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Minerals and Metals of the British Empire.

THE War brought into painful prominence certain facts regarding the resources and distribution of commodities, animal, vegetable, and mineral, which had indeed long been known, but the real significance of which in such a period of stress had not been fully grasped by any one of the Powers concerned. The waste of time, man-power, and material involved in the efforts made to overcome the resulting difficulties created a profound impression, from which flowed a stream of resolutions and good intentions. Meanwhile the years are slipping by and there is yet little indication of an Empire policy regarding minerals and metals.

While it is obvious that the development and conservation of the resources of the British Empire in plant and animal life require all the care and attention that can be given them, the case of minerals is peculiar. It is generally admitted that there is, in accessible form, enough of every mineral in the world to enable its inhabitants to carry on along present lines for a great period of time; but the distribution is unequal, the demand for certain minerals may at any moment overstep the known resources, new sources have to be discovered, and when they have been found and exploited they cannot be rejuvenated or replaced.

One of the lessons of the War was the need for each nation to be fully aware, in detail, of its own resources in minerals and of the means available for rendering them fit for industrial purposes and munitions of war; to be aware also of its actual relations with the rest of the world with respect to resources, transport, marketing, and treatment of minerals. The official statistics available to Governments are practically limited to those of production and of movements, represented by imports and exports. Such statistics, though better than none and essential for certain purposes, convey a totally erroneous conception of the actual resources of a territory; they throw no light on those available for future exploitation; they are always too late to indicate the significance of new finds; and they contain no reminder of the reserves that are fairly accurately known but are not exploited under the fiscal or commercial conditions that are prevalent at the time of their publication. For many years the United States, through its Geological Survey, and later, the Bureau of Mines, has done good service, not solely to its own nationals, by the publication of elaborate statistics relating to the mineral resources of the

States, with such figures as could be assembled regarding other countries, and frequently enlivened by informative reviews of the industry in specific minerals. It was not unnatural, therefore, on ground so well prepared, that Spurr's "Political and Commercial Geology," in 1920, should have stimulated the two leading institutions of American miners and metallurgists to form a joint committee under the chairmanship of Prof. C. K. Leith, to consider and report upon foreign and domestic mining policy and industrial preparedness ("International Control of Minerals." New York, 1925).

This Committee enunciated certain propositions "in the interest of efficient and conservational use of the world's mineral resources and in minimising international difficulties arising from the discovery, development, transportation, and marketing of mineral resources." The propositions put forward cannot be discussed here; in the main, they are equally applicable to any great State. In other quarters there is evident the same desire that these problems should be attacked; quite recently, from Germany, comes a proposal for the formation of an "International Institute of Mines." As things are at present, however, it is more practicable to restrict the field of action to States or federations of States.

The matter has recently been taken up with vigour by Sir Thomas Holland: in a presidential address in 1925 (*Trans. Inst. Min. and Met.*, 34, 1925, pp. xlv-lxiii), he directed attention to the possibility of shortages of certain base metals in the not very distant future; in 1926, at the Royal Society of Arts ("International Interests in Raw Materials," *Jour. Roy. Soc. Arts*, 75, 1926, pp. 42-61), he enlarged upon the need for investigation and collection of data regarding the natural resources of the British Empire; this has been followed up by his paper, a "Proposed Review of the Mineral Resources of the Empire," read before the Institution of Mining and Metallurgy on April 21, part of which is printed elsewhere in this issue.

In this paper Sir Thomas proposes that: "In each of the Dominions and, if possible, in each of the larger Colonies, committees of specialists should be appointed and entrusted with the duty of reviewing for each large State or unit of area its mineral resources and smelting capabilities, having in mind the desirability of accumulating, in addition to the ordinary official statistics of production and movement, the essential data necessary for the formulation of an economic policy, as well as for obtaining the information required to institute measures designed to secure military safety."

These proposals are now under discussion in London, and, if approved, it is intended to submit them, with such modifications as may be deemed desirable, for further discussion by the second Empire Congress of Mining and Metallurgy to be held in Canada this autumn. Should the Congress adopt the scheme and proceed to put it into being, there will be for the first time within the British Empire an organisation for the collection of live data and for the prompt examination and elucidation of their implications by men with knowledge of the facts.

The essence of the plan is decentralisation: in each territorial unit, whatever it may be, the special committee would be responsible for the collection and consideration of data within its ambit, and its methods would be those best suited to the local circumstances and special problems. The co-ordinating bodies would be the constituent members of the Empire Council of Mining and Metallurgical Institutions, established at the first Congress, held at Wembley in 1924, in order that each may benefit by the experience of the others, and especially in order that correlation and subsequent economic co-operation by the various Governments may be facilitated at future Imperial conferences of the kind recently held in London.

