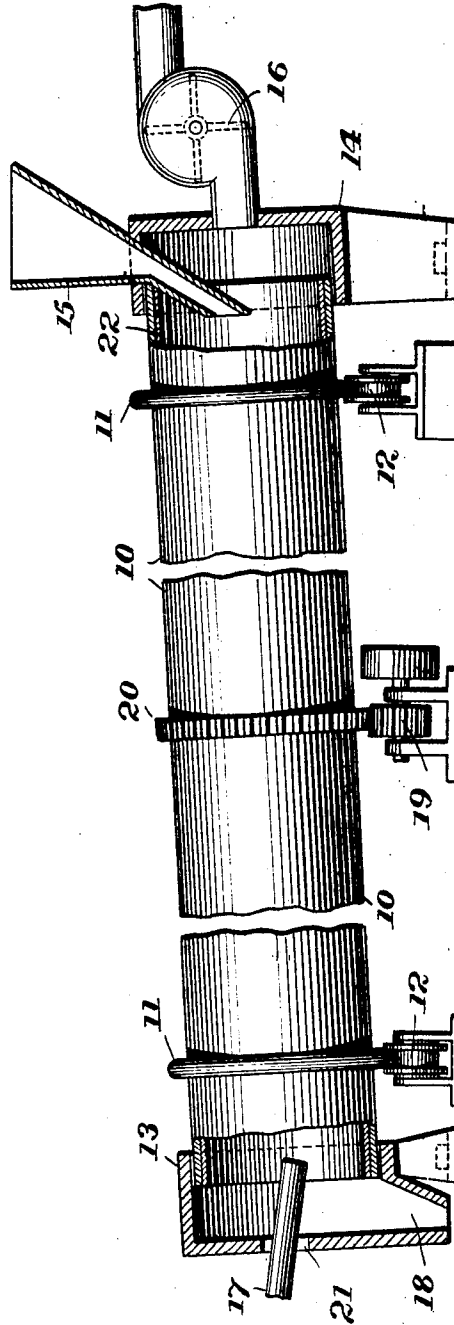


E. F. GOLTRA.
TREATED IRON ORE.
APPLICATION FILED MAY 2, 1910.

1,035,960.

Patented Aug. 20, 1912.



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UNITED STATES PATENT OFFICE.

EDWARD F. GOLTRA, OF ST. LOUIS, MISSOURI.

TREATED IRON ORE.

1,035,960.

Specification of Letters Patent.

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Application filed May 2, 1910. Serial No. 558,843.

To all whom it may concern:

Be it known that I, EDWARD F. GOLTRA, a citizen of the United States, and resident of St. Louis, in the State of Missouri, have invented certain new and useful Improvements in Treated Iron Ore, of which the following is a specification.

This invention relates to furnace materials and more particularly to an iron ore which by treatment has been cleaned of its gangue and rendered suitable for use in a blast furnace and in other metallurgical operations.

Some iron ores, as brown hematite, contain large percentages of clay, silica, etc., as a gangue. Heretofore this gangue has been separated in the hydraulic operations by the usual jigs, log washers, etc. The above operations are not only wasteful in ore and water, but the washed ore is not thoroughly cleaned of its gangue since the water can not reach the gangue in the crevices and pores in the ore, and due to this fact, the ore, even after it has been washed, will be clogged up with clay gangue, so that it is difficult to smelt the same. In addition the product is wet, thus adding to its undesirable characteristics. In furnace operations, it is desirable that the ore be in a dry and porous condition and cleaned of its gangue as much as possible, so that it can be easily acted upon by the gases and the heat in the reducing or other operations.

The objects of this invention are therefore to produce a new furnace material which will have all of the above named desirable characteristics, namely one that will be cleaned of its gangue and in a dry and porous condition. A number of processes for producing this material have been described in my prior applications, Serial Nos. 536,403, filed January 4, 1910; and 523,091, filed October 18, 1909. The processes as described in the above-applications may be summed up as follows: The ore and its gangue are heated at a temperature and for a period sufficient to render the gangue brittle and easily separable from the ore. The ore and its gangue are tumbled to shake loose the gangue from the ore, and the ore and gangue are subjected to a strong air blast so as to sweep, clean and remove the gangue from the ore.

In order that the material may be more clearly described, one form of process and apparatus for producing the same will be

described in detail, the process and apparatus being that shown and described in my prior application, 523,091.

