SESSION II.
1921.

NEW ZEALAND.

KAURI-GUM INDUSTRY

(REPORT OF THE COMMISSION APPOINTED TO INQUIRE INTO AND REPORT UPON).

Presented to both Houses of the General Assembly by Command of His Excellency.

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COMMISSION.

JELLICOE, Governor-General.

To all to whom these presents shall come, and to REGINALD PALMER GREVILLE, Esquire, F.R.G.S., of Auckland, Commissioner of Crown Lands and Chief Surveyor for the North Auckland Land District, and Kauri-gum Superintendent; RODNEY COATES, Esquire, of Matakohe, Farmer; FRANCIS LAWRENCE GRIBBIN, Esquire, of Auckland, Gum-merchant; ERNEST JOHN NICCOL, Esquire, of Hikuai, Tairua, Settler; JOHN NICHOLSON, Esquire, of Auckland, Gum-digger; FREDERICK PALLISER WORLEY, Esquire, M.A., D.Sc., of Auckland, Professor of Science; and MONTAGUE HARRISON WYNYARD, Esquire, of Auckland, Solicitor: Greeting.

WHEREAS it is considered expedient to inquire into matters affecting the kauri-gum industry, the kauri-gum lands and their various products, and the question as to whether any special taxation by way of royalty or otherwise should be placed on kauri-gum products for the benefit of local bodies within kauri-gum districts:

Now, therefore, I, John Rushworth, Viscount Jellicoe, Governor-General of the Dominion of New Zealand, in exercise of the powers conferred by the Commissions of Inquiry Act, 1908, and of all other powers and authorities enabling me in this behalf, and acting by and with the advice and consent of the Executive Council of the said Dominion, do hereby constitute and appoint you, the said

REGINALD PALMER GREVILLE,
RODNEY COATES,
FRANCIS LAWRENCE GRIBBIN,
ERNEST JOHN NICCOL,
JOHN NICHOLSON,
FREDERICK PALLISER WORLEY, and
MONTAGUE HARRISON WYNYARD,

to be a Commission to inquire into and report upon the above matters generally, and in particular to inquire into and report upon—

(1.) The present export trade in kauri-gum, and especially in respect to the particular grades of gum exported, the countries to which it is exported, and the industrial uses to which kauri-gum is put.

(2.) Whether it is advisable that there should be a standard grading of kauri-gum for export, and whether the State should control the entire export.

(3.) The present methods of recovering kauri-gum from the gum-bearing soils, and how they may be improved.

(4.) To what extent operations have progressed with regard to the extraction of oils and other valuable products from the kauri peat swamps, and what are the best means of advancing the development of this industry.

(5.) The durability of kauri swamp timber, and its value for fencing, building, and other purposes.

(6.) The best means of treating the kauri-gum lands for settlement purposes generally, and the suitability of such lands for setting apart for occupation under the provisions of section 11 of the Land Laws Amendment Act, 1919.

(7.) All aspects of the question with regard to the issue of licenses under the Kauri-gum Industry Act, 1908.

(8.) The best means of preventing damage to kauri-gum lands by fires.

(9.) The advisability of establishing a laboratory for research in connection with kauri-gum and its products, including kauri peat.

(10.) Whether or not any special taxation for the benefit of the local bodies in kauri-gum districts should be placed on kauri-gum production by way of royalty or otherwise.

(11.) If the Commission is of opinion that the imposition of such royalty or taxation is advisable, what is a fair and equitable royalty or tax to fix, and in what manner should it be apportioned.

(12.) Whether it is advisable, in the event of the Commission recommending the imposition of such royalty or taxation, to apply part of the revenue so raised to research work in connection with the kauri-gum industry.

And, with the like advice and consent, I do further appoint you,

REGINALD PALMER GREVILLE,

to be Chairman of the said Commission.

And you are hereby authorized to conduct any inquiries under these presents at such times and places as you deem expedient, with power to adjourn from time to time and place to place as you think fit, and to call before you and examine on oath (or otherwise) such persons as you think capable of affording you information as to the matters aforesaid, and to call for and examine all such documents as you deem likely to afford you information on any such matters.

