

UNITED STATES PATENT OFFICE.

GEORGE W. REESE, OF KITTANNING, PENNSYLVANIA.

COPPER-SMELTING.

SPECIFICATION forming part of Letters Patent No. 603,590, dated May 3, 1898.

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To all whom it may concern:

Be it known that I, GEORGE W. REESE, of Kittanning, in the county of Armstrong and State of Pennsylvania, have invented certain new and useful Improvements in Copper-Smelting; 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 pertains to make and use it, reference being had to the accompanying drawings, which form part of this specification.

My invention relates to improvements in copper-smelting whereby a greater proportion of the copper contained in the ore is obtained than by the processes heretofore practiced, and consequently a smaller proportion of copper is contained in the "waste" slag, which is thrown away.

By the use of the ordinary copper-smelting process, in which the molten ore is run from the furnace into a forehearth, thence into settling-pots, and thence into a slag-pot, which is thrown upon the "dump," I find that by the exercise of ordinary skill and care the waste slag contains approximately from 0.70 per cent. to one per cent. copper. For instance, taking an ore containing three per cent. copper, it is found that the waste slag when the process is completed contains from 0.70 per cent. to one per cent. copper, showing a waste of about one-third. Heretofore this waste slag, containing from 0.70 per cent. to one per cent. copper, has been thrown away, there being no practical means of saving it. I have discovered that the addition of manganese to this waste slag when in a molten state causes a separation and precipitation of the copper contained therein to the bottom of the container and that a great saving of the one-third waste is accomplished.

By the well-known process above mentioned of smelting copper the slag in the slag-pot contains from 0.70 per cent. to one per cent. copper, so homogeneously mixed therewith that it has heretofore been thrown away as waste; and it is the object of my present invention to prevent this waste in a simple and cheap manner.

My invention may be practiced in several ways—that is to say, the manganese may be added at any step throughout a smelting proc-

ess to cause a separation and precipitation of the copper in sufficiently large quantities to make the invention highly advantageous in a commercial sense, and hence the scope and spirit of my invention will not be departed from by any variation of the time and manner of application of the manganese to the molten copper ore. After the manganese is added in the slag-pot it is found that the copper has concentrated or collected at the bottom thereof, and the top is removed, saving that part of the lower portion which contains a sufficient percentage of copper to justify resmelting, which may be accomplished by pouring off the top while in a molten state, or preferably the whole mass permitted to cool, and after removal from the pot that portion of the bottom of the mass to be saved is removed in any convenient and desirable manner. After the manganese is added to the slag in the slag-pot it is preferably allowed to boil for a short time, and I find that the bottom of this mass contains about 8.80 per cent. copper and the top only about 0.35 per cent., which enables me to obtain a large gain over the previously well-known methods and to justify the resmelting of the lower portion with great commercial gain.

In those methods which do not use a slag-pot the usual resultant product may be saved in any desired manner and subjected to the application of the manganese while in a molten state without departing from the spirit and scope of my invention.

I do not limit myself to any particular proportionate percentage of manganese; but it may vary from one-half of one per cent. up until the manganese used will equal the amount of copper saved; but I preferably use about one per cent. of manganese.

I am unable to state at this time the chemical reactions which take place in the practice of my process.

If desired, the manganese can be added directly at the furnace by adding it to the molten copper ore, or it may be added with the ore before it is fed to the furnace, and thus made to operate upon the whole mass contained within the furnace, the result being that a much smaller percentage of copper is found in the waste slag, or the manganese can be added at any desired step in a smelting proc-

ess, it serving, in combination with the molten copper ore, to cause a separation and precipitation of the copper in greatly-increased percentage over the usual copper-smelting process.

The copper in the ore treated is found, so far as I am able to determine, as a chalcopyrite or double sulfid of copper and iron; but my invention is adapted for use in connection with all other kinds of copper ores which are smelted into matte and where part of the copper is lost in the slag. I have not thus far specified any particular species of manganese, for it is found that about the same results are obtained by the use of metallic or oxid of manganese of any form.

I am aware that it is old and common to use manganese in the manufacture of iron and steel; but when combined with these metals it serves to desulfurize and carbonize the metal, and that it has also been added with these metals in a sufficient quantity to form a constituent part of the final product or metal. My invention differs from these previous uses of manganese in connection with molten iron and steel in that in connection with iron and steel it removes the sulfur and serves to carbonize it, while in connection with molten copper ore or slag containing copper it causes a separation and precipitation of the copper in a greatly-increased percentage, as before stated.

Copper frequently contains either oxid of copper, arsenic, antimony, or tin, separately or combined, and I am aware that oxid of manganese has been added to copper while it is in a molten state for the purpose of purifying it of these objectionable elements. This is very different from my invention, which makes use of manganese in connection with copper "ore," whereby the copper yield from the ore is greatly increased, as fully explained herein.

My invention does not contemplate the use

of any particular proportion of the manganese to a given quantity of ore nor to the quality of the manganese, as each of these may be varied without departing from the scope and spirit of my invention, the result varying according to the conditions.

Thus far I have used manganese ore, usually known as "oxid of manganese," more or less pure, and find the results to be about as herein stated. That portion of the waste slag which is saved may be again resmelted by passing it through the same furnace, but preferably in some cases by passing it through a different furnace, for the reason that that portion which is saved contains a greater percentage of copper than the ore which is being first treated. However, the resmelting of the saved portion of the waste slag may be accomplished in any desired manner without effecting or departing from the scope of my invention.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a copper-smelting process, first separating part of the copper from the ore while the ore is in a molten state, and then subjecting the resultant slag to the application or addition thereto of manganese, for the purpose described.

2. A copper-smelting process consisting in first separating part of the copper from the ore while in a molten state, subjecting the resultant slag to the addition of manganese and then removing the bottom portion of the slag and subjecting it to a second smelting process, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

GEO. W. REESE.

Witnesses:

A. S. PATTISON,
HERBERT E. PECK.