The filtrate from H was evaporated to dryness in a platinum basin, and the residue treated with strong sulphuric acid. The resulting sulphates were ignited in small portions at a dull red heat in a platinum basin, in order to decompose the sulphates of iron and aluminium, &c. From time to time small portions of the ignited sulphates were extracted with water, and the filtered solution tested with ammonium sulphide. As soon as the ammonium sulphide gave a pure flesh-coloured precipitate of sulphide of manganese the ignition was stopped.

After the whole mass had been treated in this manner, it was boiled with water and filtered. The filtrate on evaporation gave a large residue of practically pure manganese sulphate (I).

The residue insoluble in water was ignited and bottled (K).

By this means the bulk of the manganese was separated from the other metals of the iron group without the use of any special reagent.

The 150 grammes of manganese nodules originally taken were thus split up into ten fractions of simpler though still, for the most part, complex composition.

Each of these fractions was subjected to a rigorous qualitative, and in several cases quantitative, analysis. Whenever practicable, the various products of analysis were examined spectroscopically and the principal lines measured.

The following is a brief summary of the results arrived at:—

A. Chiefly silica and silicates.

The results of a full quantitative analysis of a similar insoluble residue obtained from another portion of the nodules are given in Table III.

B. Sulphides of copper, lead, and molybdenum.

No arsenic, antimony, or tin.

No bismuth, cadmium, or mercury.

C. Calcium sulphate, containing merely spectroscopic traces of barium and strontium.

D. The hydrochloric acid solution of this small precipitate gave no characteristic emission or absorption spectrum.

Yttrium and cerium group metals absent.

E. and F. These precipitates contained iron, aluminium, and manganese. Yttrium and cerium group metals absent. Uranium, chromium, beryllium, and titanium absent.

G. This residue consisted chiefly of potassium chloride, derived from the potassium permanganate used. Sodium, magnesium, and a mere trace of lithium were also found. Traces of copper and iron group metals were also present.

Rubidium and cæsium were searched for spectroscopically but not found.

H. Consisted chiefly of sulphides of iron, nickel, and cobalt, along with a little thallium.

I. Practically pure manganese sulphate.

K. Elements found—Iron, aluminium, manganese, a trace of zinc. Uranium, beryllium, &c., searched for but not found.

Quantitative Analysis.

The qualitative analysis above described having been completed, the general outlines of a scheme for the quantitative analysis of these nodules were sketched out, based upon the qualitative results arrived at. In order to facilitate adherence to this scheme, a diagrammatic plan of the various operations was drawn up; and in order to maintain a clear and systematic account of the progress of the very complex and protracted investigation, this diagrammatic plan was filled in in detail as the written notes of the work done accumulated. During the course of the analysis this system of double record proved very useful, as it was always possible by referring to the diagram to get a