It is suggested that reports of progress made by the special committees in the Dominions during the next three years should be discussed at the Empire Mining and Metallurgical Congress, which will be arranged to follow that to be held at Montreal this year. The International Geological Congress has shown that it is possible, even with a very loose organisation, to assemble information of a most valuable character on specific subjects, exemplified in the reports on the world resources of coal and iron. The scheme to be laid before the Empire Congress in Canada is more far-reaching: it involves the consideration not only of the mineral resources and their development and treatment in the units of the British Empire, but also of the changing interactions, as adjustments take place due to new discoveries, new methods, new migrations of material, the growth of new industrial centres, and the consequences of political action. In short, to fulfil its functions properly, the proposed organisation must be not only alive but also assured of a prolonged life.

The territorial committees will have to concern themselves with such questions as the conservation of minerals; the encouragement of prospecting; the support of the geological survey, keeping it in touch with realities and advising on the choice of

areas ripe for intensive geological investigation ; the elimination of wasteful methods of mining, and of movement of ore ; and the consideration of suitable centres for refining and smelting. The local mining laws should be critically examined with the view of simplification and, so far as possible, unification. Statistics should be analysed and presented in more useful form.

The discussion of these and other matters would be carried on by the Congress and Empire Council from the point of view of Empire requirements. Amongst the larger questions might appear that of State ownership of minerals, the inclusion of mining in the public utility services, the accumulation of reserve stocks, fiscal interrelations, etc., which cannot be dealt with by the official and State-aided organisations already existing for the collection and publication of mineral statistics.

While such an organisation as the Imperial Mineral Resources Bureau will doubtless continue to function usefully, the scheme outlined by Sir Thomas Holland would be far more effective in securing the essential details promptly and their consideration by specialists actually in touch with the ramifications of the industry. It is only by some such process that the great industries of mining and metallurgy can be brought into a position from which they can speak with full authority to their several Governments, and thus influence the creation of sound domestic and Empire politics.

An Engineer-Astronomer.

The Scientific Papers of William Parsons, Third Earl of Rosse, 1800-1867. Collected and republished by the Hon. Sir Charles Parsons, K.C.B., F.R.S. Pp. v + 221 + 18 plates. (Newcastle-upon-Tyne: Sir Howard Grubb, Parsons and Co., 1926.)

IT is always interesting and sometimes profitable to turn for a moment from the achievements of to-day to contemplate the difficulties, struggles, and aspirations of the pioneer in some special field of scientific endeavour. To do so, however, is not always a simple matter, since it often entails a laborious search through the publications of various learned societies ; and, at the end of the search, a feeling that something of importance may after all have been missed. When, however, the whole of the written work of some specialist has been collected together and republished in one volume, it can be studied at any time with the greatest facility.

All those who are interested in the history and development of the reflecting telescope have cause

for satisfaction in that this collation of scientific work has been effected in recent years in the case of two of the most distinguished pioneers in the construction and improvement of that instrument.

In 1912 the collected scientific papers of Sir William Herschel were published by the Royal and Royal Astronomical Societies. Among these papers is one which gives a fairly full account of the construction and working of that great 40-foot reflector which may justly be described as the world's first giant telescope, destined not to be doubled in aperture for 130 years. It is only to be regretted that Herschel published very few details of the purely optical part of his work. Fortunately, however, he did commit to writing a very full account of his methods of figuring specula ; and, as this manuscript is still extant, it is to be hoped that it may yet one day be published.

We have now before us the scientific papers of William Parsons, third Earl of Rosse, brought together and published in one volume by his son, the Hon. Sir Charles Parsons. These papers, considered in relation to the work of Herschel, may be said to constitute the next chapter in the history of the reflecting telescope. Unlike Herschel, Lord Rosse had no special reason for reticence with regard to his methods, and the full account which he gives of his many optical experiments, successful and unsuccessful alike, makes very interesting reading. Thus, the first paper of the series, written in the days before he had fully mastered the art of figuring his specula to a paraboloid, describes a simple and ingenious method of reducing the aberrations of a spherical surface. This he accomplished by casting a speculum in two concentric parts, with a small space between them. The two parts were then worked together to what was, optically, a single spherical surface. The resulting spherical aberration was then reduced by drawing back the central portion by means of three fine screws. It is rather surprising to read that this apparently crude method proved successful in a mirror having a focal ratio of only 1 to 4 ; but, as the aperture of this speculum was only 6 in., it seems unlikely that it was called upon to bear very high powers. Yet its maker was so satisfied with it that he declared his intention of constructing one (in three pieces) so large as 18 in. in diameter. But no such instrument is afterwards mentioned, and it appears that Lord Rosse soon turned instead to more promising methods of improving, and more particularly enlarging, his specula.

In this connexion many of Lord Rosse's experi-