And, using all due diligence, you are required to report to me, under your hands and seals, not later than the thirty-first day of March, one thousand nine hundred and twenty-one, your opinion on the aforesaid matters.

And you are hereby strictly charged and directed that you shall not at any time publish or otherwise disclose, save to me in pursuance of these presents, or by my direction, the contents or purport of any report so made or to be made by you.

And it is hereby further declared that these presents shall continue in force although the inquiry is not regularly continued from time to time or from place to place.

And, lastly, it is hereby further declared that these presents are issued under and subject to the provisions of the Commissions of Inquiry Act, 1908.

Given under the hand of His Excellency the Governor-General of the Dominion of New Zealand; and issued under the Seal of that Dominion, at the Government House at Wellington, this 21st day of February, 1921.

D. H. GUTHRIE, Minister of Lands.

Approved in Executive Council.

F. D. THOMSON,
Clerk of the Executive Council.

GOD SAVE THE KING!

EXTENDING TIME OF KAURI-GUM INDUSTRY COMMISSION.

JELLICOE, Governor-General.

To all to whom these presents shall come, and to REGINALD PALMER GREVILLE, Esquire, F.R.G.S., of Auckland, Commissioner of Crown Lands and Chief Surveyor for the North Auckland Land District, and Kauri-gum Superintendent; RODNEY COATES, Esquire, of Matakohe, Farmer; FRANCIS LAWRENCE GRIBBIN, Esquire, of Auckland, Gum-merchant; ERNEST JOHN NICCOL, Esquire, of Hikutai, Tairua, Settler; JOHN NICHOLSON, Esquire, of Auckland, Gum-digger; FREDERICK PALLISER WORLEY, Esquire, M.A., D.Sc., of Auckland, Professor of Science; and MONTAGUE HARRISON WYNYARD, Esquire, of Auckland, Solicitor: Greeting.

WHEREAS by a warrant dated the twenty-first day of February, one thousand nine hundred and twenty-one, and issued under my hand and the public seal of the Dominion, you were appointed a Commission to inquire into and report on various matters affecting the kauri-gum industry, and you were directed and required to report to me not later than the thirty-first day of March, one thousand nine hundred and twenty-one:

And whereas it is expedient that the said period should be extended as hereinafter provided:

Now, therefore, I, John Rushworth, Viscount Jellicoe, Governor-General of the Dominion of New Zealand, in exercise of the powers conferred by the Commissions of Inquiry Act, 1908, and all other powers and authorities enabling me in that behalf, and acting by and with the advice and consent of the Executive Council of the said Dominion, do hereby declare and appoint that the time at or before which you shall present to me your report aforesaid is here extended to the thirtieth day of April, one thousand nine hundred and twenty-one.

And, with the like advice and consent, and in further pursuance of the said power and authority, I do hereby confirm the said Commission except as herein varied.

Given under the hand of His Excellency the Governor-General of the Dominion of New Zealand; and issued under the Seal of that Dominion, at the Government House at Wellington, this 24th day of March, 1921.

D. H. GUTHRIE, Minister of Lands.

Approved in Council.

F. D. THOMSON,
Clerk of the Executive Council.

GOD SAVE THE KING!

FURTHER EXTENDING TIME OF KAURI-GUM INDUSTRY COMMISSION.

JELLICOE, Governor-General.

To all to whom these presents shall come, and to REGINALD PALMER GREVILLE, Esquire, F.R.G.S., of Auckland, Commissioner of Crown Lands and Chief Surveyor for the North Auckland Land District, and Kauri-gum Superintendent; RODNEY COATES, Esquire, of Matakohe, Farmer; FRANCIS LAWRENCE GRIBBIN, Esquire, of Auckland, Gum-merchant; ERNEST JOHN NICCOL, Esquire, of Hikutai, Tairua, Settler; JOHN NICHOLSON, Esquire, of Auckland, Gum-digger; FREDERICK PALLISER WORLEY, Esquire, M.A., D.Sc., of Auckland, Professor of Science; and MONTAGUE HARRISON WYNYARD, Esquire, of Auckland, Solicitor: Greeting.

