(No Model.)

J. B. SWEET.

FURNACE.

No. 576,970. Patented Feb. 9, 1897.

Fig. 1.

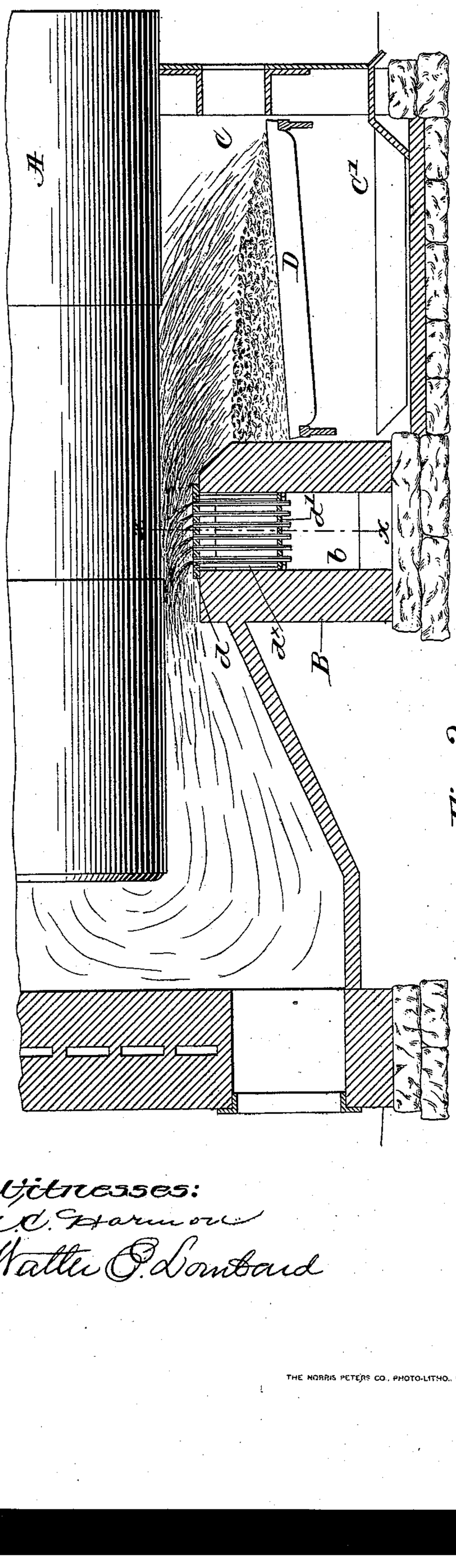


Fig. 3.

