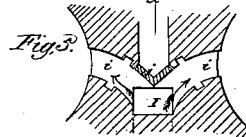
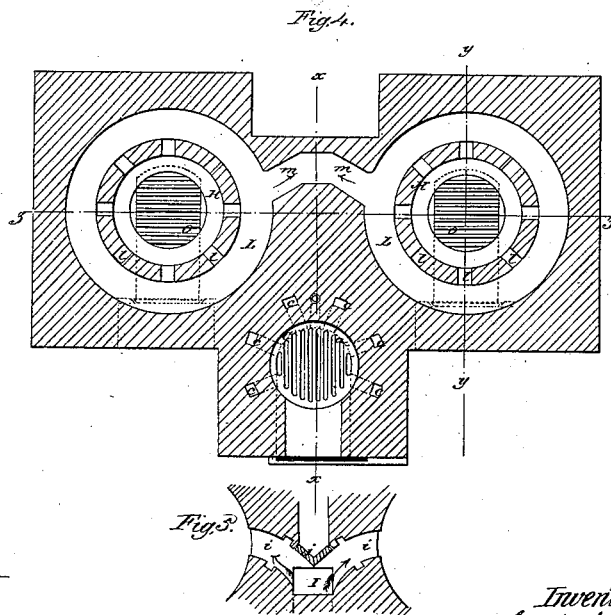
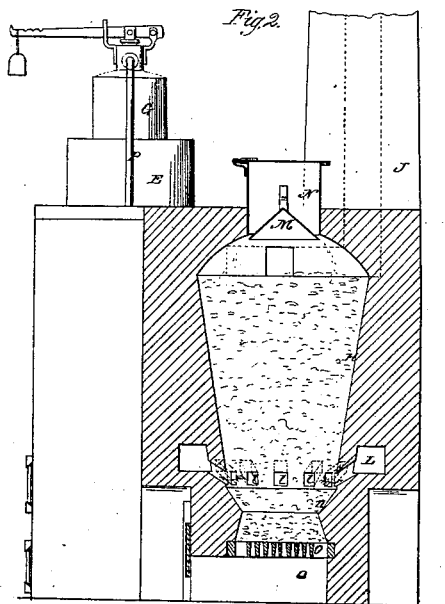
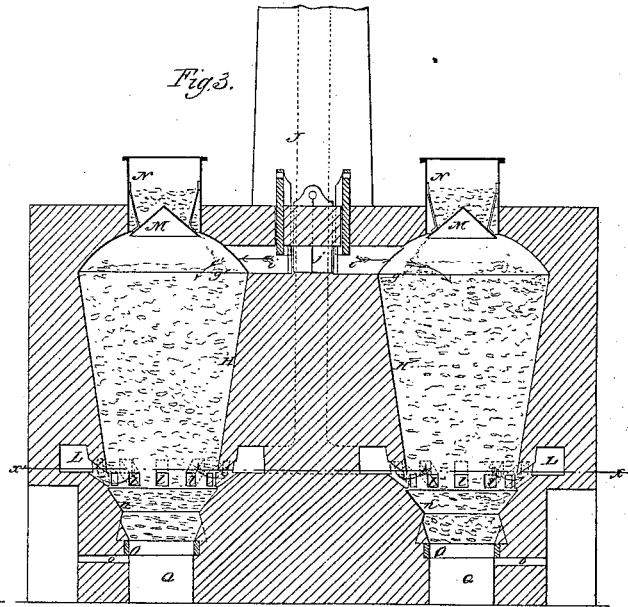
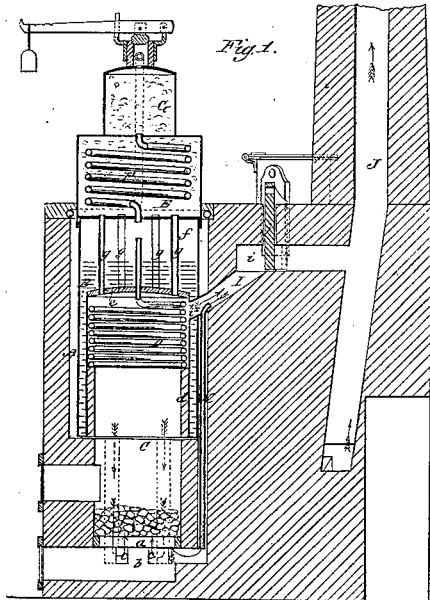


G. W. BAKER.
METALLURGICAL REVERBERATORY FURNACE.

No. 46,984.

