UNITED STATES PATENT OFFICE.

JAMES A. BURDEN, OF TROY, NEW YORK.

IMPROVEMENT IN PROCESSES FOR LINING OR FETTLING PUDDLING-FURNACES.

Specification forming part of Letters Patent No. **171,772**, dated January 4, 1876; application filed December 10, 1875.

To all whom it may concern:

Be it known that I, JAMES A. BURDEN, of the city of Troy, in the county of Rensselaer and State of New York, have invented a new and Improved Method for Lining or Fettling Puddling-Furnaces; and that the following is a full, true, and exact description of my said improved method, which relates to the ordinary reverberating furnaces for puddling cast or pig iron.

It is well known that in the ordinary reverberating-furnace it is necessary that the plates of iron or other material which form the sides of the furnace should be protected by some non-conducting and refractory material from the intense heat by which the iron is melted and its impurities removed. Various substances have been used for this purpose; but it has been found in practice that the best material is the magnetic iron ore brought from the mines of Northern New York.

Heretofore this ore has been used in the following manner: A sloping wall has been built around the sides of the furnace, with large selected lumps of iron ore, commonly known as puddling-ore, and then the interstices have been filled with fine ore, which, becoming partially melted, adheres to the lumps, and forms a comparatively smooth surface. To this method, however, there are many serious objections. If the lump and iron ore have not thoroughly adhered before the pig-iron is introduced into the furnace and melted, the liquid iron works through the fine ore between the lumps, sometimes destroying a part or the whole of the wall, and at other times remaining mixed with the wall, which results in a considerable loss of iron and ore, besides damaging the furnace frequently in a very serious manner.

The puddler, in making his heat of iron into balls, frequently welds the balls to the masses of iron thus left in the lining of the furnace, involving a great loss of time, and great waste of iron and fuel before the masses can be separated. The iron is so firmly united with the lining that it becomes a part of the furnace, and before the furnace can be put in working order it is frequently necessary to remove the lining, and sometimes large portions of the brick-work and bottom of the furnace. Very frequently, too, while in operation, the lining-wall will be partially melted or broken down, and must be repaired before introducing the pig-iron for the next heat.

With the kind of fettling above described, this is a delicate and tedious operation, for the large lumps of ore are taken one by one on a long-handled "spoon," and placed so as to fill up the breech in the wall, and often much time is thus wasted.

My method is an improvement upon the one above described. Instead of using, as heretofore, large lumps, which are selected for this purpose, and sold at a higher price than ordinary ore by the mining companies, I use the ore as it runs from the mine, small lumps and fine together, the lumps small enough to be easily handled with a shovel. I first melt a small amount of cinder in the furnace, and while that is in the liquid state I throw into the furnace, with a shovel or other suitable instrument, small lumps and fine ore, until I form a sloping wall of suitable height and thickness around the sides of the furnace. Then with a proper instrument I dash the melted cinder at the bottom of the furnace over the sloping wall of ore built up as I have described.

The ore is cold, and the melted cinder, when dashed upon it, becomes chilled and "sets," and forms a smooth impervious surface over the inner side of the lining-wall, which thus becomes a complete protection to the sides of the furnace.

The advantages of this method are obvious. Fine ore is preferred to lump ore, and a great saving in material is effected. As the ore is thrown in by the puddler with a shovel instead of being laid in lumps one by one, there is a saving of labor, iron, and fuel. As the wall made by my process is a solid mass, the melted iron cannot penetrate it and produce the injurious effects hereinbefore described.

In making iron in a furnace lined with a wall formed of lumps of any kind of material, the angles or corners of the lumps frequently crack off by the action of the heat, and fall into the puddled iron when nearly finished, thus damaging the product. By my improved method such accidents are prevented, as the wall made in the manner described is smooth and solid.

By this process more iron is taken from the furnace in proportion to the charge, and of better quality.

The wall of lump ore formerly used presented a ragged surface, and the lumps which would break to pieces or fall bodily into the charge would not be sufficiently deoxidized to produce good wrought iron; but in the use of my improved lining it is found that as the cinder melts under the intense heat, small portions of the lining are slowly and perfectly deoxidized, and are added to the charge, so that there is an actual gain of from two and one-half to five per cent. in quantity, as well as a better quality, of wrought-iron produced.

If in making the furnace the lining-wall becomes partially broken down, it is easily repaired. After the heat is withdrawn from the furnace the workman leaves a portion of the melted cinder at the bottom of the furnace. He then with a shovel fills up the breach in the wall with small lumps and fine ore, and dashes the cinder over it, in the manner above described, making the repairs in much less time than was absolutely necessary by the old method.

Having given a full and exact description of my said improved method, what I claim as new, and desire to secure by Letters Patent, is—

The method above described of lining or fettling puddling-furnaces, by throwing in coarse and fine iron ore, mixed together as it comes from the mine, forming therewith a sloping bank or wall, and coating and compacting it together by dashing over it melted cinder from the furnace.

In witness whereof I have hereunto set my hand this 8th day of December, 1875.

JAS. A. BURDEN.

Witnesses:

ESEK COWEN,

JOHN J. HASSETT.