

UNITED STATES PATENT OFFICE.

GIDEON E. MOORE, OF NEW YORK, N. Y.

PROCESS OF MANUFACTURING SPIEGELEISEN.

SPECIFICATION forming part of Letters Patent No. 529,458, dated November 20, 1894.

Application filed March 21, 1894. Serial No. 504,515. (No specimens.)

To all whom it may concern:

Be it known that I, GIDEON E. MOORE, a citizen of the United States, and a resident of the city of New York, county and State of New York, have invented certain new and useful Improvements in the Manufacture of Spiegeleisen, of which the following is a specification.

My invention relates to a process for the manufacture of spiegeleisen from the mineral known as franklinite, which consists of a compound of the oxides of manganese, iron and zinc, or from mixtures of minerals or ores containing franklinite, such as the ores occurring at the zinc mines in Sussex county, New Jersey, which consist of mixtures of franklinite, willemite, zincite and other minerals contained in a gangue consisting of carbonate of lime, with more or less carbonate of manganese, or both, which gangue in the following description will be termed "limestone."

In the methods of working these ores heretofore employed the ores are crushed and then, either with or without previous concentration by washing, jigging or other means, mixed with coal and heated on the hearth of a Wetherill or other suitable form of furnace for the manufacture of oxide of zinc. The residuum of this operation, which consists of a scoria or cinder containing, besides the iron and manganese, all of the silica, lime and other impurities of the ore, and the ashes of the coal, as well as a certain proportion of oxide of zinc, usually four or five per cent. or thereabout, is smelted in the blast furnace to produce spiegeleisen.

The object of my invention is to obtain the compounds of iron and manganese contained in these ores, free from the lime, silica and most of the zinc, and in a condition as to size of particles suitable for direct use in the blast furnace for making spiegeleisen, and thus to supply the furnace with a much purer and more concentrated material for the smelting operation, whereby the output of the furnace may be greatly increased without materially adding to the expense for fuel and labor involved in the processes heretofore employed.

In carrying out my invention I proceed as follows, to wit: I take the lump ore, as it comes from the mine, and break it, if needful, into pieces of suitable size. In most cases pieces

of about six to eight inches cube will be found suitable, but the size is only material as regards the size, construction and mode of operation of the furnace to be employed. I then calcine, or "burn," the ore in a furnace or kiln of any known and suitable size, shape or material, wherein it may be subjected to the combined action of heat and an atmosphere of reducing gases, until the limestone has become deprived of its carbonic acid or of so much of it that it has acquired the property of slaking, or disintegrating, or falling to powder or to particles of greater or less degree of fineness, when subjected to the action of hot or cold water, or steam, or to prolonged exposure to the air.

I consider the ordinary lime kiln, using either blast or natural draft, a suitable kiln to be used in the calcination, and consider it advantageous to burn the ore in admixture with the fuel, as is done in the older forms of lime kilns. By this means the carbonic acid as it is separated from the lime is, at least to a large extent, reduced to carbonic oxide, which penetrates through the porous lime to the inclosed particles of franklinite and promotes the reduction and volatilization of the greater part of the oxide of zinc contained therein. The heat during the calcination should be carefully regulated so as to avoid as far as possible action of the lime on the silicate of zinc, and to prevent the ore from sintering or melting. The waste gases from the kiln or furnace are made to pass through dust chambers or other suitable form of collecting apparatus, wherein the oxide of zinc evolved with the gases is collected, to be utilized for the manufacture of spelter or for whatever technical application it may be suited for.

When the ore has been properly calcined it consists chiefly of a mixture of calcined gangue, more or less undecomposed silicate of zinc together with the other silicates of the ore, and the product of the partial reduction and decomposition of franklinite, namely a mixture of magnetic oxide of iron, oxide of manganese and a relatively small proportion of oxide of zinc. The particles of both the silicates and the decomposed franklinite will, if the operation has been properly conducted, show little change of dimensions from those

of the particles in which they existed in the original ore. I then cause the calcined ore to slake or disintegrate by acting thereon with hot or cold water, or steam, or exposure to the air, whereby the lime of the gangue falls to powder, leaving the silicates and decomposition products of the franklinite unchanged. I then separate the particles of decomposed franklinite from the calcined and disintegrated gangue and silicates of the ore by washing, sifting, screening or magnetic separation or by a combination of two or more of these means of separation, and smelt them directly in the blast furnace for spiegeleisen, in the same manner that the residuum of the Wetherill furnace is now treated; but the process that I prefer to employ is to remove the disintegrated gangue by washing or sifting, and then to separate the decomposed franklinite from the silicates by magnetic separation. The decomposed franklinite is sent to the blast furnace and the silicates may be treated by any known and suitable process for the extraction of the zinc that they contain.

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

The process of manufacturing spiegeleisen from ores containing franklinite and contained in a limestone gangue, which consists in calcining the ore and gangue in an atmosphere of reducing gases causing the calcined gangue to slake or disintegrate by hydration, separating the decomposed franklinite from the calcined and disintegrated gangue and the siliceous minerals of the ore, and smelting it in the blast furnace for spiegeleisen substantially as hereinbefore described and set forth.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 19th day of March, 1894.

GIDEON E. MOORE.

Witnesses:

EDWARD SCHROEDER,
R. W. MILNE.