W. L. IMLAY.
Roasting Ores.

No. 197,855. Patented Dec. 4, 1877

Fig 3

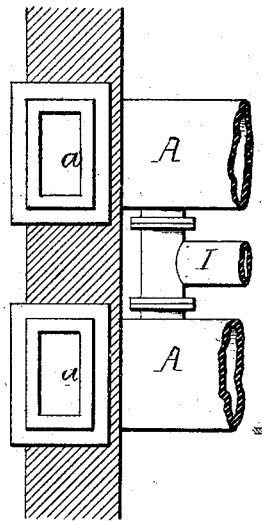



Fig 1

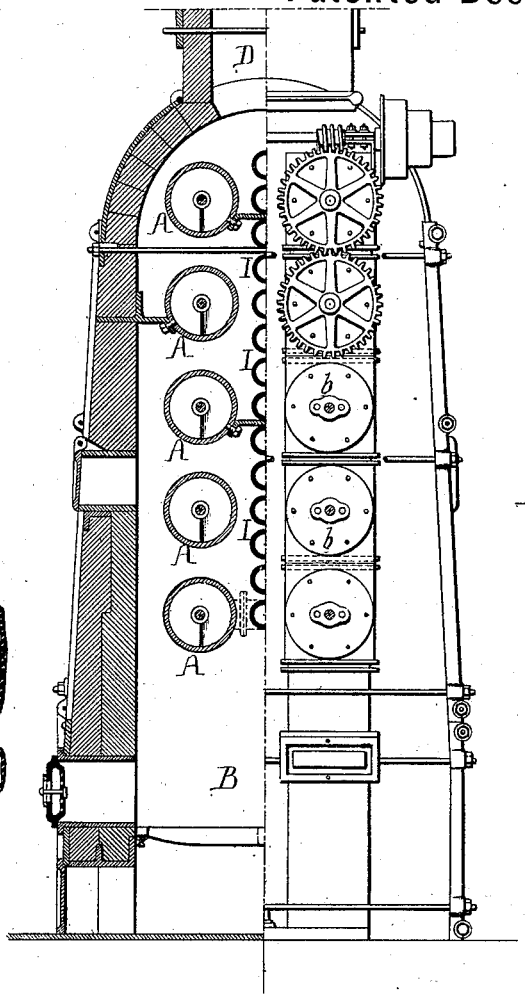
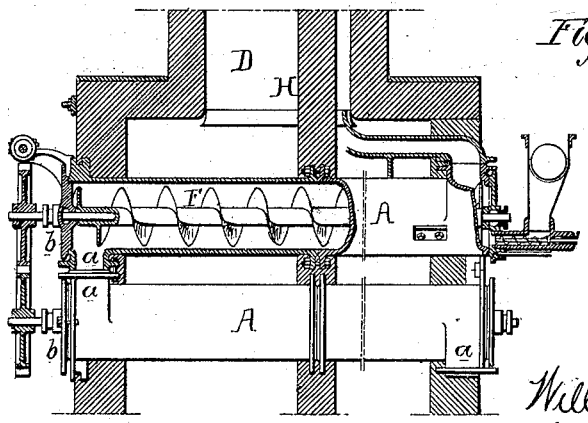



Fig 2.




Witnesses
Harry Howson Jr.
Harry Smith

Inventor
William L. Imlay
by his Attorneys,
Howson and Son

# UNITED STATES PATENT OFFICE.

WILLIAM L. IMLAY, OF CAMDEN, NEW JERSEY, ASSIGNOR OF ONE-HALF HIS RIGHT TO GEORGE STURGES, OF PHILADELPHIA, PENNSYLVANIA.

## IMPROVEMENT IN ROASTING ORES.

Specification forming part of Letters Patent No. **197,855**, dated December 4, 1877; application filed May 26, 1877.

*To all whom it may concern:*

Be it known that I, WILLIAM L. IMLAY, of Camden, New Jersey, have invented a new and useful Improvement in Apparatus for Oxidizing and Desulphurizing Ores, of which the following is a specification:

The object of my invention is to cheaply and readily construct an ore oxidizing or desulphurizing apparatus, in which the ore can be thoroughly treated before being allowed to escape.

This object I attain in the following manner, reference being had to the accompanying drawing, in which—

Figure 1 is an end view, partly in section, of my improved desulphurizing or oxidizing apparatus; Fig. 2, a transverse section of part of the same; and Fig. 3, a detached sectional plan view of part of the apparatus.