Referring to the drawings which show one form of apparatus, 10 designates a runway in the form of a tube or drum provided with a number of rings 11, 11, resting on a number of sets of anti-friction rollers 12, 12. The ends of the drum extend into stationary heads 13, 14, which are bolted to a suitable frame-work, and the hopper 15 on head 13 discharges into the drum. A suction fan 16 is connected to the head 14 and is driven by a suitable motor so as to create a strong blast in and through the drum 10. A burner 17 extends through the head 13 so as to heat the blast. This burner may be an ordinary oil burner provided with an air blast. The head 13 is further provided with an air hole 21, or air holes, so as to allow the blast to enter near the burner and be heated thereby. The head is further provided with a discharge or outlet 18 for the cleaned ore. The drum is inclined from the inlet to the discharge end and is rotated by a driving pinion 19 engaging a gear 20 on the drum. The drum is lined with a suitable refractory lining 22. The ore as mined is crushed so as to reduce it to workable form. It is not necessary to pulverize it, but it is sufficient if it can pass through a two or two and one-half inch mesh. This crushed ore is placed in the hopper 15 and is discharged into the drum 10. The burner 17 furnishes the necessary heat and the temperature will be the greatest at the lower end of the drum, but at the upper end this temperature will be considerably reduced, so that the fresh wet ore will not be heated to a sufficient degree so as to hard bake the gangue. As the ore moves downwardly it will be tumbled and thrown around so as to knock loose all of the gangue which clings to it, this gangue becoming more and more heated and more and more loose, dried and pulverized as it proceeds toward the lower end of the drum. The ore is cleaned and washed of its gangue by the blast passing through the drum, the gangue being drawn off by the strong blast which is created by the suction fan 16. The drum is made long enough and the speed of rotation is governed so that at the time when the ore reaches the discharge 18 practically all of the gangue has been dried out and rendered separable, shaken off of the ore

and drawn off by the blast. Since the temperature will gradually increase from the upper to the lower end of the drum, the gangue is gradually dried and thus rendered very brittle, and due to this gradual increase, the gangue on the ore as it is admitted will not be subjected to the high temperature as would be the case if the burner 17 were placed at the upper end of the drum.

During the operation, the heat will drive off the moisture in the ore so as to render the gangue brittle, and this heating is preferably carried to such an extent so as not only to drive off the free moisture but also to drive off the combined moisture or any other volatile matter which may be contained in the ore. The heat will not only render the clayey gangue brittle but any hard stone contained in the ore will be separated. This stone gangue will sometimes occur in the form of layers. Now, the heat will cause the ore and stone to expand at different rates, and thus the stone will be broken and cracked off. In the tumbling operation, the ore and gangue will be thrown around and tumbled so as to thoroughly shake loose the gangue from the ore, and as this tumbling action proceeds the gangue will be knocked off the ore and will be carried off by the strong blast passing through the drum. The heat will crack open the lumps of ore and expose all the gangue so as to thoroughly dry the same. The strong blast in passing over, through, and around the ore as it is thrown around and tumbled will seek out the dried out and loosened gangue in, around and clinging to the ore and in the crevices and pores, and carry this gangue along with it leaving the heavier ore lumps to pass off to the discharge chute. It will thus be seen that the air blast washes the ore and its gangue

as in the water washing process but the blast can enter the crevices in the ore where the stream of water cannot enter, thus thoroughly cleaning the ore of its gangue, and leaving it in an open and porous condition. The ore will be further rendered porous by the expulsion of the volatile matter from the interior of the lumps.

The cleaned ore as it leaves the apparatus, is in a condition to be used in the blast furnace, the steel furnaces, and other metallurgical operations, and no preliminary calcining is necessary. The moisture, both free and combined, and other volatile matter have been driven off, and the ore has been placed in a dry and porous condition, which is so desirable for furnace operations. Further, the ore has been cleaned of its gangue and so the transportable weight has been considerably reduced.

I have described one particular form of process for producing this new material, but it will be obvious that this material may be obtained by other processes than described, and it is therefore to be understood that this material is not to be limited to any particular process.

Having thus described the invention, what is claimed is:

A furnace material consisting of a dry concentrated iron ore, said ore being calcined and freed from substantially all gangue and substantially all free and combined moisture to render the ore porous and clean, substantially as described.

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

EDWARD F. GOLTRA.

Witnesses:

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