UNITED STATES PATENT OFFICE.

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METHOD OF CHARGING BLAST-FURNACES.

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To all whom it may concern:

Be it known that we, THOMAS McDONALD and JACOB C. BARRETT, both of Youngstown, in the county of Mahoning and State of Ohio, have invented a new and useful Method of Charging Blast-Furnaces, of which the following is a full, clear, and exact description.

Our invention relates to the charging of materials forming the furnace burden into such furnaces, and to the preparation of the materials preparatory to their introduction into the furnaces.

The object of our invention is to provide a simple and effective method of preparing and charging the ores or other materials forming the burden by the use of which the yield of iron from the materials charged is largely increased, while the cost of producing the iron is greatly reduced, and in the use of which the proportion of finely divided ore materials in the materials used can be largely increased, while the amount of flue dust carried from the furnaces in the gases is lessened.

A large proportion of the iron ores now available for use is in a finely divided state and when such materials are charged into the blast furnaces a considerable amount of the comminuted materials is carried out of the furnace in suspension in the blast furnace gases into the gas mains, dust catchers and furnace stoves, where it becomes deposited. The deposits of finely divided materials must be removed from the places in which they become deposited, the handling of which adds to the cost of operating the furnaces.

We have discovered that by mixing the charges of materials forming the furnace burden or the charges of the ore or iron bearing materials with enough water to make the water content equal at least three per cent. by weight of the materials and then charging the wetted materials into the furnace, that the proportion of finely divided materials forming the furnace burden can be largely increased, while the percentage of the materials charged that will be carried out of the furnaces in the form of flue dust, will be very materially decreased, and that the temperature of the top portion of the furnace will be lessened, the coke consumption reduced, and the working of the furnaces be made more uniform.

In the preparation of the materials, preferably only the ores are mixed with water, so as to form a more or less pasty mass which is then charged into the furnace although all of the materials forming the furnace burden may be wetted if desired. The wet, pasty mass, when charged into the blast furnaces forms a cover or blanket over the materials previously charged and the finely divided materials located at a lower level in the furnaces, from which the moisture has been expelled by the heat of the furnaces are retained in the furnaces, and their escape with the gases, which pass through the wet pasty materials, is overcome and prevented.

The mixing of the water with the materials is preferably done just as the materials are being discharged into the skip car or bucket in which they are hoisted to the furnace top, although the water may be added at any time prior to the discharge of the materials into the furnace shaft from its lower bell and hopper. Obviously the water may be added and mixed with the materials in a revolving drum or other form of mixing apparatus from which the resulting paste is transferred to the skip car or hoisting bucket.

The advantages of our invention are many and will be apparent to those skilled in the art. The percentage of materials charged into the furnace which are carried out of the furnace in the form of flue dust is very materially reduced, while the yield of iron per ton of ore charged is greatly increased, in this way resulting in a very considerable reduction in the cost of the smelting operation. The gases passing from the furnaces are cleaner and their heating qualities thereby increased, while the reduction in the amount of flue dust formed and necessary to handle in cleaning the gas mains, dust catchers and stoves tends to lessen the operating cost of the furnace. The burden of the blast furnaces can be formed of a greater proportion of finely divided materials than has heretofore been found possible. Our improved method enables a larger amount of flue dust being used in the burden than that formed by the furnace, when found necessary or desirable. The addition of the water to the burden forming materials lessens the temperature in the top of the furnace shaft, in this way preventing warping or cracking of the bell, hopper or hopper extension of the furnace. The amount of water added to the burden may be increased above three per cent., without departing from our invention

and other changes may be made within the scope of the claims.

We claim:

1. In the charging of blast furnaces, the steps consisting in mixing at least three per cent., by weight, of water with the successive charges of materials, and then charging the wet materials into the blast furnace; substantially as described.

2. In the charging of blast furnaces, the steps consisting in mixing at least three per cent., by weight, of water with the successive charges of ore and then charging the wet materials into the blast furnace; substantially as described.

3. The method of charging blast furnaces, consisting in mixing the ore of the furnace burden with a measured quantity of water and charging the mixture while wet into the furnace; substantially as described.

4. The method of charging blast furnaces consisting in mixing the materials forming the burden with a definite weight of water and then charging the wet materials into the furnace; substantially as described.

5. In the charging of blast furnaces, the method which consists in the mixture with the ore of an amount of water in excess of that due to natural causes whereby the amount of water present in successive charges is made to equal at least three per cent. by weight of the materials; substantially as described.

6. In the art of operating blast furnaces, the method consisting in rendering the amount of water present in successive charges of the burden substantially constant by the addition of an amount of water to the charges sufficient to give each charge of like material a water content equal to at least three per cent. by weight of the material; substantially as described.

In testimony whereof, we have hereunto set our hands.

THOMAS McDONALD.
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Witnesses:
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A. C. COOK.