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VISIT TO NORTH AMERICA AND UNITED KINGDOM, 1951

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INTRODUCTION.

The following notes are designed to summarise the work done during my recent visit to North America and United Kingdom. The purpose of the trip to the U.S.A. was to act as an alternate representative at the International Materials Conference, Washington, in which capacity I was attached for administrative purposes to the Australian Embassy. This arrangement restricted the opportunities for making enquiries and professional contacts, but the Embassy officials and Mr. F. J. Marcusson were most co-operative in allowing me to make good use of the time not occupied on I.M.C. matters. In acknowledging their assistance it is also a pleasure to record the assistance extended by officers of the Ministry of National Development in Melbourne, Sydney and London, the Consulate-General, New York, and the High Commissioner's office, Ottawa, all of whom made travel and other arrangements which enabled me to make full use of the limited time at my disposal. Thanks are also due to Dr. G. C. Monture of the Canadian Supply Mission, Washington, who arranged the visit to Ottawa and Asbestos, and to Mrs. Burrell of the Peerless Mica Co., who arranged the visit to France to see the manufacture and application of Samica foil

ITINERARY.

My itinerary was as follows:-

1951.	
11th. May	Travelling by air Melbourne to Canberra and Sydney. Discussions with Department of Trade and Customs officers in Canberra.
12th. May	Left Sydney by air for U.S.A.
13th. May	Arrived San Francisco; night stop at Dallas, Texas.
14th. May	In Dallas.
15th. May	Travelling by air Dallas to Washington, D.C.
15th. May to 8th. October	Attending I.M.C. meetings in Washington.
9th. October	Travelling Washington to Ithaca, N.Y. (road)
10th. October	Visit Cornell University. Travelling Ithaca to Syracuse, N.Y. (road)
11th. October	Visit Syracuse University. Travelling Syracuse to Ottawa. (road)
12th. to 13th. October.	In Ottawa. Visit Dept. of Mines & Technical Surveys, High Commissioner, etc.

14th. October	Travelling Ottawa to Montreal (rail).
15th. October	Travelling Montreal to Asbestos (road). Visit Johns-Manville treatment plant.
16th. October	Visit Johns-Manville Jeffrey mine. Travelling Asbestos to Montreal (road). Montreal-New York-Washington (air).
17th. to 20th. October.	In Washington.
21st. October	Travelling by air Washington to Chicago; Chicago to Urbana Ill. (rail).
22nd. October	Visit Illinois State Geological Survey and University.
23rd. October	Visit State Geological Survey. Travelling to Gibson City (road), to Chicago (rail) and to Washington (air).
24th. October-2nd. November	In Washington.
3rd. November	Travelling Washington to New York (road)
4th. - 6th. November	In New York. Visit Australian Consulate-General, Trade Commissioner, metal and mica buyers.
7th. November	Travelling New York to Washington (road)
8th. November-6th. December	In Washington; I.M.C. meetings.
7th. December	Travelling by rail, Washington to New York. Left New York by air for London.
8th. December	Arrived London.
8th. - 11th. December.	In London. Visit Board of Trade, Electrical firms, Australian Scientific Liaison Officer, Commonwealth Geological Liaison Officer.
12th. December	Visit Peerless Mica Co., High Wycombe. Travelling London to St. Austell, Cornwall.
13th. - 14th. December.	Visit clay pits, kilns and shipping port of English Clays Lovering Pochin & Co. Ltd. in St. Austell, Truro, Fowey region.
14th. December	Left St. Austell by overnight train for London.
15th. December	Arrived London.
16th. December	Travelling by air, London to Basle, Switzerland.
17th. December	Visit Swiss Electrical Co. works Breitenbach (Switzerland) and Samica Corporation works Valdoie near Belfort (France).
18th. December	Travelling by air Basle to London.
19th. - 20th. December	In London. Visit Micanite & Insulating Co., Walthamstow, and interviews with copper trade representatives.

21st. December	Left London by air for Australia via Rome, Singapore, etc.
25th. December	Arrived in Sydney. Travelling Sydney to Melbourne.

INTERNATIONAL MATERIALS CONFERENCE.

The International Materials Conference was convened in February 1951, its primary function being to ensure the equitable distribution of certain scarce commodities, and to consider what steps should be taken to expand production, increase availabilities, and conserve supplies. This work is carried out by seven autonomous Committees, each dealing with a commodity or group of related commodities. Australia is a member of the Copper-zinc-lead, Pulp-paper, Sulphur, Tungsten-molybdenum, and Wool Committees, but is not represented on the Cobalt-nickel-manganese and Cotton-cotton linters committees.

