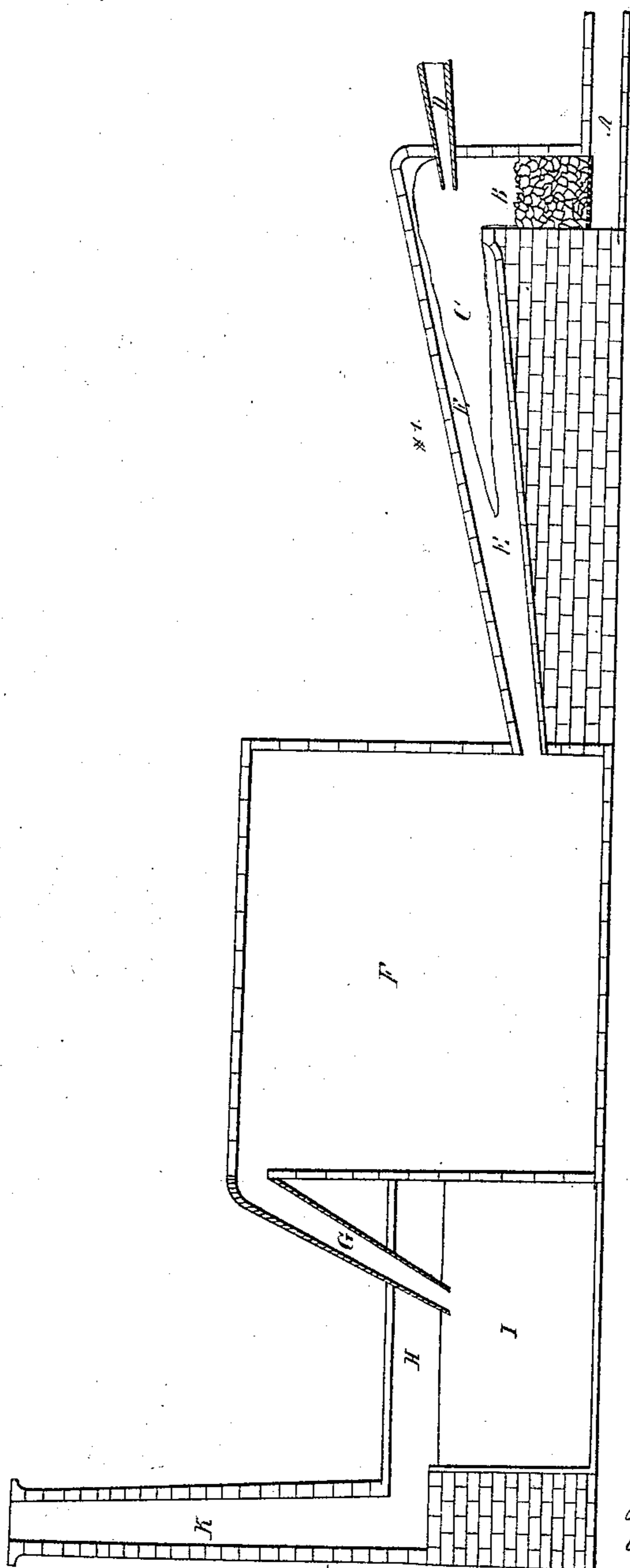


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PROCESS OF CALCINING ORES AND MINERALS.

No. 36,437.

Patented Sept. 9, 1862.



Witnesses  
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# UNITED STATES PATENT OFFICE.

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## IMPROVED PROCESS OF CALCINING ORES AND MINERALS.

Specification forming part of Letters Patent No. **36,437**, dated September 9, 1862.

*To all-whom it may concern:*

Be it known that we, BETHUEL KEITH, ADOLPH BEHR, and NATHANIEL SHEPARD KEITH, all of the city of New York, in the county of New York, in the State of New York, have invented a new and improved mode of oxidizing, or, as technically termed, "roasting" or "calcining," oxidizable metals, oxidizable substances, and the various ores, and reducing to a globular form all unoxidizable metals, which may be contained therein; and we do hereby declare that the following is a full and exact description of the process, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

The nature of our invention consists in introducing into, with, and through a flame the materials to be oxidized or formed into globules in a minutely-divided state, and perfectly diffused through the air, which is introduced therewith in quantities sufficient to support the combustion and oxidation. This process is particularly applicable to ores known as "bisulphurets" and "sulphurets."

