I. M. PHELPS.
Roasting Ore.

No. 198,413. Patented Dec. 18, 1877.

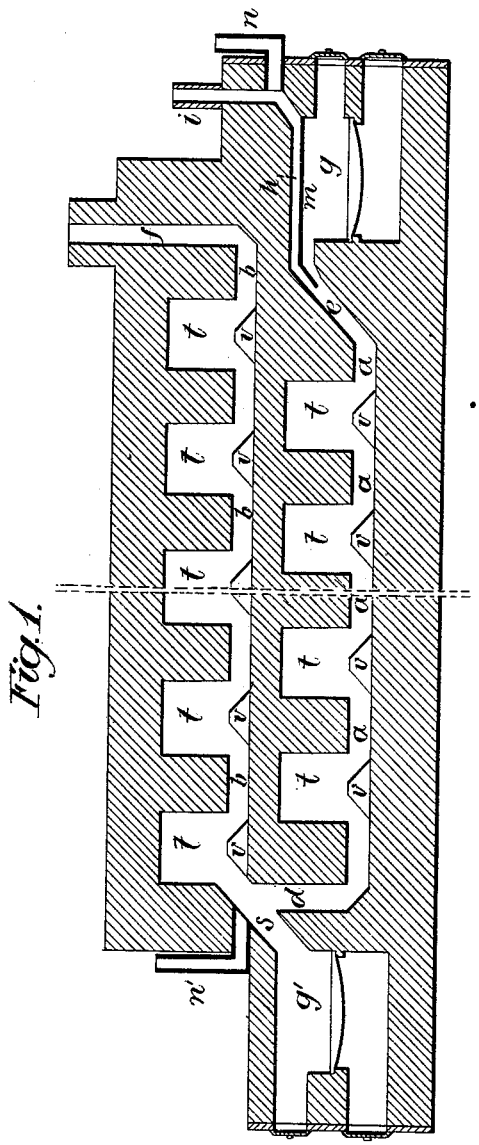

Fig. 1.

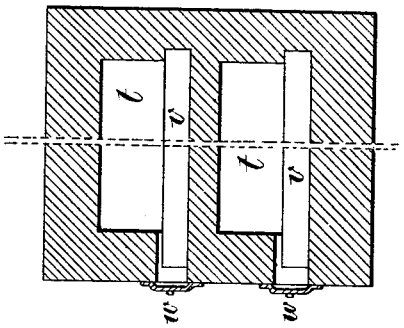

Fig. 2

Witnesses
Henry Howson Jr
Harry Smith

Inventor
Ira M. Phelps
by his Attorneys
Howson and Son

UNITED STATES PATENT OFFICE.

IRA M. PHELPS, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR OF A PART OF HIS RIGHT TO THEODORE L. CHASE AND H. J. FILLMAN, OF SAME PLACE, AND D. K. ALLEN, OF BOSTON, MASSACHUSETTS.

IMPROVEMENT IN ROASTING ORES.

Specification forming part of Letters Patent No. **198,413**, dated December 18, 1877; application filed November 2, 1877.

To all whom it may concern:

Be it known that I, IRA M. PHELPS, of Philadelphia, Pennsylvania, have invented a new and useful Improvement in Processes and Apparatus for Oxidizing and Desulphurizing Ores, of which the following is a specification:

The object of my invention is to effect the rapid and thorough oxidation and desulphuration of gold and silver bearing sulphurets—an object which I attain in the following manner, reference being had to the accompanying drawing, in which—

Figure 1 is a longitudinal vertical section of a furnace wherein my invention may be carried into effect, and Fig. 2 a transverse section of the same.

It should be understood in the outset that my invention is intended for the treatment of ores which have been previously reduced to a fine powder in a pulverizing-mill—such, for instance, as that for which Letters Patent No. 196,039 were granted to me on the 9th day of October, 1877.

In the furnace shown in the drawing are formed two main flues or passages, *a* and *b*, arranged one above the other, and communicating with each other at one end through the vertical flue *d*. The opposite end of the flue *a* communicates with the flue *e*, and the corresponding end of the flue *b* with a discharge-flue, *f*, the latter leading to a suitable chamber, wherein the metallic dust, as it passes from the furnace, is collected prior to amalgamation, as described in a separate application which I am about to make for a patent.

The flue *e* communicates with a fire-place, *g*, and with a passage, *h*, which intervenes between the body of the furnace and a partition, *m*, forming the roof of the fire-place, said passage *h* communicating with a feed-pipe, *i*, into which the powdered ore is fed from the pulverizing-mill, or from any other suitable receptacle.

A bent pipe, *n*, is arranged adjacent to the feed-pipe *i*, and when the furnace is in operation a blast of air from any suitable blowing apparatus is forced through this pipe and into the pipe *i*.

In the present instance an inclined flue, *s*, leads from the connecting-flue *d* to a second fire-place, *g'*, and an air-pipe, *n'*, is combined with this flue *s* in the same manner and for the same purpose as the pipe *n* is combined with the pipe *i*.

Each of the flues *a* and *b* is enlarged in size at intervals, so as to form chambers *t*, and in each flue, in line vertically with each of these chambers, is placed a bridge-bar, *v*, preferably of pyramidal form, as shown in Fig. 1. These bridge-bars are inserted into the furnace through openings provided with doors *w*, so that when they are worn they can be removed and replaced by new ones without difficulty.

The operation of the furnace is as follows: The powdered ore descending the pipe *i* is carried by the air from the pipe *n* through the passage *h* and into the flue *e*, where it comes in contact with the flame from the fire-place *g*. This flame so heats the ore that the sulphur in the same will be ignited, the air which is introduced with the ore furnishing the oxygen necessary for the combustion of the sulphur. As the ore passes through the flue *a* this combustion continues, the progress of the ore being retarded at intervals by the bridge-bars *v*, which, in combination with the chambers *t*, cause a series of reverberatory effects, so that the ore is thoroughly commingled with the air, and sufficient time given for the effective action of the air on the sulphur in the ore. At the flue *d* a fresh volume of flame and a fresh supply of air are introduced, and the same retarding and reverberatory effects which occurred in the flue *a* are repeated in the flue *b*, the ore finally escaping through the flue *f* into the dust-chamber.

Although I have shown and described a double furnace—that is, one in which two main flues, two fire-places, and two air-blasts are used—this arrangement is not absolutely necessary, as, in treating some classes of ore, a furnace having a greater number of flues, fire-places, &c., may be necessary, while other classes of ore may be successfully treated in a single furnace; and in cases where two or more main flues are used, they may be ar-

ranged side by side, instead of being arranged one above the other, as shown.

Various forms of retarding-chambers and bridge-bars may also be used; but the forms shown have been found to work well in practice, and are preferred.

I claim as my invention—

1. The combination, in an apparatus for desulphurizing ores, of a flue or passage having retarding-chambers *t* and deflecting bridge-bars *v*, with a fire-place and a blast-pipe for causing a jet of air to blow the powdered ore with the flame from the fire-place through said flue or passage, all substantially as specified.

2. The combination of the main flue or passage *a*, the flue *e*, fire-place *g*, passage *h*, feed-pipe *i*, and air-pipe *n*, as specified.

3. The combination of the removable bridge-bars *v* with the side wall of the furnace, having openings provided with doors *w*, as set forth.

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

IRA M. PHELPS.

Witnesses:
RICHARD L. GARDINER,
HARRY SMITH.