WHEREAS by a warrant dated the twenty-first day of February, one thousand nine hundred and twenty-one, and issued under my hand and the public seal of the Dominion, you were appointed a Commission to inquire into and report on various matters affecting the kauri-gum industry, and you were directed and required to report to me not later than the thirty-first day of March, one thousand nine hundred and twenty-one:

And whereas the time within which you were required to report was extended to the thirtieth day of April, one thousand nine hundred and twenty-one: And whereas it is expedient that the said period should be further extended as hereinafter provided:

Now, therefore, I, John Rushworth, Viscount Jellicoe, Governor-General of the Dominion of New Zealand, in exercise of the powers conferred by the Commissions of Inquiry Act, 1908, and all other powers and authorities enabling me in that behalf, and acting by and with the advice and consent of the Executive Council of the said Dominion, do hereby extend the period within which you are required to report until the thirty-first day of May, one thousand nine hundred and twenty-one.

And, with the like advice and consent, and in further pursuance of the said power and authority, I do hereby confirm the said Commission except as herein varied.

Given under the hand of His Excellency the Governor-General of the Dominion of New Zealand; and issued under the Seal of that Dominion, at the Government House at Wellington, this 27th day of April, 1921.

D. H. GUTHRIE, Minister of Lands.

Approved in Council.

C. A. JEFFERY,
Acting Clerk of the Executive Council.

GOD SAVE THE KING!

FURTHER EXTENDING TIME OF KAURI-GUM INDUSTRY COMMISSION.

JELLICOE, Governor General.

To all to whom these presents shall come, and to REGINALD PALMER GREVILLE, Esquire, F.R.G.S., of Auckland, Commissioner of Crown Lands and Chief Surveyor for the North Auckland Land District, and Kauri-gum Superintendent; RODNEY COATES, Esquire, of Matakohe, Farmer; FRANCIS LAWRENCE GRIBBIN, Esquire, of Auckland, Gum-merchant; ERNEST JOHN NICCOL, Esquire, of Hikuai, Tairua, Settler; JOHN NICHOLSON, Esquire, of Auckland, Gum-digger; FREDERICK PALLISER WORLEY, Esquire, M.A., D.Sc., of Auckland, Professor of Science; and MONTAGUE HARRISON WYNYARD, Esquire, of Auckland, Solicitor: Greeting.

WHEREAS by a warrant dated the twenty-first day of February, one thousand nine hundred and twenty-one, and issued under my hand and the public seal of the Dominion, you were appointed a Commission to inquire into and report on various matters affecting the kauri-gum industry, and you were directed and required to report to me not later than the thirty-first day of March, one thousand nine hundred and twenty-one:

And whereas the time within which you were required to report was extended to the thirty-first day of May, one thousand nine hundred and twenty one: And whereas it is expedient that the said period should be further extended as hereinafter provided:

Now, therefore, I, John Rushworth, Viscount Jellicoe, Governor-General of the Dominion of New Zealand, in exercise of the powers conferred by the Commissions of Inquiry Act, 1908, and all other powers and authorities enabling me in that behalf, and acting by and with the advice and consent of the Executive Council of the said Dominion, do hereby extend the period within which you are required to report until the eleventh day of June, one thousand nine hundred and twenty-one.

And, with the like advice and consent, and in further pursuance of the said power and authority, I do hereby confirm the said Commission except as herein varied.

Given under the hand of His Excellency the Governor-General of the Dominion of New Zealand; and issued under the Seal of that Dominion, at the Government House at Wellington, this 30th day of May, 1921.

D. H. GUTHRIE, Minister of Lands.

Approved in Council.

C. A. JEFFERY,
Acting Clerk of the Executive Council.

REPORT.

To His Excellency the Right Honourable John Rushworth, Viscount Jellicoe, Admiral of the Fleet, Knight Grand Cross of the Most Honourable Order of the Bath, Member of the Order of Merit, Knight Grand Cross of the Royal Victorian Order, Governor-General and Commander-in-Chief in and over His Majesty's Dominion of New Zealand and its Dependencies.

