(No Model.) 2 Sheets—Sheet 1.

J. W. BATES.

SMOKELESS BOILER SETTING.

No. 519,658. Patented May 8, 1894.

Fig. 2.

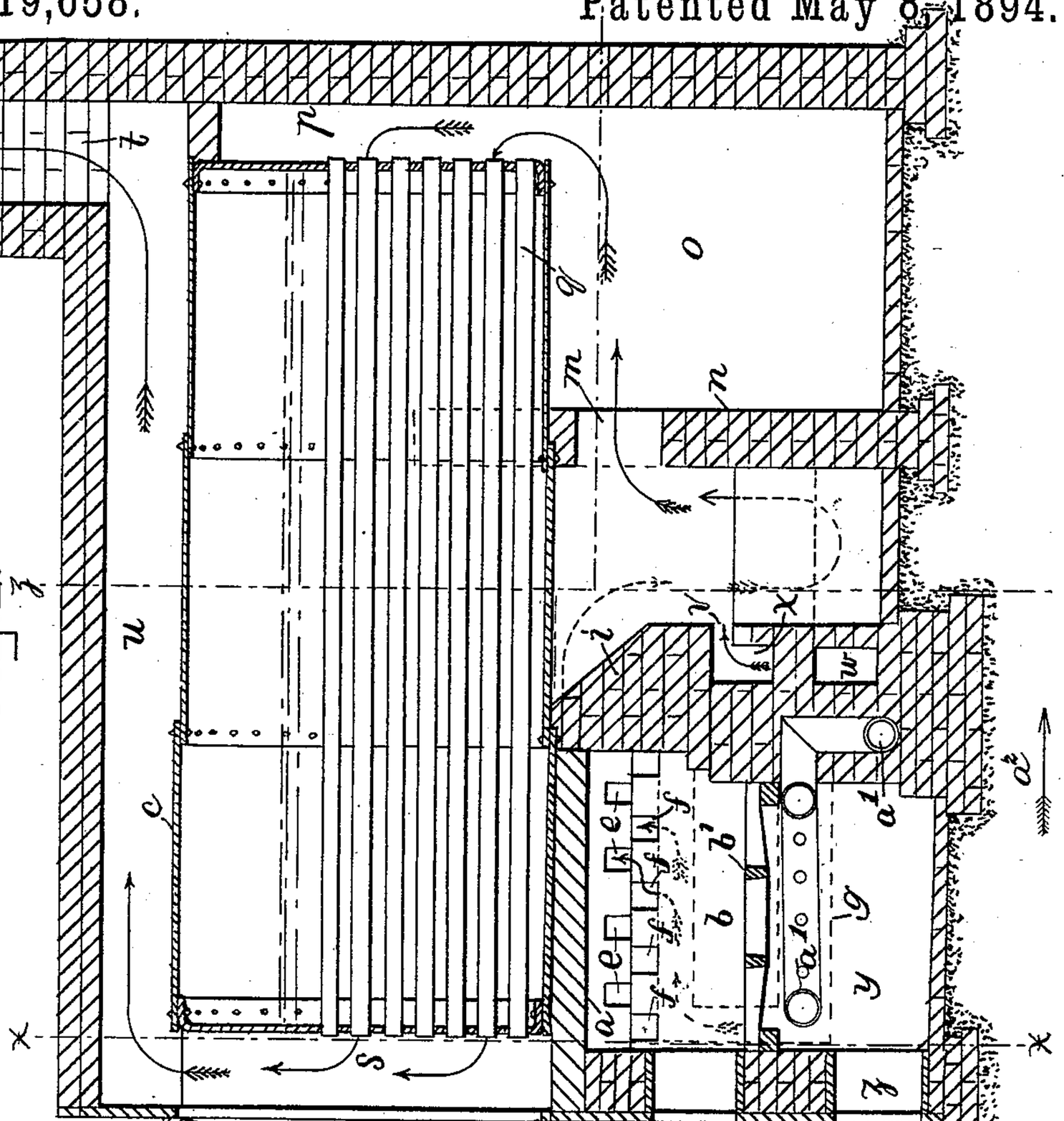
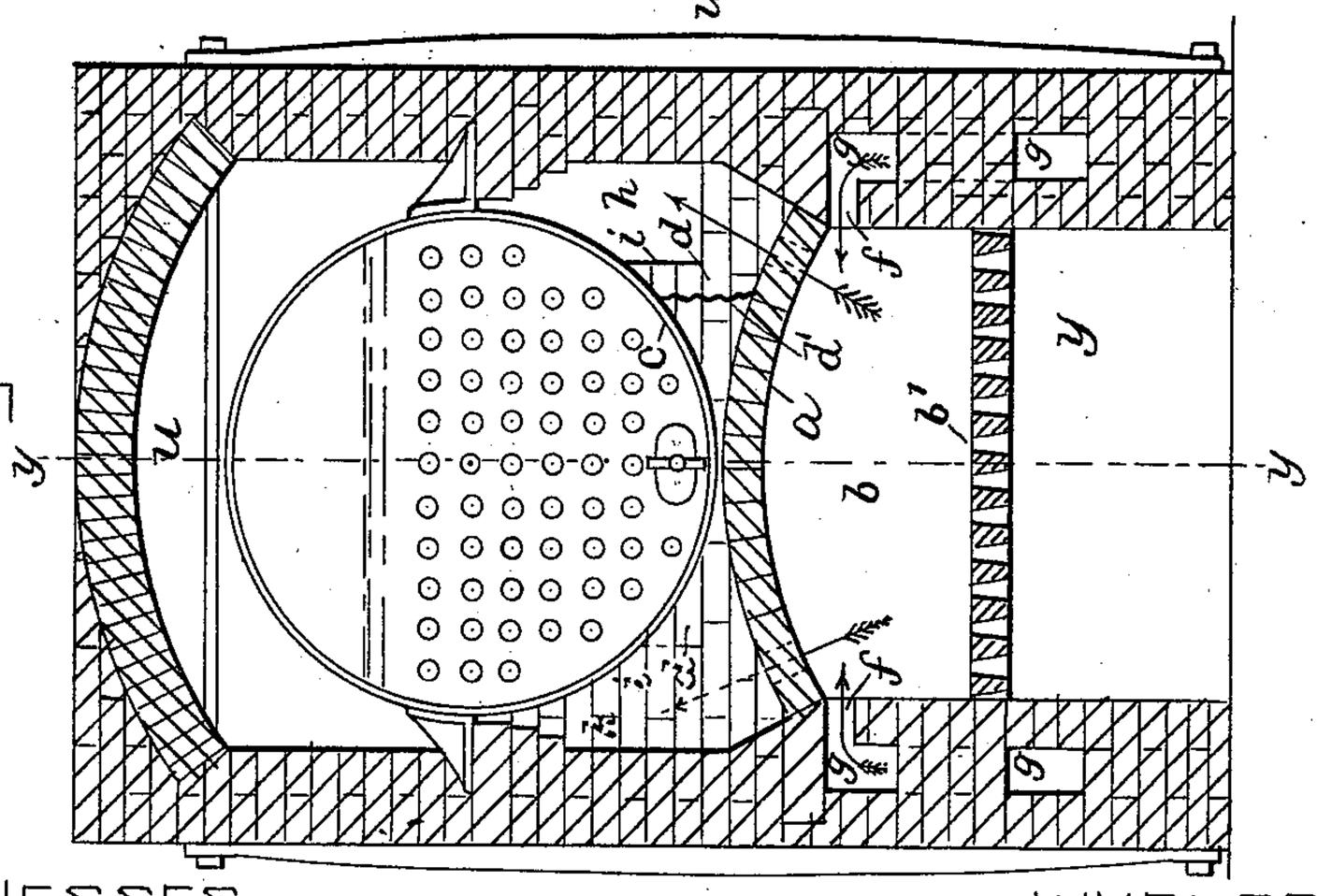


