Patented Dec. 13, 1927. 1,652,646

UNITED STATES PATENT OFFICE.

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PROCESS OF FORMING SODIUM TUNGSTATE.

No Drawing. Application filed March 30, 1922. Serial No. 548,144.

Our invention relates to improvements in treating ores, and the same has for its object more particularly to provide a simple, efficient and inexpensive process of preparing or treating the ores in order to obtain therefrom the element or substance to be recovered.

Further, said invention has for its object to provide a process by means of which the ore may be prepared in order to render soluble the element or substance to be recovered.

Further, said invention has for its object to provide a simple and efficient process in which the heat necessary to effect the required chemical changes results from the interaction of certain of the ingredients present in the mass.

Further, said invention has for its object to provide a simple and efficient process in which the heat necessary to effect the required chemical changes results from the interaction of certain of the ingredients present in the mass, the components and conditions of the mixture being so balanced that the chemical reactions propagate themselves without artificial aid after having been once started.

Further, said invention has for its object to provide a process in which the oxygen, necessary to effect the combustion of the contained fuel, is produced by the interaction of the ingredients of the mass.

Further, said invention has for its object to provide a process in which the products of combustion will form or produce certain compounds whose action will serve to disintegrate the ore and produce soluble compounds of certain of the constituents of the ore which is under treatment.

Further, said invention has for its object to provide a process in which the products of combustion react upon the ore causing the desired disintegration under the influence of the heat produced by the combustion itself, and resulting in the formation of soluble compounds containing the valuable constituents to be recovered.

Further, said invention has for its object to provide a process of treating tungsten ores by means of which the tungsten content of the ore is converted into soluble tungstates.

Further objects will in part be obvious and in part be pointed out hereinafter.

To the attainment of the aforesaid objects and ends, our invention consists in the successive steps, constituting our process, hereinafter described and then pointed out in the claims.

We have found that in the decomposition of tungsten ores with an alkali, such as sodium carbonate, the tungsten bearing minerals are decomposed and a soluble tungtate of the alkali metal produced, and that by mixing the ore with sodium nitrate and an appropriate amount of carbonaceous material, such as charcoal or bituminous coal, a mixture is produced which, when ignited, is capable of propagating its own heat and combustion by the interaction of the oxygen of the sodium nitrate with the carbonaceous material.

Further, we have found that the combustion of the carbon by the oxygen of the sodium nitrate will produce sodium carbonate, which in turn, reacts with the tungsten ore and forms the soluble tungstate, which is the product to be recovered.

In carrying out our process we form a mixture composed, preferably, of

	Parts.
Tungsten bearing ore	500
Sodium nitrate	330
Charcoal	75
Sodium silicate solution	38
Water	13

The tungsten bearing ore as well as the charcoal are first reduced to a finely comminuted state or powder, either together or separately. If ground separately, they are thoroughly mixed in any appropriate manner. To this mixture the water and sodium silicate are added, and the whole then mixed until all the ingredients are thoroughly incorporated. The sodium nitrate is then added to this mixture either in a ground condition, and evenly incorporated with it, or the same is incorporated by grinding, which powders it at the same time. The sequence of operations in which the water and sodium silicate are added to the mixture of ore and charcoal and thoroughly incorporated with it before the sodium nitrate is added is an important one, as otherwise the action of sodium nitrate upon the charcoal, if the materials were in a dry state, might cause untoward conditions or results. The mixture is then placed upon a suitable heat resisting floor or support, or the same may be placed into a shallow, open receptacle or container.

The mass is then ignited whereupon the combustion will propagate itself completely throughout the mass. Upon the completion of the operation, the resulting soluble tungstate may be separated by lixiviation from the residue in usual manner.

By means of our process we have been enabled to recover as high as 98.97% of the tungsten present in the ore treated.

In connection with our process, it is to be noted that it does not require the use of a furnace or analogous apparatus as the operation may be carried out upon a floor or any flat support or in any suitable container, and that it is unnecessary for the propagation and completion of the combustion and chemical reactions involved to supply air thereto, either at atmospheric or higher pressure, as all the oxygen required for the combustion of the fuel is supplied internally from the ingredients used, and in the proper proportion as the combustion progresses.

Further, it is to be noted that while we specify the use of a small quantity of water in connection with the sodium silicate, in order to moisten the mass, the use of such water may be omitted, but we prefer to use the same as it tends to cause a more perfect or intimate mixture of the components of the mass, and produces a somewhat greater yield of the soluble tungsten compounds, and serves further to avoid any untoward results or conditions.

Having thus described our said invention what we claim and desire to secure by Letters Patent is:

1. The process of treating ore containing a valuable amphoteric metal which consists in finely dividing the ore, mixing the same with a comminuted carbonaceous material and a salt of an alkali metal serving as an oxidizing agent, and adapted to react on the ore to form a readily soluble compound with the valuable metal thereof, and igniting the mixture whereby to cause the reaction to propagate autogenously throughout the mass and form said soluble compound, substantially as specified.

2. The process of treating tungsten bearing ore which consists in finely dividing the ore, mixing the same with a comminuted carbonaceous material and a nitrate of an alkali metal serving as an oxidizing agent and adapted to react on the ore to form a soluble compound of the alkali metal and tungsten, and igniting the mixture whereby to cause the reaction to propagate autogenously throughout the mass and form said soluble compound, substantially as specified.

3. The process of treating tungsten bearing ore which consists in finely dividing the ore, mixing the same with a comminuted carbonaceous material and an oxidizing agent having a metallic base capable of forming with the tungsten of the ore a soluble tungstate, and igniting the mixture whereby to cause the reaction to propagate autogenously throughout the mass and form said soluble tungstate, substantially as specified.

4. The process of treating ore containing a valuable amphoteric metal which consists in finely dividing the ore, mixing the same with a comminuted carbonaceous material, an oxidizing agent having a metallic base capable of forming a readily soluble compound with the valuable metal of the ore, and a binder, and igniting the mixture whereby to cause the reaction to propagate autogenously throughout the mass and form said soluble compound, substantially as specified.

5. The process of treating tungsten bearing ore which consists in finely dividing the ore, mixing the same with sodium nitrate and charcoal, igniting the mixture and causing the reaction to propagate throughout the mass and form a soluble compound carrying the tungsten of the ore treated, substantially as specified.

6. The process of treating tungsten bearing ore which consists in finely dividing the ore, mixing the same with sodium nitrate, charcoal, and a binder, igniting the mixture and causing the reaction to propagate throughout the mass and form a soluble compound carrying the tungsten of the ore treated, substantially as specified.

7. The process of treating tungsten bearing ore which consists in finely dividing the ore, mixing the same with sodium nitrate, charcoal and sodium silicate, igniting the mixture and causing the reaction to propagate throughout the mass and form a soluble compound carrying the tungsten of the ore treated, substantially as specified.

8. The process of treating tungsten bearing ore which consists in finely dividing the ore, mixing the same with sodium nitrate, pulverized charcoal and sodium silicate in solution, igniting the mixture and causing the reaction to propagate throughout the mass and form a soluble compound carrying the tungsten of the ore treated, substantially as specified.

9. The process of treating tungsten bearing ore which consists in taking about 500 parts of tungsten bearing ore, finely dividing the ore, mixing the same with sodium nitrate about 330 parts, pulverized charcoal about 75 parts, and sodium silicate solution, igniting the mixture and causing the reaction to propagate throughout the mass and form a soluble compound carrying the tungsten of the ore treated, substantially as specified.

Signed at the city of New York, in the county and State of New York, this 20th day of March, one thousand nine hundred and twenty-two.

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