From February to May 1951, the Australian representative on the Copper, Paper, Sulphur and Tungsten committees was Mr. F. A. Meere, Department of Trade & Customs, with Dr. H. G. Raggatt, Ministry of National Development, as alternate representative on the Copper, Sulphur and Tungsten Committees. On my arrival in Washington I was accredited as alternate representative on the four committees and Dr. Raggatt returned to Australia. A week later Mr. F. J. Marcusson, Department of Trade & Customs, relieved Mr. Meere, and until 6th. August Mr. Marcusson and I shared the work on the four committees. This was a particularly busy period, as all committees were endeavouring to reach agreement on schemes of allocation, and it was not unusual to have two or more meetings in one day. This gave us insufficient time to prepare cases and to carry on the routine administrative work, and a fair amount of this had to be done at week-ends and in the evenings. The position was eased in August by the arrival of Mr. R. F. F. Hall, Department of Trade & Customs, who relieved me as alternate representative on the Pulp-paper and Sulphur Committees. This gave me a better opportunity of attending sub-committee and working group meetings which had previously had to be missed, and to take part in various informal discussions, etc. which are an important adjunct to the regular meetings of the committees.

From 16th. May to 6th. December I attended I.M.C. meetings as follows:-

	Committee meeting.	Sub-committee meeting.
Copper-zinc-lead	28	10
Pulp-paper	4	-
Sulphur	8	1
Tungsten-molybdenum	25	25

These figures exclude attendance at informal meetings at which I.M.C. matters were discussed.

Under the rules of procedure (which are almost identical for each committee) the chairman, vice chairman and sub-committee of each committee are elected for a term of six months. At the election held by the tungsten committee in October, Australia was appointed to the sub-committee on distribution, which had become the principal working group of the full committee. The sub-committee recommends any scheme of distribution to be considered by full committee, and membership is mainly of consumer countries. I was elected to chairmanship of the sub-committee, apparently in the belief that I had less inducement to be partisan than members who represented consumer interests. Meetings of this sub-committee were fairly frequent, and I was nearly as busy on I.M.C. matters during the last month of my stay as I was during the first two months.

It is not relevant to these notes to make a report on the operations of I.M.C.; a statement outlining the work of the first twelve months is published in "The Australian Mineral Industry - Economic Notes & Statistics" Vol. 4 No. 3.

WASHINGTON.

Residence in Washington gave me the opportunity of meeting some of the officers of the U.S. Geological Survey and the U.S.A. Bureau of Mines. These included:-

Bradley - Chief Geologist, U.S.G.S.
Bannerman - Assistant Chief Geologist, U.S.G.S.
Larsen - Assistant Chief Geologist, U.S.G.S.
Rove - Mineral Resources Division, U.S.G.S.
Schaller - Research Chemist, U.S.G.S.
Fleischer - Chief, Division of Investigations, U.S.G.S.
Postel - Chief Draftsman, U.S.G.S.
Whitmore - Acting Chief Topographic Engineer, U.S.G.S.
Dietrich - Non-metals section, U.S. Bureau of Mines.
Josephson - Chief, Chemical Division, U.S. Bureau of Mines.
Johnson - Non-ferrous metals section, U.S. Bureau of Mines.
Miss Trought - Editor, Mineral Trade Notes, U.S. Bureau of Mines.

I made several attempts to meet Dr. J. Boyd, then Director of the U.S. Bureau of Mines, but he was so busy in the dual position of head of the Defence Minerals Administration and the Bureau of Mines that I was unable to see him. He resigned both these offices during my stay in Washington and is now an executive of Kennecott Copper Co.

I was asked by Dr. Raggatt to make some specific enquiries in Washington, the results of which are summarised as follows:-

(a) Recovery of fluorine from rock phosphate. The managing director of Sulphates Ltd. had suggested that an American process for removing fluorine from rock phosphate might be of interest to Australia. The process was described in "Industrial & Engineering Chemistry" for July, 1949. Rock phosphate and silica are finely ground, slurried, and fed into a rotary kiln to be sintered at 2700° to 2900° F. The sinter is quenched with water before leaving the kiln and super heated steam and some hydrogen fluoride pass out with the flue gases.

It is clear from a perusal of the paper that the method is primarily one of defluorination, and the recovery of hydrogen fluoride was not contemplated when the method was devised. The de-fluorinated rock is used to some extent as a fertilizer but mainly as an animal feed supplement. The paper stated that methods of recovery (of HF) are being studied, but the Chief of the Bureau of Mines Chemical division (Josephson) has not heard of any advances being made towards the commercial production of hydrogen fluoride by this process. Even if satisfactory recovery of HF could be achieved, the value of the process in relieving the shortage of fluorine in Australia would remain a matter for speculation. If there is any demand for phosphatic feed supplement in Australia it must be very small, and establishment of a kiln to produce this material and hydrogen fluoride would scarcely be justified. Another disadvantage is that the rock phosphate used in Australia has a lower fluorine and silica content than Florida rock, and the process would be more expensive to apply here than in the U.S.A.

