

United States Patent Office.

JAMES MYERS, JR., OF BROOKLYN, NEW YORK, ASSIGNOR TO BAR-
RON'S STEEL-MANUFACTURING COMPANY.

Letters Patent No. 84,644, dated December 1, 1868.

IMPROVED MODE OF PRODUCING STEEL.

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 MYERS, Jr., of Brooklyn, in the county of Kings, and State of New York, have invented a new and improved Mode of Producing Steel; and I do hereby declare that the following is a full and exact description thereof.

It is well known that certain varieties of cast-iron, containing carbon in such condition and proportions as give the well-known characters of cast-iron, viz, fusibility, brittleness, and incapacity of being forged, after having been melted and cast into articles of any desired form, of moderate size, may be subjected to a process by which, according to present scientific theories, all, or the greater portion of the carbon, is removed from such articles, the iron assuming new qualities. It loses its brittleness; it is, to a considerable degree, flexible; it has a toughness nearly equal to that of wrought-iron, but is incapable of being forged, except to a very limited degree, as wrought-iron, or of being remelted, as cast-iron.

This iron is known in the arts, in this country, as malleable cast-iron, but is properly called cemented cast-iron.

The process by which this change in cast iron is effected is, subjecting the articles of cast-iron, possessing the requisite properties for being acted upon, to cementation in close retorts, kept at a high heat for a prolonged period, by means of oxides, especially the oxides or ores of iron known as hematites.

Sometimes the articles of cast-iron are cast, without any preliminary preparation of the iron from the ordinary cupola-furnace, and sometimes from an air or reverberatory furnace, without blast, in which the iron, while in a molten state, has been subjected to a preliminary process, by which a portion of the carbon has been removed from it.

A serious commercial objection to the extensive use of the processes for the conversion of cast-iron into the so-called malleable cast-iron is, that such castings as have been converted into malleable cast-iron as are defective, or out of use, cannot be either forged or remelted. They cannot be sold as scrap-iron, and are worthless as a raw material in the arts.

It has, therefore, become a great desideratum to discover some process which can be applied to this worthless material to revive it for use in the arts. I not only accomplish this by my invention, but produce, at a comparatively small cost, a material of great commercial value.

I adopt two modes in carrying my invention into effect.

In the one case, I take cast-iron suitable to be converted into malleable iron, and subject it to the process of cementation, in a close retort, in contact with oxides, whereby the cast-iron is converted into the state known as malleable cast-iron, having first cast the iron to be

converted into shapes of any desired form for use. This process, I call that of decarburization. I then subject the shapes and forms so made to the process of recarburization, hereafter described.

In the other case, I obtain, from any suitable source, such shapes of malleable cast-iron, made by any known process, and subject them to the process of recarburization, which is as follows:

The articles of malleable cast-iron, formed by the process above described, or obtained of a suitable quality from any source, I place in a refractory retort capable of being surrounded by flame or heated gas, so that the contents of the retort may be brought, when heat is applied by any suitable device, to a white heat, or thereabouts.

Into an orifice in the retort, at a point which is indifferent, I place a tuyere, so constructed that a current of cold water may pass through it, to prevent its destruction by the heat of the retort, for the purpose of admitting gases produced as follows:

Into a vessel, suitably constructed for the purpose, usually placed outside of the stack containing the retorts, I heap a quantity of ordinary charcoal, although braise, or fine charcoal, coke, mineral coal, or any other solid carbonaceous matter may be used, but with less advantage. This vessel is called the carburetter.

After the coal is heaped into the carburetter, it is ignited, and when the moisture is fully evaporated, a necessary precaution, the vessel is closed, with the exception of an orifice for admitting atmospheric air, forced by a bellows, or any suitable device, and an orifice for ejecting the gases.

Upon forcing the atmospheric air through the ignited coal in the carburetter, carbonic-oxide gas, and carburetted-hydrogen gas, principally the former, are evolved, which pass from the carburetter into a suitable pipe, and enter the retort through the tuyere. A provision is thus made for a supply of carbonic-oxide gas, and carburetted-hydrogen gas, as well as nitrogen from the atmospheric air, into the retort.

In addition to the supply of gases from this source, I usually provide an apparatus, which may be of any suitable construction, by which a current of any liquid hydrocarbon may, at the same time, flow into a pipe entering the tuyere above named, or another tuyere entering the retort, and be discharged into the retort, where it assumes a gaseous form upon being subjected to the heat of the retort.

Although I prefer to bring into the retort gases from the two sources above described, one alone may be used, but with less advantage.

The essential feature in this portion of my procedure is the introduction of any suitable device of gases produced from the combustion of any solid or liquid carbonaceous matter, or liquid hydrocarbons, into the retort, for the purpose of acting upon the malleable

ble cast-iron. This process I call that of recarburation.

The operation of these gases upon the malleable cast-iron in the retort is as follows:

The temperature of the retort is kept at about a white heat. The castings are gradually converted into steel, the conversion proceeding progressively inwards, until the whole article is converted, the time required being from thirty minutes to three hours for such articles as are usually made of malleable cast-iron. The cost of conversion is not more than two dollars per ton.

These articles can be forged, hammered, rolled, worked, or tempered as effectually as any articles of cast-steel, and may be remelted into ingots or bars for commercial steel of a superior quality. Tools of any description made of malleable cast-iron may be converted and finished.

A particular advantage of this procedure is the facility of obtaining perfect uniformity in the steel, all articles of a definite size being always converted into steel within the same time, of a perfectly uniform quality under the same treatment.

So far as I am informed, I am the first person who has ever converted malleable cast-iron into true steel by this process.

I do not claim the invention of either of the above-described processes, viz, that by which cast-iron is converted into so-called malleable cast-iron, or that by which ordinary bar-iron is converted into steel by

means of gases from carbonaceous matters, either with or without the aid of gases produced from hydrocarbon, these processes having been before used separately.

The essence of my invention consists in combining two processes which have only before been used separately, into a series constituting a continuous process of several steps for producing a useful result never before attained; and also in a new application of a metallurgical process, whereby a material comparatively worthless is increased to from threefold to tenfold its original value.

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

1. The conversion of cast-iron into steel, by the combination of the two processes of decarburation and recarburation above described, in the manner and for the purpose substantially as above stated.

2. The conversion of articles of malleable cast-iron, produced by any known process, into steel, by the application of gases produced from any solid or liquid carbonaceous substances, in the manner substantially as described.

3. The production of cast-steel, by remelting steel formed from malleable cast-iron, when made in the manner above described.

JAMES MYERS, JR.

Witnesses:

JOHN L. HAYES,
BYRON ROSE.