150 MECHANICAL PROPERTIES AND COMPOSITION OF STEEL.

constant in increasing the tensile strength and in. hardening the iron as carbon did, except that larger quantities were required to obtain the same effect. The effects of phosphorus on the tensile strength are shown in Fig. 2. In the only tests ever before made on the action of phosphorus on steels the mechanical effects were credited with being constant, as in carbon and manganese. My conclusions were obtained by plotting curves with all the elements excepting phosphorus constant, and also by making carbon variable as shown in Fig. 3, where it will be noticed that for a given increase in the higher percentage of phosphorus the increase of tensile strength is



FIG. 3.

greater than it otherwise would be for a low phosphorus steel. Phosphorus, however, does show a constant effect the same as carbon and manganese when the steel contains more than 0.25 per cent. of this element.

The quantity of sulphur in the specimens examined was small and hence negligible. The injurious effect of large quantities, as 0.05 per cent., is not due to sulphur as such, but to its formation into a sulphide of iron, utterly destroying cohesion between the steel crystals. The presence of silicon may accentuate the effect of MEG

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