Feb. 9, 1943. L. F. McGLINCY 2,310,703

METHOD OF TREATING STEEL

Filed Jan. 8, 1941

FIG. 1.

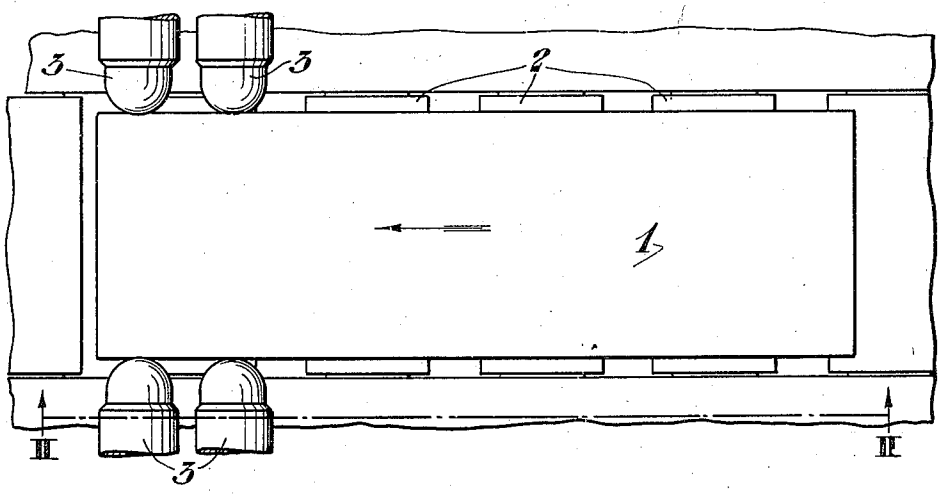
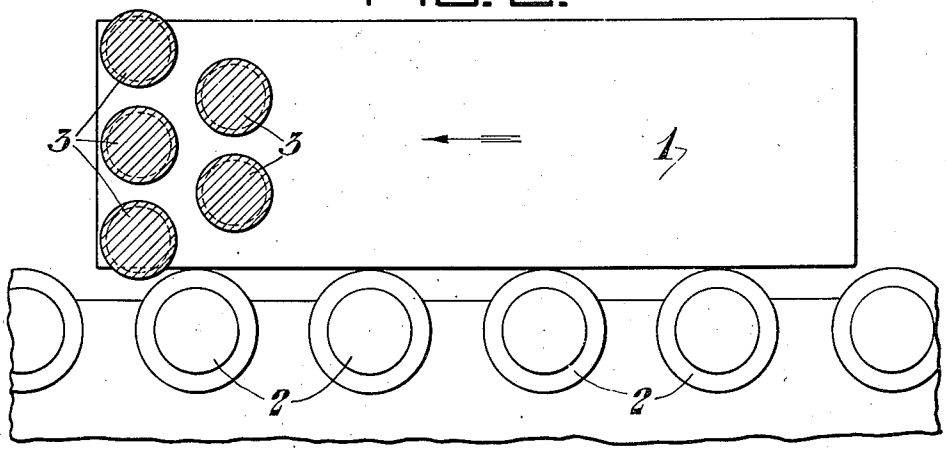


FIG. 2.



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Patented Feb. 9, 1943

2,310,703

UNITED STATES PATENT OFFICE

2,310,703

METHOD OF TREATING STEEL

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Application January 8, 1941, Serial No. 373,667

2 Claims. (Cl. 148—2)

This invention relates to a method of treating steel, and more particularly to cast steel which is in the form of an ingot.

In the conventional manufacture of steel the molten metal is poured from the furnace into a ladle from which it is teemed into molds. After the steel in the molds has solidified to a substantial degree, the ingot comprised thereof is stripped from the mold and, while still highly heated, removed to a soaking pit wherein the temperature of the ingot is equalized.

After the equalization of the temperature of the ingot while in the soaking pit, it is removed therefrom, and while heated to a forging temperature, subjected to the action of a blooming mill wherein the ingot is roughly reduced and shaped into an article from which it may subsequently take a diversity of forms.

The grain structure of the metal of the ingot is that of a casting and is, accordingly, very coarse and sensitive to distortion when drawn from the soaking pit preparatory to rolling.

