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# UNITED STATES PATENT OFFICE.

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## METALLURGICAL APPARATUS.

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*To all whom it may concern:*

Be it known that JOHN MOORE SAMUEL, citizen of the United States, residing at Douglas, in the county of Cochise and State of Arizona, has invented certain new and useful Improvements in Metallurgical Apparatus, of which the following is a specification.

The present invention has as its object an improved method of transferring calcines from the roasters to the reverberatory furnaces. The lower hearths of roasters ordinarily operate at about 1300° F., but it is seldom that the calcines reach the reverberatory furnace at a temperature exceeding 800° F. This great loss of heat is occasioned by the methods heretofore employed in transferring the calcines from the roasters to the reverberatory furnaces. In fact, heretofore no particular care has been taken or efforts made to conserve this heat although it is self evident that if all of this heat could be conserved or retained, the treatment of the calcines could be more economically carried out and the cost of operation of the reverberatory furnace greatly reduced. The present invention, therefore, has as its primary object to disclose a method of transferring the calcines from the roasters to the reverberatory furnace in a manner to reduce to a minimum the loss of heat through radiation or otherwise so that the calcines will enter the furnace at approximately the same temperature at which they leave the roasters, and thus the fuel ratio will be greatly reduced.

I have discovered that loss of heat by the calcines, in the ordinary methods of transferring the calcines from the roaster to the reverberatory furnace is greatly increased when the calcines are exposed so that heat radiates directly from them to the air. For example, there is great loss of heat from the calcines when they are allowed to drop from the roaster into the calcine car and when they are permitted to drop through the air from the calcine car into the calcine hopper over the reverberatory furnace. There is also loss of heat when the calcines are allowed to fall from the last mentioned hopper into the reverberatory furnace through pipes which are not insulated and which have loose and open connections with the top of the reverberatory furnace. Furthermore, there is great loss of heat through radiation when the calcines are exposed in the larry cars in which they are sometimes conveyed from one part of the furnace to another.

As before stated, so far as I am aware, no efforts have heretofore been made to conserve the heat of the calcines while transferring them from the roaster to the reverberatory furnace. It is true that there have been attempts made to provide more or less closed connections between the roaster calcine hoppers and the calcine cars, but these connections have not in any way been insulated, nor were they in any sense intended for the purpose of conserving the heat of the calcines but solely and primarily for the purpose of preventing dust being raised in discharging the calcines into the car. That in providing such connections there was absolutely no intention of conserving the heat of the calcines, is evident from the fact that in other ways and at other points the calcines were left exposed to such an extent as to cause great loss of heat before being introduced into the reverberatory furnace. For example, calcines have been left exposed in the larry cars and in the travel of these cars from the roasters to the reverberatory furnaces, heat of course is rapidly lost by radiation from the calcines. In fact, no attempt has been made to provide closed connections at any point where the calcines would, in the ordinary operation of the plan, be permitted to remain quiescent, because under such conditions there would be no formation of dust and, as before stated, connections were not provided nor any other steps taken with the object in view of preventing the escape of heat from the calcines.

In a normal calcine charge, the heat of formation of the silicates exceeds the heat abstracted by the fusion of the slag and matte so that these two latter will be superheated approximately 400° F. by this excess