2 Sheets—Sheet 1.

J. D. WHELPLEY & J. J. STORER.

GAS GENERATING AND BLAST HEATING APPARATUS FOR METALLURGIC AND OTHER PURPOSES.

No. 111,288. Patented Jan. 24, 1871.

Fig. 1.

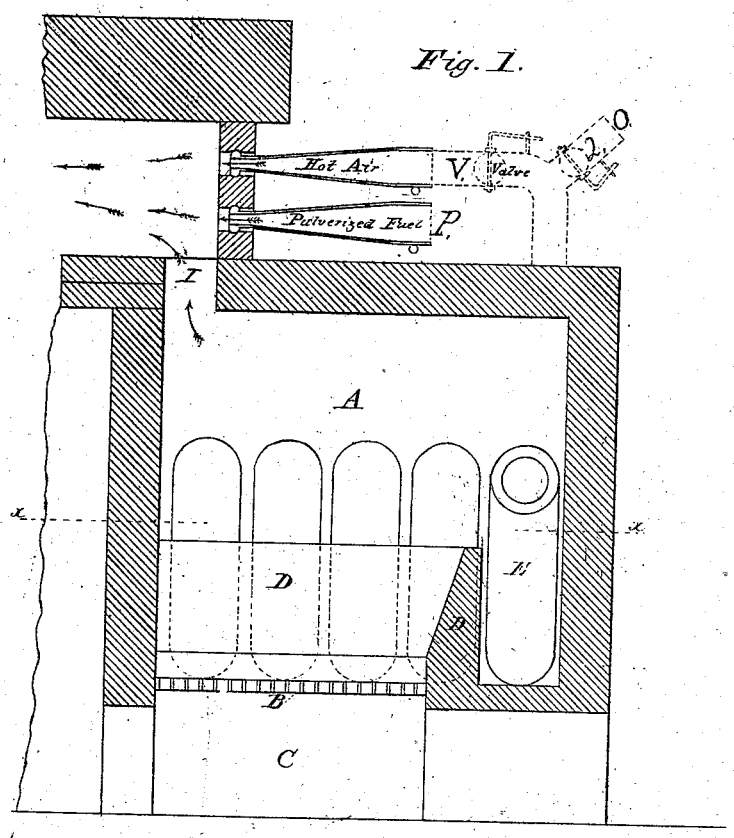
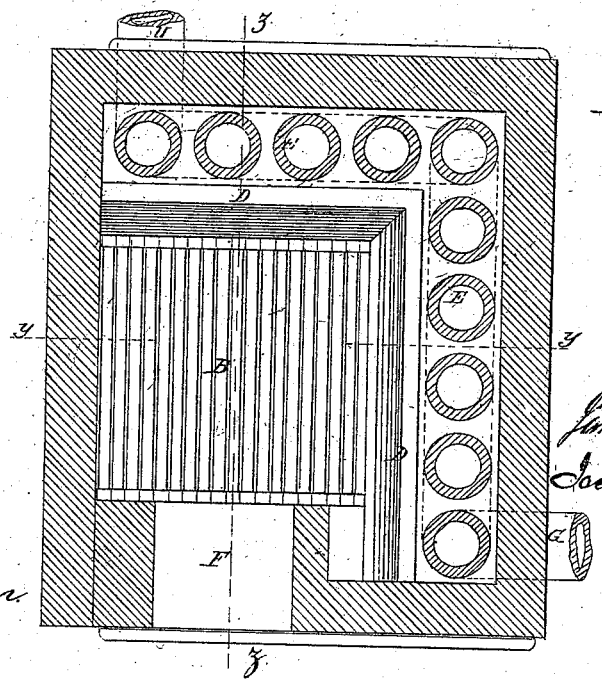


Fig. 2.



Witnesses:
Chas. McNickerson
Fred. W. Longley

James D. Whelpley.
Jos. J. Storer.
Inventors.

THE ECKERT LITHOGRAPHING CO., WASHINGTON, D. C.