Fig. 1.



WITNESSES.

C. J. Morgan

C. E. Whitney

INVENTOR.

John W. Bates

By A. P. Thayer

Atty

THE NATIONAL LITHOGRAPHING COMPANY,
WASHINGTON, D. C.

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Fig. 4.

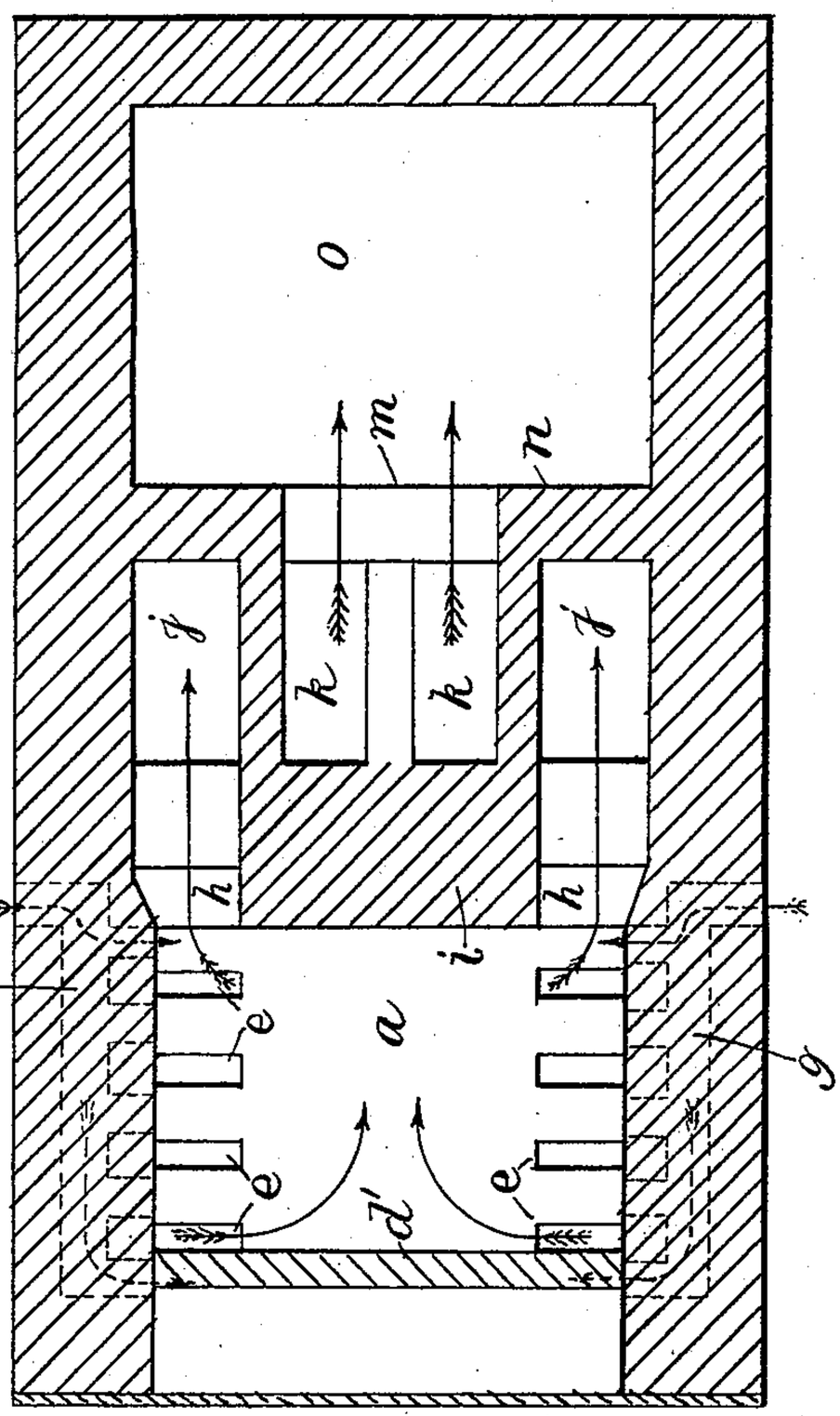
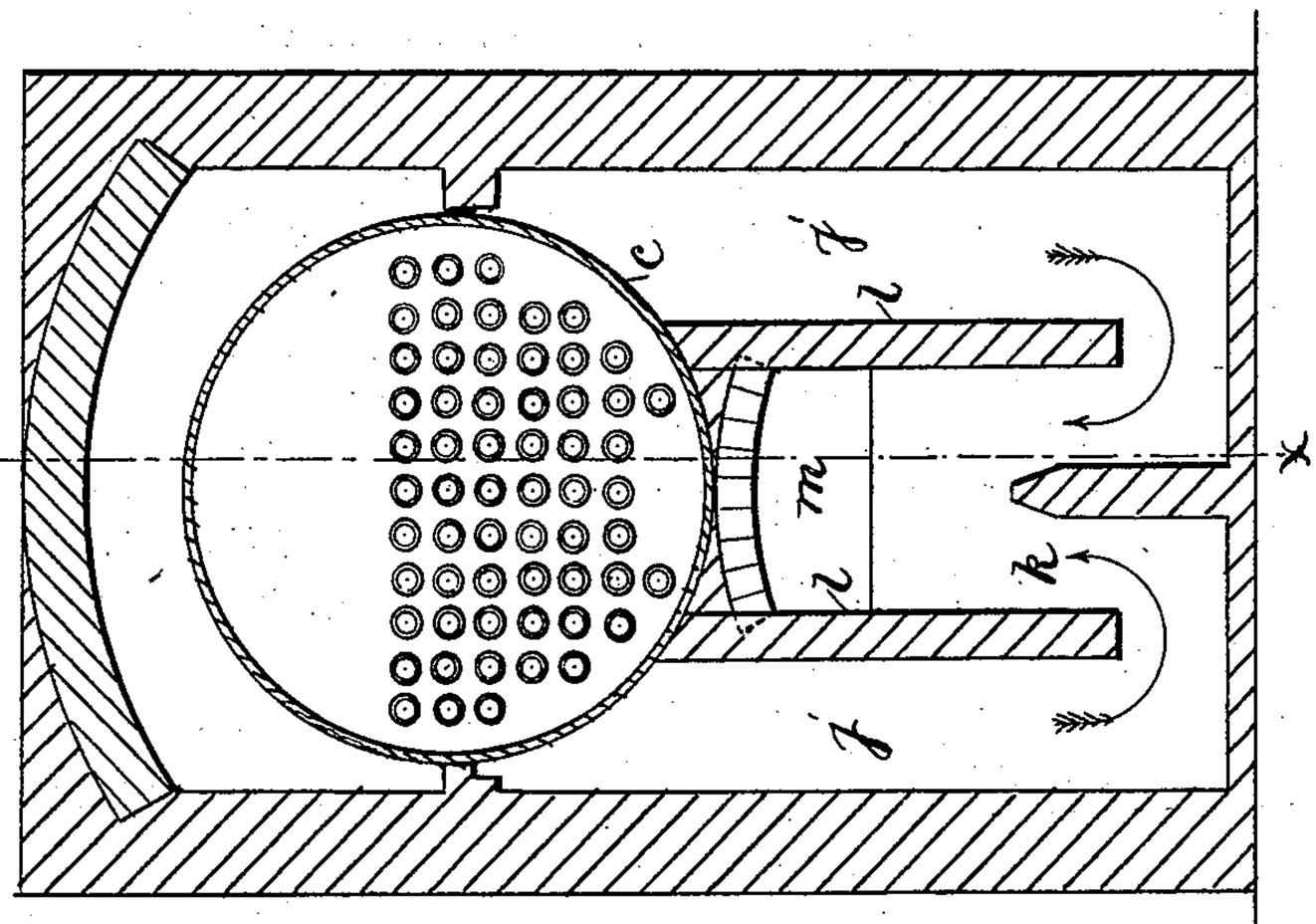


