UNITED STATES PATENT OFFICE.

WINFIELD S. POTTER, OF NEW YORK, N. Y.

PROCESS OF PREPARING MANGANESE-STEEL INGOTS FOR ROLLING.

975,370. Specification of Letters Patent. Patented Nov. 8, 1910.

No Drawing. Application filed June 16, 1910. Serial No. 567,331.

To all whom it may concern:

Be it known that I, WINFIELD S. POTTER, a citizen of the United States, residing at New York city, New York, and whose post-office address is No. 30 Church street, New York city, New York, have invented certain new and useful Improvements in Processes for Preparing Manganese-Steel Ingots for Rolling; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to the casting and the heat treatment of ingots of manganese steel and more particularly to a method of obtaining the ingots in such a physical condition that the metal will withstand rolling when it is heated to a high temperature.

I have discovered that when the steel is heated to temperatures lying within a range approximately between 640° C. and 720° C. and held for a considerable time within this range, or when the temperature is slowly raised or lowered through this range, that a reconstruction or recrystallization of the mass of steel may be effected. This reconstruction at temperatures between 640° C. and 720° C. may be applied to ingots cast in the ordinary manner in iron molds having heavy walls, but the time required to break down in this manner the dendritic structures occurring in ingots which have been so cast is objectionably long. For this reason I prefer to cast the ingots in molds having inner walls or surfaces in contact with the poured-in metal, which are of such a character that the heat of casting is slowly abstracted from the ingots. To this end the inner walls of the molds may be made up largely of materials which are refractory and which conduct heat slowly, such as sand or ganister. Good results may also be obtained by casting the ingots in molds having thin inner walls of metal, in which case the inner wall of the mold may be backed with a layer of material which is a poor conductor of heat, such as fine sand or asbestos, and this non-conducting layer may in turn be supported by a casing of metal. By casting in molds of this nature, the crystalline arrangement of the metal in the outer portion of the ingots is of a very much more favorable character than the pronounced dendritic structure found in the outer portion of ingots of manganese steel cast in heavy iron molds.

In carrying my invention into practice, the manganese steel of the desired composition is cast into molds which for the purposes of illustration may consist of cast iron shells made in two halves, the division being on a plane passing through the longitudinal axes of the molds, which shells of cast iron are lined with a layer of silicious ganister, five or six inches in thickness. The ingots may be tapered or parallel. If the ingots are tapered, the molds may be removed by lifting, or if the ingots are made parallel, they may be separated from the molds by opening the split molds on the plane of division, as, for example, by releasing any suitable fastening mechanism, such as bolts or clamps provided for the purpose.

After casting, the ingots are preferably allowed to remain in the molds until they have set and until they have cooled to an average temperature between 600° C. and 800° C. The molds are then removed from the ingots and the ingots placed in soaking pits or heating furnaces, which pits will at this time have a temperature of about 700° C. The temperature of the soaking pit and the contained ingots is now equalized at some point within the critical range lying between 640° C. and 720° C., and is then preferably slowly raised and lowered through the critical range until the freezing structures in the steel have been removed and the desirable reconstruction effected. For example, if the temperature in the soaking pit and the ingots has been equalized at 750° C., the furnace and its contents will be slowly cooled to about 600° C., and the temperature then slowly raised to about 750° C. The slow cooling and slow reheating may then be repeated, if necessary, to complete the recrystallization of the steel. The ingots will now usually be heated to a much higher temperature for rolling, although when the desirable reconstruction has once been executed, the ingots may be cooled off and subsequently reheated for rolling. Proceeding in the usual manner, the temperature is raised to and maintained at about 1150° C. until the ingots have this temperature throughout. The ingots are now removed from the furnace or soaking pit and immediately rolled. If the greatest obtainable ductility is required, the ingots may be

heated to about 1250° C. and held at this temperature until heated to 1250° C. throughout. In this case and in order to avoid crushing, the outer portion of the ingot must first be cooled to 1150° C., for example, or lightly worked, and thereby somewhat cooled and strengthened before any heavy reductions in the rolls are attempted, as set forth in my U. S. Patent No. 938,893, dated November 2, 1909.

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

1. The process of preparing ingots of manganese steel for rolling, which consists in casting the ingot, equalizing the temperature within the ingot, slowly passing the temperature through a range lying between 600° C. and 750° C. until reconstruction is effected, and finally raising the temperature of the ingot to above 1100° C. for rolling; substantially as described.

2. The process of preparing ingots of manganese steel for rolling, which consists in casting the ingot, equalizing the temperature within the ingot, slowly passing the temperature through a range lying between 600° C. and 750° C. until reconstruction is effected, and finally raising the temperature of the ingot to about 1150° C. for rolling; substantially as described.

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

WINFIELD S. POTTER.

Witnesses:
ELSA M. GEILFUSS,
WILLIAM H. DAVIS.