

of coal tends to the loss of oxygen and hydrogen more rapidly than the other constituents and therefore, to the relative increase in the proportion of carbon. The common elements in coal are: carbon, hydrogen, oxygen, nitrogen, sulphur, phosphorus, iron, calcium, magnesium, etc., the last four or five usually occurring in small proportions.

These elements are not merely linked up to form a few specific compounds. Many of the complex compounds, which existed in the plants from which the coal was derived, would each form whole series of degradation products during the slow transformation into coal. In every specimen of coal we get many compounds representative of some of the exceedingly numerous possibilities in the above series. There is no *prima facie* reason why any two different samples of coal should be alike in composition; for not only may different plants have gone to form their substance, but also the metamorphosis may have followed different lines. It can thus be easily understood that although a great amount of work has been done on the subject, very little is yet known of many of the actual chemical compounds existing in coal.

When coals are consumed, whether that destruction be in the form of slow decomposition such as weathering, or more rapid decomposition as spontaneous combustion, or actual burning in the furnace, the action is primarily the oxidation of the combustible matter of the coal, that is to say (a) the coaly matter itself and (b) the pyrite, marcasite and other sulphur compounds which the coal contains. Other heat-giving reactions may occur to a small extent in some cases, but in a practical sense the only combustible elements are carbon C, hydrogen H, and sulphur S. Of these elements the carbon greatly predominates in heating value although its heat is largely augmented by that from the hydrogen, or in other words, the coaly matter proper provides enormously the greater part of the total heat, but as will be shown later the pyrite and other sulphur compounds are supposed by some observers to be the first to oxidize, and therefore to play a most important part in the early stages of combustion.

Harger¹ says in an address to the Liverpool section of the Society of Chemical Industry, that coals are conglomerates of four classes of bodies:

Approx. Composition and Calorific Value.

	Carbon	Hydrogen	Oxygen	Cal. Val.
	C_G	C_G	C_G	
1. Carbon residuum	96	2 $\frac{1}{2}$	1 $\frac{1}{2}$	8,765
2. Resins	79	10	11	9,130
3. Humus bodies	63	5	32	6,480
4. Hydrocarbons	75-85	25-15	0	12,000

¹ Society of Chemical Industry. Vol. XXXI, February 1912, pp. 413-416.