2 Sheets—Sheet 1.

P. J. STANTON & J. HUTCHINSON.

Furnace.

No. 203,666. Patented May 14, 1878.

Fig. 1.

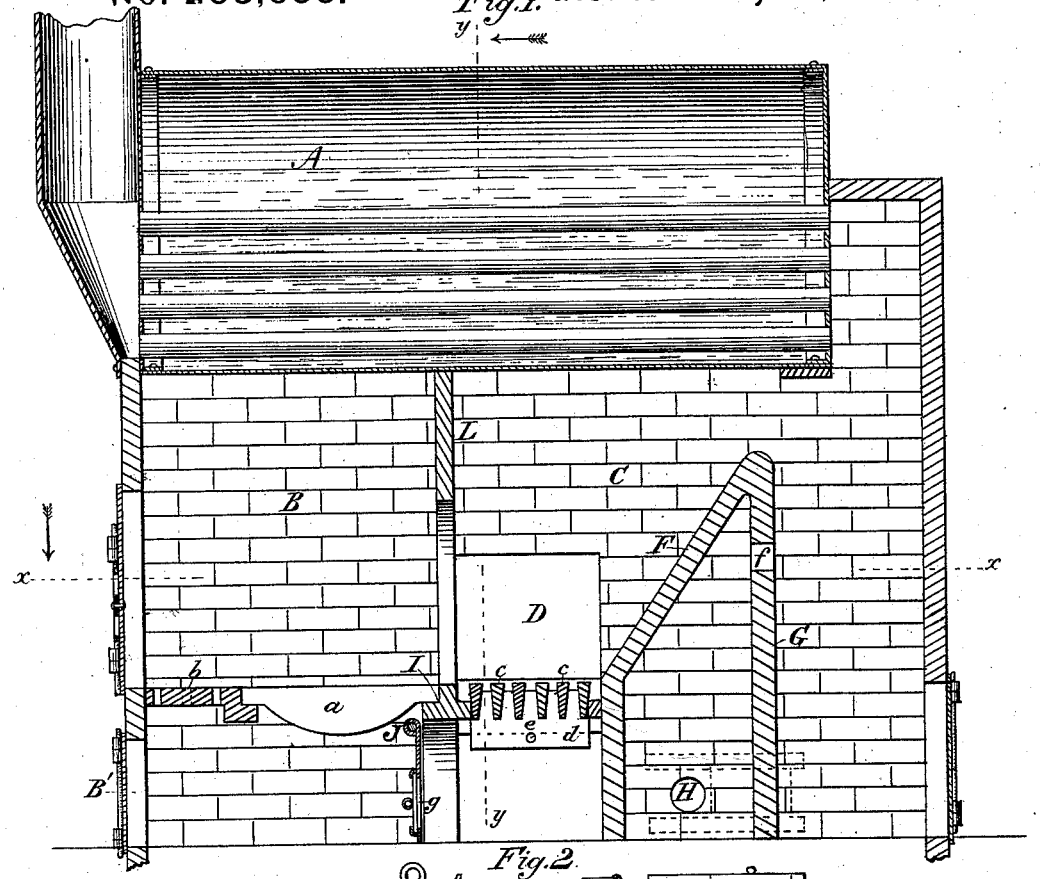
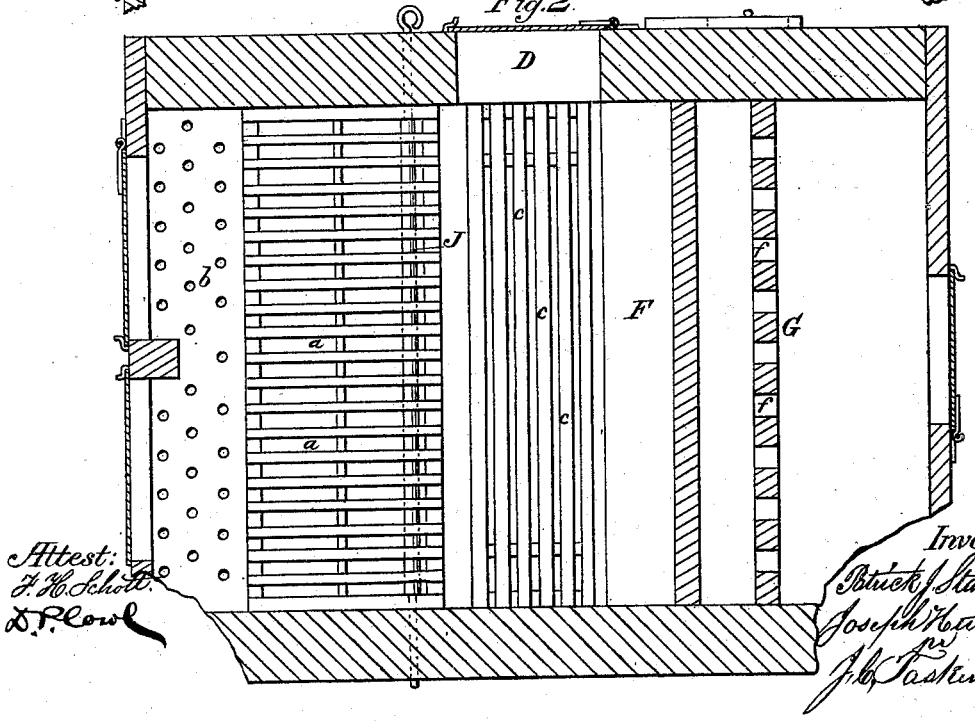


Fig. 2.



