UNITED STATES PATENT OFFICE.

JOSEF PERINO, OF CHARLOTTENBURG, NEAR BERLIN, GERMANY.

PROCESS OF EXTRACTING COPPER FROM COPPER PYRITES.

SPECIFICATION forming part of Letters Patent No. 401,056, dated April 9, 1889.

Application filed March 3, 1888. Serial No. 266,054. (No model.) Patented in Germany January 28, 1888, No. 44,498; in Norway February 10, 1888, No. 794; in Sweden February 10, 1888, No. 1,496; in England February 10, 1888, No. 2,019; in Luxemburg February 10, 1888, No. 957; in France February 13, 1888, No. 188,695; in Belgium February 13, 1888, No. 80,635; in Italy March 31, 1888, No. 23,074 and No. 398; in Portugal April 12, 1888, No. 1,237; in Spain [illegible] 18, 1888, No. 7,901, and in Austria-Hungary October 20, 1888, No. 18,314 and No. 32,839.

To all whom it may concern:

Be it known that I, JOSEF PERINO, a subject of the King of Prussia, residing at Charlottenburg, near Berlin, in the Kingdom of Prussia, German Empire, have invented a new and Improved Process of Extracting Copper from Copper Pyrites, (for which I have received patents in other countries as follows: Norway, No. 794, dated February 10, 1888; Sweden, No. 1,496, dated February 10, 1888; Spain, No. 7,901, dated May 18, 1888; England, No. 2,019, dated February 10, 1888; Luxemburg, No. 957, dated February 10, 1888; France, No. 188,695, dated February 13, 1888; Belgium, No. 80,635, dated February 13, 1888; Austria-Hungary, No. 18,314, tome 38, folio 2,724, and No. 32,839, tome 22, folio 2,652; Italy, Nos. 23,074 and 398, dated March 31, 1888; Portugal, No. 1,237, dated April 12, 1888; Germany, No. 44,498, dated January 28, 1888,) and the following is a full, clear, and exact description thereof.

The invention relates to a process for obtaining copper from copper pyrites.

The object of the invention is to provide a new and improved process for converting the sulphuret of copper of copper pyrites into sulphates by means of nitric iron salts.

The process consists of subjecting the copper pyrites to the action of heat at the same time adding nitric iron salts. The nitric iron salts, owing to their great decomposibility, give off oxygen at a moderate heat, forming at the same time gaseous oxides of nitrogen and a residue of ferric oxide. The surplus oxygen combines first in its nascent state with the sulphuret of copper and forms directly sulphate of copper, while the sulphates of iron of higher degrees, which, beside the sulphuret of copper, are always present, are affected by the oxygen less easily. The proportion of oxidation of the sulphuret of copper and the sulphuret of iron depends upon the temperatures at which the process is carried out. This reaction begins somewhat above 100° centigrade, and it increases gradually with the increase of temperature up to 200° centigrade, at about which temperature the conversion of the sulphuret of copper into the sulphate is completely effected. The several sorts of existing copper pyrites and the copper pyrites containing iron pyrites show some differences in their behavior in this respect, according to which the temperatures are to be regulated. The duration of this oxidizing process may be one or two hours according to the increase of heat.

According to circumstances it may be advisable to increase while producing simultaneously sulphate of iron the heat up to the decomposing temperature of the sulphate of iron, (*i. e.* to low red heat,) where the oxide of copper, which may have been produced in the first stage of the sulphating process, is also converted into sulphate, as sulphate of copper is able to support higher temperatures than ferric sulphate. The copper will thus be sulphated as perfectly as possible. The residue obtained is then lixiviated with warm water and the copper of the vitriol lye thus obtained precipitated according to any suitable method, preferably by means of iron, according to the well-known cementing methods and refined.

In practically carrying out the new method a regenerative process may very suitably be connected therewith, which process has principally for its object to produce nitric iron salt. The lye of green vitriol resulting from the process is directly mixed with a concentrated solution of nitrate of lime, whereby sulphate of lime (gypsum) as a substance that is very difficult to dissolve is eliminated and a solution of ferrous nitrate is formed, which is run off and collected in receivers, which are in communication with the sulphating apparatus. The nitric oxides produced during the sulphating process are conducted by a slowly-passing air-current into the said receivers, whereby a further oxidation of ferrous salts to ferric salts will take place. The nitric oxide thus obtained is oxidized again by the oxygen contained in the added air, and nitrous vapors are produced which are absorbed at boiling heat by carbonate of lime suspended

in water, or also milk of lime. A gradual formation of nitrate of lime now takes place, which will be more rapid in the presence of arenaceous quartz. The latter serves for obtaining ferrous nitrate from the lye of green vitriol produced by the cementing process.

The further converting of the ferrous nitrate into ferric nitrate is effected in the known way, and the final employment of the latter in the sulphating process takes place in the above-described manner.

In precipitating the lye of green vitriol by nitrate of lime the latter must not be added in excess, as otherwise it would prejudice the sulphating process of the copper.

Having thus fully described my invention, I claim as new and desire to secure by Letters Patent—

The herein-described process of obtaining copper from copper pyrites, consisting in heating the copper pyrites mixed with nitric salts of iron to a temperature of about 200° centigrade, whereby sulphate is produced, lixiviating the mass with water, and finally precipitating the copper, as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JOSEF PERINO.

Witnesses:

GUSTAV HÜTSMANN,

B. ROI.