

# UNITED STATES PATENT OFFICE.

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## PROCESS OF UTILIZING FURNACE-FLUE DUST.

No. 803,792.

Specification of Letters Patent.

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*To all whom it may concern:*

Be it known that I, SAMUEL B. SHELDON, a resident of Buffalo, in the county of Erie and State of New York, have invented a new and useful Improvement in Processes of Utilizing Furnace-Flue Dust; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to a process of producing coke for metallurgical purposes, and more especially to such a process which will also enable the utilization of blast-furnace dust.

In the reduction of iron ore in blast-furnaces a large amount of dust is produced and passes out of the furnace. The quantity of such dust varies with different characters of ore and also with different conditions of working the furnace and is a very decided waste unless the same can be utilized. This dust consists of fine coke or other carbon, lime, and fine ore or partially-reduced ore. The quantity of ore varies by weight of the total amount of dust and represents a considerable percentage of the value of the ore being reduced. This dust is collected in suitable dust-catchers and must then be disposed of, and if thrown away the labor necessary to remove it is an additional expense. Heretofore attempts have been made to utilize this flue-dust, one being by wetting the same and again charging into the blast-furnace. Opinions differ as to the efficiency of this method; but the weight of opinion is that either this dust at once passes out of the furnace or else induces conditions which tend to increase the production of flue-dust by the furnace. It has also been proposed to sinter the flue-dust in suitable rotary kilns. This requires apparatus which is expensive to maintain and also entails a considerable amount of labor. Furthermore, the sintering process in the kiln results practically in the oxidation of the carbon contained in the flue-dust, so that this ingredient is practically lost.

My process has for its object to utilize such flue-dust and in a manner which is economical and which does not affect the working of the blast-furnace.

The invention consists, generally stated, in mixing the flue-dust with the coal which is used for coke, so that in the coking process the carbon of the flue-dust will be incorporated with the coke and the ore contained therein will be either wholly or partially reduced to a

metallic state. I have discovered that a percentage of flue-dust can be mixed with the coking-coal without in any manner affecting the coking process or impairing the quality of the coke. In fact, it seems to increase the quality of the coke, as the metallic iron or suboxid of iron, or both, resulting from the reduction of the ore in the dust binds the coke all the more firmly together. There is also a considerable percentage of lime in the flue-dust, and this fluxes with the silicious material in the coal and serves to bind the coke more firmly together and improves its physical structure. This coke can be then utilized for any metallurgical purpose, preferably for blast-furnace work, being charged in the required proportion in the ordinary manner into the furnace and the process carried on in the usual way. The character of the flue-dust is so changed in the coking that it is not again carried out of the furnace.

My invention can be carried into effect with any existing forms of apparatus, and as these form no part of the invention they are neither illustrated nor described.

The blast-furnace may be of any suitable form, and the dust produced thereby will be collected in any known or desired manner. This dust will be conveyed by any suitable means to the coking plant, and the latter also may be of any existing or preferred construction. Here the flue-dust will be mixed with the coal in the necessary proportions in any suitable manner either by hand or machinery. The mixture will then be charged into the coking-oven in the usual way, and the coking process will be carried on exactly as heretofore. Any form of coking-oven will be employed, either beehive or, preferably, of retort or by product type, as the latter usually are located in closer proximity to the blast-furnaces than the beehive type.

During the coking process the reducing atmosphere which is produced reduces all the iron in the flue-dust either to a metallic state or to a suboxid of iron, or both. The lime of the flue-dust fluxes with the silicious matter in the coal, and the carbon of the flue-dust is incorporated with the coal, and thus made available for further production of iron in a blast-furnace.

The quantity of flue-dust mixed with the coke may vary to a considerable extent. It may be mixed with the coal in such quantities that all the flue-dust produced by the furnace will be incorporated with the quan-



tity of coke which that furnace will need in the further production of iron. As the quantity of flue-dust produced by furnaces varies, the proportion of the same to the coal used for coking will also vary. I have found that under ordinary conditions a quantity of flue-dust amounting to about three to five per cent. of the weight of the coal used for coking will practically consume all of the flue-dust produced. As this flue-dust contains a considerable per cent. in weight of iron ore, a considerable loss is prevented, and the metallic iron produced by the reducing process in the coke-oven and the fluxing action of the lime on the silicious matter of the coal binds the structure of the coke more firmly together and increases its value for blast-furnace work, this firm coke producing less flue-dust than is produced by the use of a coke having a loose structure.

My process of utilizing the flue-dust does not necessitate any additions to or changes in existing blast-furnaces or coking plants. It can be mixed with the coal without any special apparatus whatsoever, and the amount of labor necessary to do this is very little greater than is necessary to carry the

flue-dust away to dump. It in no manner interferes with or modifies the existing processes either of coking the coal or reducing the ore, and therefore adds nothing either to the cost or labor of these processes. As a consequence it provides a very economical way of disposing of the flue-dust, and at the same time all of said dust is saved, both the carbon and the ore contained therein.

What I claim is—

1. The process of utilizing blast-furnace-flue dust, which consists in mixing flue-dust and coal in substantially the proportions of flue-dust produced by a furnace and the amount of coal consumed by said furnace, and then coking the mixture.

2. The process of utilizing blast-furnace-flue dust, which consists in mixing the same with coal, the proportion of flue-dust being from three to five per cent. of the weight of the coal, and then coking the mixture.

In testimony whereof I, the said SAMUEL B. SHELDON, have hereunto set my hand.

SAMUEL B. SHELDON.

Witnesses:

F. H. BURNETT,  
MARY E. CARR