Patented Mar. 28, 1865.



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UNITED STATES PATENT OFFICE.

G. W. BAKER, OF NEW YORK, N. Y.

IMPROVEMENT IN ROASTING AND DESULPHURIZING ORES.

Specification forming part of Letters Patent No. 46,984, dated March 28, 1865.

To all whom it may concern:

Be it known that I, G. W. BAKER, of the city, county, and State of New York, have invented a new and Improved Metallurgical Reverberating Furnace; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to make and use the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a vertical section of my invention, taken in the line *xx*, Fig. 4; Fig. 2, a vertical section of the same taken, in the line *yy*, Fig. 4; Fig. 3, a vertical section of the same, taken in the line *zz*, Fig. 4; Fig. 4, a horizontal section of the same, taken in the line *aa*, Fig. 3; Fig. 5, a horizontal section of a portion of the same, taken in line *yy'*, Fig. 3.

Similar letters of reference indicate like parts.

This invention relates to a new and improved combination-furnace for oxidizing and volatilizing pyritical and other ores containing the precious metals, iron, and copper; and it has for its object economy in fuel, compactness in arrangement, and the least possible amount of handling or manipulation in managing the furnace doing the roasting of the ore.

A represents a blast-air-heating chamber which surrounds an upright steam-boiler, B, and C is a deep fire-chamber which extends from the grate-bars *a* upward within the boiler, as shown clearly in Fig. 1. The blast-chamber A is made to communicate with the ash-pit *b* of the fire-chamber by means of a series of passages, *c*, extending down through the masonry, and having their orifices at the rear and sides of the ash-pit, as shown in Figs. 1 and 4. The blast in chamber A may be created by an ordinary blower or by any other suitable means, the blast being introduced at the top and descending around the boiler B and through the masonry to the ash-pit, thereby becoming heated and supplying the fire in such condition.

The boiler B, at its lower part, is of annular form in its transverse section, in order that it may encompass the upper part of the fire-chamber, and in the upper part of this fire-chamber, resting upon the masonry thereof or the lining *d* of the boiler, there is a coil of

pipe, D, the lower end of which passes through or taps the boiler, so as to communicate with it, the upper end passing up through the internal head-piece, *e*, of the boiler and above the water-level in the latter to the steam chamber or space *f*, as shown clearly in Fig. 1. This coil of pipe D, it will be seen, forms a portion of the boiler, and is a rapid steam-generator, as it has a large surface exposed to the direct action of the heat in fire-chamber C.

E represents a hot-air chamber, which is directly above the boiler, and communicates with the fire-chamber C by means of flues *g*, the latter passing up through the upper part of the boiler and serving to assist in the generation of steam, as well as heating the chamber E and drying the steam as it passes through coil F. Within the hot-air chamber E there is another coil of pipe, F, which connects the steam-chamber *f* with a steam-dome, G. This coil F consequently is a part of the boiler, and it is heated in consequence of being in the chamber E.

H H represent two reverberating retorts, which are in the form of inverted truncated cones. The upper parts of these retorts communicate, by means of passages *h h*, with a flue, I, which taps the fire-chamber C at *i* through the boiler. (Shown clearly in Fig. 1.) This flue I is provided with a damper, *j*, and the passages *h h* are also each provided with a damper, *k k*. When the latter are closed and the damper *j* opened, the flue I communicates directly with the smoke-stack J, and when *j* is closed and *k k* opened the flue I communicates with the retorts. The flue I is supplied with heated air (uncombined or fresh oxygen) by means of a pipe, K, which leads from the ash-pit *b*. Each retort H is surrounded near its lower end with an annular passage, L, and these passages communicate with the retorts by means of holes *l*, (see Figs. 2, 3, and 4,) the passages L communicating with the smoke-stack J by means of passages *m m*, (shown in Fig. 4,) thereby constituting reverberating retorts.