(b) Use of ground rock phosphate as fertilizer. I was asked to ascertain (i) The quantity of ground phosphate rock used in the U.S.A.; (ii) the chemical composition of the rock used for this purpose; and (iii) the soil and climatic conditions of the areas in which it is used. My report to the Secretary was as follows:-

"The Scientific Attache of the Embassy and myself visited/the Agricultural Research Station at Beltsville, Maryland, on 25th. September and had a long discussion with Messrs. Jacob and Anderson of the Division of Fertiliser and Agricultural Lime.

We were impressed by the desire of these Research Officers to give us a fair appreciation of the present position in what is a fairly contentious subject in the U.S.A. and it is felt that they were anxious not to present a biassed picture for or against the use of ground rock.

The answers to your specific questions are as follows:

(i) Estimated quantity of ground rock used in the United States at the present time is 800,000 short tons per year. The annual production of superphosphate is estimated at 10,000,000 tons per year and this figure may be regarded as an approximation to the consumption. A comprehensive statement on commercial fertiliser consumption is enclosed herewith. In Table 6 the consumption of ground rock is stated at 728,533 tons and the consumption of super-phosphate of all grades at only 2,121,932 tons. There is, however, a large quantity of phosphatic fertiliser included under the heading of mixtures (at the head of the table) and the total figure of 10 million tons of super is probably a reasonable estimate. If the figures are correct, the ratio of ground rock to superphosphate is approximately 7½ per cent.

(ii) The Research Officers could not give any specific information on the chemical composition of the phosphate rock used for direct application, but said that the composition varied to a considerable extent. Approximately 75 per cent of the ground rock used in the United States is from the Florida area and the remainder is from Tennessee. In reply to a question regarding any undesirable elements such as fluorine, Mr. Jacob said that as far as he was aware the ground rock used throughout the United States was not treated in any way for the removal of any element. He could give no reason for stating that the Tunisian rock used in the U.K. and France is regarded as superior to others for direct application. He added that the Nauru and Ocean Island rock is not favourably regarded for direct application, but thought that the Christmas Island rock might be better.

(iii) The most favourable conditions under which ground rock may be used are stated as follows:-

(a) level country;
(b) pH 5.8 - 7;
(c) minimum rainfall 25".

Both officers emphasised the fact that the effect of ground rock is not immediate and that several seasons must elapse after application before the full benefits are apparent. The ground rock is not entirely satisfactory for grain crops alone, but has given good results where grain crops are rotated with leguminous pasture crops. One case was quoted where outstanding results were obtained with a four-year rotation of corn, soya beans, oats and alfalfa. Under these conditions the phosphorous is re-cycled to a considerable degree through organic material. Ground rock has not proved satisfactory for what alone, although there may be odd cases where conditions have been suitable.

There is only one other point which might be mentioned. More than half of the ground rock used in the United States is used in Illinois and an appreciable amount is used in Missouri. The officers at the Research Station are of the opinion that the large proportion of consumption in these two States is due to the influence of those conducting experimental research at the University of Illinois and not necessarily to any set of unusually favourable soil and climatic conditions in that region. This point is mentioned because it suggests that there could be an extension of the use of ground rock in other parts of the United States if greater encouragement was given by State authorities."

(c) Report on new sulphur discovery in Louisiana. Some prominence was given in the press to a statement attributed to Dr. Boyd (Bureau of Mines) to the effect that a new sulphur dome had been discovered in Louisiana, and that the extra production would solve the free world shortage within a short period. I was asked to report on the significance of the statement, which implied that full development of Australian resources of sulphide sulphur was less urgent than had been believed.

The views of the Freeport Sulphur Co. and of Josephson (Bureau of Mines) confirmed the impression held by some I.M.C. members that the report had been distorted to give it over-optimistic significance. The newly discovered dome is situated in swampy country at the tip of the Mississippi delta and development involves engineering problems. Planned production is estimated at the rate of 500,000 tons per year, but this cannot be achieved before 1954. Josephson's guess is that reserves may be of the order of 8 to 10 million tons. He is of the opinion that the cost of the new sulphur will be high and that the cost of all Frasch sulphur from present sources will rise within the next few years. This will reduce the cost differential between Frasch sulphur and sulphur from other sources, and should make development of sulphide sulphur more attractive.