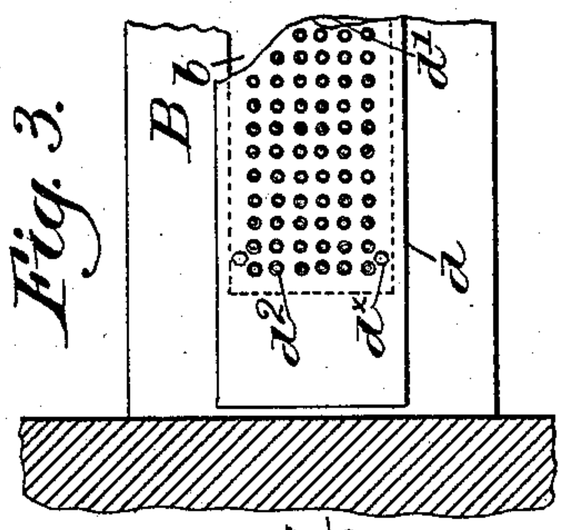
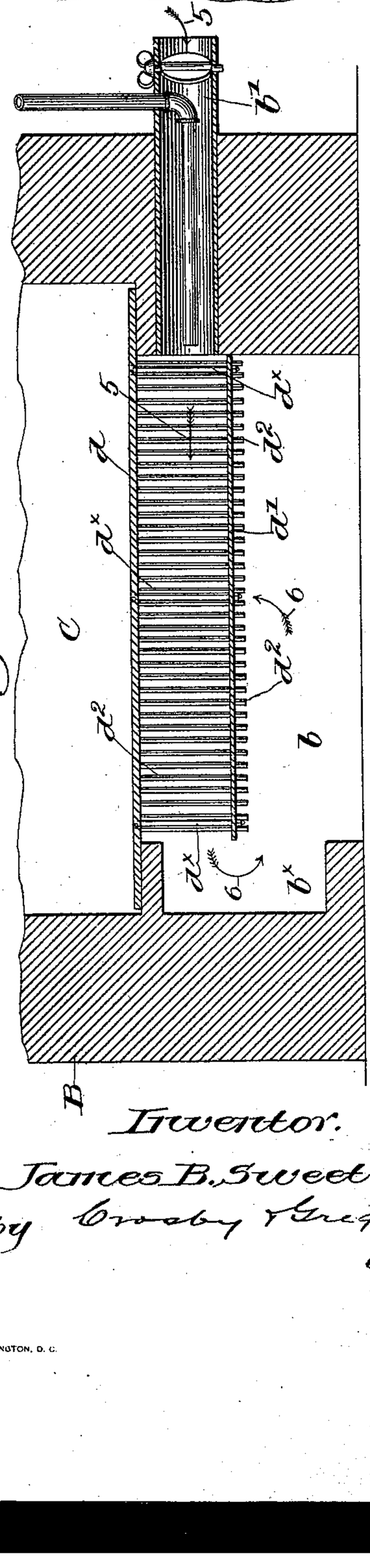


Fig. 2.



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UNITED STATES PATENT OFFICE.

JAMES B. SWEET, OF MALDEN, MASSACHUSETTS.

FURNACE.

SPECIFICATION forming part of Letters Patent No. 576,970, dated February 9, 1897.

Application filed October 19, 1896. Serial No. 609,322. (No model.)

To all whom it may concern:

Be it known that I, JAMES B. SWEET, of Malden, county of Middlesex, State of Massachusetts, have invented an Improvement in Furnaces, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

This invention relates more particularly to steam-boiler furnaces, and has for its object the production of means whereby a more complete and perfect combustion of fuel is attained, thereby greatly lessening or practically doing away with the generation of smoke and increasing the efficiency and decreasing the amount of fuel used, the construction for effecting such results being very simple, durable, and economical.

In carrying out my invention I admit fresh air into the bridge-wall and discharge it therefrom at the top in a highly-heated state to combine with the products of combustion and effect a thorough consumption thereof, the air being heated in such manner that the exit therefor in the bridge-wall is maintained cool enough to withstand the fierce heat generated adjacent thereto.

Figure 1 is a longitudinal vertical section of a furnace embodying my invention, a portion of a steam-boiler being shown in elevation. Fig. 2 is a transverse sectional view, enlarged, of the fresh-air delivery and heating device on the line *x x*, Fig. 1; and Fig. 3 is a partial top or plan view of the bridge-wall with the air-heating device applied thereto.

The boiler A, of any usual construction, is set above the bridge-wall B, located at the back of the fire-chamber C, provided with a suitable fuel support or grate D above the ash-pit C′.

The bridge-wall B has a transverse chamber *b* therein extending from one to the other side and open at its top, a suitable fresh-air inlet *b′* opening into said chamber, as clearly shown in Fig. 2, preferably at one side.

A preferably metallic plate *d* covers the top of the chamber *b*, resting on the top of the bridge-wall, and a second plate *d′* is suspended by suitable bolt-rods $d^{\times}$ from the plate *d* and secured in place within the chamber *b*, parallel to the plate *d*, but above the air-inlet *b′*.

Each plate is provided with a series of holes, the holes in one plate being in vertical alinement with the holes in the other, and open-ended pipes d^2 are secured in said holes, depending from the plate *d* and preferably extending somewhat below the plate *d′*, as shown best in Figs. 1 and 2.

