

UNITED STATES PATENT OFFICE.

HOMER HOLLAND, OF WESTFIELD, MASSACHUSETTS.

IMPROVEMENT IN PROCESSES FOR TREATING AURIFEROUS AND ARGENTIFEROUS SULPHURETS.

Specification forming part of Letters Patent No. 12,948, dated May 29, 1855.

To all whom it may concern:

Be it known that I, HOMER HOLLAND, of Westfield, in the county of Hampden, in the State of Massachusetts, have invented a new and useful process for the production and extraction of gold and silver from the several and various natural metalliferous ores, pyrites, and sulphurets, in which either or both may occur, of which the following is a specification.

The chemical reagent used in my process for resolving the various ores, pyrites, and sulphurets is the nitrate of soda—an article, I believe, not hitherto employed in any process of dry assaying, and one of which I have found no mention in any work or treatise on metallurgy.

The nitrate of potash, which in its general chemical character somewhat resembles the nitrate of soda, has heretofore been used in a single crystal for blow-pipe testing, and to scarify and oxidize in remelting gold and silver in the crucible; but it is utterly impracticable in any hitherto recognized process for separating gold and silver from the sulphurets on a larger scale, since it readily ignites, and its combustion is so violent and explosive as to eject the matter from the crucible, while the heat that it generates is so intense as to volatilize a portion of the metals subjected to its influence; and, indeed, the use of the nitrate of potash, even in dry crucible assays, is now, according to the best authorities, obsolete. But on the other hand I have discovered, and through my process am able to make use of, certain properties in the nitrate of soda which render it highly useful in the disintegration and resolution of metalliferous sulphurets, and which show that it is very different in its action from the nitrate of potash. Unlike the last-mentioned salt, the nitrate of soda, when ignited, burns slowly and mildly, and more especially so with the metalliferous sulphurets, while there is also neither violent action to explode and scatter the mixture, nor heat generated sufficiently intense to volatilize the metals. This hitherto unrecognized difference in the action of the nitrate of potash and the nitrate of soda on metalliferous sulphurets is the property which I make use of in my invention, and which I believe to be clearly distinguishable from all processes hitherto adopted, for although it consists in part of so well known a material as the nitrate of soda, yet this ma-

terial is so combined with and proportioned to the ores acted upon by the method pursued in my process as to give to the practical metallurgist advantages essentially different from those he can obtain by any other method practiced for the dry assaying of the precious metals.

The manner in which my process is conducted is as follows: A quantity of the nitrate of soda as free as possible from any admixture with other salts is provided, together with a quantity of any metalliferous sulphuret, both being separately or jointly finely pulverized by means of Bogardus's eccentric mill or any other suitable mechanical contrivance, and then thoroughly mixed together in a dry state in the proportion of two hundred and ninety-one parts of the nitrate of soda to every hundred parts of the sulphur previously determined and known to exist in the ore to be operated upon. About one-third part of this mixture must then be deflagrated in a large cast-iron basin having a concave sole or hearth, like that of a Clausthal cupel, heated from beneath to moderate redness, and at separate intervals of about half an hour each the remaining two-thirds are to be added while the mass in the basin is being thoroughly stirred and intermixed. Then the heat, moderate at first, is gradually to be increased until the sulphurous acid vapors have entirely passed off, and full oxidation and redness of the ores are obtained. When cooled down the silver or gold, or both, previously contained in the ore will be found reduced to fine grains or particles, which may be readily separated by means of a concentrator, or amalgamated by mercury from the resolved and decomposed mass in the same manner as from any other auriferous and argentiferous sands or oxides. In some instances, however, and more especially in treating the bisulphurets, it will be found expedient to subject the pulverized ore to a preliminary roasting, in order to expel in an acid form some portion of the sulphur, by which means a certain amount of the nitrate of soda will be saved in the operation; and consequently I do not and cannot in any way restrict myself to any precise ratio of the proportions of the several ores and nitrate of soda, since a greater or less proportion of the salt will, under different circumstances, to a certain extent, effect

the decomposition required. An excess can in no instance whatever either injure the process or vitiate the result, nor can likewise the degree of transmitted heat, provided, always, it be moderate at first and increased gradually. Neither is it absolutely necessary that in all cases the nitrate of soda should be mixed before roasting with the ore, since in some instances it may be found advantageous to gradually stir it in while the ore is being roasted.

When copper pyrites are decomposed and resolved by my process, it will be found advantageous to lixivate the cooled mass with water, so as to dissolve the sulphate of copper, which otherwise would attack the mercury used in amalgamating the gold or silver.

Having now described and particularly set forth the nature of my invention and the manner in which the same is or may be used or carried into effect, I would observe, in conclu-

sion, that I do not confine myself to the precise details or arrangements which I have had occasion to describe or refer to, as many variations may be made therefrom without deviating from the principles or main features of my invention; but

What I claim as my invention in the process of treating sulphureted ores for obtaining gold and silver is—

The substitution of nitrate of soda as an improved agent over common niter for oxidizing the sulphur, for reasons given in the specification setting forth the difference.

In witness whereof I, the said HOMER HOLLAND, have hereunto set my hand and seal this 7th day of May, 1855.

HOMER HOLLAND. [L. S.]

Witnesses:

STAFFORD REEVES,
J. WINCHESTER.