To enable others to understand perfectly the process and its results, we will proceed to describe the operations.

To effect a complete oxidation or reduction of metals and ores, it is necessary to expose them to the action of heat and air. When the materials are in a state of minute division and well diffused through air, intense heat will quickly oxidize all the oxidizable substances, and at the same time will melt and form into globules all the particles of unoxidizable metals present. These results may be accomplished by the aid of apparatus such as is exhibited by the accompanying drawings.

1 represents a reverberatory furnace or oven, built of fire-brick and clay, so as to resist the heat. A fire of wood or coal is kindled in the fire-space B, allowing a draft through the draft-channel A, and the lower end of the pipe G being above the surface of the water I in the reservoir H, the draft will be sufficient to support combustion. As soon as the fire is well burning, the blast of air from the blower is started and communicated to the flame C by means of the pipe D. This operation produces an intense oxidizing-flame for some distance in the oven E E E. The surface of the water in the reservoir is now raised, so as to cover

the end of the pipe G. The finely-divided material to be oxidized or reduced is now introduced into the blower, and is, with the air, carried directly into the flame. The intense heat and free access of air instantly completes the oxidation and reduction. The now oxidized and reduced substances pass into the chamber F, where the heavier particles settle to the bottom, while the lighter particles, together with the gases and volatilized substances, pass through the pipe G, leading from the top of the chamber to the water I in the reservoir H. Here the water takes up these light particles and the condensable gases, and allowing the uncondensed gases to pass off through the chimney K. The blower used may be any kind which will give motion to the finely-divided particles introduced therein, and at the same time keep up a continuous and steady blast of air. In cases where sulphurets and bisulphurets are oxidized, and it is desirable to collect in its purity the sulphuric acid generated and set free by the process, the chamber F must be made of a sufficient length, or a series of chambers may be connected, so as to allow all of the fine particles to settle, and nothing but the gaseous substances enter the water, where the sulphuric acid will be readily condensed and absorbed.

The principal advantages of our process are—

First: A complete oxidation of all oxidizable substances is effected, as they are exposed to the free access of air and an intense heat. Their diffused condition gives them no chance to melt or cake together.

Second. All of the particles of unoxidizable metals—such as gold, silver, &c.—are in the intense heat melted into globules, so that by a subsequent washing or amalgamating they may be readily collected without loss.

Third. It requires the least time and the least expenditure of fuel, as each particle is instantly oxidized and passes off, the quantity being so regulated as to make use of the heat to its fullest capacity.

Fourth. It can be carried on longer without interruption and with less labor, as there is no filling and stirring, as in working a common reverberatory furnace or oven.

Fifth. It is not injurious to the health of the persons attending to its workings, as all of

sulphurous and other gases are driven out of the chamber and reservoir before the oxidized substances are withdrawn.

Sixth. In cases where ores and metals of different specific gravities are mixed, it effects their separation mechanically and without extra labor.

Seventh. The sulphurous acid generated by the former processes of roasting of sulphurets and bisulphurets is by this process further oxidized into sulphuric acid, the free access of air and the intense heat being the conditions which cause this change. The sulphates formed during former processes at the intense heat of our process give off their sulphuric acid. This acid may be collected as before described, and is useful in separating silver and gold.

What we claim as our invention, and desire to secure by Letters Patent, is—

A mode or process of oxidizing (or roasting or calcining) all oxidizable substances—such as metals, minerals, sulphurets, bisulphurets, and ores—and at the same time and operation reducing to a metallic state such unoxidizable metal as may be present therein, by the use of the apparatus and in the manner herein described, or any other apparatus or manner substantially the same, and which will produce the intended results.

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