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ROASTING OF ZINC SULPHIDE ORES PREPARATORY TO LEACHING.

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To all whom it may concern:

Be it known that I, HERBERT WILLIAM GEPP, of Collins House, 360 Collins Street, Melbourne, in the State of Victoria, Commonwealth of Australia, have invented certain new and useful Improvements in the Roasting of Zinc Sulphide Ores Preparatory to Leaching; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to certain improvements in the roasting of sulphide ores preparatory to leaching and refers more especially to the roasting of zinc blende preparatory to leaching with sulphuric acid or spent electrolyte for the formation of zinc sulphate solution prior to electrolysis for the deposition of metallic zinc or spelter.

The invention is applicable to any process which involves the preparation of solutions of zinc sulphate such as the manufacture of "lithopone" and such like processes.

This invention relates to the treatment of concentrates, slimes, tailings and other metallurgical products as well as to crude ores and it will be understood that in this specification the term "ores" will include metalliferous products as well as the crude material.

The methods which have become standard for the roasting of zinc sulphide ores for the distillation process have been found to be more or less satisfactory when the roasted ore is to be leached with sulphuric acid.

In the roasting of ores preparatory to distillation it is sought to eliminate the sulphur whether present as sulphide or sulphate.

On the other hand when the ores are to be leached with sulphuric acid the presence of sulphates is an advantage, as it reduces the amount of sulphuric acid from an outside source which has to be added. This, of course, is true, more or less, in the electrolytic process, and still more so in the manufacture of lithopone where practically the whole of the sulphuric acid appears in the final product as barium sulphate.

In the electrolytic zinc process it is usually necessary to add a quantity of sulphuric acid to the leaching solution in order to make up losses occasioned in the working of the process and to maintain the proper concentration of zinc in the solution.

In the roasting of zinc suphide ores, when it is desired to effect the more or less complete elimination of the sulphur and to obtain a "dead" roast or "sweet" roast (such as is the practice preparatory to the distillation process) it has been found necessary to maintain the operation at a high temperature and if the gases are to be used for the manufacture of sulphuric acid the admission of air must be carefully controlled.

In the roasting of zinc sulphide ores, when it is desired to effect a "sulphating" roast and to obtain a maximum proportion of metallic sulphates, it is necessary to maintain the temperature as low as possible to prevent the breaking up of the metallic sulphates formed (and in particular zinc sulphate) and further an excess of air is required to effect the oxidation to sulphates which renders the gases too dilute for the manufacture of sulphuric acid.

The object of this invention is to provide certain improvements in the roasting of zinc sulphide ores preparatory to leaching whereby a "sulphating" roast is effected with the formation of a maximum quantity of metallic sulphates which when introduced into the leaching solution reduces the amount of sulphuric acid which would otherwise be required to be added thereto or obviates such additions altogether.

I accomplish this object by first roasting the ores to a dead roast, then mixing the same with sufficient sulphide sulphur bearing material to bring the sulphide sulphur contents of the mixture to about 2% then roasting the said mixture at a low temperature and in the presence of an excess of air under such conditions that the sulphide sulphur is converted to sulphate then at intervals adding further quantities of sulphide sulphur bearing material and again roasting under such conditions that the additional sulphide sulphur is converted to sulphate whereby a maximum proportion of metallic sulphates is formed.

It will be obvious that where the ore does not require to be "dead" roasted or "sweet" roasted or has been previously approximately dead roasted the 2% mixture is subjected to the second operation which consists more particularly in roasting the 2% mixture at a relatively low temperature in the presence of an excess of air to convert the said mixture to a sulphate and at intervals adding further quantities of green or unroasted sul-

phide ores to keep the mixture at approximately 2% sulphide sulphur content continuing the roast under such conditions that the additional sulphide sulphur is converted into sulphate whereby a maximum proportion of metallic sulphate is formed.

In carrying this invention into effect when treating zinc blende ores, the ore is first subjected to a "dead" or "sweet" roast at a high temperature whereby the sulphide sulphur contents is reduced to a minimum. To this dead roast material is added sulphide sulphur preferably in the form of green or unroasted concentrates bringing the sulphide sulphur contents of the mixture to approximately 2%. This mixture is then fed into the furnace and is roasted at a relatively low temperature in the presence of an excess of air. As the sulphide sulphur contents of the mixture is sulphated further additions of sulphide sulphur are made at requisite intervals so as to preferably bring the sulphide sulphur contents up to approximately 2%; continuing the roast under such conditions that the sulphide sulphur is converted into sulphate and whereby the maximum proportion of metallic sulphates is formed.

Where roasted calcine is delivered to the reduction works with the sulphide sulphur reduced to a minimum and also when treating oxidized ores, it is necessary to add sulphide sulphur preferably in the form of green or unroasted concentrates during the sulphating operation. As the efficiency of the sulphate formation increases as the percentage of sulphide sulphur decreases, it is preferable to add the green sulphide concentrates successively so regulating the additions that the percentage of sulphide sulphur in the charge does not rise above 2% at any period of the roasting operation.

I claim:—

1. A process for roasting sulfide ores wherein after the initiation of the roasting operations, successive additions of sulphide sulphur bearing material are made to bring the sulfide sulphur contents of the mixture to approximately 2% at each addition and then roasting at a low temperature and in the presence of an excess of air under such conditions that a maximum amount of metallic sulfates are formed.

2. A process for the roasting of zinc sulphide ores which consists in first roasting the ores to a dead roast then mixing the same with sufficient sulphide sulphur bearing material to bring the sulphide sulphur contents of the mixture to about 2% then roasting the said mixture at a low temperature and in the presence of an excess of air under such conditions that the sulphide sulphur is converted to sulphate then adding further similar quantities of sulphide sulphur bearing material and again roasting under such conditions that the additional sulphide sulphur is converted to sulphate whereby a maximum proportion of metallic sulphates is formed substantially as described.

In testimony whereof I affix my signature.

HERBERT WILLIAM GEPP.

Witnesses:

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G. R. CULLEN.