

United States Patent Office.

JAMES PARK, JR., OF PITTSBURG, PENNSYLVANIA.

Letters Patent No. 72,755, dated December 31, 1867.

IMPROVEMENT IN THE MANUFACTURE OF STEEL AND IRON.

The Schedule referred to in these Letters Patent and making part of the same.

TO ALL WHOM IT MAY CONCERN:

Be it known that I, JAMES PARK, Jr., of the city of Pittsburg, in the county of Allegheny, and State of Pennsylvania, have invented a new and useful Improvement in the Melting of Cast Steel; and I do hereby declare the following to be a full, clear, and exact description thereof.

The object of my invention is the production of cast steel of so low or mild a temper as to be susceptible of welding, and to possess the toughness and malleability of wrought iron, with greatly superior strength and fineness. Such a quality of steel is a great desideratum in the manufacture of rifle-barrels, locomotive fire-box sheets and flues, boiler-plates, and other articles which are made by welding, forging, or flanging, and in which toughness and strength are essential.

The production of such low-tempered steel has been found a matter of great practical difficulty, even where, as in Europe, clay crucibles are used for melting, and in this country the difficulty is enhanced by the employment of plumbago crucibles, as the carbon of the plumbago is readily communicated to the steel when it arrives at a fluid state, and thereby the temper of the steel is increased.

To enable others skilled in the art to make use of my invention, I will proceed to describe the process which I employ to secure the desired result, and in so doing I shall explain the operation as carried on with the ordinary appliances of crucibles and melting-“hole” or furnace, although my process may be carried on to advantage with the use of a reverberatory or other furnace having a chamber suited for containing the melted steel.

In the first place I take a quantity, say forty pounds, more or less, of wrought iron, which has been partially converted in the ordinary method, by converting-furnace or otherwise, and which contains about one per cent. of carbon, the amount of carbon which the converted wrought iron should contain being sufficient to cause it to melt freely; but with this limit, the smaller the quantity of carbon in the iron, the simpler will be the process. This partially-converted iron I place in a crucible, such as is ordinarily used by steel-makers, capable of holding double the quantity (say eighty pounds) of steel. The crucible thus charged I place in the ordinary melting-“hole” or furnace, where it remains until the carbonized wrought iron is thoroughly melted, using for this purpose one or more charges of coke or other suitable fuel. I then heat in the melting “hole,” or in any suitable furnace, a quantity of good wrought iron, which has not been carbonized or converted, raising it to a high welding or white heat, and as soon as the carbonized wrought iron in the crucible is sufficiently melted, I add to it about an equal quantity of highly-heated wrought iron. I then cover up the crucible again, and charge the melting-hole or furnace with additional fuel, continuing the melting-process until the entire contents of the crucible are melted and reduced to a liquid condition. The result of this process is that the contents of the crucible (eighty pounds, more or less, of melted metal) contain no more carbon, excepting what may have been imbibed from the plumbago of the crucible, than did the forty pounds composing the first charge of partially-converted wrought iron, so that the percentage of carbon in the entire mass is reduced nearly one half, or, in the example given, to about one half of one per cent. I then still further reduce the amount of carbon by teeming or pouring one half of the contents of the crucible into each of two other crucibles of similar capacity, previously heated in another melting-hole or furnace, and charged with highly-heated wrought iron, the quantity of wrought iron being, as before, about equal to the quantity of melted steel poured in from the first crucible. These second crucibles are then covered over with their lids, placed in the melting-hole, with another firing or charge of fuel, until the contents are completely fused. This process of diminishing the quantity of carbon by the addition of non-carbonized wrought iron, and repeated melting, can only be continued to the point where the metal ceases to become fluid, and begins to show fibres, or to assume the character of wrought iron, or “come to nature,” as it is termed. The degree of carbonization of the resulting steel may by this means be exactly determined according to the requirements of the manufacturer. If very low steel is desired, the process is not carried so far as to allow the metal to become fibrous, and the melted steel is cast into a suitable mould to form an ingot, which is then hammered and rolled in the usual manner. If, on the other hand, a fine quality of wrought iron is wanted, the process is continued until the metal begins to “come to nature,” when it will contain no appreciable amount of carbon, and ceases to remain in a liquid condition. It is then balled and hammered, or rolled into the desired shape.

By the means which I have described, I obtain a thoroughly-refined homogeneous material, superior in every respect to the finest grades of wrought iron, and possessing the toughness and malleability of wrought iron with greatly-increased strength. As before stated, the process may be carried on in larger quantities in a suitable furnace, having a chamber or pot to hold the melted metal during treatment, in which case the use of crucibles is dispensed with. The relative quantity of heated wrought iron, and of the melted carbonized iron, may be varied according to the result desired to be attained.

Having thus described my improvement in the melting of cast steel, what I claim as my invention, and desire to secure by Letters Patent, is—

Producing cast steel of mild or low temper, or wrought iron, in the manner substantially as hereinbefore described, by first melting partially-carbonized wrought iron in the ordinary or any other suitable furnace, and then adding to and melting in it highly-heated wrought iron, so as to reduce the percentage of carbon in the mass, and repeating the process, if necessary, until the carbon is sufficiently reduced or entirely removed.

In testimony whereof, I, the said JAMES PARK, Jr., have hereunto set my hand.

JAMES PARK, Jr.

Witnesses:

W. BAKEWELL,

W. F. GRAHAM.