in (I) and (II) above. Transport costs would also be reduced for the same thermal equivalent.

IV. The advantages of fine grinding and suitable grading to produce a waterproof briquette have been established, but the question of the relation between cost of treatment and increased value of the product is assessable only in the Colony. The additional labour necessitated by careful grading, temperature and pressure control is more than compensated for by the fact that a binder has not to be purchased and mixed. In a briquetting project it would be sufficient to postulate briquetting of the fines, the "nuts" being quite satisfactory as such. If coal cleaning were adopted, the fines would require drying before briquetting and would, of course, have a lower ash content.

V. Experiments have not been carried out on the suitability of the air-dried lignite for the manufacture of producer gas, but there is no reason to suppose that successful operation could not be achieved with a mechanical-grate producer of the Morgan type. There does not seem, however, to be any advantage in making producer gas for purposes such as brick-burning, for which the air-dried solid fuel can be used.

VI. Carbonisation of the lignite is not recommended at the present time, as this would involve the construction of elaborate plant that would be difficult to operate in Sierra Leone with the native labour available. Moreover, the small particle size of much of the lignite, and its lack of caking power, would lead to the production of a very dusty coke of high ash content, for which it would be difficult to find useful applications.

VII. The clay bed overlying the lignite appears promising for the manufacture of sound bricks and tiles for local use. When ground and admixed with fine sand, it is also suitable for making crude earthenware.

Grateful acknowledgment is made to Dr. J. G. King, O.B.E., Ph.D., D.Sc., F.R.I.C., A.R.T.C., Chairman of the Imperial Institute Consultative Committee on Coal and Petroleum, for valuable assistance in the preparation of this report, for advice and guidance during the course of the investigation, and for arranging the washing and briquetting trials.

Thorotungstite—A Misnomer

Almost 30 years ago, in 1921, Mr. B. W. Thunder discovered a yellow mineral at the Kramat Pulai tin workings at Pulai, Kinta District of Perak, Malaya, which appeared to correspond in many respects with tungstite, the naturally occurring hydrated tungstic oxide (WO_3 H_2O?). Pure material was difficult to obtain, but in 1926 sufficient had been found to enable the Geological Survey Department, Federated Malay States, to carry out a reasonably complete chemical analysis and mineralogical examination. It was apparent from these investigations that a new mineral had been discovered, as the analysis showed, *inter*

alia, 69·69 per cent. tungstic oxide, 16·(cent. rare earth oxides (nearly all ceri the new mineral was therefore called " of the mineral under the title " Thorot tungsten and thorium from the Federate by J. B. Scrivenor and J. C. Shenton (whole Nos. **113**), 487-490.

During the same year (1927), samples Institute for commercial valuation, but of the supply, no developments result in the literature, the mineral seems to of mineralogical curiosities that are of u scientific interest.

In 1948, presumably as a result of minerals, some doubt appears to have b original chemical analysis. The Ge Federation of Malaya, consequently re but found no thoria, nor was there any counter. A similar result was obtained discovered near the original locality. La the Imperial Institute for confirmation.

Partial analyses carried out indepen M.A., A.R.I.C., of the Mineral Resourc Tooke, B.Sc., A.R.I.C., of the Geological of Malaya, were in complete agreement that the mineral contains no thoria, but c of the rare earth metals. Scandium, wh in the analysis, was not detected. More zirconium, although the original analysis

With regard to the rare earth oxides found that the yttrium group prepond in the ratio of about 3 : 1. His colleag F.R.I.C., further showed, by spectrogra is the chief constituent of the yttrium g thorium cannot be established. The ab confirmed.

The Mineral Resources Division has Ltd., a further consignment of speci "thorotungstite" from their property mineral incorporating physical, chemi published later. The X-ray data wil Claringbull of the British Museum (Nat to record here that the results show "thorotungstite" is inapplicable as a t and that a new name is consequently de mineral in future be called *yttrotungstite*

. Transport costs would also be reduced for uivalent.

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alia, 69·69 per cent. tungstic oxide, 16·00 per cent. thoria, and 1·77 per cent. rare earth oxides (nearly all ceria). By analogy with tungstite, the new mineral was therefore called "thorotungstite." A description of the mineral under the title "Thorotungstite—A mineral containing tungsten and thorium from the Federated Malay States," was published by J. B. Scrivenor and J. C. Shenton in *Amer. J. Science*, 1927, **13** (whole Nos. **113**), 487-490.

During the same year (1927), samples were forwarded to the Imperial Institute for commercial valuation, but owing to the uncertain nature of the supply, no developments resulted. After being duly recorded in the literature, the mineral seems to have been relegated to the list of mineralogical curiosities that are of unique occurrence and of purely scientific interest.

In 1948, presumably as a result of growing interest in radioactive minerals, some doubt appears to have been cast on the accuracy of the original chemical analysis. The Geological Survey Department, Federation of Malaya, consequently re-examined the 1926 material, but found no thoria, nor was there any reaction with the Geiger-Müller counter. A similar result was obtained with another sample recently discovered near the original locality. Later, the matter was referred to the Imperial Institute for confirmation.

Partial analyses carried out independently by Mr. L. C. Chadwick, M.A., A.R.I.C., of the Mineral Resources Division, and by Mr. G. H. Tooke, B.Sc., A.R.I.C., of the Geological Survey Department, Federation of Malaya, were in complete agreement on essential points, and showed that the mineral contains no thoria, but consists essentially of a tungstate of the rare earth metals. Scandium, which might have caused trouble in the analysis, was not detected. Moreovcr, neither aalyst found any zirconium, although the original analysis showed 1·96 per cent. ZrO_2.

With regard to the rare earth oxides in the mineral, Mr. Chadwick found that the yttrium group preponderates over the cerium group in the ratio of about 3 : 1. His colleague, Mr. W. H. Bennett, M.Sc., F.R.I.C., further showed, by spectrographic examination, that yttrium is the chief constituent of the yttrium group, and that the presence of thorium cannot be established. The absence of radioactivity was also confirmed.

The Mineral Resources Division has received from Kramat Pulai, Ltd., a further consignment of specimens, including the so-called "thorotungstite" from their property, and a fuller report of the mineral incorporating physical, chemical and X-ray data will be published later. The X-ray data will be supplied by Dr. G. F. Claringbull of the British Museum (Natural History). It is sufficient to record here that the results show conclusively that the term "thorotungstite" is inapplicable as a true description of the mineral, and that a new name is consequently desired. It is suggested that the mineral in future be called *yttrotungstite*.

E. H. B.