UNITED STATES PATENT OFFICE.

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METHOD OF EXTRACTING MANGANESE FROM ITS ORES.

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To all whom it may concern:

Be it known that I, FRIEDRICH HEUSLER, doctor of philosophy, chemist, residing at No. 9 Hohl, Dillenburg, German Empire, have invented new and useful Improvements in the Method of Extracting Manganese from Its Ores, of which the following is a specification.

The present invention relates to an improved method of producing metallic manganese with the aid of carboniferous reducing agents.

The hitherto known method of producing metallic manganese according to Tamm consists of melting manganese ores with carboniferous reducing agents, such as soot, oil or the like, in the presence of a suitable flux in a graphite crucible. This process proceeds from the manganese ore. Experiments have shown, however, that the output obtained with this method can essentially be increased if a portion of the manganese ore is calcined at red-heat prior to the process of reduction. During this process a part of the oxygen escapes and by applying a suitable temperature during a sufficiently long period a product is obtained which essentially corresponds to the formula Mn_3O_4. When mixing the calcined manganese ore with ground crude manganese ore a mixture for reducing purposes is obtained which contains more manganese than if uncalcined manganese ore is used. It is a striking fact that a mixture of crude and calcined manganese ore with soot, oil or a simlar reducing agent, to which eventually any suitable flux such as limestone, is added, can be well reduced in a graphite crucible, considering that calcined manganese ore alone permits of no good reduction.

It is already well known that manganese ore, representing the low degree of oxidation, may be reduced in the presence of aluminium or magnesium. However, the reactions connected with this method differ from those observed with Tamm's method of reduction. In the aluminothermic proceeding the preliminary reduction of the manganese ore to a lower stage of oxidation is necessary for the reason that the manganese ore is liable to too violent a reaction. Therefore, the aluminothermic reduction permits of no conclusion as regards the applicability of the calcined manganese ore to the method according to Tamm, all the less since, according to the present invention, a mixture of manganic oxid and manganese ore is subjected to the reduction, contrary to the known method by which oxid of manganese is treated by itself. Experiments have shown that the proceeding according to the present invention offers an output of manganese which exceeds that obtained with the method according to Tamm by about 30% and still more. Moreover, in the almino-thermic proceeding the employment is known of a mixture of oxids of manganese with a low, and of oxid of manganese with a high, proportion of oxygen, for the purpose of accelerating the speed of reaction in the aluminothermic reduction of manganic oxids with low percentage of oxygen. The greater output obtained thereby is due to the fact that the reaction mass is prevented from being cooled, which is a property of the aluminothermic proceeding, wherein the heat is supplied by the reaction itself. In the process of reduction with carbon this question cannot be taken into consideration, as in this case the reaction mass is heated from without. Contrary to the method according to Tamm, no increase of the reaction-speed is obtained with the new method.

As compared with the aluminothermic proceeding the method according to the present invention permits to charge the reaction space available with a greater quantity of manganese. It was not to be foreseen that this could be attained by the employment of manganic oxids of low percentage of oxygen, the reduction of which offers more difficulties and a lower output than the manganic oxids having a high percentage of oxygen. By adding manganic oxids to the manganese ore according to the present invention an output is obtained which amounts to 90% of the theoretical. The proportion of quantities may vary; however, it is preferably not below 20% for manganese ore and therefore not above 80% for manganic oxid. The new method has the further advantage that the calcined manganese ore can be separated from its admixture of iron by magnetic treatment.

The calcining process may be increased by the action of reducing gases, such as petroleum-gas or water-gas.

The proceeding may, by way of example, be carried through in the following manner, which is found to give the best results: 100 parts of ground crude manganese ore and 50 parts of calcined manganese ore are

mixed with a flux and a carboniferous substance, such as soot or oil. The compound is then heated in a graphite crucible to as high a temperature as possible preferably by means of a blower. Instead of a graphite crucible any other suitable vessel of fire-proof material may be employed, and instead of the blower an electric furnace may equally well serve.

Now what I claim as my invention and desire to secure by Letters Patent in the United States, is—

1. The hereindescribed method of extracting metallic manganese from its ores which consists in first preliminarily calcining a portion of the manganese ore at a red heat, then proportionately mixing together a quantity of the calcined ore with a quantity of crude uncalcined ore, and subsequently subjecting this mixture to a reducing process.

2. The hereindescribed method of extracting metallic manganese from its ores which consists in first preliminarily calcining a portion of the manganese ore at a red heat, then proportionately mixing together a quantity of the calcined ore with a quantity of crude uncalcined ore, and subsequently subjecting this mixture to a reducing process in the presence of a flux and a carboniferous agent.

In testimony whereof I have affixed my signature in presence of two witnesses:

FRIEDRICH HEUSLER.

Witnesses:
JEAN GRUND,
CARL GRUND.