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2nd May, 1933.

MEMORANDUM:

Senator the Hon. A.J. McLachlan,
Minister in charge of Development,
CANBERRA.

The Hon. C.E. James,
Minister for Mines,
TASMANIA.

DOLOMITE DEPOSITS AT SMITHTON, TASMANIA

As instructed we have investigated the possibilities of the commercial utilisation of Dolomite from the deposits in the district of Smithton, North West Tasmania.

We have considered the report prepared by Mr. P.B. Nye, M. Sc., B.M.E., Tasmanian Government Geologist, which report is so complete that we have decided that a visit to the area at the present juncture is unnecessary. Ample evidence is available that large tonnages of high grade dolomite can be won at a low cost by quarrying.

The quality of the dolomite according to the analyses of the samples as given in Mr. Nye's report is excellent and subject to necessary experimental and investigational work we believe that the impurities would not be seriously detrimental.

We have studied reports on the possible methods of the utilisation this dolomite as prepared by Mr. Nye and by representatives of the Waterworth Syndicate in Hobart. We have had conferences with Messrs. Waterworth and J. Reynolds and with members of the staff of the Electrolytic Zinc Company of Australasia Limited at Risdon who have supplied us with much valuable and pertinent information.

Production of Metallic Magnesium

The Waterworth Syndicate has urged that consideration should be given to the production of metallic magnesium from the Smithton dolomite in view of the low cost of the dolomite, of electrical power for electrolysis, and of wood fuel and water at Smithton.

So far as we have been able to investigate the position, metallic magnesium is not produced in Great Britain or in any of the Dominions or Colonies; plants which were operating in Canada and in England are idle but no information is available to us at present regarding the reasons which brought about cessation of work.

Metallic magnesium is produced by the electrolysis of fused magnesium chloride; various modifications of the electrolytic method have been or are in use in the United States, Germany and France, in which countries the metallic magnesium of commerce is produced either as metal or magnesium alloy. The annual production is difficult to determine but appears to be not less than 2000 tons. In the Indian Ocean, such as India, South Africa and the Near and Far East and New Zealand.

Sulphate of Magnesium - 500 to 750 tons, including small amount of chemically pure magnesium sulphate.

Magnesium Carbonate - 150 to 200 tons.

Magnesium Chloride - 300 to 350 tons.

Magnesium Oxide - 100 to 150 tons.

The total value of imports of all magnesium compounds into Australia was at a maximum of £25,497 in 1929, dropping to £14,700 in 1932.

Whilst magnesite, the naturally occurring carbonate of magnesium, is the best source of magnesium on account of its high content of 47% of magnesium oxide compared with 22% of the same compound in pure dolomite (which is a chemical combination of the carbonate of lime and magnesia), a study of literature indicates that dolomite is used as a source of magnesium compounds.

"Non-Metallic Minerals: Occurrence - Preparation - Utilisation" by Ladoo, and published by the McGraw Hill Book Company, New York, 1925, gives on page 205 a chart illustrating the manufacture of compounds of magnesia from dolomite; this chart having been prepared by the Magnesia Association of America.

The United States production of dolomite for the manufacture of magnesia and basic magnesium carbonate was 91,000 tons in 1918, falling to 53,000 tons in 1922. The last year for which figures are available is 1928 when 94,000 tons were used.

In 1920 over 600,000 tons of dolomite were mined for various purposes, including the manufacture of refractories and of heat-insulating materials and of epsom salts.

It would appear that the production of high grade magnesium compounds is technically practicable by processes which on a reasonable scale could be operated cheaply.

We recommend that certain tests should be carried out by the Waterworth Syndicate with such assistance as could be rendered by the Department of Mines through its Laboratory at Launceston to determine on a Laboratory scale the application of known technical methods for the production from dolomite of magnesium oxide, magnesium carbonate, basic hydrated magnesium carbonate and magnesium sulphate.