The plate *d′* extends from one end wall of the chamber *b* to the mouth of a flue $b^{\times}$ in the other end wall and fits snugly between the front and back walls, so that the chamber is divided thereby into two parts connected at the end farthest from the inlet *b′* by the flue $b^{\times}$.

The fresh air enters, through pipe *b′*, into the space between the plates *d* and *d′* in the direction of the arrows 5, Fig. 2, impinging against the plate *d* and tending to reduce its temperature raised by the products of combustion passing over the bridge-wall B. As heat is thus withdrawn from the plate *d* it raises the temperature of the air, which follows the direction of the arrows 6, Fig. 2, through the flue $b^{\times}$ and passes beneath the plate *d′* to the open lower ends of the series of pipes d^2, which latter are heated by conduction from the plate *d*, as well as by passage of the warmed air around them. The air then ascends through the pipes and is still further heated thereby, so that it emerges at the top of the bridge-wall in a highly-heated state, and thence mingles with and supplies oxygen to the products of combustion, which are thereby brought into a high state of combustion, consuming any products which have not been consumed or reduced to a gaseous condition when they reach the bridge-wall.

As the heat above the bridge-wall is intense the plate *d* would in a short time become useless from disintegration were it not for the continual abstraction of heat therefrom to heat the incoming fresh air, and heat is also abstracted by conduction to the attached tubes d^2.

It will be seen that the cold fresh air serves to maintain the cover-plate *d* at a suitable temperature to withstand the furnace heat and that the abstracted heat is taken up by the air, so that the latter is highly heated at its discharge, and hence will not cool down the fire at all.

I am aware that it is not broadly new to deliver fresh air to the products of combustion

at the top of the bridge-wall of a furnace, but so far as I am aware the grating or similar structure through which the air is discharged must be constantly replaced, and the air is not thoroughly heated prior to its discharge.

By my invention I effect great economy in fuel, attain greater efficiency from the fuel consumed, and prevent the outpouring of great volumes of smoke from the stack, it being well known that the smoke is composed of the unconsumed products of combustion and is not only very objectionable, but is a positive loss in efficiency.

The entrance-pipe b' is shown in Fig. 2 as provided with a suitable damper b^5 to regulate the admission of fresh air, and inasmuch as the cold air sometimes tends to keep the pipes d^2 adjacent the inlet too cool I may introduce exhaust or live steam into the pipe b' by means of a pipe f, leading thereinto.

By making the heating device as shown dust, cinders, &c., can pass down through the tubes d^2 into the chamber b, from which they can be readily removed, and, if necessary, the two plates and the pipes can be bodily lifted from the bridge-wall chamber.

Having described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a furnace, having a bridge-wall having two superposed transverse chambers therein, a perforated top for the upper chamber, a fresh-air inlet for said chamber at one end, and a connection between the two chambers at the opposite end, and flues extending from the perforated top through the upper and opening into the lower chamber, to heat the air as it passes through the upper chamber prior to its entrance into and discharge through said flues, substantially as described.

2. In a furnace, a bridge-wall, a transverse chamber therein having a fresh-air inlet, a perforated cover-plate for the top of the chamber, depending open-ended pipes secured to said plate, a second perforated plate between the open lower ends of said pipes and the air-inlet, dividing the chamber into two compartments, and a connection between said compartments at the end of the chamber removed from the inlet, whereby the fresh air passes into the upper compartment around the pipes, to enter thence the lower compartment and pass up through the depending pipes to be discharged at the top of the bridge-wall, substantially as described.

3. In a furnace, a bridge-wall having a chamber therein, parallel perforated top and bottom plates in said chamber, dividing it into upper and lower compartments, pipes depending from the upper and extended through the lower plate and open from end to end, a communication between and at one end of said compartments, a fresh-air inlet opening into the opposite end of the upper compartment, and independent means to heat the incoming fresh air, substantially as described.

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

JAMES B. SWEET.

Witnesses:
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