Fig. 3.



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UNITED STATES PATENT OFFICE.

JOHN W. BATES, OF HOBOKEN, NEW JERSEY, ASSIGNOR OF ONE-HALF TO JAMES T. TRORY, OF BROOKLYN, NEW YORK.

SMOKELESS BOILER-SETTING.

SPECIFICATION forming part of Letters Patent No. 519,658, dated May 8, 1894.

Application filed February 6, 1893. Serial No. 461,292. (No model.)

To all whom it may concern:

Be it known that I, JOHN W. BATES, a citizen of the United States, and a resident of Hoboken, in the county of Hudson and State of New Jersey, have invented certain new and useful Improvements in Smokeless Boiler-Settings, of which the following is a specification.

My invention consists in improvements in boiler furnaces designed to facilitate the supply and due admixture of superheated oxygen with the combustible elements of the coal, and for more effective combustion of the combined elements for producing greater heat in the combustion chamber, and less waste by the escape of unconsumed portions of the elements and at the same time to improve the construction of the arch, all as hereinafter fully described reference being made to the accompanying drawings, in which—

Figure 1, is a transverse sectional elevation of my improved boiler furnace taken on line *x x*, Fig. 2, with part of the wall separating the regenerative chamber from the escape passage at the front of the boiler broken out. Fig. 2, is a central longitudinal sectional elevation through the furnace and boiler on line *y y*, Fig. 1. Fig. 3, is a transverse sectional elevation on line *z z*, Fig. 2, as seen looking in the direction indicated by arrow a^2, Fig. 2. Fig. 4, is a horizontal section on line *w w*, Fig. 2.

