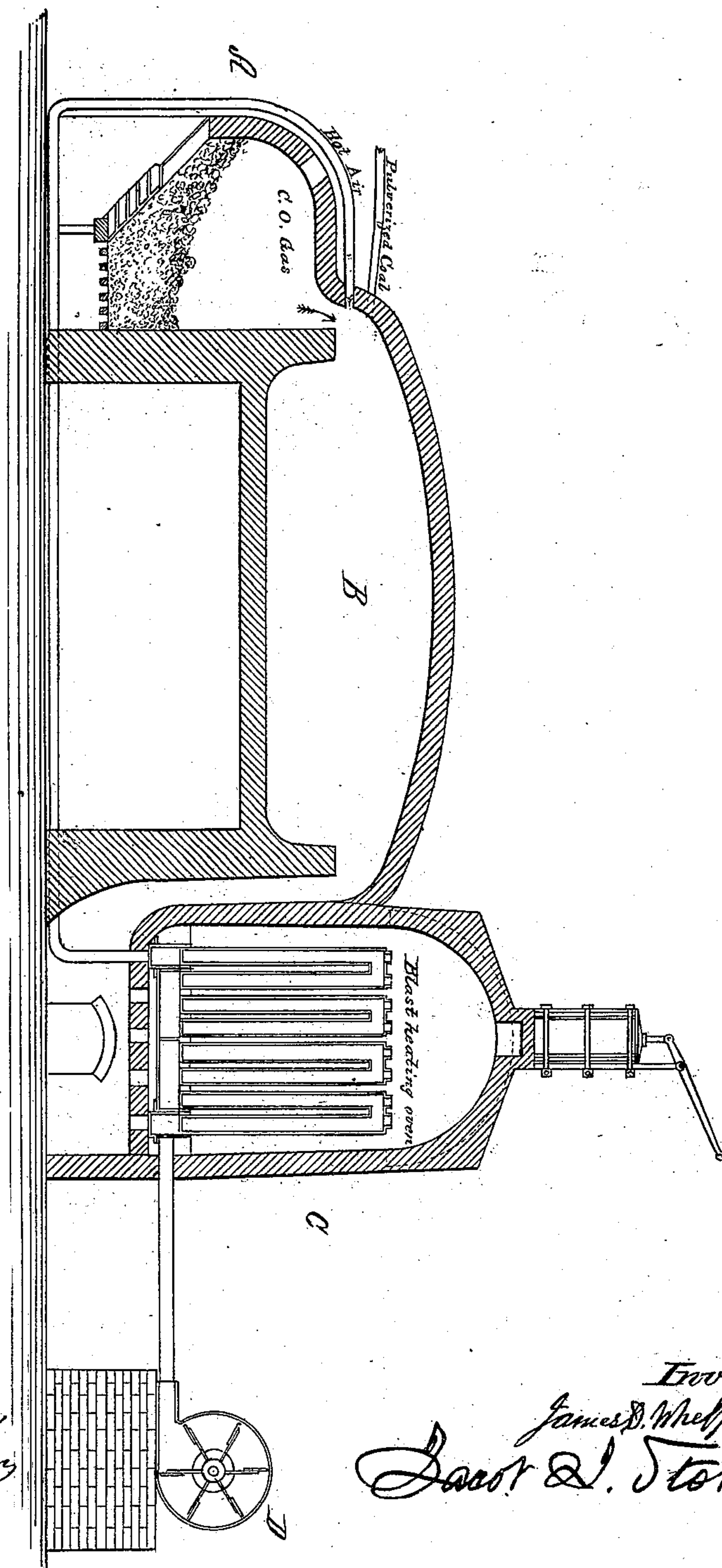


J. D. WHELPLEY & J. J. STORER.  
HEATING METALLURGIC AND OTHER FURNACES.

No. 109,785.

Patented Nov 29, 1870.



Witnesses:  
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# United States Patent Office.

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

Letters Patent No. 109,785, dated November 29, 1870.

## IMPROVEMENT IN HEATING METALLURGIC AND OTHER FURNACES.

The Schedule referred to in these Letters Patent and making part of the same.

*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 made a new and useful Improvement in Heating Metallurgic and other Furnaces; and we hereby declare the following to be a full and exact description of the same.

In patent No. 53,208, dated March 13, 1866, reissue No. 3,857, dated March 1, 1870, we have described methods and apparatus for preparing and using pulverized fuel in all the usual forms of furnaces. While there had been several prior attempts to use such fuel they all proved unsuccessful in practice, as is well known to metallurgists and engineers.

In patent No. 101,067, dated March 22, 1870, we have described such additional improvements as to better adapt our methods and apparatus to puddling, heating, and reverberatory furnaces.

