular metal furnace surrounded with water of the generator. The ash-pits a' a^2 in this case are separated by a partition-plate a^3, held at its upper part by fire-bars and at the front end between the webs h'. In this case one ash-pit door only common to the two ash-pits a' a^2 is provided; but in lieu of this separate ash-pit doors—viz., one for each ash-pit—may be provided on the plate h, if desired.

In the arrangement shown in Figs. 3 and 4 the partition a^3 is shown as a brick wall, the front end of which lies between the webs h', and at the top where the joint or connection is made with the grate special inverted-T-shaped bars c^2 are provided, the horizontal part of such bars being sufficiently far enough from the grate-bars to prevent the ashes which lodge upon them reaching the fire-bars.

In the arrangement shown in Fig. 5 the furnace shown is provided with two furnace-doors e, one above each of the ash-pits, the partition a^3 being a brick one and having an inverted-T bar c^2, as in Figs. 3 and 4. This figure represents the front view of a furnace for heating steam or water, say for steam generation, or a furnace of any other kind or for any other desired purpose. This construction of furnace having separate doors e to the common furnace-space or combustion-space above the grate and the separate ash-pits a' a^2 is adapted better in cases where the furnace is large.

This construction and arrangement of furnace, together with the mode of carrying on the burning of the fuel, is particularly useful and effective in the burning of small and poor fuels or materials difficult of combustion by air alone.

In a single furnace operated after the method and constructed as herein described and where the air is supplied and pressure in the ash-pits maintained above that of the atmosphere by means of forced draft the temperature of gases given off and coming from the furnace is practically constant or uniform; also, by stoking and working the opposite sides of the furnace at different times the gases given off from the fresh fuel, mixing with those of a higher temperature on the opposite side, are readily burned and the obviation of the formation of smoke effected, and, moreover, when the furnace is cleaned at one side and the bars more or less bared the entrance of a large volume of cold air into the furnace is practically wholly prevented.

What is claimed is—

1. A furnace having the free combustion-space above the grate in which the gases of combustion have freedom for movement and admixture; a plurality of closed and separate ash-pits under the said grate, disposed side by side in relation to the point from which the furnace is worked whereby the grate is divided into two portions capable of being worked independently, and means for supplying the air to said ash-pits separately, at a pressure above that of the atmosphere and for regulating and controlling such supply, said free combustion-space being common to both portions of the grate and being without division and the said grate being in the same horizontal plane throughout, substantially as and for the purpose set forth.

2. A furnace consisting of the combination of a main combustion-space above the grate on which the fuel is borne and burned by air, a plurality of closed ash-pits under the grate, arranged side by side, and separated by partitions extending vertically and longitudinally of the ash-pits, said partitions reaching only to the grate but not above the same, fire-doors at the front of the furnace and over such ash-pits, from which the fuel on the grate above each of said ash-pits is worked in the direction of the length of said grate and ash-pits, and means for supplying air to said ash-pits separately at a pressure above that of the atmosphere, and for regulating and controlling such supply, the said combustion-space being common to all portions of the grate for the free movement of the gas from one portion to the other and the said grate being in the same horizontal plane throughout, substantially as and for the purposes set forth.

3. A furnace consisting of the combination of the grate c, on which the fuel is borne and burned by air; a common combustion-space d above the grate; a fire-door e through which the fuel on the grate c is worked; ash-pits a' a^2 under the grate c; a partition a^3 separating the ash-pits; steam-jet blowers b' b^2 for supplying air separately to the ash-pits; steam-supply pipes f' f^2 and regulating and controlling steam-supply cocks f^3; substantially as set forth.

4. A furnace consisting of the combination of the grate c on which the fuel is borne and burned by air; a common combustion-space

b above the grate; a fire-door e through which the fuel on the grate is worked; ash-pits a' a^2 under the grate c; a partition a^3 separating the ash-pits; a plate h inclosing the front of the ash-pits; steam-jet blowers b' b^2 for supplying air separately to the ash-pits, connected by their heads to the plate h, and the bodies whereof are disposed horizontally and within the ash-pit under the grate; steam-pipes f' f^2 for supplying steam to said blowers; and cocks f^3 on said pipes for controlling said supply separately of each blower, and doors i in the plate h for gaining access to the ash-pits; substantially as set forth.

In testimony whereof we have hereunto set our hands in the presence of the subscribing witnesses.

JAMES JONES MELDRUM.
THOMAS F. MELDRUM.
WILLIAM THOMSON.

Witnesses to the signature of James Jones Meldrum:

THOS. BURROW,
WM. MORTIMORE DIDSBURY.

Witnesses to the signatures of Thomas F. Meldrum and William Thomson:

JOHN LINDSON,
JAMES JOHN CAIRNS.