

Blast furnaces have been run to their fullest capacity and the molten metal is taken therefrom and poured into a receiver or mixer from which it is drawn off at intervals and placed directly into the converter where the process of making the steel is carried out. In former days the practice was to run the molten material from the blast furnaces into sand, thus making what is commonly known as pig-iron. The pig-iron was then melted in cupolas and was from there placed in the converters. This gave a great advantage over present practice as the second melting gave the iron an additional opportunity to throw off impurities which were left after coming from the blast furnaces.

In the converting of the pig-iron into steel the old practice was to place the molten pig-iron in the converter in which it was given a long blow, thus preventing the metal from becoming too hot, whereas the practice of to-day is to blow the heat in several minutes less than formerly and artificial means are being used to keep the temperature of the metal as nearly normal as possible. It is evident that this not a success for when the metal becomes overheated in the converter it is very seldom that it is brought to a normal temperature at the time the pouring of the ingots begins, the result being that the ingots are piped deeply and segregation is more noticeable.

The foregoing statement in favor of old methods can be substantiated by the records of the steel companies, as under the old way of working, the percentage of second-class and piped rails was more than 50 per cent. less than it is to-day.

Greater care should be exercised in the heating of the ingots. They should be allowed to remain long enough in the soaking pits for the centres to become thoroughly solidified and the outside to be heated to a good rolling temperature. Under no circumstances should they be allowed to come to a cinder heat. This result can be accomplished by allowing the ingots to remain in the furnace a sufficient length of time to obtain the foregoing results. The flame in soaking pits should be kept as mild as possible.

When the ingot is being reduced in the blooming rolls, the reduction should be slow and gradual, so as to prevent the tearing and disarrangement of the structure of the steel. In shearing the bloom, a sufficient amount should be taken from the front end and back to clean off all raggedness, and enough more from the front end to cut off all piping, thus ensuring the balance of the bloom to be of sound material.

Before converting the blooms into rails it is the better practice to reheat them, in order to make the temperature of the blooms more regular.

The rail rolls should be so designed that the reductions made in each pass will be equalized. The rolls in use some fifteen or twenty years ago contained thirteen passes from the first roughing to the finishing pass with the result that a much closer grained steel was obtained in the rails than is obtained at the present time on account of most mills using large blooming rolls with heavy reductions in each pass, in not reheating, and in forming the rail from the bloom in nine passes instead of thirteen which, as mentioned above, was the practice some years ago.

The finishing temperature of the steel can best be regulated by specifying the temperature at which the bloom should be when entering the roughing rolls, rather than to try and regulate the temperature by the hot saw shrinkage clause which is common to the specifications of most railroads.

In the cambering of the rails great care must be taken so that when they finally cool they will be as near straight as possible, and thus reduce the cold straightening to a minimum.

If the steel companies were compelled to adopt the practice outlined above it is the opinion of the writer that failures due to the defects of manufacture would be considerably reduced.

Of course, the ideal rail is one that is very hard, thus having good wearing qualities, and yet should be elastic. This ideal can only be obtained by having the carbon high and the phosphorus very low.

The steel manufacturers now state that their ores are such that they cannot guarantee a lower phosphorus in their steel by the Bessemer process than 0.10 per cent., so that unless large deposits of purer ore are found it would appear

that the Open Hearth process will continue to gain in favor for the manufacture of steel to be used in rails. Of course, the Bessemer steel will continue to be useful for the manufacture of pipes, nails, and wire for fencing. When the steel companies universally adopt the Open Hearth process for the manufacture of rail steel, let us hope that they will not increase the units of their furnaces one hundred per cent. as has been done in many cases with the Bessemer process. The smaller the capacity of the Bessemer converter and the Open Hearth furnace, the more uniform will be the grade of steel obtained.

Railroad officials in writing specifications should embody clauses which are just as important as the clauses they are laying great stress on at present, namely, controlling the amount to be sheared from the bloom and also the temperature at which the rail should be sawed. The former clause is a very important one, but the latter, in the opinion of the writer, is of very little consequence in view of the fact that there are scarcely two mills in the country that have anywhere near the same distance between the finishing roll and the hot saw. It will therefore be seen that this clause does not obtain the results it is supposed to obtain.

In obtaining a good grade of rails a great deal of responsibility rests on the inspection. The inspector at the works should be a man who is as familiar with the manufacture of steel and the workings of the particular mill at which he is stationed as is the superintendent of the works. The railroads should see that a man with such ability is looking after their interests at the time their orders are being rolled. If this policy had been carried out in the past the railroads would have been promptly notified when the steel companies were contemplating any change which would be detrimental to the quality of the rails being manufactured. The railroad companies then could be protected and gain their point much easier than it can now be obtained.

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