

carbonless iron. They represented a chemical compound of carbon and iron, termed *Cementite*, containing about seven per cent. carbon.

THEORETICAL STEEL.

Thus theoretically, all the steels containing from about one to seven per cent. of carbon, might be composed of only pearlite and cementite, if the proper conditions obtained in the manufacture. As a matter of fact, the iron-carbon alloys containing from 1.5 to 2.5 per cent. carbon, are not common in the arts.

CAST IRON.

Above 2.5 per cent. the alloy is usually termed cast iron. If it consists of pearlite and cementite, it is known as white cast iron. The irons of commerce do not, as a rule, contain more than, say, 4.5 per cent. carbon.

Owing to the manufacturing processes not being always favorable to the production of white cast iron, what is called grey cast iron is produced instead; without necessarily any alteration of the carbon content.

In grey cast iron, the carbon, instead of being wholly in the pearlite and cementite condition, as is the case when the iron is white, is partially in the form of graphite; thus grey cast irons may contain pearlite, cementite and graphite; pearlite and graphite; pearlite, ferrite and graphite; or finally ferrite and graphite.

Several slides were exhibited showing some of these varieties of grey cast iron.

The graphite in these cases forms into layers more or less curved. The metal is so cut up by these graphite layers that it is rendered comparatively brittle, soft, and weak. The white cast iron, while brittle, is hard and strong.

A slide was thrown on the screen showing the pearlite-cementite composition of white cast iron.

MALLEABLE CAST IRON.

An interesting slide representing the micro-structure of malleable casting was shown. The structure consisted of ferrite and graphite. The graphite, instead of being in the form of layers, as in grey cast iron, takes the form of minute lumps, showing on the screen as roundish spots. In this iron the graphite consists of minute lumps surrounded by ferrite; while in the ordinary grey casting of similar composition, the metal is more or less surrounded by layers of graphite, rendering the grey casting brittle, and the other malleable.