MAY IT PLEASE YOUR EXCELLENCY,—

We, the Commissioners appointed by Your Excellency on the 21st day of February, 1921, to inquire into matters affecting the kauri-gum industry, the kauri-gum lands and their various products, and the question as to whether any special taxation, by way of royalty or otherwise, should be placed on kauri-gum products for the benefit of local bodies within kauri-gum districts, and to report upon the matters referred to in the Commission, a copy of which is attached hereto, have the honour to report as follows:—

We assembled at Auckland on the 14th March, 1921. After a short opening address by the Chairman, various matters were discussed, and the itinerary for the Dargaville district and the Coromandel Peninsula was arranged. Leaving Auckland on the afternoon of the same day we arrived at Dargaville on the following morning, and inspected the workings of the principal gumfields in the vicinity. On the 16th March a sitting was held at Dargaville, where a considerable amount of evidence was given by persons representing various interests concerned in our inquiry.

On the 17th March one section of the Commission inspected gum workings at Te Kopuru, and the farming of what were formerly poor gum lands in the neighbourhood, while another proceeded to the coast, where exceptional facilities existed for making a close examination of the strata of gum-bearing country.

On the 18th March, accompanied by Mr. V. Trounson, County Chairman, and Councillors A. E. Harding and L. P. Pateman, of the Hobson County Council, we inspected the national Kauri Park, situated about twenty-five miles north of Dargaville. The park comprises an area of about 65 acres of magnificent kauri forest.

On the 19th March we returned to Auckland, and held a meeting to arrange the itinerary for the districts of the far North.

On the 21st March we proceeded to the Thames by steamer, and thence by motor-cars to Coromandel. On the following morning we continued our journey across the Coromandel Peninsula to Whitianga (Mercury Bay), where a short sitting was held and evidence taken. On the evening of the same day we held a sitting at Gumtown, and examined witnesses. On the 23rd March we returned to Coromandel, where we took evidence in the morning, and on the evening of the same day evidence was taken at Thames. On the following day we returned to Auckland.

On the 29th March, after the Easter holidays, we proceeded from Auckland by steamer to Houhora, where we held a sitting on the evening of the 30th March, and took evidence. Further evidence was taken at sittings held at Waiharara and Waipapakauri on the 31st March and 1st April respectively. While in these localities, workings on gumfields situated at Kaingaroa, Sweetwater, Waipapakauri, and other places were inspected.

On the 2nd April we arrived at Kaitaia, the most important town in the far North, where a well-attended meeting was held and a great deal of evidence taken.

On Sunday, the 3rd April, we proceeded to Te Paki, near the Parenga Gumfields, and inspected the country situated between Te Paki and Spirits Bay.

On the following day the important gum-workings of the Parenga Oil Company were inspected, and in the evening a sitting, attended by a large number of Maoris, was held at Te Hapua. Here, after receiving a hearty welcome from the chief of the Aupouri Murupaenga Rewiri, the evidence of Maori gum-diggers and local gum-buyers was taken.

On the following day, the 5th April, we returned, via Te Paki and the Ninety-mile Beach, to Kaitaia, and on the next day proceeded via Lake Ohia to Mangonui, where evidence was taken the same evening. We proceeded thence, on the 7th, via Russell, to Whangarei, where a well-attended meeting was held on the evening of the 8th April, and evidence was heard. In the afternoon of the same day an inspection was made of the experimental farm carried on by the Department of Agriculture at Puwera, for the purpose of ascertaining the best methods of treating poor gum lands.

On the 9th April we returned to Auckland. For various reasons it was found necessary to suspend further business until the 18th April, on which date we left Auckland for Mangawai and Ruakaka, where the evidence of a large number of gum-diggers was taken on the 18th and 19th April respectively. The well-known gumfields at Mangawai and Ruakaka were inspected.

We returned to Auckland on the morning of the 21st April, via Paparoa, where farming operations on gum lands were inspected. Sittings were held in Auckland on the 22nd, 23rd, 26th, and 27th April, when thirty-six witnesses, representing every interest connected with the kauri-gum industry, were examined.

