

UNITED STATES PATENT OFFICE.

ERNST ENKE, OF KATTOWITZ, GERMANY.

PROCESS OF SULFATIZING ORES, &c.

No. 826,925.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, ERNST ENKE, doctor of philosophy, chemist, a subject of the German Emperor, and a resident of Kattowitz, Upper Silesia, Germany, have invented certain new and useful Improvements in Processes for the Sulfatization of Ores and Their By-Products, of which the following is a specification.

It has already been proposed to treat waste of metallic zinc and zinc ores with sodium bisulfate by roasting. One has, however, not discovered how this process can yield a marketable product and how it can be made profitable. It has been overlooked that it is necessary to roast with bisulfate at such a degree of temperature that the ferrous sulfate which is formed is decomposed again. Thus much sulfuric acid has been lost, as all zinc ores, and particularly their by-products, are more or less rich in iron, and consequently such method has hitherto been practically valueless, for which reason it has not been employed.

It has further been proposed to add to other metals mixtures of sulfatic ores of zinc and lead. With this method the ores have been heated up to that degree of temperature at which begins the decomposition of the ferrous sulfate which is formed; but the roasting is done in the open air or by using the oxygen contained in the air for obtaining the decomposition into ferric oxid and sulfurous acid, which is then submitted to further treatment with a view of obtaining sulfuric acid. This process suffers from the same disadvantage as the first-mentioned method, because all the sulfuric acid in combination with the iron is lost and it cannot be recuperated or its recuperation would be unpractical, for the reason that it is too much diluted with air and that it exists in relatively small quantities. Therefore this process is also not fit for practical exploitation.

A third process which is known suffers from the same disadvantage, and this process consists in treating copper ores with ferrous sulfate with addition of pyrites to replace the sulfuric acid lost in the open roasting.

All known methods suffer, apart from

other inconveniences, from the disadvantage that large quantities of sulfuric acid are lost in consequence of the open roasting.

The improved process which forms the object of this present invention allows the really economical extraction of the metals from ores, their by-products, waste products, or residues.

The improved process is as follows: The ores, their by-products, and the like are mixed with such quantities of acid alkali sulfates or ferrous sulfate, or mixtures of both, that the alkalies which at the fusion form sulfates receive the required quantity of sulfuric acid from the added compositions of sulfuric acid. In preference sodium bisulfate is mixed with the ferrous sulfate. It is essential that the air be excluded during the melting and that the temperature be raised to such a degree that the ferrous sulfate which is formed at the beginning is separated into oxid of the iron and sulfuric acid, so that the latter can combine as soon as it is formed with any alkali present in the charge and adapted to form a sulfate, so that this sulfuric acid is not lost and a considerable saving in bisulfate to be added is obtained. The temperature at which the other metallic sulfates decompose is, however, not reached, so that upon lixiviation a solution is obtained which is free from iron and contains as little metallic sulfate as possible. Ferrous sulfate is employed particularly for the purpose of enriching the charge to be lixiviated so much with iron that the lixiviated residue forms a marketable product.

This process differs from the known methods by excluding the air during the melting.

What I claim as my invention, and desire to secure by Letters Patent, is—

The process of sulfatizing ores or their by-products which consists in adding sodium bisulfate and ferrous sulfate to the ore, and heating the mixture with the exclusion of air to a temperature sufficient to decompose only the ferrous sulfate.

In witness whereof I have hereunto set my hand in the presence of two witnesses.

ERNST ENKE.

Witnesses:

E. A. MAN,
A. W. MAN.