

UNITED STATES PATENT OFFICE.

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PROCESS OF TREATING ORES.

No. 810,572.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, JOSEPH SAVELSBERG, doctor of philosophy, a subject of the King of Prussia, residing at Papenburg-on-the-Ems, Germany, have invented certain new and useful Improvements in Processes of Treating Ores; 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 appertains to make and use the same.

This invention relates to the extraction of metals from their ores, and more particularly from oxid ores, as will be hereinafter particularly described and claimed.

In the extraction of many metals—such as nickel, cobalt, copper, and the like—the corresponding ores are melted in the shaft-furnace to obtain a matte, and from the latter the metals are extracted. Since only a few ores, as copper sulfid, contain sufficient sulfur for the formation of this matte, it is necessary in some cases to add sulfur-bearing substances or sulfur. To such ores belong the New Caledonian nickel and cobalt ores, which contain the metal in the form of an oxid. They are of themselves melted with difficulty and are very unsatisfactory in their working in a shaft-furnace, as the greater part of them are in the form of powder or fines.

It has been the practice to mix metallic sulfur with the ores and then briquet the mixture and charge the briquets into the furnace in order to form the matte. The briquetting is very costly, and it is difficult to prevent the briquets from breaking before they reach the melting zone in the furnace, as they very often are broken or fall apart in the upper part of the furnace, producing too large a percentage of fines, thereby increasing the difficulties and the costs of working. First, the operation of the furnace is choked, requiring a larger percentage of coke or coal for its operation; second, there is also a large percentage of dust, owing to the higher pressure of the blast that must be used with the material in a fine state, and much valuable product is lost; third, the briquetting of the products sets free the sulfur, and much of it is burned and rendered useless by the production of sulfurous-acid gas. It is therefore necessary to use an excess of sulfur or sulfur-bearing materials.

The object of the following invention is to avoid the briquetting of the material and dis-

pense with the difficulties above mentioned and in a single operation obtain a sulfurization and a sintering of the ores in the converter or other suitable apparatus with the use of forced blast. To this end the ores are mixed with sulfur or sulfur-bearing materials and flux, if necessary, and a suitable quantity of pulverized coal or coke is well mixed together and charged into a converter on a bed of glowing fuel or ore and simultaneously force blast is blown through the mass. The charge is so heated that the sulfur reacts upon the ores containing the metals to form sulfur compounds of these metals and the sulfurous acid is reduced by the glowing carbon again to sulfur. These reactions during the process produce sufficient heat to bring the mass to the sinter containing sulfids of the metals, and the sinter is then broken and charged into a shaft-furnace and melted down, as usual.

In the above-described process sulfur-containing materials—such as sulfates, gypsum, sulfids, and the like—may be used. When sulfates are used, a corresponding larger quantity of reducing substances, such as powdered coal or coke, will be necessary to reduce the sulfates to sulfids. Other sintering processes that have been carried out in the converter have for their object to utilize the heat of combustion of the sulfur for carrying on the process and for sintering ore for desulfurization. The present invention has for its object exactly the opposite—that is, the sulfurization of the ore—and does not rely upon the heat of combustion of the sulfur to carry on the process and sinter the ore, but on the heats of reaction due to the combination of the sulfur with the heavier metals of the ore.

The advantages of the present invention are very important. First, the cost of briquetting material is entirely dispensed with; second, the materials for the shaft-furnace are exceptionally well suited for working in this manner, since they are in hard pieces; third, fuel is saved in the operation in the shaft-furnace; fourth, there is considerable saving of sulfur, since the sulfurization process is so economically carried out in the converter that the smallest possible excess of sulfur will be necessary; fifth, there is no dust resulting from fines; sixth, a richer matte is obtained; seventh, an absolute dry material is used in the shaft-furnace, while in briquet-

ing, a large percentage of water is necessary to form the briquets, thereby requiring more fuel to dry it off.

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

1. The process of treating oxid ores, which consists in mixing the ore with sulfur-containing substance, and a fuel and blowing the mixture in a suitable furnace, substantially as described.

2. The process of treating oxid ores, which consists in mixing the ores with sulfur-containing substances, carbon and a flux and placing the mixture on a bed of glowing material, and blowing the charge, substantially as described.

3. The process of treating oxid ores, which consists in mixing the ore with sulfur-containing substances, pulverized carbon and a flux,

charging the same into a suitable furnace onto a bed of glowing carbon and ore and blowing the charge to cause the sulfur to combine with the metal of the oxids to form sulfids and sinter the mass, substantially as described.

4. The process of treating oxid ores containing nickel, cobalt and copper, which consists in mixing the ore with sulfur, carbon and a flux, charging the same into a suitable furnace and blowing the mixture, substantially as described.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

JOSEPH SAVELSBERG.

Witnesses:

WILLIAM KUEPPEOS,
JOH. SCHULZ.