UNITED STATES PATENT OFFICE.

SAMUEL A. FORD, OF ALLEGHENY, PENNSYLVANIA.

IMPROVEMENT IN CONVERTING NON-CHILLING IRON INTO CHILLING-IRON.

Specification forming part of Letters Patent No. **202,530,** dated April 16, 1878; application filed December 26, 1877.

To all whom it may concern:

Be it known that I, SAMUEL A. FORD, of Allegheny, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Process of Treating Non-Chilling Irons and Light Chilling-Irons; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to the conversion of non-chilling into chilling irons; and consists in submitting a charge of melted non-chilling iron to the action of an air-blast for a few moments only—say from one to six minutes—the air-blast being cut off either just before or just after the appearance of the carbon-flame, according to the depth of chill required in the product.

In the manufacture of pig metal two processes are commonly followed in the blast-furnace—the one known as the "cold-blast" and the other as the "hot-blast" process, and the products are known in the trade as "hot-blast iron" and "cold-blast iron."

The cold-blast iron is low in silicon, and is especially adapted for chill-castings, &c.; but its production is limited by the nature of the ore required and the small size of furnaces it is practicable to work to advantage. The hot-blast iron, on the contrary, can be produced in any quantities desired, as there is practically no limitation either in quality of ore or size of furnace; but the hot-blast iron is high in silicon, and, though well adapted for the Bessemer process, is a non-chilling iron, totally unfit for the manufacture of chill-castings.

The best chilling cold-blast irons will average seven-tenths of one per cent. of silicon and about four or five per cent. of carbon, and the average yield of a furnace worked by the cold blast will be from eight to twelve tons of metal per day; but the hot-blast furnaces may be constructed to yield eighty or one hundred tons per day. The cost of cold-blast charcoal chilling-iron will run at the present time thirty five to forty dollars per ton, while the hot-blast non-chilling iron can be procured at from seventeen to twenty dollars per ton.

The main object of the present invention is to utilize the comparatively cheap hot-blast iron in the manufacture of chill-rolls, car-wheels, chill-plows, malleable castings, and under all similar circumstances where the more expensive coal-blast charcoal chilling-irons are now necessarily used; but the process is equally applicable to the treatment of light chilling-irons where it is desirable to increase the depth of the chill.

I will now proceed to describe my invention, so that others skilled in the art to which it appertains may apply the same.

Having melted the desired quantity of pig iron in a cupola or other suitable furnace, or, if convenient, taking such a charge of molten iron directly from the blast-furnace, I introduce it into a furnace, where it can be treated by an air-blast. For this purpose I prefer a Bessemer converter, wherein I submit the molten metal to the action of the air-blast for a few moments, shutting off the blast either just before or just after the appearance of the carbon-flame, varying the time slightly, according to the quality of the metal and the depth of chill required.

If only a small amount of chill is required, I cut off the blast just before the carbon of the metal begins to oxidize, which point can be determined by the increased strength of the flame with absence of the brilliant yellow color. When a deep chill is desired, the blow is continued until the brilliant yellow due to the oxidation of the carbon appears in the flame; but it is cut off before the disappearance of the silicon-flame, or that flame which is seen at the commencement of the blow. The blow, having been carried to the extent indicated according to the desired chill, is then cut off, and the metal poured into a ladle or other suitable vessel, and thence directly into chill-molds, or into sand-molds for the formation of castings, or into pigs, which can be subsequently remelted in a cupola or other suitable furnace for the manufacture of chill-castings. The whole process will usually occupy a space of time varying from one to five minutes; but under some circumstances it may be necessary to continue the blow somewhat longer, especially if the hot-blast iron composing the charge be extremely high in silicon.

The metal thus treated has not lost the qualities of cast-iron, but will be found to have acquired the properties of the cold-blast charcoal chilling-irons. It will be found to be very hard, of great strength, and, if cast in a chill-mold, will, when broken, show long white

crystals tapering into gray metal. When cast in sand-molds, if the chilling property is not too great, it will exhibit a dark-gray color and close grain resembling cold-blast charcoal-iron; but if the chilling property is very high, then the edges of the casting will be slightly chilled and the center of the piece of light-gray color.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

The method herein described for converting non-chilling irons into chilling-irons, and for increasing the chilling capacity in light chilling-iron, which consists in subjecting a charge of the melted metal to the action of an air-blast for a limited time only, the blow being cut off either immediately before or immediately after the appearance of the carbon-flame, and before the disappearance of the silicon-flame, substantially as specified.

In testimony whereof I, the said SAMUEL A. FORD, have hereunto set my hand.

SAMUEL A. FORD.

Witnesses:
JAMES I. KAY,
F. W. RITTER, Jr.