

## UNITED STATES PATENT OFFICE

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PROCESS FOR BLOWING CUPRIFEROUS METALLIC-SULPHIDE MELTS, ESPECIALLY LOW-GRADE COPPER MATTES, DIRECT TO BLACK COPPER

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This invention relates to a process for blowing cupriferous metallic-sulphide melts, especially low-grade copper mattes, direct to black copper.

The blowing of copper matte in the converter has hitherto been performed by blowing air through the molten matte in such quantity to burn off the sulphur compounds of the iron, copper and the like, as quickly as possible, and solely by utilizing the resulting heat and the heat generated by the formation of the slag.

Since considerable quantities of heat are consumed by the heat losses due to radiation and the like, and by the endothermic reaction between  $\text{Cu}_2\text{S}$  and  $\text{Cu}_2\text{O}$  at the end of the operation, whereby the bath is liable to solidify, the blowing in the converter must be effected as rapidly as possible. This, however, gives rise to considerable drawbacks, inasmuch as the converter discharges extensively, and also because, owing to the resulting high temperature ferro or ferrosomeric-silicates, or even ferrite are formed instead of ferrous silicate, which render the fusion of the slag difficult. Consequently, the yield of copper is greatly impaired. If, in addition, plumbiferous mattes are present, the bulk of the lead will be volatilized, and must be recovered by roundabout ways from the flue dust.

These drawbacks are obviated by the process of the present invention, according to which the blast air is so controlled, in blowing, that, in contrast to the existing process, the oxidation of the oxidizable constituents proceeds gradually, the duration of the process being thus increased to at least double the time hitherto required. The resulting heat deficiency is balanced, according to the present invention, by auxiliary heating. The result of such a procedure is that the process is carried on slowly and quietly without any discharge from the converter or any over-oxidation of the iron. In the case of plumbiferous mattes there is no substantial volatilization of the lead, but by far the greater portion of this latter is recovered, in a form ready for the blast furnace, in the slag. Another beneficial result of the gradual course

of the reaction is that only small quantities of copper matte or ready-formed copper are projected into the slag layer, the yield of copper being therefore substantially improved. This increased yield of copper can be further augmented by the inclusion of a settling stage, prior to tapping the slag, during which the blowing is suspended, and the auxiliary heating is maintained solely in order to keep the bath in a fluid condition.

Another substantial advantage of the present process is that, during its gradual passage through the bath, the atmospheric oxygen is more fully utilized than in the case of the known processes.

The process is also particularly suitable in connection with the utilization of the effluent gases for sulphuric acid manufacture, since the blast apparatus can be completely enclosed, thus keeping out the unavoidable adjacent air, which has always to be taken into account in the present blowing in the converter. As the result of this and the more complete utilization of the blast air, substantially more concentrated effluent gases are obtained.

The process is particularly adapted for blowing low-grade copper mattes, which could not hitherto be blown direct, since larger quantities of slag are produced, which could not be kept in a sufficiently fluid condition.

The existing practice consisted in roasting these low-grade mattes and then subjecting them to a concentrative smelting in a shaft or reverberatory furnace, in order to raise the copper content to the degree (35-40% of Cu) considered necessary for blowing.

In blowing low-grade copper mattes in accordance with the present invention, this preliminary treatment is dispensed with, the crude, low-grade matte being poured in the molten condition direct from the crude-ore furnace into the blower, and blown slowly, with addition of suitable slagging agents. When a certain amount of slag has been formed, the blast may be safely suspended—the auxiliary heating being maintained—the charge left to settle, and the slag tapped off. If desired, a fresh quantity of matte,

and additions, may then be introduced and the blowing continued until the furnace is full of concentrated matte, which can then be blown to completion in the same, or another apparatus.

5 According to the process, mixed ores or mattes, containing copper sulphide and resulting from some other than a decidedly copper-works process, can also be worked up 10 directly to black copper by blowing.

The process can be carried out in any type 15 of blowing apparatus that is provided with auxiliary heating means and operated with solid, liquid or pulverized fuel, or in any convenient manner.

Claims:—

1. A process for the direct blowing of cupriferous metallic-sulphide melts to black copper, which comprises slowly bubbling air 20 through the bath to effect a gradual oxidation of the oxidizable constituents and at the same time maintaining the bath in molten condition by auxiliary heating.

2. A process for the direct blowing of low- 25 grade copper matte melts to black copper, which comprises slowly bubbling air through the bath to effect a gradual oxidation of the oxidizable constituents and at the same time maintaining the bath in molten condition by auxiliary heating.

3. A process for the direct blowing of cupriferous metallic-sulphide melts to black copper, which comprises slowly bubbling air through the bath to effect a gradual oxidation 35 of the oxidizable constituents and at the same time maintaining the bath in molten condition by auxiliary heating and thereafter allowing the bath to settle while maintaining the auxiliary heating.

40 In testimony whereof, I affix my signature.  
HERMANN MASCHMEYER.

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