UNITED STATES PATENT OFFICE.

HENRY ARDEN, OF SAN DIEGO, CALIFORNIA.

PROCESS OF PYRITIC SMELTING.

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To all whom it may concern:

Be it known that I, HENRY ARDEN, a citizen of the United States, residing at San Diego, in the county of San Diego and State of California, have invented certain new and useful Improvements in Processes of Pyritic Smelting, of which the following is a specification.

This invention is a process of pyritic smelting by means of atmospheric air, the object of the invention being to provide a process of effecting oxidation in cases in which the heat of oxidation is insufficient for the maintenance and completion of the reaction, and more particularly for the smelting of sulfid ores. The term "ore" is used herein in its broadest sense, as including concentrates, mattes and other sources of metal or metallurgical products. The invention will be described as applied to the pyritic smelting of copper ores, but is not restricted thereto.

I prefer to proceed substantially as follows: The sulfid ore, usually mixed with a suitable flux, is charged into a smelting furnace provided with twyers for the admission of air, and is subjected therein to the action of air previously heated to a high temperature by passage through an electric furnace or heater. This furnace is preferably of the resistance type, the resisters being composed of a material or coated with a material which will not undergo substantial oxidation at the temperatures employed. I have found that such resisters are conveniently prepared by coating carbon in the form of bars with a refractory layer of carborundum, applied as a paint, using sodium silicate as a binder; or an excellent resister, particularly where currents of comparatively high potential are used, comprises a bar of carborundum consisting of grains bound by sodium silicate or otherwise. It will be understood that I do not restrict myself to the use of any particular material as a resister, it being essential merely that it should remain substantially unoxidized by air at the temperature employed. The air should be heated to such degree, and should be introduced in such volume, as will suffice to maintain the temperature of the ore at the point necessary for the smelting.

In the treatment of ores of low calorific value, and more particularly in the treatment of ores which are deficient in sulfur, it is advantageous to introduce with the air a heavy hydrocarbon or the vapor of a hydrocarbon, which by its oxidation supplements the heat conveyed by the air and diminishes the amount of oxygen introduced into the furnace under a given pressure. The heavy hydrocarbon may be vaporized in the furnace employed for heating the air or sprayed therein; but my preferred procedure is to vaporize the hydrocarbon in an independent furnace, preferably an electric resistance furnace, and to convey the vapors through the furnace employed for heating the air and thence into contact with the ore. The quantity of hydrocarbon vapors may be easily regulated by a suitable automatic feed, to meet the two purposes of its introduction, viz., to diminish the amount of oxygen under a given pressure of the blast, or to increase the heat thereof. The chief advantages of this process of smelting are the high purity of the product or matte due to the absence of solid fuel and the relative completeness of the oxidation of the sulfur; and the ease and regularity of control of the temperature and oxidizing conditions of the furnace, said temperature and other conditions being readily regulated by controlling the temperature of the electric furnace, the volume of air traversing the same, and the quantity of hydrocarbon admitted. Such ease of control is of particular importance in the smelting of sulfid ores by reason of the wide variations in their calorific value.

I claim:

1. The process of pyritic smelting, which consists in establishing a zone of electrically developed heat in proximity to a body of sulfid ore, and conveying heat to said ore by means of a stream of air, substantially as described.

2. The process of pyritic smelting, which consists in heating air to a high temperature, commingling therewith a hydrocarbon vapor, and conveying the same into contact with a sulfid ore, substantially as described.

3. The process of pyritic smelting, which consists in heating air to a high temperature by means of electrically developed heat, commingling therewith a hydrocarbon vapor, and conveying the same into contact with a sulfid ore, substantially as described.

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

HENRY ARDEN.

Witnesses:
G. W. FISHBURN,
R. H. GUNNIS.