Metallurgical Comment

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Correspondence and Discussion Invited

RE-ROLLED RAIL BARS FOR CONCRETE REINFORCING.

Quite recently in the pages of one of our contemporaries, there appeared a discussion on the question of the advisability of using for the purpose of reinforcing concrete, bars that have been re-rolled from old rails. Some of the statements made in this discussion were, to say the least, rather sweeping and could hardly have been made with a full knowledge of facts.

At the outset, it is to be clearly understood that **the following is not a discussion as to the relative merits of low and high carbon steel for reinforcing concrete.** It is merely intended to point out a few facts that have come under the writer's observation and which it will be seen must necessarily have a great effect on the question as to the desirability of re-rolled rail bars.

Before discussing the re-rolling of rails, the writer would take exception to the following statement that appeared in the referred to articles and which is apparently given as a reason why re-rolled rail bars are as well made as other bars rolled from billets:

"It is a matter of common rumor, if not common knowledge, that the scabbed, piped and otherwise defective billets are used for rolling into reinforcing bars; also, in many cases, the crop ends from the ingot, rejected as not being good enough for a rail, are so rolled."

Such a statement, if true, would warrant a deep searching investigation—if true; but, the reader will see that the matter is one of "common rumor if not one of common knowledge." To the man who is accustomed to think, "common rumor" is a very dangerous and untrustworthy source of information. To the practical man, however, portions of the statement contain a refutation of their truth. It is a matter of practical knowledge that to roll steel containing a "pipe" means that the final metal will contain this same cavity in compressed and elongated form. The surfaces of the cavity do not weld together under rolling for the very good reason that they are generally badly oxidized. One can readily imagine the form of concrete bar resulting from this "piped" billet or from the rail crop end which is rejected because it contains the "pipe" of the ingot from which it is cut. It cannot be said with absolute certainty that no "piped" billets are ever rolled into concrete bars, just as it cannot be said that no "piped" rails are ever put out in service even after the greatest precautions; but, what is more to the point, it can be said that **great precautions are taken to prevent such a thing happening.**

To come back to the re-rolling question, it must be admitted that the proper re-rolling of a rail into a smaller rail section does give an extremely good and serviceable rail **provided the original rail was free from defects.** Re-rolling is not going to cover up those defects. On the contrary, it has been the writer's experience that the re-rolling in diagonal passes tends to uncover such defects as hidden "pipes," seams, etc.; so that the final inspection very easily eliminates the undesirable rails. This fact is used as an argument that the same thing will happen in re-rolling a rail into bar sections. To a very limited extent, this may be true. As far as the sound steel itself is concerned, the re-rolling certainly tends to give it a higher elastic limit and ultimate strength; so that, provided an engineer favors the use of "high elastic limit" steel, one apperently gets perfection in this product. But we must stop to consider that if the rail has a defect to begin with, say a small undiscernible open seam, this flaw will not be readily detected in the final bar. It is comparatively easy to inspect re-rolled rail sections; but, one would have to go over each foot of a re-rolled rail bar with extreme care in order to detect some of the fine seams that the writer has seen in these bars as resulting from a defect in the original rail. Supposing, however, for the sake of argument, that it is admitted that all the original rails are free from defects, there still exists a fact that must be recognized if one uses the re-rolled product.

In the table below the writer gives some analyses from actual rails that were selected at random from a pile of rails that had been re-rolled:

	Rail No. 1	No. 2	No. 3	No. 4
Carbon	.29	.31	.05	.51

The wide range in carbon content of these rails is at once apparent. The tests of the re-rolled product showed the consequent variation in strength that one would expect. But, it may be said that this variation is abnormal; rails are manufactured to-day under a very definite chemical specification. Quite true; but, if one will take the trouble to look up these specifications, such as those of the American Society Testing Materials, it will be found that in Bessemer rails there is a range of from .35 to .55 carbon for rails varying in size from 50 to 100 lb. section (the carbon content being given for the various sizes of rails); and, in open hearth rails, the range for the same rail sections is from .46 to .75 carbon. As rails used for re-rolling are of all sizes, it would seem to follow that one would get bars with varying strengths; **certainly the bars would not be all alike as far as carbon is concerned.** To such an argument as this, the answer might be that re-rolling mills sort the rails into piles according to section, etc.; but, it is seen that even if this is done, the rails may some of them be Bessemer and others Open Hearth, and a glance at specifications shows that, say for 80 lb. rails, Open Hearth shall be between .52 and .65, and Bessemer between .4 and .5 carbon, which gives a range of from .4 to .65 in 80 lb. rails piled without taking into account whether they were Open Hearth or Bessemer rails. Such argument might go on indefinitely. It is fact with which we are concerned.

It will be noticed that in the given analyses, one of the rails showed merely .05 carbon. In fact, this was an old wrought iron rail. The point is that these old rails (not necessarily wrought iron) are finding their way to the re-rolling mills, and with them there is absolutely no definite guarantee of carbon content, so that the final product is necessarily a variety. It is beside the question to say that the steel in rails is all of good tested quality; that these old rails are very good steel, etc. The steel is of good tested quality for rails, but, it does not necessarily follow that it will give an even quality of steel for bars.

If engineers wish to use steel whose carbon content is likely to vary widely, all well and good. They do so knowing that the steel they are using may have a wide range of strength. **This fact must be recognized and**