Statistics assembled by the I.M.C. show the estimated deficit of sulphur in all forms to be 1,400,000 tons in 1951 and 1,800,000 tons in 1952. Production from new sources of elemental sulphur during the next few years will do little more than offset the decline in production from present sources, whilst at the same time there is a steadily increasing demand. Even if I.M.C. estimates prove to be wide of the mark, additional production of 500,000 tons by 1954 will not end the shortage, although it will be of considerable value in helping to bridge the gap. The discovery does not weaken the necessity for more extensive utilisation of Australian resources of sulphide sulphur.

URBANA, ILLINOIS.

The State Geological Survey of Illinois is one of the most active and well organised of its kind in the U.S.A., and I was given permission to visit the headquarters in Urbana to meet the Mineral Economist and to see the laboratory and other facilities. The Director of the Survey (Dr. M. M. Leighton) went to a great deal of trouble to ensure that the best use was made of the limited time at my disposal.

Relations between the State and Federal geological and mineral agencies have been uneasy for many years, but there is evidence of a substantial degree of co-operation on most matters. In respect of the collection of statistics, the spheres of operation have been defined by a formal agreement between the State Geological Survey and the U.S. Bureau of Mines, and a mutually satisfactory method of collection has been evolved. In addition to an inspection of the very fine laboratories I had interesting discussions with the Director (Dr. Leighton), the Mineral Economist (Dr. Voskuil), the Chief of the Industrial Minerals section (Mr. Lamar), the Chief of the Industrial Chemicals section (Dr. Reed) and one of his research staff (Dr. Finger), the Statistician (Miss King) and Dr. Grim of the Geology Department of the University. Following are some general notes compiled at the time of the visit.

(a) <u>Industrial Minerals (Mr. Lamar)</u>. Fluorspar is the principal industrial mineral and Illinois is the principal producer of fluorspar in the U.S.A. It occurs in two distinct forms in the south-eastern part of the State. In the first form it is in beds associated with galena, sphalerite and barite in parts. The other form is in vertical veins which persist to a depth of about 600 feet; it is fairly clean but runs into calcite in places. The separation of the calcite from fluorspar presents no great difficulty, but what is called the quartz matrix type necessitates fine grinding followed by flotation. Acid grade is sold at approximately $45.00 and metallurgical grade at approximately $38.00 per short ton at mines. The Rosiclare Mine is in Illinois but near the border with Kentucky and the State Survey shares its interest in the mine with the adjoining State and the Federal Agencies.

Other industrial minerals include limestone and dolomite, the latter being used for cement aggregate, road ballast, agricultural purposes and for the production of some chemicals. The interesting point is that a considerable quantity of both limestone and dolomite is mined underground and it is stated that the cost is closely comparable with ordinary quarry methods. Felspar is obtained from glacial sands and by flotation from some river sands. Tripoli is produced, and is claimed to be equal in quality to the standard grades of Missouri Tripoli, but is not as favourably regarded by the trade on account of its greyish colour, which is believed to have some relation to its properties for industrial use. The Geological Survey does not accept this as valid and believes that the Illinois tripoli is just as good as the Missouri product. Glass sands are produced in several parts of Illinois and supply 6 or 8 glass making plants in the State. At some localities the sands are broken down by sluicing and a simple washing process produces a white sand containing 99.9 per cent silica with .035 per cent Fe_2O_3. Moulding sands are produced by blending various grades of crushed sandstone. No barite is produced in Illinois, but considerable quantities of clays, agstone, building stone, sand and gravel, and Fuller's earth are produced.

(b) Mineral Economics Section (Dr. Voskuil). The function of the Mineral Economics Section is very similar to that of the Australian counterpart insofar as statistics and economic problems are concerned, but there is no attempt to divide the Section to deal with metallic or non-metallic minerals. The Statistical section collects and assembles production figures on a yearly basis only, and does this in collaboration with the United States Bureau of Mines. An agreement under which this co-operation is maintained was signed in 1931 and gives the State the right to collect statistics for the following minerals - clays, Fuller's earth, lime, limestone, silica sand, sand and gravel, sandstone and tripoli. Under this agreement the appropriate forms are sent under cover of a letter signed by the Chief of the Survey, but are actually despatched by the Bureau of Mines. The producers return the forms to the Survey, which passes them on to the Bureau of Mines after recording the statistics. It seems that the purpose of this arrangement is to ensure that the State is asking for the statistics and to let the U.S. Bureau of Mines know to whom the forms are being despatched, but the first impression is that the same purpose could be achieved by a rather simpler procedure. In the case of minerals not covered by the 1931 agreement, the U.S. Bureau of Mines sends out the forms and receives them on return, but makes a copy which is made available to the State Survey. The secrecy provisions are satisfied by an endorsement to the effect that the information is for the use of the Federal and State Governments only and, in the case of minerals for which there are less than three producers, the producers are asked to indicate whether they have any objection to the statistics being published in such a way that individual production will be disclosed. Some producers take advantage of this provision, but I understand that a majority of the larger producers does not object to publication of their statistics. There is no attempt to establish a uniform valuation of production, but the State Survey would prefer to have values stated at the pithead, that is the f.o.b. value less cost of putting on transport.