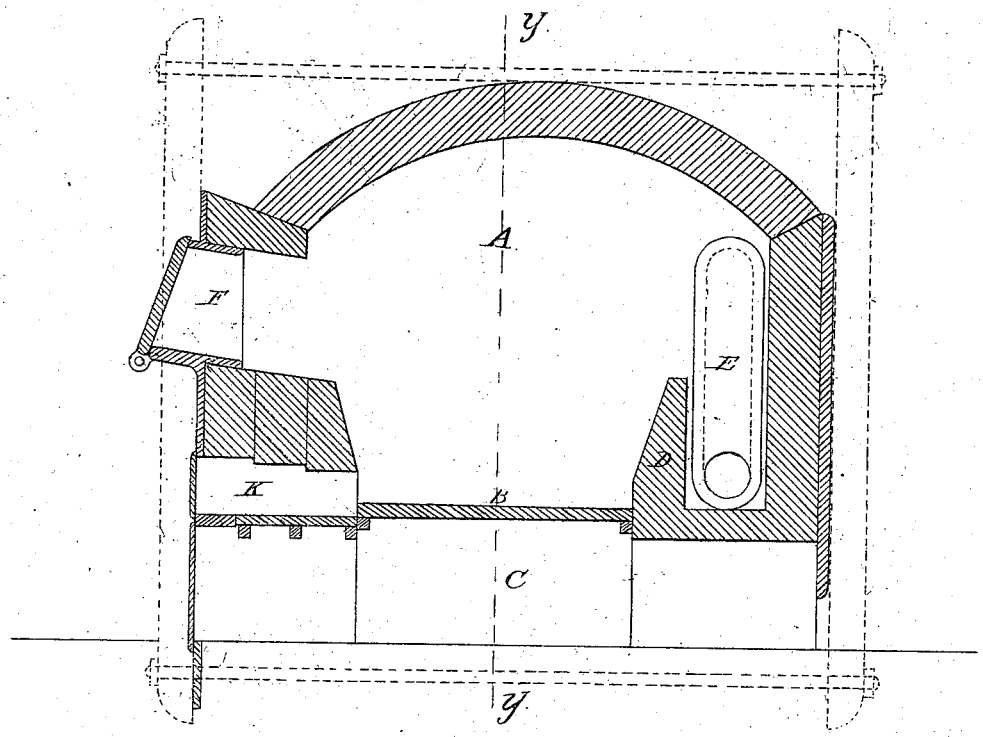
2 Sheets—Sheet 2.

J. D. WHELPLEY & J. J. STORER.

GAS GENERATING AND BLAST HEATING APPARATUS FOR METALLURGIC AND OTHER PURPOSES.

No. 111,288. Patented Jan. 24, 1871.

Fig. 3.



Witnesses:
Charles M. Nickerson.
Fred. W. Longley

James D. Whelpley
Jasor L. Storer
} Inventors.

THE ECKERT LITHOGRAPHING CO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

JAMES D. WHELPLEY AND JACOB J. STORER, OF BOSTON, MASSACHUSETTS.

IMPROVEMENT IN GAS-GENERATING AND BLAST-HEATING APPARATUS FOR METALLURGIC AND OTHER PURPOSES.

Specification forming part of Letters Patent No. **111,288**, dated January 24, 1871.

To all whom it may concern:

Be it known that we, JAMES D. WHELPLEY and JACOB J. STORER, of Boston, in the county of Suffolk and State of Massachusetts, have invented a new and useful Improvement in Gas-Generating and Heating Apparatus; and we hereby declare the following to be a full and exact description of the same, reference being had to the accompanying drawing, which forms a part of this specification.

Figure 1 is a cross-section and elevation on the line Y Y of Fig. 3. Fig. 2 is a horizontal and plan view and horizontal section on line X X, and Fig. 3 is a vertical section on line Z Z of Fig. 2.

The same letters indicate like parts in all the figures.

The object of the invention is to produce a combined gas-generator and hot-blast apparatus, which may be used in the working or manufacture of ores, metals, chemicals, glass, &c., for the generation of steam, and for distillation, evaporation, &c. It is, in effect, a large blow-pipe, which may be economically applied to these and many other purposes, and to reverberatory and other furnaces, in lieu of the present or ordinary fire-places. It may be used with pulverized fuel, according to our patented methods of burning such fuel, and in that respect is a modification and improvement on the invention described in our Patent No. 109,785, dated November 29, 1870. In that patent the blast-heating apparatus is separate from the gas-generator, being heated by waste heat from the furnace. In our present invention they are united, so that the air which serves for the hot blast is heated in the generator.

For blast-furnaces where hot blast is used the air is often heated in ovens or chambers of the same or like construction to this of ours, the air-pipes, too, being placed in a like position to ours; but only the heated air is applied or utilized in the blast of the blast-furnace, not the products of the combustion of the fuel heating the air.

We use and apply not only the hot air heated in passing through the pipes by the fuel in the generator, but also the gases formed by the combustion of said fuel.

By our method so little air is admitted into the generator that the escaping gases are almost purely carbonic oxide, or, when desirable, carbonic oxide and hydrogen, with a minimum of uncombined oxygen and carbonic acid. These gases, escaping at the outlet of the generator at a high temperature, have the hot-air blast immediately directed upon and mingled with them, and thus a blow-pipe flame of great intensity is created, which, as will be seen, may be made of sufficient volume to fill a furnace of any capacity, or may be, according to the size of the apparatus, diminished to the desired capacity of a small furnace, cupel, muffle, or forge, &c.

