

not our intention in this article to examine the causes of this superiority. In a general manner we may say that if it is due to the presence of titanium in the pig metal, very small quantities of this substance are then sufficient to secure such results. In our blast-furnace tests we have not been able to obtain more than a few hundredths to one tenth of one per cent of titanium. It is met in quantities varying from 0.2 to 1 per cent in many pigs here and in England, to which it seems to impart a "greater tenacity."* The higher the grade of the iron the more titanium it is likely to contain. On the other hand, titanic pig made from ores from St. Urbain, Canada, containing as much as 41 to 48 per cent of titanic acid, smelted by the Forbes treatment under low temperature and pressure of blast, contained only traces—0.03 to 0.05, exceptionally 0.26 titanium—and still the qualities of the pig metal and iron were "exceptionally good" (analyses made at the Paris School of Mines).

But, if but comparatively very small amounts of titanium and silicon are found in the pig metal from a cold furnace, the percentage of carbon, mostly in the combined state, is often very high. Analysis of the metal from our small coke furnace of 1893 gave:—

Silicon	0.36	traces to 0.16
Titanium	None	0.07
Comb. carbon	2.835	2.90
Graphitic carbon	0.253	0.24

Even the salamander contained only Si, 1.05; Ti, 0.054. The metal, though "white," has not the ordinary characters of white iron. Its grain is generally very close and fine, its fracture more steel-like in colour and appearance and it is remarkably tough and hard. Under special conditions we have obtained pig metal containing:—

Silicon.....	0.29	0.62 and even	0.84
Titanium	0.85	0.78	1.94
Manganese	0.34
Carbon	4.56	4.12

It was so hard that it could hardly be broken on an anvil with a sledge hammer. It blunted the hardest drills and we had difficulty in obtaining samples for analysis.

Having been called upon by a large manufacturing firm to make tests on the chill, strength and resistance of mixtures of cast iron into which entered small percentages of different metallic elements, we had occasion to test, on the machine, our white cast iron obtained from titaniferous ores. Square bars of 1 inch section and 12 inches long between supports, broke under a load at the centre of 2700 to 2900

* Rivat Decimasié, p. 156.