One feature which appeared to me of particular value both from the State and Federal point of view is a directory of producers, which is kept up-to-date and published at intervals.

(c) Clay products (Dr. Grim). Dr. Grim was formerly an officer of the Illinois State Geological Survey but recently transferred to a position in the Geology Department of the University. He has just returned from an extensive tour of Australia as an adviser to the Building Materials Division of the C.S.I.R.O. He stressed the importance of installation of tunnel kilns for the production of bricks and mentioned that the conventional type kilns have been almost entirely superseded in the United States. The average length of time for the production of a brick in a tunnel kiln is about 3 days, and the popularity of these kilns is very largely due to this considerable saving in time. They are entirely automatic in operation and consequently very cheap to run, and Dr. Grim mentioned that the installation of tunnel kilns in Australia seems to be essential if the brick making industry is to cope with the problems of cheap and quick production of large quantities of bricks.

NEW YORK.

I was able to make a hurried visit to New York during which I had an interesting discussion with Alan Brown and Associates, who deal in a number of mineral commodities including mica, graphite, tungsten ores, etc. They mentioned that the mica market in U.S.A. was depressed by the release of 450,000 lbs. from stocks of General Electric Co. and the consequential uneasiness on the part of other firms holding large stocks.

I had intended to visit the Mica and Insulating Co. who were reported to have the American rights to manufacture Samica foil, but the company is operating in Schenectady (160 miles from New York city) and I did not have the time to make the trip. The president of the company told me in a telephone conversation that they have not reached the production stage and could not express an opinion on the suitability of Australian scrap mica for the process. He thought that any scrap utilised would have to be delivered at works at not more than $50.00 per short ton, but I doubt whether this opinion is reliable. The company is only one partner in a corporation which has the rights to manufacture Samica foil in North America (the other two partners are the General Electric Co. and Samica Corporation) and it is very doubtful if this company is fully conversant with the manufacturing problems and costs. Under the terms of an agreement, any testing of Australian scrap would have to be carried out by the British licensees, Peerless Mica Co.

OTTAWA.

I had the opportunity of accompanying the Scientific Attache of the Embassy at Washington on a car trip to Ottawa, calling at the Cornell University, Ithaca, and the Syracuse University, Syracuse, N.Y., en route. In Ottawa I visited the Department of Mines and Technical Surveys and met Dr. Convey, who was about to succeed E. S. Martindale as head of the Division of Mineral Resources, and Mr. N. H. Norrish, his administrative assistant.

I then went to the Mines Branch and met the officer in charge of the inventory of mineral resources, Mr. W. R. McLelland. He showed me the records in which details are listed of every significant occurrence of each mineral in Canada. The information is collected from publications of provincial governments and, to a certain extent, by personal investigation by officers of the Mines Branch. A card is made up for each mineral occurrence and the cards are filed under the general heading of each mineral and under sub-headings indicating the province in which the occurrence is noted. Emphasis is placed on map references and each sub-division in the filing cabinets contains a fairly large scale map for reference. The cards are in two colours, one to indicate that the occurrence is actually being worked, the other to indicate that no work has been done at the particular locality. The whole inventory is indexed and cross-indexed by a card system and appears to form a very complete record of Canadian mineral resources. Three officers are permanently occupied in going through literature and collating the information, but one of the officers spends a considerable time on field inspections to supplement the published data available about each occurrence. The Mineral Resources Division has prepared a few reports similar to our Summary Reports, but the information is limited to notes on the occurrences of each mineral and does not include statistical and economic data.

I had a brief discussion with Mr. H. M. Woodrooffe who is making a special study of the economics of certain industrial minerals, of which asbestos is the most important. He gave me some background information which was most useful when I later visited the Johns-Manville mine, and he also gave me a draft of a summary of the Canadian asbestos industry in 1950. The form of this summary is very similar to the chapters in the Australian Mineral Industry Annual Review. He mentioned that there was an unsatisfied demand for long fibre asbestos and that there had been a substantial increase in the utilisation of shorts and refuse.

I also met Mr. R. J. Traill who is in charge of the ore dressing laboratory, and was later shown the industrial minerals side of the laboratory. The equipment for testing all kinds of ores is very modern and testing can be carried out on a commercial scale if needed. It is obvious that a great amount of the equipment is idle for considerable periods, but the Branch is in a position to carry out practically any type of testing at very short notice. Mr. Traill mentioned that the recovery of elemental sulphur from sulphides is receiving attention and he is firmly of the belief that it can be economically produced from pyrite in competition with Texas sulphur, which is landed in Montreal at $30.00 per short ton. Elemental sulphur was produced on a commercial scale by the Consolidated Mining & Smelting Company at Trail, B.C. prior to and during the 1939-45 war.