On the 28th April we visited the Government gum-store in Auckland, and saw in operation the Maclaurin salt vacuum process of separating gum from dirt and other foreign matter. We also visited Messrs. E. Mitchelson and Co.'s gum-store, and inspected their methods of cleaning gum.

In order to allow time for transcription of the large amount of evidence taken in the course of the inquiry, our work was then suspended until the 16th May, on which date we reassembled at Auckland for the purposes of deliberating and making further necessary investigations preliminary to the drafting of our report. The final report, which in the meantime was revised by a small committee, was finally adopted on the 10th June.

In the course of our investigations we have travelled a distance of about 1,600 miles, and held eighteen public sittings. With the exception of the sittings at Auckland most of the evidence was taken at night, the days being occupied by travelling and inspections of gumfields. The number of witnesses examined was 108. They may be classified as follows: Representatives of public bodies, 11;

gum-producers representing companies, 8; gum-merchants, 10; gum-brokers, 6; gum-buyers, 12; gum-diggers, 25; gum sorters and graders, 3; gum-bleeders, 2; farmers, 20; police constables, 3; engineers, 3; editor, 1; biologist and instructors in agriculture, 3; member of Parliament, 1.

Dealing with the various questions submitted to us for inquiry, and taking them in the order set out in your Commission, we beg to submit for Your Excellency's consideration the results of our investigations.

(1.) *The present export trade in kauri-gum, and especially in respect to the particular grades of gum exported, the countries to which exported, and the industrial uses to which kauri-gum is put.*

There are about twelve regular exporters of kauri-gum, but the bulk of the export trade is confined to about six firms. Included amongst the largest exporters are firms who are merely agents of foreign buyers. Each exporter grades and packs the gum according to the requirements of the buyers, most of it being sold against samples. The greater part of the gum exported by each firm is graded in probably not more than thirty grades. These grades have been built up to suit the special requirements of individual customers, as the result of years of training. Some firms deal principally in the higher-grade gums, while others confine their businesses almost altogether to the poorer grades. We have found it difficult to obtain any exact information with regard to the particular grades put up by each exporter, on account of the reluctance of the firms to divulge the inner workings of their businesses.

With regard to the countries to which kauri-gum is exported, this information is published in a concise form year by year in the annual report of the Kauri-gum Department (C.–12), the export for the previous twelve years being given in each report. From information taken from this source it is found that for the past ten years the export has been as follows:—

Country to which exported.	Tons.	Value. £
United States of America	28,812	2,107,975
United Kingdom	17,088	854,871
Canada	4,310	286,687
Germany	2,259	82,037
Australia	320	24,165
Belgium	283	11,727
France	129	11,061
Russia	129	7,692
Austria-Hungary	285	7,557
Netherlands	110	4,133
Sweden	70	1,932
Italy	47	1,565
Japan	12	628
Hong Kong	8	539
Total	53,862	£3,402,569

Thus the average export per annum has been 5,386 tons, and the average value £63 per ton.

The figures for the year ending 31st March, 1921, are as follow:—

Country to which exported.	Tons.	Value. £
United States of America	3,224	345,992
United Kingdom	2,544	149,422
Canada	314	24,481
Australia	49	4,802
Japan	..	4
Total	6,131	£524,701

The average value for this period was £85 11s. 7d. per ton.

Much of the gum exported to the United Kingdom has probably been re-exported to other European countries.

With regard to the industrial uses to which kauri-gum is put, your Commission has found it very difficult to obtain any precise information. The general testimony of the men in the trade is that the gum is used mainly for the manufacture of varnish and linoleums, and to a lesser extent for the manufacture of certain kinds of paints. Vague statements that kauri-gum is used for other purposes were made to the Commission, but no definite information is available on the subject. It is clear, however, that any use of kauri-gum other than those mentioned above is of minor importance.

The use of low-grade gums in the manufacture of linoleums is a trade that has developed during the last twenty years; and, owing to the fact that supplies of the "bold" high-grade gum have been in a large measure exhausted, the proportion of low-grade or linoleum gum exported every year has become greater. From information obtained from all the exporters in Auckland with regard to the export for the last two years, we find that 40 per cent. of the weight of gum exported is used for the manufacture of varnishes, and 60 per cent. in the linoleum industry. If, however, account is taken of the amount of dirt and foreign matter associated with the linoleum gums, the weight of kauri-gum used in each of these two industries is approximately the same.

