To all whom it may concern:

Be it known that I, Hermann Maschmeyer, manager, and resident at 43 Chaussée d’Anvers, Hoboken, near Antwerp, Belgium, have invented new and useful Processes of Treating Impure Copper Matte and Ores, of which the following is a specification.

Plumbiferous copper matte, as produced, for instance, in lead works, and plumbiferous sulfid copper ores with similar contents of lead and copper, have hitherto usually been treated in the following manner: The lead-matte containing about 10-15% Pb and 15% Cu is partly roasted and then smelted in the blast furnace into lead-bullion (base-bullion) and a higher grade matte. In this manner and by eventually repeating the operation of partly roasting and smelting in the blast furnace, a concentrated matte with about 30-40% Cu and 8-13% Pb is obtained. This concentrated matte is brought up to a higher grade of concentration by repeated roasting and smelting in blast furnaces, so as to finally obtain on the one hand a plumbiferous black copper (a so-called “alloy” with 60-70% Cu and 20-30% Pb), and on the other hand a copper matte low in lead. The lead is separated from the plumbiferous black copper by smelting in reverberatory furnaces and blowing air over it, while common black copper is obtained from the copper matte poor in lead by further roasting and smelting.

Or, according to another method of treatment, the leady concentrated matte is converted into white metal containing 60-73% Cu and 6-10% Pb by repeated roasting and smelting in the reverberatory furnace. This white metal is then exposed to an oxidizing current of air in the reverberatory furnace with the effect that copper oxid is formed, which reacting on the remaining sulfid of copper, precipitates metallic copper; or the crassened white metal may be first partly roasted and then directly smelted together with the other raw part of the white metal.

The treatment of the plumbiferous copper matte by the above described well-known methods not only entails considerable cost and difficulties, but also results in considerable loss in the metal.

The process the subject of the present invention has for its object to eliminate from impure matte and ore nearly all the lead and other impurities, and to obtain in a comparatively simple manner copper free from lead, while avoiding repeated roasting and smelting and minimizing the loss of metal.

The process comprises two combined operations, the first of which consists in subjecting the impure copper matte or ore to a well-known process by which it is partially freed from sulfur and converted into an agglomerated mass by sintering. This is effected by blowing through the solid mass which is in a greasy or pulverulent state, after ignition air (or oxygen), and being carried out in pots similar to those used in the Huntington-Heberlein process for roasting lead ores.

According to this invention the material to be treated in this first operation should contain as much silica as will convert during the sintering process all the lead present in the mass into silicate of lead. The necessary quantities of quartz or quartz-bearing fluxes or ores must therefore be added to the copper matte before roasting and sintering by blowing.

The second phase of the present process consists in smelting down in a reverberatory furnace the product resulting from the blowing process, which product contains the lead as silicate and the copper partly as oxide or metal and partly as sulfid.

Smelting in the reverberatory furnace precipitates in the well-known manner copper as metal by the reaction between copper sulfid and oxid; the lead going into the slag.

The lead being present in the form of silicate of lead, its reduction to metal is impossible, as sulfid of copper will react on lead oxid, or oxid of copper on sulfid of lead; but neither sulfid nor oxid of copper will react on silicate of lead.

As the result of a single smelting operation in the reverberatory furnace, it is possible to obtain from the impure matte produced by the blowing and sintering process a black copper almost free from lead and at the same time a slag containing nearly all the lead.

Other impurities of the copper matte, such as arsenic or antimony, are partly volatilized in the blowing process, and partly remain in an oxidized state in the agglomerated mass, the latter going into the slag.
when smelting in the reverberatory furnace; the copper which remains being almost free from these impurities.

A further step in the present invention consists in the following: To the material to be smelted in the reverberatory furnace a larger amount of copper oxid is incorporated than is necessary for the reaction which takes place between the copper sulfid and the copper oxid. This may be effected either by burning off a correspondingly larger proportion of sulfur or by adding any copper oxid bearing fluxes to the mass before or after the blowing process. Thus a certain excess of copper is present in the fused bath formed in the reverberatory furnace, and this excess of copper oxid causes a further refining of the black copper by oxidizing the metallic lead as well as other impurities, such as arsenic and antimony and driving them into the slag.

Copper matte, which may contain smaller or larger quantities of lead, and to which have been added smaller quantities of an alloy of lead, copper and arsenic, as is often found in lead blast furnace work deposited in a thin layer between the lead-bullion and the matte, may be treated in the same manner, and copper and lead thus obtained in a simple and cheap way. By this treatment the greater part of the arsenic contained in the alloy is volatilized in the blowing process, while the remaining part is converted into arseniate of lead, the lead content of the alloy being converted into lead silicate. By the subsequent smelting in the reverberatory furnace the lead and the remaining arsenic enter the slag in the above described manner, and black copper poor in lead and arsenic is produced.

Now what I claim and desire to secure by Letters Patent is the following:

1. The process for eliminating lead arsenic, antimony and other impurities from impure cupriferous substances, consisting in converting such substances into a sintered and agglomerated mass, which contains lead as silicate and the other impurities in a slaggcd form, while copper is contained partly as an oxid or metallic copper, and partly as a sulfid, and then smelting down the sintered and agglomerated mass in a reverberatory furnace; the resulting product being almost pure copper and a slag containing the lead and other impurities.

2. The process for eliminating lead arsenic, antimony and other impurities, from impure cupriferous substances, consisting in incorporating with such substances a certain amount of copper oxid and converting it into a sintered and agglomerated mass, which contains lead as silicate and the other impurities in a slaggcd form, while copper is contained partly as an oxid or metallic copper, and partly as a sulfid, and then smelting down the sintered and agglomerated mass in a reverberatory furnace; the resulting product being almost pure copper and a slag containing the lead and other impurities.

3. The process for eliminating lead arsenic, antimony and other impurities from impure cupriferous substances, consisting in first converting such substances into a sintered and agglomerated mass, which contains lead as silicate and the other impurities in a slaggcd form, while copper is contained partly as an oxid or metallic copper and partly as a sulfid, the contents of copper oxid present in the mass being kept higher than is necessary for the reaction between copper oxid and copper sulfid, and then smelting down the sintered and agglomerated mass in a reverberatory furnace; the resulting product being almost pure copper and a slag containing the lead and other impurities.

In testimony, that I claim the foregoing as my invention, I have signed my name in presence of two witnesses, this eighth day of March 1909.

HERMANN MASCHMEYER.

Witnesses:
GAB. DE LERSY,
ARTHUR ADAMS.