Within a suitable structure of fire-brick or other refractory material are arranged, in the manner described hereinafter, a number of sets of retorts, A, two sets, with five retorts in each set, being shown in the present instance; but the number of sets, as well as the number of retorts in a set, may be varied in practice to accord with the desired capacity of the apparatus. Less than five retorts in a set, however, is seldom desirable. Beneath the retorts is a fire-place, B, the products of combustion from which, after impinging against the retorts, escape from the chimney D.

The retorts A are arranged one above the other, the ore being fed into the uppermost and discharged from the lowest of the series, after traversing the entire length of each retort. This is effected by causing each retort to communicate at one end with the retort or hopper from which it receives its supply of ore, and at the opposite end with the retort or receptacle into which it delivers said ore, and by providing each of said retorts with an endless screw, F, which conveys the ore from the receiving to the discharge end. Thus, in Fig. 2, the upper retort A receives at its rear end the supply of ore, which is conveyed forward by the screw F to the front end, where it is discharged into the retort beneath, the screw in which is such as to convey the ore to the rear end, where it is discharged into the next retort below, this movement being continued throughout the entire series of retorts.

The degree of heat within the structure A is differential, being greatest at the surface of the fire and gradually decreasing toward the top, so that the lowermost retort of each set is hottest, the degree of heat in each succeeding retort above being less, whereby the ore which is introduced into the upper or coolest retort is subjected to a gradually-increasing degree of heat from the moment of its entrance to the moment of its exit.

Communication between the retorts is effected by flanged necks *a*, which are embedded in the walls of the furnace during the construction of the same, as shown in Fig. 2. This is an important feature of my invention, as it enables me to make a gas-tight joint between the retorts without that expensive fitting of the same which would otherwise be demanded. When the retorts are made in sections, I build within the furnace, in line with each row of joints, partition-walls H, Fig. 2, so as to inclose the joints for the same purpose.

The covers *b* of the retorts are outside of the walls of the structure, so that they can be readily removed when it is desired to gain access to the interior.

It is desirable in most cases, in order to facilitate the oxidizing of the ore, to pass volumes of heated air through the retorts in contact with the ore, in addition to the external heat to which said retorts are subjected.

In order to effect the thorough and rapid heating of these volumes of air, I place between every two sets of retorts a bent pipe, I, of any desired length, this pipe receiving its air at the top from any suitable blower, and discharging it at the bottom, near the discharge ends of the lowermost pair of retorts, (see Fig. 3,) the heated air thus introduced rising through the sets of retorts in a spiral course, owing to its confinement between the threads of the screw-conveyers, and finally passing off to the chimney from the uppermost retort of each set, at a point near the receiving end of the same.

By this means the volumes of heated air are

caused to pass through the retorts in a direction contrary to that in which the ore is conveyed, and are brought into direct contact with every part of the latter, thus insuring their effective action upon the same. Moreover, the air is introduced at the upper or coolest end of the furnace, and becomes hotter as it descends, being finally discharged into the retorts when it has reached its point of greatest heat.

An important feature of my invention is the gradual desulphurizing of the ore as it passes from the coolest to the hottest end of the apparatus, for by the time the ore arrives at the excessively-heated retorts the greater portion of the sulphur has been driven off; whereas, if ore containing a large quantity of said sulphur were delivered directly upon a plate heated to the point of redness, (as is frequently the case with the bottom retort in my apparatus,) it would destroy the iron of which the retort is composed.

I wish it to be understood that I do not desire to claim the passage of the ore through heated retorts by means of screw-conveyers, nor the subjection of the ore to the action of volumes of heated air during its passage, as both of these features are shown in the patent of J. H. Clark, No. 180,649, March 9, 1875; but

I claim as my invention—

1. The mode herein described of oxidizing or desulphurizing ores—that is to say, by causing them to traverse in one direction through a series of externally-heated retorts, from which the products of combustion are excluded, but through which a draft of previously-heated air is passed in a course contrary to that pursued by the ores, all substantially as set forth.

2. An oxidizing or desulphurizing apparatus in which the joints of the retorts, or the joints between adjacent retorts, or both, are embedded or inclosed on all sides in the walls of the structure, as and for the purpose set forth.

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

WILLIAM L. IMLAY.

Witnesses:

HERMANN MOESSNER,

HARRY SMITH.