(2.) Whether it is advisable that there should be a standard grading of kauri-gum for export, and whether the State should control the entire export.

The establishment of a standard grading of kauri-gum is a complex problem, and it is necessary in the first place to point out that the grading of kauri-gum differs materially from the grading of such products as wool, flax, and butter, on account of the much wider variation in the quality and characteristics of kauri-gum. The question is further complicated by the fact that many of the so-called grades exported are not uniform grades, but consist of a mixture of gum of different qualities. Of the characteristics considered in assessing the commercial value of kauri-gum the following are the chief, if not the only ones considered: (1) Size; (2) colour; (3) hardness; (4) purity. It is to be noted that no scientifically determined properties, such, for instance, as specific gravity or melting-point, are considered.

With regard to the four above characteristics, in the case of gum exported from New Zealand the size varies from that of "bold" gum, several inches in diameter, through various sizes down to that of fine dust. The colour varies through all shades from very pale amber to black. The hardness varies from that of the best dial gum to that of the chalky gum obtained from swamps. Finally, the purity varies from that of rescraped dial gum, which contains no impurity, down to that of chips and dust, containing up to 75 per cent., and possibly more, of foreign matter.

Whereas some of the grades of gum exported are comparatively uniform, inasmuch as they cannot be subdivided into grades of gum of widely differing characteristics, many of the grades exported are in reality mixed grades, the gum not having been completely separated into uniform grades.

The methods of grading at present in use are crude, and from the point of view of description far from satisfactory. They are based primarily on a division into several main classes, depending partly on colour and partly on origin—viz., white gum, black gum, swamp gum, and bush gum. These main classes are divided into a number of subclasses, depending partly on size, partly on colour, partly on cleanness, and partly on the hardness of the gum. Each of these subclasses is further divided into various grades. In addition, as mentioned above, many of the exported grades are mixtures of various proportions of different uniform grades. No system of grading which does not take account individually of the various characteristics of gum can convey an accurate description of its nature and quality.

The preponderance of evidence given in our inquiry was that a system of standard grading was desirable. The opinion of most of the merchants, however, was that though such a system might be desirable, it was, from their point of view,

impracticable. The merchants apparently regarded standard grading as imposing a necessity of putting the gum up into certain defined grades, rather than a system of assessing the grades after they have been put up by the merchant according to his usual practice.

After long and careful consideration of the whole subject, we are of opinion that a system of standard grading is not only highly desirable, but is also easily practicable. We therefore recommend—

(1.) That it is advisable that there should be a standard grading of kauri-gum for export, and that a Government grader of kauri-gum be appointed, such officer having no other connection with the kauri-gum industry.

(2.) That at present there should be no interference with the particular grades put up by merchants for export.

(3.) That, in order to prevent the possibility of any disorganization of trade, it is not at present desirable to compel an exporter to have his gum graded or classified by the Government grader.

(4.) That, in grading any gum already put up for export, account should be taken separately of the following characteristics: (1) Size; (2) hardness; (3) colour; (4) cleanness; (5) moisture; the grading officer, in giving his certificate, to state points given for each of the above characteristics.

(5.) That the following names of classes and subclasses at present generally recognized by the trade should be officially recognized in Government grading:—

Class 1—White range gum—
- (1.) Dial or bright gum.
- (2.) Rescraped.
- (3.) Seven-eights scraped.
- (4.) Three-quarter scraped, or No. 1 ordinary.
- (5.) No. 2 ordinary, including good hard nuts.
- (6.) No. 3 ordinary.
- (7.) Cut or clean chips.
- (8.) Cut or clean seeds.
- (9.) Cut or clean dust.
- (10.) Diggers' chips.
- (11.) Diggers' dust.

Class 2—White swamp gum—
- (1.) Bold (with heart).
- (2.) Nuts (with heart).
- (3.) Weak.
- (4.) Chips.
- (5.) Seeds.
- (6.) Dust.