M represents conical feeders, which are placed at the centers of the arched vaults or roofs of the retorts and at the lower parts of cylinders N, through which the retorts are fed or charged with ore, a sufficient space being allowed between the lower edges of M and the

lower edges of the cylinders N for the ore to pass into the retorts. (See Figs. 2 and 3.) These feeders cause the ore to be well distributed in the retorts, so that they will fill or become charged evenly, and at the same time they will not materially admit of cold atmospheric air, and also will admit of a steam-blast being introduced at any time by means of a pipe, P, leading from the steam-dome. By my arrangement it will be seen that I introduce dry steam, the latter being dried in passing through the coil F, forming a blast to drive off the accumulating vapors in the retorts. It will also follow from this proposed method of introducing steam that in its descent the hottest portion of the retort is reached where a partial or complete decomposition of the steam will be effected, thus producing oxygen and hydrogen where most effective in completing the decomposition of the ores, said gases acting then most powerfully in their nascent state. The lower end of the retorts are beveled or shouldered, as shown at *n*, for the purpose of reducing the area of the grates O and loosening the ore above the grates and beneath the holes *l*.

The operation is as follows: The blast of atmospheric air entering from the ash-pit *b* supports combustion, the oxygen of the air decomposing the fuel and uniting with the carbon, forming carbonic-acid gas, a small portion of carbureted hydrogens and aqueous vapor. The deep fire-chamber C being kept supplied with fresh fuel, the carbonic-acid gas is reduced in passing upward through the fresh fuel, distilling it, and thereby becomes carbonic-oxide gas by assuming another equivalent of carbon. The carbonic oxide and carbureted hydrogen escape into the flue I with the remaining carbonic gas and aqueous vapor. The first-mentioned gases, in uniting with the fresh blast of uncombined oxygen from pipe K, are partially inflamed, and are thus conducted to the retorts, where the oxidizing and volatilizing processes are carried on by the combustion of the volatile elements of the ores under treatment.

Below each grate O of the retorts there is a

discharge-room, Q, for a carriage or wagon to enter. These rooms are provided with airtight doors. The discharge is effected by means of a tool inserted through a hole, *o*, the prepared ore being worked down into the carriage or wagon.

I do not claim, broadly, the employment or use of steam in oxidizing ores, as that is quite an old idea, it being first used in 1843, in Russian Finland, at the iron-works Dals-Bruck. It has also been used in various instances since, in many places, both here and in foreign countries, (see Plattner's *Metallurgie Roast Process*, page 67; Sheerer's *Lehrbuch der Metallurgie*, Band 2, page 77;) but,

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

1. A reverberatory retort constructed and operating substantially as herein described.

2. The use of steam as a blast to carry forward the vapors evolved from the ore and surround the latter with a constantly-changing atmosphere.

3. The blast-chamber A, boiler B, arranged relatively with the fire-chamber C, substantially as shown, when said parts, thus arranged, are used in connection with a hot-air pipe, K, leading from the ash-pit of the fire-chamber into the flue I, which forms a communication between the fire-chamber C and one or more reverberating retorts, H, for the purpose herein set forth.

4. The coil D, in combination with the boiler B, hot-air chamber E, flue *g*, and steam-coil F, all arranged to operate substantially as and for the purpose specified.

5. The annular passages L at the lower parts of the retorts, when arranged, as shown, to communicate with the smoke-stack to form reverberatory retorts.

6. The conical feeders M, arranged or applied to the retorts, substantially as and for the purpose herein set forth.

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Witnesses:

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