18·71 per cent; of *Eq. Telmateia*, 26·75 per cent; of *Conifers*, mostly less than 2 per cent; of *Fungi*, 3·10 to 9·5 per cent; of *Lichens*, 1·14 to 17 per cent (the last in *Cladonia*), but mostly between 1·14 and 4·30 per cent. In *Lycopodium dendroideum*, Hawes, in his analyses (p. 362), found 3·25 per cent of ash; in *L. complanatum*, 5·47 per cent, and in *Equisetum hyemale*, 11·82 per cent.

Lycopodium chamæcyparissus afforded Aderholt 51·85 per cent of alumina; or, when without spores, 57·36 per cent; while Ritthausen obtained 39·97 alumina for this species, and 37·87 for *L. complanatum*. In *Lycopods* the silica constitutes 10 to 14 per cent of the ash. In the ash of Mosses have been found 8 to 23·58 per cent of potash, 4 to 16 of silica, 1·06 to 6·56 of phosphoric acid, 4·9 to 10·7 of magnesia. Among *Ferns*, the amount of ash, so far as determined, varies from 5 to 8 per cent.

The ash of *Fungi* affords 21 to 54 per cent of potash, 0·36 to 11·8 of soda, 1·27 to 8 of magnesia, 15 to 60 of phosphoric acid, and 0 to 15·4 of silica. Among *Lichens*, the ash of *Cladonia rangiferina* contains 70·34 per cent of silica; of other species, less, down to 0·9 per cent.

Trapa natans, of bogs, in Europe, affords 13 to 25 per cent of ash; and 25 per cent of this is oxide of iron (Fe_2O_3) with a little oxide of manganese. Of the ash of the fruit scales, over 60 per cent is oxide of iron. The *Ilex cassine* of North Carolina (the leaves of which produced the Black Drink of the Indians) afforded, from leaves collected in May and dried, 5·75 per cent of ash, which is remarkable (No. 11, above) for the amount of potash and magnesia. Another Holly afforded 11·39 of magnesia, and 12·34 of lime.

Ash of bean straw (6 to 7 per cent of dried) affords 35 to 45 per cent of potash; of buckwheat straw (6·15 per cent), 46·6 of potash; of oat straw (5·1 per cent), 22 per cent of potash.

Soda is a prominent constituent in the ash of *Sea-weeds* (*Fuci*), analysis giving 14·39 per cent of ash, and in this, 24 of soda, with 14·5 of potash. Scirpus (bulrush) afforded 8·65 per cent ash, and in it 10·3 per cent of soda with 9·7 of potash; and Juncus, 6·6 of soda to 36·6 of potash. The ash of beets contains 14·8 per cent of soda; of carrots, 22·1 per cent; but grasses generally 1 to 5 per cent of soda.

The amount of *sulphur* in the ash of grasses, straws, and woods is usually 1 to 2·5 per cent; in that of Fucus, 18 per cent; in that of common vegetables, 3 to 6 per cent. The amount of *chlorine* in the ash of grasses is 3 to 5·5 per cent; in that of vegetables, 3 to 11 per cent; in that of Fucus, 10 per cent; in that of Juncus, 14·2 per cent; in that of woods, usually less than 1 per cent. (These percentages are taken from tables in Johnson's *How Crops Grow*, New York, 1887.)

Kinds of Rocks.

(1) **General explanations.** — Rocks are conveniently divided into two general sections: (1) the Fragmental or Clastic, and (2) the Crystalline.

For the study of even the coarser kinds of rocks, the geological student should have a pocket lens. In investigation, it will generally be necessary to supplement this with a compound polariscope-microscope made especially for the study of rocks; but a thorough study of the elements of petrology is required for the satisfactory use of the latter instrument.

Fragmental Rocks. — The fragmental rocks are those that have been made out of fragments of older rocks. They are also called *clastic* rocks, from the Greek for *to break*. All the sand, gravel, stones, earth, mud, and clay of the world is worn or pulverized or decomposed rock. Each grain, however small or large, may hence be spoken of as a fragment of preëxisting rocks. The rocks of an age are mostly made out of the *detritus* (worn-out rocks) of preceding time.