

IRON AND STEEL.

EDITED BY P. W. SHIMER.

CARBON IN STEEL.

IN *Zeitschrift für angewandte Chemie*, 1893, parts 11, 13, and 14, Dr. Richard Lorenz gives some remarkable results obtained by him in the determination of carbon in steel by different methods. The conclusion is reached that the method by volatilization in a current of chlorine, the double chloride of copper and ammonium method, the copper sulphate method, and the chromic acid method yield results that are below the truth. A direct oxidation method devised by the author gives higher results which are supposed to be more nearly correct.

As to the chlorine method the conclusions are as follows: When the ignition in chlorine is prolonged beyond the point of complete volatilization of the ferric chloride, carbon goes off in combination with chlorine. When the ignition is interrupted before this point is reached, some iron carbides remain undecomposed and these are not completely oxidized in the subsequent combustion in oxygen. Even when the ignition is interrupted at the proper point, the results are low.

The conclusions as to the action of cupric ammonium chloride solution on steel are the following: 1. The reaction, which apparently is very rapid, is really, in its last stages, at the ordinary temperature, quite slow, and often requires many days to complete it. 2. On account of the presence of chlorine in the carbonaceous residue it is necessary to burn it in a tube containing lead chromate instead of the usual copper oxide. 3. By too long standing in contact with the copper solution a part of the carbon is lost either by solution or by a gradual throwing off of gaseous hydrocarbons. The series of carbon results obtained by allowing the copper solution to act on samples of steel borings from sixteen hours to ten days show an increase of carbon to a maximum (usually after several days) and then a decrease, owing to loss of carbon by long standing in the copper solution. The higher results are supposed to be more nearly correct. By use of a neutral copper sulphate solution the carbon results obtained

were much lower than when the solution of the double salt was used. This was plainly due to loss of gaseous hydrocarbons.

In the standard method proposed by the author he weighs from two to four grams of steel into a porcelain boat and covers the sample with a layer of powdered fused lead chromate. The boat is pushed into a porcelain tube and heated to a white heat in a specially constructed combustion furnace provided with blast of air. From thirty to forty minutes are required to complete a determination. A few of the more important determinations are the following :

	A	B.	C.	D.
Carbon (average, by author's method)	0.63	0.74	1.00	1.05
Carbon (maximum, by double chloride method) ..	0.63	0.72	0.96	0.99

For the determination of carbon in chrome steel, ferro-chrome and manganese the method seems to give higher and probably more trustworthy figures than the methods heretofore used.

In his work with the double chloride of copper and ammonium solution the author seems to have failed to profit by the work of the American committee on international standards. If his double chloride solutions had been absolutely free from carbonaceous matter and had been strongly acidified with hydrochloric acid as the committee found essential, it is probable that the results would have agreed closely with those obtained by his ingeniously devised direct combustion method.

GERMAN ECONOMY IN IRON MANUFACTURE.

BY FRANK H. MASON, CONSUL-GENERAL.

IT has been recently noted in England with something like alarm that the production and export trade of iron and steel in Germany have been steadily growing during the past ten years at a rate out of all proportion to the development of Great Britain in the same field, and that railway wheels, ties, axles, wire, etc., of German origin are not only making serious inroads upon foreign markets which British exporters have hitherto almost exclusively controlled, but are now sold to some extent in England. The fact that, in spite of all advantages which English ironmasters derive from long experience, cheap and abundant

¹ *Consular Reports*, No. 155, August, 1893.