

R. SPENCER.

Decomposing and Desulphurizing Ores.

No. 44,986.

Patented Nov. 8, 1864.

Fig. 1.

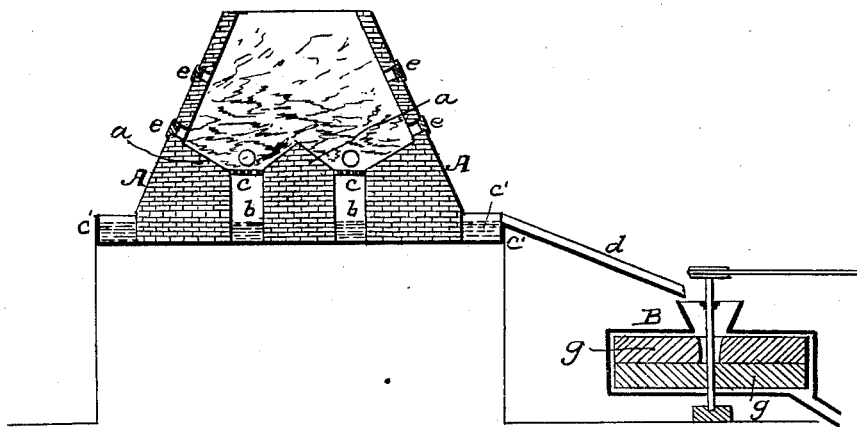
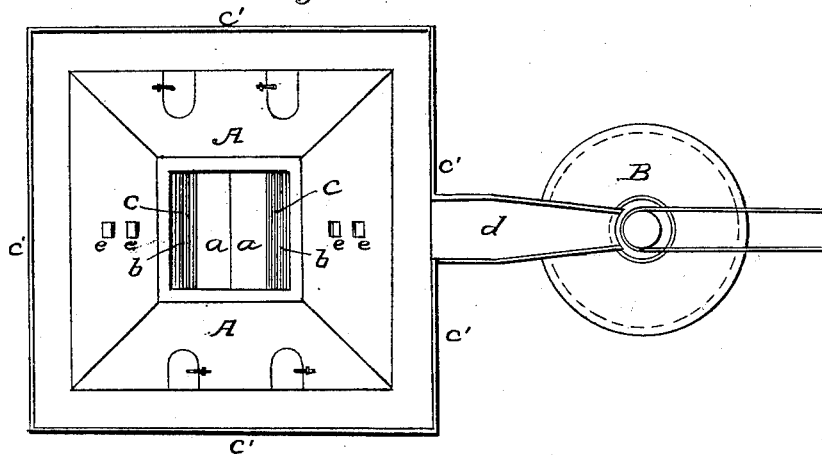


Fig. 2.



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UNITED STATES PATENT OFFICE.

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IMPROVED METHOD OF DECOMPOSING AND DESULPHURIZING ORES.

Specification forming part of Letters Patent No. 44,986, dated November 8, 1864.

To all whom it may concern:

Be it known that I, ROBERT SPENCER, of New York city, county and State of New York, have invented a new Mode of Treating Ores; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, making a part of this specification, in which—

Figure 1 is a vertical longitudinal section through an apparatus which may be used in my process of treating ores. Fig. 2 is a top view of the same.

Similar letters of reference indicate corresponding parts in the two figures.

This invention is intended to dispense with the cumbrous machinery which has hitherto been employed in the reduction of the ores containing precious metals, and to effect this part of the process of separating the metals from their matrix or gangue in a more simple and inexpensive manner.

The object of my invention is mainly to reduce ores to an impalpable powder, preparatory to separating the metals, by subjecting a mass of ore, as it is taken from the quarry, to the action of heat for a sufficient length of time to drive off the sulphur, and then, while in a highly heated state, suddenly cooling the mass and thus causing it to crack and crumble into atoms, as will be hereinafter described.

Another object of my invention is to partially decompose the matrix in the process of chilling and disintegrating it, and to render it sufficiently soft to greatly facilitate its further reduction by mechanical means, as will be hereinafter described.

The following is a description of my process of treating ores.

In the accompanying drawings I have represented a kiln or furnace, A, which will greatly facilitate the roasting process, as the ore which is put therein will be confined to the action of the heat by the four inclosing walls. This kiln A may be made of the rude stones found near the quarries, or it may be made of brick or of metal, whichever material is found most convenient.