Recent experiments in England have demonstrated that an air-blast heated to 500° Fahrenheit, combined with the gas or vapor from heated stearine, will fuse platinum and other materials heretofore considered refractory to any influence excepting the oxyhydrogen blow-pipe.

Our invention is not the combination of the hot-air blast and gases or vapors of carbon, hydrocarbon, hydrogen, or other gases, but is a convenient and economical apparatus, by means of which the gases may be produced, the air-blast heated, and the two combined for use; but our invention includes the use, when desirable, of pulverized fuel in aid or in modification of such blow-pipe flame.

Siemen has stated that the gases passing from his generators to the furnace or fire-pot through the gas-conductors lose a large portion of their heat, (about nine-tenths, or 1100° Fahrenheit,) and that this cooling of the current of gas, inducing a siphon action in the conductors, is necessary to the correct working of his apparatus.

By our arrangement no such loss of heat as this is incurred, but the gases escaping from the generator meet and combine at their full heat with the hot blast; consequently this process is operated with much less expenditure of power—*i. e.*, loss of heat—than is that of Siemen's, and much time is saved by heating the blast in the generator rather than in a so-called regenerator, or by the waste heat of a furnace.

The shape and manner of construction of this combined gas-generator and hot-blast apparatus may be such as will make it most easy

of application to the furnace, boiler, or other purpose to which it is desired to apply it. For some purposes and applications it may be a brick or clay lined iron cylinder, containing the grates and heating-pipes, and set on trucks or rollers, so as to be easily portable; or it may be a square or cylindrical permanent structure of brick, properly strapped with bands or plates, and placed against a furnace, or under or in front of a boiler, in lieu of the usual fire-pot. It may be lined or constructed with any refractory material, and the hot-air pipes may be set vertically, as shown in drawing, or horizontally or in coils, and the gas-exit may be at the most convenient point for service. The blast may be furnished by fan-blower, bellows, or any other suitable apparatus.

It is obvious that by simple adjustment of the supply of air and fuel an oxidizing, neutral, or reducing flame may be obtained at pleasure.

Its value above all other methods of obtaining and applying heat for metallurgic and chemical purposes, and for the heating of tubing, shafting, and the like, is apparent.

The gas and hot-air jets may be distributed by means of separate tubes or flues, so as to be projected at different points upon or about the work to which it is applied; and pulverized fuel, when used in combination with this apparatus, may be projected above or below the column of hot air, as may be found most efficient to produce desired effects.

The following description will enable any one to make and use our invention.

In the drawing, A is the body of the gas-generator, with grate-bars B and ash-pit C. Surrounding the generator is a ledge or wall, D, leaving a space between said ledge and the walls of the generator, in which are placed pipes E, for heating the air used as blast.

The gas-generator A is charged with coal in the manner well known in generating carbonic oxide and other gases. A draft or forced blast enters the fuel through the grate-bars. The depth of coal on the grate-bars should be kept thick by charging through the feed-door F. As soon as the coal or other fuel becomes well ignited, cold air is forced through pipes E by any suitable blast apparatus, attached at G. In passing through the pipes E the air is heated, and leaves by the hot-air pipe, (shown in Fig. 1,) where it mingles with the gas from the gas-generator, and, together or in combination with it, is projected into the furnace, cupel, muffle, or under the boiler, or upon the work for which it is intended. Any cinder that accumulates may be removed through K. The gas, as formed, passes from the generator through opening I, and the hot air through H.

Pulverized fuel may be applied, when desired, through pipe P, Fig. 1, and either above or below the hot-air blast, or the apparatus may be used and applied without the pulverized fuel.

V, Fig. 1, is a valve in the hot-air pipe, to regulate the supply of hot air required for work. O, Fig. 1, is a branch of hot-air pipe, fitted with valve Q. When V is closed and Q opened, all the hot air will pass out of the branch O into the open air. It is obvious, then, that by proper arrangement of the two valves any desired proportion of hot air for the required action of the blow-pipe can be had.

When the valve E is closed, or nearly so, the pipes E would be in danger of destruction were it not for the branch O and safety-valve Q, which permit a constant and full current of air to pass through them.

Having thus described our invention, what we claim, and desire to secure by Letters Patent of the United States, is—

1. The improved gas-generator and blast-heating apparatus combined, substantially as and for the purposes described.

2. The improved gas-generator and blast-heating apparatus, substantially as described, combined with the use and application of pulverized fuel, substantially as described.

3. The utilization or conversion into use of the hot gases and products of combustion from an oven used for heating a blast of air, in combination with the heated blast, substantially as and for the purposes described.

JAMES D. WHELPLEY.
JACOB J. STORER.

Witnesses:
CHARLES M. NICKERSON,
FRED W. LONGLEY.