These tests would involve the treatment of the dolomite according to the flow-chart above mentioned. Further, the possible utilisation of gypsum or calcium sulphate instead of sulphuric acid for the production of magnesium sulphate and epsom salts, should be examined exhaustively because of the high price of pure sulphuric acid delivered at Smithton.

If sufficient encouragement is obtained as the result of these investigations and experiments then a close estimate should be made of the capital and operating costs for a plant at Smithton to produce the quantities of the product which could be sold in Australia, supplemented by such quantities as a market survey might indicate could be sold in the countries surrounding the Pacific and Indian Oceans, such as India, South Africa and the Near and Far East and New Zealand.

The raw material, namely magnesium chloride, used in Europe is a by-product from the production of potassium salts of Stassfurt in Germany and at similar deposits in Alsace-Lorraine. The raw material used in America is obtained, so we are informed, as a by-product from the production of common salt.

Production of metallic magnesium in Britain or Australia must depend for its market mainly upon the British and Dominion Governments and British Manufacturers. Therefore a close economic study should be preceded by all necessary consultation with the Naval, War and Air Authorities of Great Britain through the appropriate Authorities in Australia House.

Again, we are of opinion that the production of aluminium by the electrolysis of fused chlorides is a cognate industry to the production of metallic magnesium; therefore, as there is a well established, efficient, and powerful British Aluminium Company, consultation with the representatives of this Company is indicated.

Consequently, after discussion with Messrs. Waterworth and J. Reynolds we recommended that a cable should be despatched to Senator C.W. Grant who is at present in London recommending that Senator Grant who has been interested in the possibilities of this proposed industry, should confer with the Right Hon. S.M. Bruce at Australia House and interview the appropriate British Government representatives and the Managing Director of the British Aluminium Company to ascertain, firstly whether the production of metallic magnesium was of important interest to the British Government; secondly, whether the production of metallic magnesium was likely to be undertaken in Great Britain, and thirdly, whether the conditions in Tasmania as outlined previously, particularly in relation to the supply of suitable raw material and of cheap power would induce the active interest and support of the British Government and British Aluminium Company.

We are of the opinion that only with the support of at least the Governments of Great Britain and of the Commonwealth of Australia and of Tasmania and preferably with the active co-operation of the British Aluminium Company, can this industry be undertaken in Tasmania.

Therefore we recommend that the results of Senator Grant's investigations and negotiations should be awaited before further investigations be undertaken in regard to this particular utilisation of Smithton dolomite.

Production of Salts of Magnesium.

The commercial salts of magnesium are:

Magnesium Sulphate - (Epsom salts) crystallised with 7 molecules of water.

Magnesium carbonate - of various qualities of grades and degrees of fineness.

Magnesium oxide - do. do. do.

Magnesium chloride.

Magnesia Alba which is one of the articles of Commerce is a basic carbonate of magnesia. The various compounds of magnesia are used for medicinal, pharmaceutical and manufacturing purposes and the annual consumption in Australia under present circumstances may be given somewhat tentatively as follows:

We think that this work should be carried out primarily by the Waterworth Syndicate with such assistance as may be possible from the Officers of the Department of Mines of Tasmania and from the Official Representatives signatory to this report.

We are of opinion that there is justification for the work outlined above and we shall be glad to render any further help which is within our power in order to determine more closely the possibilities of the proposed industry.

We have had a conference with a representative of the Waterworth Syndicate and Mr. E.E. Kurth M.Sc. of Hobart and we understand that Mr. Kurth has been engaged by the Syndicate to make the laboratory investigations recommended. Mr. Kurth is, from our personal knowledge, fully capable of doing this work.

We have not included in this report considerable information which has been available to us and which we have studied closely. A complete file is available in the records of the Department of Mines at Hobart which may be consulted as necessary.

Signed (H.W. Gepp)

Consultant on Development
to the Commonwealth Government

Signed (F. Stillwell)

of the Council for Scientific
& Industrial Research

Signed (P.B. Nye)

Government Geologist.