ASBESTOS.

I was the guest of the Johns-Manville Company at their mine and mill workings as Asbestos, approximately 120 miles east of Montreal, Quebec Province. The Mine Manager, Mr. K. Lindell, was away for most of the time I was in the town, but his assistant, Mr. W. H. Soutar, arranged for the best use to be made of the time available. The Production Manager, Mr. Deely, conducted me over the whole of the treatment plant, and one of the Under-Managers at the mine, Mr. Cook, took me underground and showed me that side of the Company's operations.

Until about two years ago the ore was won entirely plan/ from an open pit of circular ~~cross section~~, approximately 5,000 feet in diameter at the rim and vertical depth of about 600 feet. These dimensions represent the limit of lateral expansion and underground mining was commenced about two years ago. Some ore is still being extracted from the pit, but considerably more is now being hauled from the 750 ft. level of the underground workings. The mine is highly mechanised and the Company claims to have the most up-to-date Canadian made equipment, particularly for mine haulage and winding. All ore mined underground is crushed before being brought to the surface. A crew of hand-cobbers inspects each face after shot-firing and hand picks any fibres longer than 3/8". These are specially treated in a hand-cobbing shed without going through the ordinary mill treatment. Ore reserves are estimated to be sufficient for 75 years at the present rate of operations, but the limits of the ore body have not been completely determined.

The mill flow-sheet is very simple, comprising coarse crushing to approximately 3/8" (this stage is carried out underground in the case of the mine operations) followed by a series of aspiration processes which remove the longer fibres first and then by a final hammer mill process which removes the grades 6 and 7. The mill treats approximately 500 tons of ore per hour, yielding from 45-52,000 tons of fibre per month. The output of fibre in 1951 was 550,000 short tons. The mill recovery of fibre is 16.35 per cent of the ore treated, the yield being as follows:-

Grade 3 fibres	-	.15 per cent
Grade 4 fibres	-	2.7 per cent
Grade 5 fibres	-	1.5 per cent
Grade 6 fibres	-	5.5 per cent
Grade 7 fibres	-	6.5 per cent

Shorts and refuse are not being saved as the production would exceed the demand and the recovery of very short fibre is considered uneconomic at the present time. The cost of production is estimated to be $25.00 to $30.000 per short ton of packed, graded fibre.

The quality of finished fibre is carefully controlled by laboratory tests, which include the Quebec standard testing procedure, and various refinements of that procedure which the Company believes necessary to maintain uniformity. The testing officer stated that it is largely for the satisfaction of the Company that certain of these tests are carried out and that they have developed Company standards. One of the tests is for kerosene absorption and establishing the suitability of the fibre for use in bitumen base floor tiles which are becoming increasingly popular. Another test is to determine the suitability of the fibre for filtration purposes.

The company operates a mill for the production of asbestos cement and other finished asbestos products, but I did not have time to visit this section of their operations.

UNITED KINGDOM.

The Prime Minister's Department approved my spending up to 2 weeks in the U.K. obtaining trade opinions about the use of Samica foil and to have discussions with the British Commonwealth Geological Liaison Officer and other officials. I was also given permission to visit clay treatment plants in Cornwall and the I.C.I. works at Billingham, but after discussing an itinerary with Departmental representatives in Australia House I considered it expedient to cancel the visit to Billingham in favour of a visit to the Samica Corporation factory at Valdoie, France.

(a) Cornish Clay Industry. I was the guest of the producing company - English Clays Lovering Pochin & Co. Ltd. - on a tour of some of the claypits and kilns in the St. Austell region. This large company was formed by a series of amalgamations of the interests of families which had been engaged in clay winning for several generations, and is now responsible for 75% of the productive capacity of the industry. Before visiting the pits I had a general discussion with Mr. Moore, one of the company executives, who told me that it was contrary to their policy to disclose certain aspects of the operations. I had been previously told by a Board of Trade official that the company had "secret" processes, but he could only surmise that they were concerned with the beneficiation of the clay for certain industrial uses.

Details of the general clay winning and treatment methods are given in the Board of Trade Working Party Report on China-Clay (H.M.S.O. 1948) and may be summarised as follows:-

(i) Sluicing from pit sides by water jet.

(ii) The sand-clay slurry is passed through "sand pits" to settle out coarse impurities.

(iii) Clay slurry is pumped to the pit top and led into a series of shallow concrete channels to settle out fine impurities (grit, etc.)