I provide an arch *a*, in the furnace chamber *b*, directly under the part of the boiler *c*, exposed to the heat of the furnace to protect the part of the shell of the boiler that would otherwise be exposed to the direct action of the heat and to provide regenerative combustion chambers *d*, above the arch and under the sides of the boiler to which the gases ascend through a line of passages, *e*, along each base of the arch so as not to impinge directly against the boiler and directly under the arch and in close proximity to passage *e* are inlets *f*, for fresh superheated oxygen to mix directly and uniformly with the entire volume of gaseous products of the coal entering the chambers *d*, for regenerative effect therein, the air being conducted to said inlets *f* along passages *g* in the side walls of the furnace to be heated. Besides the better protection of the boiler from excessive heat afforded by the passages through the arch located along the bases of the arch, the fresh air entering through the sides is brought more directly into the gases than when the passages through the arch are distributed throughout its area, and another essential advantage is, the arch is much simpler to make and withstands the effects of the heat better.

At *h*, are outlets in the bridge wall *i* at the inner ends of the regenerative chambers through which the gases pass into a secondary combustion chamber behind the furnace consisting of three divisions *j*, *j* and *k* separated vertically for the most part of the depth of the chamber by the partition *l*, causing downward flow of the gases in divisions *j*, and upward flow in division *k*, from which the gases escape through passage *m*, in another bridge wall *n*, into still another chamber of larger dimensions where under the rear end of the boiler the hot gases are delayed to have greater heating effect on the boiler than if caused to escape rapidly through a contracted passage. The wall *d'* separates the regenerative chamber *d*, from escape passage *s*. From chamber *o* there is a passage *p*, with which the tubes *q*, communicate for the escape of the hot gases through them in the usual way to the escape passage *s*, at the front end of the boiler and thence to the chimney *t* in any approved way as along the flue *u*, over the boiler. The secondary combustion chamber *j*, *j* and *k* is also supplied with fresh oxygen for further regenerative effect this air being introduced through inlets *v*, in the back of the bridge wall for being heated in advance of entering the chamber. Air may be admitted to the ash pit *y* through the door way *z* in the usual manner when material draft is sufficient but for stronger draft it may be forced in through a pipe *a'* which may traverse the sides of the chamber under the fire grate *b'* and distribute the air through small perforations *e'* at intervals along the pipe.

Besides the protection of the boiler plate by the arch interposed between the primary chamber and the boiler shell above, more efficient combustion is attained in the first instance because fire is not exposed to the chilling effect of the low temperature of the boiler, the gases entering the regenerative chambers

d are therefore of much higher temperature and more capable of effective combustion in exposure to the chilling effect of the boiler, and higher temperature will likewise result in the secondary chamber where the regenerative action will also be more effective, and the gaseous products of combustion entering the heating chamber *o* will consequently be more effective.

My contrivance of the arch intermediate of the fire and the boiler is distinguished from other arches thus located by the arrangement of the passages through it along the bases of the arch as above set forth.

I claim—

1. In a boiler furnace, the combination of the primary furnace chamber, the arch intermediate of the said chamber and the part of the boiler over said chamber, the regenerative chamber above the arch, a line of passages thereto along each base of the arch, fresh air inlets in the side walls of the furnace under the arch and adapted to supply air directly to the streams of gases entering the regenerative chamber through said passages, the passages through the bridge wall, above the arch, from the regenerative chambers, and the secondary chamber having the longitudinal down draft divisions receiving the gases at the top, and the longitudinal middle division receiving the gases at the bottom substantially as described.

2. In a boiler furnace, the combination of the primary furnace and the secondary furnace behind the bridge wall both having direct action on the boiler and said secondary furnace consisting of two longitudinal down draft divisions receiving the products of primary combustion atop, and the intermediate longitudinal up draft division receiving the said products from the other divisions below, and discharging them from the top, and the fresh air inlets in the back of the bridge wall to said secondary combustion chamber substantially as described.

3. In a boiler furnace the combination of the primary furnace chamber, the arch intermediate to said chamber and the part of the boiler over said chamber, the regenerative chamber above the arch, passages thereto through the arch, fresh air inlets supplying air to the gases entering the regenerative chamber through said passages in the arch, and the secondary combustion chamber behind the bridge wall, consisting of the two down draft divisions receiving the products of primary combustion atop, and the intermediate up draft division receiving the said products from the other division below and discharging them atop, and the fresh air inlets in the back of the bridge wall to said secondary combustion chamber substantially as described.

Signed at New York, in the county and State of New York, this 30th day of December, A. D. 1892.

JOHN W. BATES.

Witnesses:
W. J. MORGAN,
C. E. WHITNEY.