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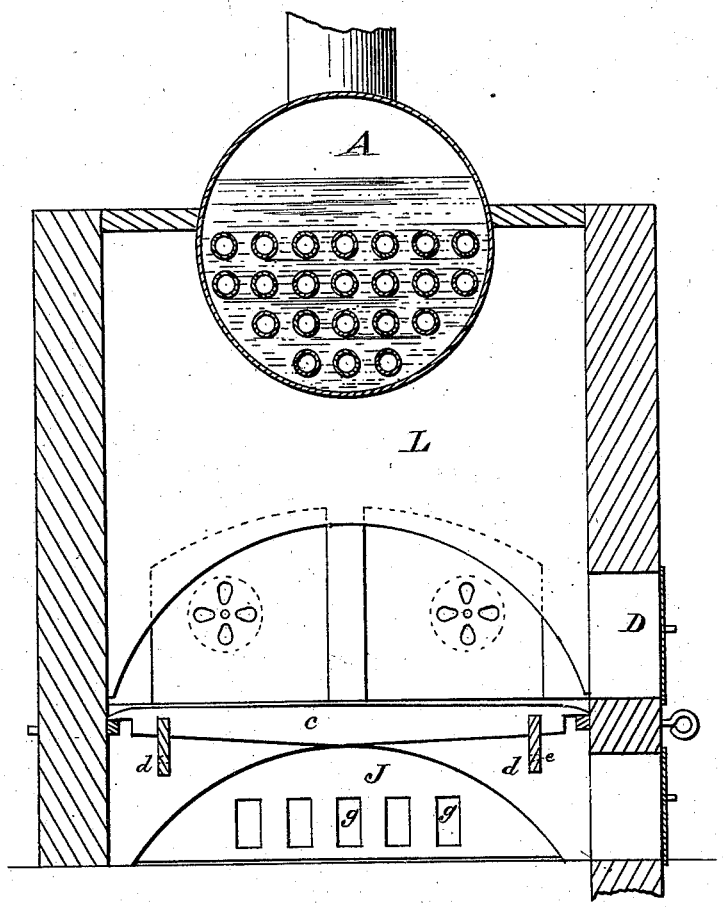
2 Sheets—Sheet 2.

P. J. STANTON & J. HUTCHINSON.

Furnace.

No. 203,666. **Patented May 14, 1878.**

Fig. 3.



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UNITED STATES PATENT OFFICE.

PATRICK J. STANTON AND JOSEPH HUTCHINSON, OF CHICAGO, ILLINOIS.

IMPROVEMENT IN FURNACES.

Specification forming part of Letters Patent No. **203,666**, dated May 14, 1878; application filed January 28, 1878.

To all whom it may concern:

Be it known that we, PATRICK J. STANTON and JOSEPH HUTCHINSON, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Furnaces; and we do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

The object of this invention is to improve that class of furnaces in which bituminous coal and other smoke-producing fuel is used, so as to prevent the escape of smoke into the surrounding atmosphere, which causes great discoloration of the buildings, and is liable to so many other objections that the consumption of such fuel in furnaces of the ordinary construction is forbidden in many cities; and, further, to not only prevent the escape of smoke, but, by consuming it, together with the other escaping products of combustion, to economize greatly in the quantity of fuel required to produce certain results; and the invention consists in the construction and arrangement of the different parts of the furnace, as will be hereinafter fully described, and then specifically pointed out in the claims.

In the accompanying drawings, Figure 1 is a vertical longitudinal section of the furnace as applied to an ordinary tubular steam-boiler. Fig. 2 is a horizontal section of the furnace above the grate and on the line *x x* of Fig. 1, and Fig. 3 represents a transverse vertical section on the line *y y* of Fig. 1.

Many attempts have heretofore been made to accomplish the result aimed at in this invention by various devices, such as introducing fresh air into the furnace back of the bridge-wall, or at the doors over the fuel. Jets of steam have also been introduced to assist in the decomposition of the gases from the burning fuel, all of which have, to some extent, ameliorated the nuisance complained of, but, so far as our knowledge extends, have failed to completely suppress it.

The drawings show the apparatus applied to a steam-boiler, which is indicated by the letter A. Under this boiler is a furnace, B, constructed somewhat similar to those in common use, the principal difference being that a perforated cast-iron plate, *b*, is placed across the furnace in front of the grates *a*, its rear edge being recessed to form a bearing for the front end of the grates. The perforations in this plate admit of the passage of cold air from the ash-pit B′ through the fresh fuel when it is first put in the furnace and before it becomes thoroughly ignited. This air carries with it the gases evolved by the first heating of the fuel, and, passing backward over the more highly-heated fuel, becomes ignited, the oxygen carried with it being sufficient to support the combustion.

