

UNITED STATES PATENT OFFICE.

ROBERT McKNIGHT, OF PITTSBURG, PENNSYLVANIA.

ART OF TREATING ORES.

No. 912,485.

Specification of Letters Patent.

Patented Feb. 16, 1908.

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To all whom it may concern:

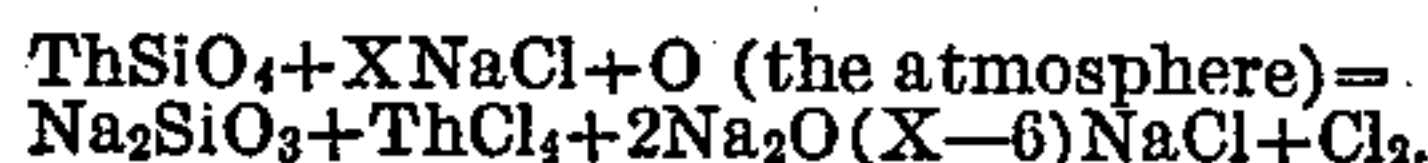
Be it known that I, ROBERT McKNIGHT, a citizen of the United States, residing at the city of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented new and useful Improvements in the Art of Treating Ores, of which the following is a specification.

My invention has reference to a treatment of ores containing thorium, in which I effect the separation and recovery of the thorium by mixing the ore with an alkaline chlorid, preferably much in excess of the amount required to furnish chlorid for the chloridizable constituents of the ore, and heating the resulting mixture until the alkaline chlorid and the thorium in the ore have reacted and volatile and soluble chlorids or double chlorids of the alkaline metal used and the thorium in the ore have been formed.

I will describe now in detail the manner in which I practice my invented art. Taking as a specific case an ore containing thorite and using sodium chlorid as the alkaline chlorid, I treat it as follows: The ore is preferably reduced to a fine consistency, most advantageously, to about thirty (30) mesh. It is then mixed with about double the amount of ordinary commercial sodium chlorid and fed into the heating furnace, which is preferably of the revolving cylindrical type, feeding, agitating and discharging the ore automatically; or the ore and salt may be fed separately into the furnace and allowed to mix within it. As to the amount of salt to be used, the more used the quicker and better are the results obtained. In practice, however, it is found that the advantages derived from the use of a large excess of the salt, such as would be expected from the law of mass action, become after a certain point counterbalanced by the disadvantage of having to handle too large a bulk of material; and hence the optimum maximum amount of salt to be used is best determined experimentally. The temperature need not exceed 700° C., which can be obtained through any available fuel. Where electricity is obtainable, a good furnace in which to carry out my invention is that described in my application for Letters Patent Ser. No. 332,403, filed August 28, 1906. By this treatment the thorium in the ore is converted into a volatile and soluble chlorid or double chlorid of the sodium and thorium, what is volatilized is condensed in a suit-

able condenser, such as is described in U. S. Patent No. 737,003, August 25, 1903, granted to me, and entitled "Apparatus for condensing fumes"; and the residue, preferably while hot from the furnace, is allowed to fall into water, and thus by the sudden change of the temperature quickly disintegrated and crumbled and the portion of the thorium which has not volatilized is obtained in solution, from which its oxid or the metal itself can be obtained in any suitable manner. In some cases it is found advantageous to let the ore which has passed through the furnace pass also through a suitable pulverizer, which is preferably done after the hot ore has been suddenly cooled by the water and thus disintegrated and made easy to crush. In this way the complete solution of the portion which has not volatilized is insured to be effected easily and well. I prefer also to use a limited amount of water, which I keep in circulation by means of a suitable pump, and thus I obtain a supersaturated solution of the thorium, which on standing is precipitated, leaving the more soluble alkaline chlorid in solution, from which it can be recovered by spontaneous evaporation or otherwise and used in the treatment of new ore.

Representing by X the variable excess of alkaline chlorid used in the specific case of the thorite ore described above, we may represent symbolically the principal reaction taking place as follows:



Having now described my invention what I claim and desire to secure by Letters Patent is:

1. The art of treating thorium ores which consists in treating the ore with an alkaline chlorid and heating the resulting mixture until volatile and soluble chlorids of the thorium have been formed, condensing what is volatilized and treating the residue with an aqueous liquid, substantially as described.

2. The art of treating thorium ores which consists in treating the ore with a large excess of an alkaline chlorid and heating the resulting mixture until volatile and soluble chlorids of the thorium have been formed, condensing what is volatilized and treating the residue with an aqueous liquid, substantially as described.

3. The art of treating thorium ores which consists in treating the ore with an alkaline chlorid and heating the resulting mixture

until volatile and soluble chlorids of the thorium have been formed, condensing what is volatilized and passing the residual ore and the thus resulting salts while hot from
5 the furnace into a solvent liquid, substantially as described.

4. The art of treating thorium ores which consists in treating the ore with an alkaline chlorid and heating the resulting mixture
10 until volatile and soluble chlorids of the thorium have been formed, condensing what is volatilized and passing the residue while hot from the furnace into water and therefrom through a suitable pulverizer, through
15 which circulates a limited amount of the solvent for the thus resulting metallic compounds, substantially as described.

5. The art of treating thorium ores which consists in treating the ore with an alkaline

chlorid and heating the resulting mixture until volatile and soluble chlorids of the thorium have been formed, condensing what is volatilized, passing the residue while hot from the furnace into water and thereafter through a suitable pulverizer, using the same
25 solution over and over again until it becomes supersaturated and deposits the less soluble thorium compounds, leaving the alkaline chlorid in solution, which can be used in the treatment of new ore, substan-
30 tially as described.

In witness whereof I affix my signature in presence of two witnesses.

ROBERT McKNIGHT.

Witnesses:

W. C. SEXTON.

FRANK McKNIGHT.