

UNITED STATES PATENT OFFICE.

WILLIAM F. M. McCARTY, OF HAGERSTOWN, MARYLAND, ASSIGNOR OF PART
TO SARAH C. ASHTON AND HERMAN DUDLEY WALBRIDGE, OF WASH-
INGTON, DISTRICT OF COLUMBIA.

PROCESS OF MAKING STEEL DIRECT FROM THE ORE BY THE USE OF NATURAL GAS.

SPECIFICATION forming part of Letters Patent No. 410,430, dated September 3, 1889.

Application filed May 21, 1889. Serial No. 311,626. (No specimens.)

To all whom it may concern:

Be it known that I, WILLIAM F. M. McCARTY, a citizen of the United States, residing at Hagerstown, in the county of Washington and State of Maryland, have invented new and useful Improvements in the Process of Making Steel Direct from the Ore by the Use of Natural Gas; and I do hereby declare the following to be a full, clear, and exact description of said invention.

My invention relates to a new and useful method of producing steel direct from the ore.

The object of my invention is to produce a good quality of steel direct from the ore at one and the same heat, thus saving the extra cost in the handlings and the heating of the metal from four to five times, as is now commonly practiced.

In carrying out my invention I use a stack or cupola furnace having shelves, on which the ore is roasted, but do not limit myself to any particular form of furnace. I prefer, however, to employ the furnace illustrated in section in the accompanying drawing, in which—

A indicates the stack, having a series of shelves B on the inside, below which is located the bosh C. D indicates the crucible of the furnace located below the bosh, and E a vacuum-chamber connecting with the crucible by means of a passage E'.

The ores are first reduced to a powdered condition and to about the consistency of river-sand, and mixed with a basic flux—viz., nitrate of soda, lime, clay, and yellow prussiate of potassa. They are then put into the stack of the furnace, and the ascending units of heat are utilized in roasting the ores. They are then passed into the furnace proper while under the action of the calorific energy of the gas, fall from shelf to shelf, and being thus brought into contact with the fluxes specially prepared to take up the phosphorus, sulphur, &c. They then fall into the bosh of the furnace, where they are still further fused by

the introduction of natural gas under pressure. At this stage of the process air may be mixed with the gas to furnish the oxygen necessary to burn out any of the carburet of iron still remaining in the iron, after which the metal is withdrawn into the crucible of the furnace and blown with natural gas, to which I add hydrocarbon oil for the purpose of carbonizing the steel to the required point. The metal is then withdrawn to a vacuum-chamber, and then the occluded gases are all withdrawn by the action of the vacuum, so that the metal may be utilized for castings free from blow-holes, &c.

I may add to the molten metal the carbon in various forms, as in plumbago, lamp-black, and bone-black, and at the same time I add such alloy of manganese of iron, or chrome in metal, or oxide, as may be desired, while to add to the quality of the metal I use tungstate dioxide or trioxide of tungsten and cyanide of potassium and yellow prussiate of potassa for giving it temper and case-hardening.

What I claim is—

The process which consists in first introducing powdered ores, combined with a basic flux, into the upper portion of a shaft-furnace, and there subjecting them to the action of a flame of natural gas; second, passing them downward into the bosh of the furnace and there subjecting them to the action of a blast of natural gas; third, passing the fused ore into the crucible of the furnace and there subjecting it to the action of jets of natural gas and hydrocarbon oil, and, finally, conveying the reduced metal into a vacuum-chamber, whereby the gases are removed from the metal, substantially as described.

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

WM. F. M. McCARTY.

Witnesses:

L. W. SINSABAUGH,
H. M. STERLING.