In patent No. 103,695, dated May 31, 1870, we have described still further improvements, especially that of introducing the fuel at different parts of the furnace, as required to produce a more perfect combustion, and to secure a uniform heat in all parts of the furnace. By the application of the methods and apparatus described and referred to in these three patents above mentioned, pulverized fuel is made available for all the common metallurgic operations of melting, heating, and puddling, and for generating steam-heating air and the like. In order to obtain better results in the use of pulverized fuel we have made the following additional improvements:

First, heretofore it has always been deemed essential to combine with the furnace in which pulverized fuel was used a fire-box for lump or ordinary fuel. This was required to give the furnace a preliminary heating, so that the pulverized fuel would ignite as soon as introduced, and also to keep up the combustion of the same. The use of such fire-box is, however, objectionable, for the reason that it is necessary from time to time to add fresh coal, which checks or varies the combustion, and also lets in cold air, which changes the character of the flame. The workmen are also in the habit of piling the fire-box so full of lump fuel as to choke the entrance of the pulverized fuel. These objections we overcome by combining a gas-generator with a furnace burning pulverized fuel.

Any of the known forms of gas-generator may be used, such as the ordinary furnace for generating carbonic oxide, the Siemen's gas-generator, the furnace for generating water-gas or the generator for coal-gas, such gas-generators, being well known and forming no part of our invention, need not be described.

In practice, we find that a good gas-generator is a

brick box, square, circular, or any convenient shape, set at the end of the furnace under the supply of pulverized fuel, so that the oxide of carbon arising from it shall pass into the throat of the furnace, as it does in the Siemen's furnace, through a long opening or throat just behind the fire-bridge. The generator, like all others of its kind, is furnished with grate-bars at the bottom, upon which refuse or lump-coal is piled, slow combustion being maintained by means of artificial blast or ordinary draught. The interior dimensions of the generator for a puddling or heating-furnace of ordinary size are about twenty-four inches square, and arched over with bricks fifteen or twenty inches above the grate-bars.

When the hot-blast is used, which is to be preferred, the oven or stove for heating the same may be placed at the extreme end of the heating or puddling-furnace, so as to be heated by the waste gases from the furnace in the manner heretofore known and used, or a separate oven may be employed.

The hot-blast may be employed both in the gas-generator and in effecting the combustion of gas and pulverized fuel. For the latter, we project through the back wall of the furnace, behind the fire-bridge a blast of hot air at say 700° or 800° Fahrenheit, which mingles with the oxide of carbon or other gas or mixture of gases, such, for example, as might be generated by the use of wet fuel, or by steam passing through the incandescent fuel, arising from the gas-generator, and produces a long gaseous flame. This flame combines with and ignites the blast of pulverized fuel which enters with it. Both the gas-jet and the jet or blast of pulverized fuel may be caused to enter at different parts of the furnace, as explained in our patent No. 103,695, above referred to. The pulverized fuel may enter above or below the injection-pipe for heated air, according to the character of the flame required upon the hearth, whether oxidizing or not.

In the drawing—

A represents a gas-generator;

B, a puddling or heating-furnace; and

C, a hot-blast oven, placed so as to be heated by the waste gases from the furnace.

The blast may be made by a fan-blower, D, or other air-forcing machine. The pulverized fuel may be supplied by means of our pulverizing and blowing apparatus, described in former patents, as mentioned in the specification of reissue No. 3,857, or by any other suitable device for supplying pulverized fuel to furnaces.

The advantages gained by this part of our invention are, the maintenance of uniform heat of great



intensity, and a flame of any character required, either oxidizing, neutral, or reducing, and the further most important advantage of burning all of the pulverized fuel in the body of the furnace itself, so that, instead of there being a great waste of heat in the fire-box, as heretofore, all the heat is utilized for the work in the furnace, the body of the furnace being the combustion-chamber.

The gas-generator may be charged at long intervals and continuously, without interfering with the working of the furnace. All the operations of melting, heating, puddling, refining, and boiling in the working of iron, steel, and other metals, may be conducted in a far better manner than by the methods in use heretofore.

The second part of our invention consists in producing a very intense heat, and this we produce by burning the pulverized fuel under pressure greater than ordinary atmospheric pressure.

In carrying out this part of our invention, the furnace or combustion-chamber must be made strong, so as to resist the pressure required. This pressure will depend upon the degree of heat required, the limit of which is only restricted by the strength and fusibility of the materials used in the construction of furnaces. The highest degree of temperature will be attained when oxygen gas is used for the blast. The blast may be heated and the combustion assisted by a gas-generator, as described in the first part of this specification.

We are aware that it is not new to produce an intense heat by effecting combustion so as to keep the products of combustion under pressure. The devices for accomplishing this by our invention, being substantially the same as those already known when other kinds of fuel are used, need not be further described.

Having thus described our invention,

What we claim, and desire to secure by Letters Patent of the United States, is—

1. The process herein described for producing heat, by burning together pulverized fuel and carbonaceous and other gases in aid of combustion, substantially as set forth and described.

2. The combination of a gas-generator and of a machine for supplying pulverized fuel, with a puddling, heating, or other furnace, as set forth.

3. The combination of pulverized fuel, gaseous fuel, and hot blast, so as to produce a flame of high temperature, and regulated as to character, as set forth.

4. The combination of a gas-generator, a machine for feeding pulverized fuel, and a hot-blast oven with a puddling or other furnace, substantially as described.

5. The process herein described, for producing heat of great intensity by burning pulverized fuel under pressure, as set forth.

JAMES D. WHELPLEY.  
JACOB J. STORER.

Witnesses:

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