The drawings represent the kiln in the form of the frustum of a pyramid, but any other shape may be adopted. Near the base of the kiln A is a ridged bottom, the inclined surfaces *a a* of which terminate into fire-chambers,

bb, into which the fuel for heating the mass of ore is placed. These chambers are furnished with removable sliding or hinged grates *cc*, for supporting the fuel, and also the superincumbent mass of ore, during the operation of heating it and driving off the sulphur, which latter may be allowed to escape into the open air, or its vapors may be collected by means of a hood placed over the top of the kiln A and condensed in a vessel arranged outside of the kiln. The bottom of this kiln A is surrounded by a wall, *c'*, of any desired height, which forms a basin, the capacity of which is much greater than that of the kiln. This basin is adapted for containing any liquid which it may be desired to employ to suddenly chill the ore, which latter is precipitated into it by loosening or removing the grates *cc*. From this basin or wall *c'* a trough, *d*, projects, into which the disintegrated ore is shoveled, and this trough conducts the ore directly into a mill, B, where it is ground to a fine powder, after which the processes of amalgamation and separation may be performed in any of the well-known modes practiced in the art.

In conducting the operation of roasting in the kiln it is not necessary to heat the ore to such a degree as will run the minerals into a slag, and if it is found desirable to regulate the degree of heat in the kiln air-vents *ee*, or dampers, may be applied as shown, or in any other suitable manner. The object of heating the ore is twofold—the heat deprives it of the sulphur, which may be more or less mixed with it, and which would partially, if not totally, destroy the subsequent process of separating the gold by amalgamation. The heating of the ore greatly expands it, and when suddenly subjected to a liquid bath causes it to crumble into atoms. This bath may be simply water, but I prefer to use an acidulated liquid, and for this purpose diluted sulphuric or other acid may be used, which will readily act upon the mineral and decompose or soften it sufficiently to render it practicable to grind the ore when thus reduced to an impalpable powder between common burr-stones *g g*, as represented in Figs. 1 and 2.

It is intended by my invention to reduce large masses of ore, particularly auriferous rock, to such a fine condition that it can be ground to powder without the aid of stamping machinery, for it is found that by sud-

denly cooling a large or small mass of quartz rock, while in a highly heated state, as I have above described, it will crack and crumble by its own gravity, and every particle or atom is loosened from the other.

In carrying out my invention it may be found desirable to use movable tanks, or basins for chilling the ore as it falls from the bottom of the kiln A, so that when one tank is full another can be moved into its place.

The furnace or kiln may be constructed with a view to allowing only a small portion of the heated quartz ore to escape at a time, and to keep up the operation of heating the ore and cooling it for a great length of time. Side openings may be made in the kiln for this purpose, and thus the necessity for putting out the fires obviated.

If desirable, a number of mills for grinding the broken ore may be connected with the basin or basins under the kiln and kept supplied, as I have described for the single mill B.

Where it would not be convenient to construct kilns for roasting large masses of ore, the ore may be piled up with alternate layers of wood and ore, and when the latter has become highly heated it may be suddenly cooled by injecting water or other liquid on it in any convenient manner. The former method of heating the ore will be found better adapted to the end in view—viz., reducing ore so as to render it practical to pulverize it between two grinding-surfaces or mill-stones.

The ore which has been thus treated is now conducted directly from the mills into vessels

containing a small quantity of mercury, and when these vessels are nearly filled with this powdered ore they are tightly closed and subjected to a high degree of heat, which vaporizes the mercury and coats the fine particles of gold with an amalgam. The amalgamating-vessels are now emptied and their contents subjected to a washing process in order to separate the metals from the mineral matrix.

It will be seen from my description of the roasting process that I drop the highly-heated ore directly from the kiln into a basin of liquid. This will crush or disintegrate the ore and partially soften it; but in order to still further soften the ore I introduce an acid into the basin, which will partially decompose the mineral matrix and enable me to readily grind the same between burr-stones. This grinding process prepares the ore for the amalgamating process and enables me to conduct this latter process very effectually.

I claim—

1. The within-described process of treating ores, consisting in heating, quenching, grinding, and amalgamating, substantially as described.

2. Precipitating the heated ore directly from the kiln into a bath of acidulated liquid previously to the grinding operation, substantially as described.

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