(iv) The slurry is then passed to settling pits where the clay is allowed to settle to the consistency of thin cream.

(v) Clay from the settling pits is gravitated through pipe lines to kilns which are usually some distance from the pits.

(vi) At the kilns the clay is further dehydrated by settling in tanks (older method) or by passing through filter presses (more modern kilns), and then laid on the kiln floor in slabs. The kiln floor consists of firebrick slabs covering flues through which heated air is circulated.

(vii) Dried clay is hand-shovelled into storage bins at the kiln and then railed to bins at the dock side for ship loading or may be crushed and beneficiated to customers' specifications. Some of the clay is shipped uncrushed for processing by individual consumers.

The coarse sand removed at stage (ii) is trucked from the pit floor to a dump at the surface. Sand waggons move along an inclined rail track to the top of the dump, where they are automatically discharged. The conical sand dumps are high and are a distinctive feature of the St. Austell and other clay winning regions. I enquiried if any use had been found for the sand (e.g. glass making) but the company has been able to use only a very small amount for building purposes. Disposal of the sand dumps is a problem, since many are situated on ground now needed for new clay pits. Unified control of the majority of pits has resulted in much greater technical efficiency and better economic development of resources, and the wasteful use of clay-bearing land for dumping sand will not be permitted in future. A few dumps are being moved by returning the sand to worked out pits.

The china clay industry in Cornwall has always been dependent on exports for disposal of the products and is sensitive to fluctuations in international trade. About 70% of the output is exported in normal times, but during the recent war the proportion fell to 28% (1944). The industry has now returned to approximately pre-war strength, and the outlook for the immediate future is bright.

(b) Trade Opinion on Samica foil. I called on representatives of the British General Electric Co., English Electric Co., Crompton Parkinson Ltd., and Micanite and Insulating Co. The first two companies do not have technical departments in London and I was unable to obtain any opinions on Samica from the representatives interviewed. At Crompton Parkinson Ltd. I met Mr. H. L. Lewis, who told me that the company was fully informed on the properties of Samica foil and would be very happy to use the material if and when it is obtainable. A small quantity had been tested, with satisfactory results, and the company would like to obtain more foil for testing in other processes. Mr. Lewis left no doubt in my mind that the company is enthusiastic regarding Samica.

Messrs. Cooper and Fleming of the Micanite and Insulating Co, Walthamstow, were much more reserved in their opinions. They contend that Samica foil and Samicanite are untried and are inclined to discount some of the claims made for it. They point out that the electrical industry is necessarily conservative in adopting new materials, and that long periods of trial under operating conditions would be needed to prove that Samicanite is a satisfactory substitute for micanite made from splittings. They expressed doubt regarding the ability of Samicanite to stand up to the vibration and mechanical wear in heavy electrical equipment. In spite of these reservations, however, the officers were prepared to admit that Samica will find a market and that it will be a useful outlet for scrap material which is at present wasted.

This company might be expected to resist the introduction of Samicanite because it is a potential competitor for one of the company's principal products, or to endeavour to obtain manufacturing rights which would enable them to exercise greater control of the market for Samica and micanite. Having failed to obtain the manufacturing rights to Samica it is natural that the company should not make any concession regarding the future value of this material, and I am of the opinion that this policy was reflected in the views expressed by the Company officials.

(c) Peerless Mica Co. I visited the factory of Peerless Mica Co. at High Wycombe, and had a long discussion with the Managing Director of the company, Mrs. Burrell. Peerless Mica Co. was started in Australia during the war and is operating a factory for the production of micanite and other mica products at Malvern, Vic. Mrs. Burrell moved to England about two years ago, formed a separate company, and erected a factory on similar lines to the Australian factory. One machine is making micanite and there is room for at least two more machines under the same roof. About 12 or 15 operatives are also engaged in hand-making micanite sheets. Cost of production of all micanite sheeting was stated to be 9/4 (stg.) per lb., compared with the equivalent of £2.3.0 (stg.) in France.

A separate factory is to be erected for the manufacture of Samica foil, for which the company has sole rights in the British Commonwealth, excluding India, Pakistan and Canada. It is planned to produce about 20 tons per month at an estimated cost of 5/- (stg.) per lb. Mrs. Burrell hopes to use Australian scrap mica as raw material for the foil, but is of the opinion that the Government should offer greater incentives to boost the production in the Harts Range.

(d) Manufacture of Samica foil. The Samica Corporation has a small factory at Valdoie, a few miles from Belfort in France. I was shown over the works by an American engineer who has been learning the process for some time, and who will be returning to the U.S.A. to direct the production of Samica foil for the American licensees. The process is as follows:-

(i) Crude mica screened to reject material less than 4mm.

