

# UNITED STATES PATENT OFFICE.

JAMES HENDERSON, OF BROOKLYN, NEW YORK.

## IMPROVEMENT IN THE MANUFACTURE OF IRON AND STEEL.

Specification forming part of Letters Patent No. 50,474, dated October 17, 1865.

*To all whom it may concern:*

Be it known that I, JAMES HENDERSON, of Brooklyn, Kings county, and State of New York, have invented a new and useful Improvement in the Manufacture of Iron and Steel; and I do hereby declare that the following is a full, clear, and exact description thereof.

My invention relates to an improvement in the manufacture of iron or steel by the pneumatic process, generally known as the "Bessemer" process; and my said invention consists in combining with the said pneumatic process for decarbonizing crude molten iron the preparation of the crude molten iron to be thus decarbonized by mixing with iron ores and other materials charged in the usual manner at the tunnel-head of the blast-furnace a given quantity of manganese, or, by preference, manganiferous iron ores, such as that known in this country by the name of "red oxide of zinc," or "franklinite," known at present to exist in the greatest quantity in New Jersey; but other iron ores rich in manganese—such as spathose or spathic carbonates—may be used instead, where they are free from sulphur or phosphorus or any other iron ores, in combination with manganese, from which the metal known as "spiegeleisen" may be made. The object to be gained by thus mixing in the blast-furnace is that the manganese, or ores or metal containing manganese in sufficient quantity, may be smelted at the same time as the other ores with which the furnace may be charged, that there may be found combined with the iron in the state of fusion in the hearth of the blast-furnace a sufficient quantity of manganese to insure its being in a fit state to be treated directly from the blast-furnace by the pneumatic processes for making steel from crude cast-iron.

The mode of procedure is to run the molten iron from the blast-furnace in the decarbonizing-vessel, and then at once treating it by the pneumatic process, in every respect similar to the mode now practiced in what is known as the "Bessemer" process of making steel from crude iron by means of currents of air blown up through and among the metal. The quantity of manganiferous ores required will vary with the quantity of manganese they contain and the character of the other ores and materials with which they may be smelted. Very pure ores—such as the richer and better qualities of Lake Superior ores or the red hem-

atites of Cumberland and Lancashire, England—will require less than where ores of an inferior quality are used, and will necessarily depend on the experience of the workmen, assisted by frequent careful analysis of the materials used, all of which should be as free from sulphur and phosphorus as possible. Ores possessing the character of the red hematites of Ulverstone and Cumberland, smelted with good coke, free from sulphur, charcoal, or best quality anthracite and good limestone, will require from five to fifteen per cent. of the franklinite to produce the desired result.

The advantage of my said improved process is that the manganese, the presence of which in the pneumatic process of decarbonization is known to be essential, if not indispensable, is more thoroughly incorporated with the molten iron than when introduced in the crucible in which the pneumatic process is operated, and, being more thoroughly incorporated and being present from the very beginning of the pneumatic process for decarbonizing, it exerts its beneficial influence more effectually than when introduced toward the end.

When sulphur and phosphorus are found in the materials a larger quantity of franklinite will be needed to overcome these deleterious substances, and the same rule will apply where there is an excess of silica in combination with the ores.

All the ores used in the smelting operations will be found to work better when reduced to about egg size.

From the above explanation it will be seen that the principle upon which the invention is founded is the application of manganese or manganiferous iron ores to be operated upon or smelted with other iron ores in the furnace, so that when in the state of fusion it can be directly decarbonized and refined by the pneumatic process.

What I claim as my invention, and desire to secure by Letters Patent, is—

Mixing manganese or the equivalent thereof with the ore or ores charged in the blast-furnace for smelting, in combination with and to produce crude molten iron to be directly converted by the pneumatic process, substantially as and for the purpose specified:

JAMES HENDERSON.

Witnesses:

WM. H. BISHOP,  
A. DE LACY.