

UNITED STATES PATENT OFFICE.

SAMUEL T. WELLMAN AND CHARLES H. WELLMAN, OF CLEVELAND, OHIO,
AND CHARLES M. SCHWAB, OF HOMESTEAD, PENNSYLVANIA.

MANUFACTURE OF BASIC OPEN-HEARTH STEEL.

SPECIFICATION forming part of Letters Patent No. 600,105, dated March 1, 1898.

Application filed January 9, 1897. Serial No. 618,643. (No specimens.)

To all whom it may concern:

Be it known that we, SAMUEL T. WELLMAN and CHARLES H. WELLMAN, residents of Cleveland, Ohio, and CHARLES M. SCHWAB, a resident of Homestead, Pennsylvania, citizens of the United States, have invented certain Improvements in the Manufacture of Basic Open-Hearth Steel, of which the following is a specification.

The object of our invention is to so carry on the process of making basic open-hearth steel as to effect large production at low cost, an object which we attain in the manner hereinafter set forth.

It is very difficult to produce in a blast-furnace pig-iron which is as low in silicon as is necessary for its successful use in the basic open-hearth process of making steel, although it is sometimes made at considerable extra cost. While it is the endeavor of all blast-furnace managers to produce a quality of iron available for use in the basic-open-hearth-steel process, large quantities that will not fill the required specifications are in ordinary blast-furnace practice being constantly accumulated.

In carrying out our invention we propose to run the blast-furnace so as to produce the pig-iron at the least possible cost, and before using this pig-iron in the steel-furnace we subject it to a special or intermediate treatment, whereby silicon can be rapidly removed and the metal readily and economically reduced to such condition that it can be used to advantage in the manufacture of basic open-hearth steel.

In carrying out our invention we run the pig-iron direct from the blast-furnace into a storage-furnace preferably of large capacity—that is to say, capable of handling one hundred tons or more. This furnace is lined with basic material and is provided with means for keeping its contents in a molten condition. For instance, it may be a furnace of the ordinary regenerative type using as fuel a mixture of gas and air, as in ordinary melting-furnaces.

The molten iron in the storage-furnace is treated with lime and ore, so as to rapidly oxidize the silicon which may be contained

in the metal, and at intervals portions of the charge are poured into a transfer-ladle and conveyed to the regular basic open-hearth furnace for being converted therein into basic steel by the usual process.

The treatment of the charge in the storage-furnace should be continued until the percentage of silicon therein is reduced to such a degree that the metal is in good condition for use in the steel-making furnace, this being what is meant by the term “desiliconized” as used herein.

Besides providing for the removal of silicon the storage-furnace also enables us to provide charges for the steel-furnaces of a more uniform character than those derived directly from the blast-furnace, for in the storage-furnace a number of different charges are mixed together. Hence the charges removed from the storage-furnace, instead of varying widely in percentage of impurities contained therein, are substantially uniform, the amount of impurities in each charge being the average represented by a number of charges received from the blast furnace or furnaces. By reason of this uniformity and of the low percentage of silicon contained in the charge introduced into the steel-furnace the operation of the latter is materially facilitated. Hence the production is materially increased, while economy is secured by the use of a special furnace in which the silicon can be most effectively removed from the iron instead of attempting to produce an iron low in silicon in the blast-furnace.

In practice we prefer to use one storage-furnace in connection with a number of steel-furnaces and one or more blast-furnaces, so that the continuous operation of the entire plant is provided for.

We are aware that furnaces for stirring and mixing pig-iron from the blast-furnace have long been used, and hence we do not claim such mixers broadly; but

What we claim as our invention, and desire to secure by Letters Patent, is—

The mode herein described of making basic open-hearth steel, said mode consisting in conveying successive charges of molten iron from a blast-furnace into a storage-furnace

of large capacity, mixing said charges in said
storage-furnace, and maintaining them in
molten condition therein, providing the mol-
ten metal in said storage-furnace with a slag
5 covering not derived from the metal itself
and capable of removing silicon from the
molten metal, and withdrawing at intervals
portions of the desiliconized iron from the
storage-furnace and conveying the same to
10 a basic open-hearth furnace for the manu-
facture of steel, substantially as specified.

In testimony whereof we have signed our

names to this specification in the presence of
two subscribing witnesses.

SAMUEL T. WELLMAN.
CHARLES H. WELLMAN.
CHARLES M. SCHWAB.

Witnesses to signatures of S. T. and C. H.
Wellman:

C. W. COMSTOCK,
JOHN M. GEORGE.

Witnesses to signature of C. M. Schwab:
WM. A. CORNELIUS,
O. E. REINHARDT.