(ii) Drying at 800° to 830° C. Two "types" of mica are being used, a "hard" flake which is fed to the oven in batches of 30 kg which take 46 minutes to dry, and a "soft" flake which is fed in batches of 46 kg and takes 49 minutes. The electric drying oven is thermostatically controlled and time of drying is regarded as critical. Timing commences when the oven returns to the operating temperature after a change of batches. The batches are loaded into shallow metal pans which are fed into the oven on overhead rails and later discharged by tipping. The charging and discharging process is not automatic.

(iii) The dried mica is discharged from the oven and quenched in a vat of sodium carbonate of SG. 1.05, and allowed to soak for from 30 to 60 minutes.

(iv) The pulp is then moved through a number of vats containing dilute (1.5%) sulphuric acid. The evolution of carbon dioxide helps to expand the mica and the lamelli lose the normal cohesion. The movement from vat to vat is done manually and this takes from 12 to 24 hours to complete. The stated objection to mechanical handling is that it creates too many fines, as the material is now very easily disintegrated.

(v) The discharge from the vats carries a slight excess of acid which is neutralised by washing in dilute sodium carbonate solution and then excess water.

(vi) The slurry is run into an agitator and washer vat to regulate the composition (as between "hard" and "soft" mica) and flow, as well as to ensure complete disintegration of the flakes.

(vii) The slurry is fed on to a copper screen (65 mesh) and the excess moisture removed by suction. The discharge is a moist pulp which is the raw feed for the foil making machine.

(viii) Pulp is manually fed into the hopper of an adapted paper-making machine, slurried, agitated, and poured on the wet belt.

(ix) A proprietory preparation "Malamine" is added as a binder before the first suction drier and heater is reached, or a boric acid-hydrous shellac mixture may be added after the first heat, depending on the properties required in the finished foil.

(x) Further drying and heating is carried out before and after the wet sheet is transferred to the drying belt.

(xi) The foil is rolled as it leaves the machine and is shipped out of the factory in lengths of about 150 feet, 20 inches wide.

The factory output is about 9 tons of 20 inch foil per month, production cost is stated to be 10/- stg. per lb. This particular factory is concerned only with the production of foil, which is at present sent to the works of Usines Dielectriques, Delle (France) and Schweizische Isola-Werke, Breitenbach (Switzerland), for fabrication into a range of insulating products. I was shown through the factory at Breitenbach, and saw the foil being used in the manufacture of insulating papers, tapes, stampings, mouldings, rods, tubes, etc. For some purposes (e.g. stampings, toaster and iron elements etc.) it is built up to the required thickness by cementing layers of foil together, whilst for papers, tapes, etc. it is used in single thickness. It is said to be much more easily worked than micanite made from splittings, and to have superior electrical qualities for many purposes.

I have no doubt that the demand for Samica products is at present unsatisfied and that the market will expand as they become better known and are produced in greater quantities. It will assist development of mica mining by providing an outlet for scrap and waste for which there is no market at present, but it will also reduce the overall demand for splittings. The Mica Advisory Committee in India recently recommended a total ban on the export of scrap mica, and this may be a clumsy attempt to retard the production of Samica outside India. If it is, it suggests that Samica is regarded as a serious threat to the Indian splitting industry. On the other hand, it is too early to forecast the limitations of Samicanite, Samicafolium and other products made from Samica foil, or the extent to which they will replace ordinary micanite.

(e) Commonwealth Geological Liaison Officer, London. Mr. R. Willett of the New Zealand Geological Survey is the first officer to be appointed to this position, and took up duty in May, 1951. He has had to build up an entirely new organisation which is still in the initial stages. He is mainly concerned with mineral resources of the British Commonwealth and envisages the establishment of an inventory similar to that maintained by the Mines Branch in Ottawa (q.v.) The B.M.R. Summary Reports, Annual Review, and Quarterly Statistics have proved of considerable value and he spoke highly of them. Enquiries are beginning to come in from Commonwealth countries and Willett has received full co-operation from all concerned in furnishing the information requested. He is anxious to avoid a "post office" role or the establishment of a statistical bureau which would clash with the functions of the Mineral Resources Division of the Colonial Geological Surveys. There was some initial difficulty in obtaining classified information from the U.K. departments, but this has been satisfactorily resolved by having Willett appointed secretary of a Committee which has access to such information.

(f) Other discussions. Whilst in London I also had discussions of a general nature with the Official Secretary of Australia House (Mr. Hewitt), the Scientific Liaison Officer (Mr. Cummins), the U.K. representative of Metal Manufacturers Ltd. and other Australian companies (Col. Evans), the director of non-ferrous metals in the U.K. Ministry of Materials (Mr. James) and one of the commodity officers in the Board of Trade (Mr. Breslin).