

UNITED STATES PATENT OFFICE.

ALLERTON S. CUSHMAN, OF CONNECTICUT.

METHOD OF EXTRACTING POTASH FROM FELDSPATHIC OR OTHER POTASH-BEARING ROCK.

No. 851,922.

Specification of Letters Patent.

Patented April 30, 1907.

Application filed January 14, 1907. Serial No. 352,187.

To all whom it may concern:

Be it known that I, ALLERTON S. CUSHMAN, a citizen of the United States, and an officer of the Department of Agriculture, and a legal resident of the State of Connecticut, whose post-office address is Department of Agriculture, Washington, District of Columbia, have invented new and useful Improvements in Methods for Extracting Potash from Feldspathic or other Potash-Bearing Rock, of which the following is a specification.

This application is made under the act of March 3, 1883, Chapter 143 (22 Stat., 625), and the invention herein described and claimed may be used by the Government of the United States or any of its officers or employees in the prosecution of work for the United States, or by any person in the United States, without the payment of any royalty thereon.

This invention has relation to the extraction of potash soda and other soluble bases from ground rocks. Feldspathic or other potash bearing rock is ground to fine powder, slined with water and placed inside of a wooden cup, box, or other suitable wooden container, which is then set inside of another larger vessel, which may be made of any suitable material. Water is now placed in the outer vessel and electrodes inserted, so that the inner or slime chamber becomes connected with the positive pole, and the outer chamber with the negative pole. A current of electricity from a dynamo is then turned on. When this is done the potash, soda and other soluble bases are partially set free from the combinations with alumina and silica in which they exist in the feldspathic rocks.

Under the influence of the passage of the electric current (electrolysis) the soluble bases pass through the wooden partition and the water in the outer vessel becomes alkaline, owing to the accumulation of potassium and sodium hydroxid. The electrical resistance of the cells arranged in this way is so high that only a small fraction of an ampere passes through under a potential of 110 volts. After a certain percentage of the alkali has been extracted in this manner, the action slows down, and it has been found necessary to devise methods to accelerate the action.

I have discovered two methods for accelerating the decomposition of the rock slime and hastening the extraction of the potash:

(a) By a suitable grinding or churning arrangement the slime in the inner chamber can be kept in a continual agitation, which causes the necessary reactions to go on more rapidly. (b) If a small quantity of hydrofluoric acid is added to the slime a very great acceleration in the rate of decomposition and extraction is obtained, and it is possible in a reasonably short time to make a complete extraction of all the potash contained in a feldspathic rock.

If instead of caustic potash it is desired to make various salts of potash such as are in ordinary use for fertilizers and other purposes, *i. e.*, nitrate, sulfate, chlorid, and phosphate, the corresponding acids, *i. e.*, nitric, sulfuric, hydrochloric, and phosphoric, are fed in a dilute form into the outer or so called cathode chamber, fast enough to neutralize the caustic alkali as it forms. By varying the amount of acid added the resistance of the cell can be controlled and the decomposition of the rock carried on under the best and most economic conditions.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is—

1. A method of extracting potash soda and other alkaline bases, from rocks and minerals containing the alkaline metals, which consists in electrolyzing the material in the anode chamber of a diaphragm cell in an aqueous electrolyte containing hydrofluoric acid.

2. A method for the preparation of the various salts of potash and other bases as set forth, which consists in electrolyzing the fine ground material in an aqueous electrolyte containing hydrofluoric acid, which is placed in a cell in which the anode and cathode chambers are separated by a diaphragm.

3. A method of extracting potash soda and other alkaline bases from rocks and minerals containing the alkaline metals, which consists in electrolyzing the materials in the anode chamber of a diaphragm cell in an aqueous electrolyte containing hydrofluoric acid and neutralizing the alkali so obtained in the cathode chamber by an acid to form a salt.

In testimony whereof I affix my signature in the presence of two subscribed witnesses:

A. S. CUSHMAN.

Witnesses:

OTIS H. GATES,
H. J. FEGAN.