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UNITED STATES PATENT OFFICE.

HANS A. FRASCH, OF NEW YORK, N. Y.

PROCESS OF EXTRACTING NICKEL FROM NICKEL-BEARING SUBSTANCES.

SPECIFICATION forming part of Letters Patent No. 791,090, dated May 30, 1905.

Application filed January 12, 1905. Serial No. 240,830.

To all whom it may concern:

Be it known that I, HANS A. FRASCH, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented a certain new and useful Improvement in Processes of Extracting Nickel from Nickel-Bearing Substances, of which the following is a full, clear, and exact description.

This invention relates to the recovery or extraction of nickel from nickel-bearing substances, and more particularly from what is known as "copper-nickel matte."

If copper-nickel matte, and particularly matte which has been concentrated by the Bessemer process, be subjected to the action of acids, such as sulfuric acid or hydrochloric acid, the nickel sulfid in the matte is readily dissolved, as is well known; but the nickel which is not combined with sulfur dissolves very slowly, if at all, and it can be brought into solution only by long-continued treatment with acids or by the addition of an oxidizing agent, in which last-mentioned case the copper also goes into solution and involves the labor and expense of subsequently separating the nickel and copper. This complexity of the operation is particularly apparent if the matte has been subjected to the Bessemer process of concentration, during which process more or less of the sulfur originally contained in the matte has been removed. In such Bessemerized matte a large proportion of the nickel contained therein does not exist in the form of sulfid and does not respond to the ordinary treatment with acid.

The object of this invention is to extract this insoluble or sparingly-soluble nickel in a useful and economical manner; and to this end the invention consists in finely dividing or pulverizing the substance containing the nickel, adding to it a solvent acid and sulfur, and under application of heat bringing the nickel into solution.

This process may be carried out either by first dissolving the soluble nickel in the usual way and then treating the matte containing the insoluble or sparingly-soluble nickel with sulfur and acid or by proceeding at once with the material containing both the soluble and the sparingly-soluble nickel, mixing it with sulfur and subjecting it to the action of a solvent acid and heat, or the nickel-bearing substance may be mixed with the acid and the sulfur added gradually as the process advances. I prefer to pulverize the matte and mix with it powdered sulfur in chemically-equivalent proportions to the insoluble nickel contained therein. The mixture of matte and sulfur is placed in a suitable vessel and subjected to the action of a suitable acid, preferably sulfuric acid or hydrochloric acid of any desired concentration, heat being applied until evolution of hydrogen sulfid ceases. I prefer to use sulfuric acid of from twenty-five to forty per cent. of strength. The sulfur may be added to the matte before the acid is added, or it may be introduced after the addition of the acid. The solution of nickel sulfate or chlorid, as the case may be, obtained by the reaction is removed from the remaining copper sulfid or other insoluble residue and utilized for any desired purpose.

Copper-nickel matte, nickel matte, and other substances or alloys containing nickel may be treated in accordance with this invention.

While flowers of sulfur are specified, other forms of sulfur may be used.

What I claim is—

1. The method of extracting nickel from substances containing same, consisting in subjecting the substance to the action of a solvent acid and sulfur.

2. The process of extracting nickel from matte containing same, consisting in pulverizing the matte and exposing it to the action of a solvent acid and free sulfur under application of heat.

3. The process of extracting nickel from copper-nickel matte, consisting in pulverizing the matte, adding to it sulfuric acid and flowers of sulfur, and subjecting the mixture to the action of heat.

In testimony whereof I have hereunto set my hand this 12th day of January, A. D. 1905.

HANS A. FRASCH.

Witnesses:
WM. H. FINCKEL,
ADA C. BRIGGS.