rye, maize, rice. buckwheat (the amount of ash 2 per cent or less) affords 40 to 50 per cent; of leaves of walnut (the ash 7 to 7·72 per cent), 21·1 per cent spring, 4 per cent autumn; of beech (ash 4·8 and 6·75 per cent), 7·8 per cent summer, 4·2 per cent autumn; wood of body of beech (amount of ash in dried 0·65 per cent), 5·3 per cent; of small wood 11·6 per cent, and of brush 12·3 per cent; of pine, fir, larch (0·3 per cent of ash), 3·6 to 6 per cent of phosphoric acid.

Carbonaceous. — The carbonaceous material of the rocks has come, as has been stated, from the decomposition of plants and animals, and chiefly the former. Wood contains about 50 per cent of carbon, along with 44 of oxygen and 6 of hydrogen. Peat is woody material altered part way toward coal, and sometimes wholly so in places. Brown coal is coal that has a dark brownish powder. Bituminous coal has a black powder, and burns with a bright flame; anthracite burns with little flame. Each contains some of the oxygen of the original wood, the anthracite the least.

Mineral oil and mineral gas consist of carbon and hydrogen alone, oxygen being wholly absent. They are the source of the flame of bituminous coal; they do not, however, exist in the coal, for when the coal is digested in a solvent of the oil, as benzine, almost no oil is taken up; the oil or gas is *produced* by the heat from a compound present in the coal. Other carbonaceous substances of similar origin are asphalt, an oxidized hydrocarbon, mineral resins, etc. Moreover, among the mineral resins are one or two which contain sulphur.

Alumina, magnesia, iron, soda, potash, sulphur, etc. — A few of the coal-making plants, especially the Lycopods, contain much alumina in their ash, and magnesia, iron, potash, soda, exist in many plants. In the decomposition of buried plants, these materials are partly dissolved out and carried away by waters, and partly contributed to rocks. The following are some analyses of the ash of plants: —

Analyses of the ash of *Lycopods* (1, 2), *Ferns* (3 to 6), *Equiseta* (7, 8), *Conifer* (9), Moss of the genus *Sphagnum* (10), and an Ilex (11): —

	KO	NaO	CaO	MgO	Fe_2O_3	Mn_3O_4	Al_2O_3	PO_5	SO_3	SiO_2	Cl
1. Lyc. clavatum	31·90	2·68	4·13	5·89	6·00	—	22·20	7·30	3·55	13·01	—
2. Lyc. clavatum	25·69	1·74	7·96	6·51	2·30	2·53	26·65	5·36	4·90	13·94	3·13
3. Aspl. filix	45·5	5·2	7·9	7·4	1·5	—	—	20·0	6·8	2·2	4·6
4. Aspid. filix	39·80	5·31	18·74	8·28	0·97	—	—	2·56	5·40	4·38	14·72
5. Osm. spicant	23·65	3·33	4·09	6·47	1·17	—	—	1·76	1·29	53·00	5·82
6. Pteris aquilina	19·35	4·78	12·55	2·30	3·94	—	—	5·15	1·77	43·65	6·20
7. Eq. arvense	19·16	0·48	17·20	2·84	0·72	—	—	2·79	10·18	41·73	6·26
8. Eq. Telmateia	8·01	0·63	8·63	1·81	1·42	—	—	1·37	2·83	70·64	5·59
9. Pinus abies	12·84	5·64	58·27	2·81	1·60	*tr.*	*tr.*	2·60	1·60	12·55	2·06
10. Sphag. commune.	8·02	12·40	3·17	4·92	6·35	*tr.*	5·89	1·06	4·33	41·69	12·09
11. Ilex cassine	27·02	0·47	10·99	16·59	0·26	1·73	—	3·34	2·50	1·32	0·66

Analysis 1 is by Ritthausen; 2, Aderholt; 3, A. Weinhold; 4, Struckmann; 5, 6, 9, Malaguti & Durocher; 7, 8, E. Wittig; 10, H. Vohl; 11, F. P. Venable.

In the analyses that have been made of Lycopods, the amount of ash is 3·2 to 6 per cent in weight of the dried plant; of *Ferns*, 2·75 to 7·56 per cent; of *Equisetum arvense*,