C is a second fire-place, which may be about one-third the size of the fire-place B, an experiment showing this to be a proper proportion, and having a separate set of grate-bars, *c*, which may be arranged as represented, or in any other suitable shape; but we have found that shown, and hereinafter described, satisfactory in practice. Where it is convenient to have an opening at the side of the boiler, as represented at D, the grate-bars *c* are placed crosswise, as shown. They are hung on rockers *d*, and, by means of a handle which may be inserted through the ash-pit door into orifices *e* in the rockers, are oscillated to shake out ashes and prevent the formation of clinkers. F is an improved form of bridge-wall, and is preferably built of fire-brick tiling, but may be of any other suitable material, and is made with a face fronting the fire at an angle of about sixty degrees. G is a brick wall built perpendicularly from the ground to the top of the bridge-wall F, supporting it and leaving a cavity between them. H is an opening, which may be supplied with a register to admit cold air, which passes out of the chamber between the bridge-wall F and the back wall G through the openings *f*, (shown in the wall G,) thus furnishing a supply of air which will unite with the flame, and thus complete the combustion of any smoke or gases which pass the bridge-wall. I is a casting or bearer for the support of the rear end of the grate-bars *a*, which rest upon it. This casting is supported upon a brick arch, the opening in which may be closed by the damper J. Through this archway the

ashes may be removed from the fire-place C, in case it is not convenient or desirable to have a side opening, as at D. Through it, also, is admitted air, by means of the damper J, to the ash-pit under the fire-place C. The openings *g*, shown in this damper, have a registering-slide attached, and as much or little air as is required can be admitted. The damper itself need be turned up only to take out ashes from the rear ash-pit, &c. When not convenient to work it from the side, as shown, it may be worked from the front by suitable connecting-rods and a bell-crank.

L is a fire-brick-arched diaphragm, its purpose being to compel the smoke and gases which rise from the fire in fire-place B to pass close to the fire in the rear fire-place C on their way to the chimney.

The operation is as follows: Fire is first lighted in B. As the coal or other fuel burns down and becomes red it is pushed back underneath the arch L into the rear fire-place C, and in that manner, after the fire is once started, a bed of incandescent fuel is constantly kept in fire-place C. The cold-air draft enters through the front ash-pit door, and passes up through the grate-bars *a*, and also through the holes in the cast-iron plate *b*, and, uniting with the smoke and gases of the fresh fire in B, it aids in consuming them. Whatever is left unconsumed is compelled, in escaping through the archway L, to pass close down to the red coals in C. The air-draft, being admitted through the damper J, passes up through the grate-bars *c* in fire-place C, creating a steady glow of flame, which entirely consumes the smoke and gases which come from the fresh fuel in the front fire-place—in short, nearly creates perfect combustion. Should any of it by chance escape combustion in its passage over the fire in C, the admission of cold air to the interior of the bridge-wall at H makes a draft through the openings *f*, which augments the flame drawn from the fire in C, keeping it close to the bottom of the boiler, and thus burning up the escaping smoke, leaving nothing but incombustible gases to pass into the chimney.

Besides using up the smoke and gases, as above described, this furnace develops all the heat which the fuel used is capable of giving out, and so thoroughly distributes it along the surface of the boiler that the maximum of heat is obtained from the minimum of fuel, and with less than ordinary wear to the boiler. The inclined face of the bridge-wall shoots the flame up against the boiler and prevents the accumulation of cinders, &c., on top of it. The wall F is heated red hot, and the admission of cold air at H creates a great draft through the orifices *f* in the wall G, thus aiding the draft to the furnace and keeping the flame close up to the boiler after it passes over the bridge-wall F.

This burning up of the smoke, soot, &c., allows the flues in the boiler to remain clear, keeping the draft strong, and obviating the necessity of constantly cleaning them out, as in the case of ordinary furnaces burning soft coal. It also prevents the annoying showers of black soot which the people of our large cities, in which bituminous coal is used as a fuel, so bitterly complain of.

Having thus described my invention, I claim as new, and desire to secure by Letters Patent, the following:

1. The combination, in a boiler-furnace, of the double fire-chambers B and C, divided by the pendent diaphragm L of the hollow-inclined bridge-wall F, whereby the products of combustion from the front fire is made to dive and deflect against the boiler from the rear fire-place by the bridge-wall, substantially as described.

2. In a boiler-furnace, the combination of the double fire-chamber B C, perforated plate *b*, diaphragm L, bridge-wall F, and the damper J, whereby the quantity of air to the rear fire-place is controlled, in the manner set forth.

In testimony that we claim the foregoing as our own we hereunto affix our signatures in presence of two witnesses.

PATRICK J. STANTON.
JOSEPH HUTCHINSON.

Witnesses:
W. B. JUDSON,
J. C. WHITNEY.