

III.—MINOR METALS.

The provision and preparation of the materials necessary for the production of non-ferrous alloys containing zirconium, niobium, tantalum, titanium, and boron; the uses to which such alloys can be put, and their production on a commercial scale.

NOTE.—In this connection, the Imperial Institute is getting into touch with such British firms as are working, or have worked, upon the subject, with a view to collecting information so as to be of aid to such institutions as may see fit to pursue the subject further.

IV.—CHEMICAL INDUSTRIES.

1. The economic extraction of bromine from sea-water (Bitterns).

(a) The constitution and character of Fuller's earth, with a view to elucidating the nature of its distinctive action.

NOTE.—Such an investigation might render possible the application of other substances, or of their preparation to render them suitable for the purposes to which Fuller's earth is put. A matter of some importance, in view of the fact that the supplies of Fuller's earth are limited in extent and distribution. A full knowledge of the distinctive actions of Fuller's earth might result in indicating other useful lines of enquiry.

V.—ALUMINIUM.

1. The devising of an economical method of extracting alumina from bauxites containing 8 per cent. and over of silica; as well as the extraction of alumina from lower-grade ores generally, including clays.

2. As to the relationship between physical properties of the commercial quality aluminium sheet (99 to 99.40 per cent. purity) and its drawing properties.

3. The determination of the commercial uses to which the residues obtained in the process of making alumina and alum from the ores of aluminium may be put.

NOTE.—Mr Murray Morrison (Chairman of the British Aluminium Company and a member of the Aluminium Committee) kindly offers to help by affording facilities to those interested. In connection with this line of research, there arises also for consideration the economic extraction of the potash contained in the clays.

VI.—IRON AND STEEL.

1. The preparation of a complete set of chemical and physical analyses of the iron ores of the world, which analyses shall have regard to the rarer elements contained in the ores.

2. The extent of the embrittling effect on ordinary carbon steel of certain substances, e.g., sodium hydrate, used in commercial processes, and the ascertainment as to how far this effect is a function of temperature and of concentration of the mixture, and whether the effect would be eliminated by the employment of alloy steels.

NOTE.—To enable this work to be carried out, the Imperial Institute would ask the various iron and steel works throughout the world to supply them with representative samples of the principal British and Foreign ores, which they would allocate to the several educational institutions applying to the Imperial Institute; the object being to secure that, as far as possible, true average bulk samples should be forthcoming, and, secondly, that duplication of work in respect of area should be avoided.

VII.—NICKEL AND COBALT.

1. A study of the magnetic properties of nickel-iron alloys.

2. To devise a cheaper method of the extraction of cobalt from its ores, especially those of a refractory nature.

NOTE.—It is necessary, in regard to most of the research work carried out in connection with iron and steel, to use such large-scale plant that it is unsuited to University laboratories. There are some matters which can, of course, be adequately dealt with in chemical and metallurgical laboratories, but some of the work would have to be carried out in the smelting works.

NOTE.—Although a considerable amount of work has been done on this subject, it is only within recent years that the pronounced effect of heat treatment on the magnetic properties of these alloys has been discovered, and it would appear that a reconsideration is necessary in the light of recent knowledge. This is particularly true of those alloys containing more than 30 per cent. nickel. Such matters as (a) the correct heat treatment for each composition in order to obtain the best magnetic properties in any definite direction, and (b) the effect of impurities on the magnetic properties, are of considerable importance, and a large field of work is available in these directions.

The Mond Nickel Company stated that they would be glad to be of any assistance that lay within their power.

It was stated by Mr. Griffiths, of that Company, that alloys of the nature indicated had been used for submarine cables and had improved the speed of transmission from 6 to 8 times.