When in the blooming mill, the ingot is rapidly reduced in the early passes and this causes surface cracks which frequently must be chipped or burned off by scarfing. It is observed that the sides of the ingot not in contact with the rolls of the blooming mill are more susceptible to cracking. This is, of course, due to the heavy reduction in the early passes. It is unquestionably true that lighter initial reductions would minimize some of this cracking on the sides of the ingot, but this is impractical from the standpoint of economy.

It is among the objects of the present invention to provide a method of treating steel which minimizes cracking of the ingot in the early passes of the blooming mill.

Another object is the accomplishment of the foregoing in a manner which is convenient and inexpensive.

To the accomplishment of these and other desirable objects and purposes, I have designed the present, preferred embodiments of the invention presented in the accompanying drawing forming a part of this specification and to which reference should be had in connection with the following detailed description, and in the drawing, for simplicity, like reference numerals have been employed to designate the same parts throughout the several views.

In said drawing:

Figure 1 is a diagrammatic, fragmentary plan of apparatus which may be used to practice the method of the present invention; and

Figure 2 is an elevational view on the line II—II of Figure 1.

According to the teachings of the present invention, molten metal of the desired analysis is poured from the furnace into a ladle from which it is teemed into the ingot molds. After the steel has substantially solidfied, the ingots comprised thereof are stripped and while still highly heated placed in a soaking pit wherein the temperature from the center to the exterior surfaces thereof is equalized. After equalization of temperature in the soaking pit, the ingots are ordinarily transferred directly from the blooming mill wherein the early passes are very heavy. Rather than minimizing cracking of the sides of the ingot by resorting to lighter initial reductions in the bloomng mill, with an attendant increase in cost of production, the teachings of the invention contemplate the provision of instrumentalities which, after the ingot has been removed from the soaking pit preparatory to introducing into the blooming mill, may be relied upon to improve or refine the grain structure thereof. More specifically, there is provided means for peening both sides of the ingot which are not in contact with the rolls of the blooming mill in the early reductions. This peening is complete on both sides of the ingot, removes all scale, and refines the coarse dendritic structure of the ingot skin so that it will be less susceptible to cracking during rolling, particularly on the initial breakdown passes through the rolls of the blooming mill.

Referring more particularly to the drawing, I have illustrated diagrammatically a form of apparatus which may be used to practice the method of the present invention. This apparatus is disposed above the feed rolls 2 on the approach table of the blooming mill and comprises, on either side of the line of pass therethrough, a series of pneumatically operated hammers 3 which are constructed and arranged in such staggered relationship as to be able to completely peen both sides of the ingot immeidately prior to the passage thereof into the rolls of the blooming mill. The manner of operation of these pneumatic hammers 3 is entirely conventional, as are the structural details thereof, and as such these aspects form no part of the present invention.

While I have shown and described certain specific embodiments of the present invention, it will be seen that I do not wish to be limited exactly thereto, since various modifications may be

made without departing from the scope of the invention, as defined by the following claims.

I claim:

1. The method of treating steel which comprises molding the steel into an ingot; permitting the ingot to substantially solidify; stripping the ingot from its mold; placing the ingot in a heated vessel; permitting the temperature of the ingot while in the heated vessel to be substantially equalized throughout to the temperature required for forging but materially below the temperature of solidification; removing the ingot from the heated vessel; peening the surface of the ingot while it is still at forging temperature and materially below the temperature of solidification, whereby the scale is removed and the grain structure of the skin of the ingot is refined; and rolling the ingot to the desired shape while it is still at forging temperature.

2. The method of treating steel which comprises molding the steel into an ingot; permitting the ingot to substantially solidify; stripping the ingot from its mold; placing the ingot in a heated vessel; permitting the temperature of the ingot while in the heated vessel to be substantially equalized throughout to the temperature required for forging but materially below the temperature of solidification; removing the ingot from the heated vessel; peening the surface of the ingot while it is still at forging temperature and materially below the temperature of solidification, whereby the scale is removed and the grain structure of the skin of the ingot is refined; and rolling the ingot to the desired shape while it is still at forging temperature, said peening being performed without material reduction in cross-sectional area.

LLOYD F. McGLINCY.