Class 3—Black gum—
- (1.) Rescraped.
- (2.) Bold unscraped.
- (3.) B1 scraped.
- (4.) B2 scraped.
- (5.) B1 unscraped (including nuts).
- (6.) B2 unscraped (including nuts).
- (7.) Cut or clean chips.
- (8.) Cut or clean seeds.
- (9.) Cut or clean dust.
- (10.) Washed chips.
- (11.) Washed seeds.
- (12.) Washed dust.

Class 4—Bush gum—
- (1.) Rescraped limb bush.
- (2.) Limb bush "all in."
- (3.) Ground bush and garbs.
- (4.) Bled bush.

The above classification does not imply any interference with the grades put up by the exporter, but only that the Government grader, in giving his certificate in accordance with the method outlined above, shall give it on the officially recognized classes.

(6.) That it should be made unlawful to export kauri-gum having mixed with it any other gum, or any material not naturally associated with kauri-gum in the soil; and that as soon as it is practicable a regulation should be brought into force making it compulsory that in the case of all gums which pass through a sieve of ½ in. mesh the proportion of dirt and foreign matter present shall be stated in the bill of lading.

(7.) That the Government grader shall have authority to take samples from such gums as are referred to in the latter part of the preceding clause, for the purpose of ascertaining the proportion of foreign matter present.

(8.) That as soon as it is deemed practicable a regulation should be made fixing the limits of dirt and foreign matter in gum which may be exported without a special permit.

The exportation of gum associated with a large proportion of dirt and foreign matter is seriously injuring the industry, and it is very desirable that measures should be taken to limit the amount of dirt and foreign matter which may be exported in any grade of gum. We are satisfied that with the appliances at present in existence on the gumfields it is not practicable to eliminate much more of the dirt and foreign matter than is separated from the gum at present. The only efficient method of doing this is that of the Maclaurin process, which, however, is not in general use. We are therefore reluctant to make any definite recommendation as to the fixing of a limit to the amount of dirt and foreign matter which should be permitted to be exported in any shipment of gum, but it is imperative that steps should be taken as soon as practicable to fix such a limit. Once such a limit has been fixed it should be made unlawful to export gum containing any higher proportion of dirt and foreign matter except under a special permit from the Minister.

With regard to the question whether the State should control the entire export, we are of opinion that there should not be a State monopoly of the export of kauri-gum, but that there should be only the measure of control recommended above.

(3.) *The present methods of recovering kauri-gum from the gum-bearing soils, and how they may be improved.*

In the early days of the industry the gum exported was practically all of large size, and was obtained by the use of the spade from places where the gum was on or near the surface of the ground, and easy to obtain. Later on, gum was dug from the deeper ground and from swampy areas, after first being located by means of the gum-spear. This led to the system of "potholing," which has resulted in leaving the land in a very unsatisfactory condition. A considerable amount of gum is still obtained in this way. In the course of time, as the prices of gum increased, it became profitable to recover the smaller gums which had previously been neglected, while at the present time the aim of the producer is to recover all the gum the land contains, down to the finest particles.

A primitive apparatus for saving the smaller fragments of gum, consisting of a galvanized-iron tub with a perforated bottom and a paddle fixed to a central shaft worked by hand, came into use about six years ago, and is still being made use of by some of the diggers. By this method gum-bearing soil puddled with water is stirred in the tub, with the object of breaking up the soil and passing it through the perforated bottom of the machine. The material left in the vessel, consisting of gum particles, woody and fibrous material, sand and earthy matter which has not been broken up, is removed and dried in the open air. After being dried it is hand-winnowed by a primitive method whereby much of the woody and fibrous material is eliminated. A considerable proportion of the fine gum is lost n the process, and a large amount of the foreign matter is retained.

Subsequently, a more elaborate form of apparatus of the same type came into use. This consists of a larger tub, having fine sieves of various meshes in place of the perforated bottom, and provided with a supply of water flowing into the tub, and steel agitators on a central shaft driven by a small engine. The retained material is released by opening a door near the bottom of the tub, and is dried in the air and generally winnowed by hand, but in a few cases a small winnowing-machine is used.

A larger and improved type of machine, designed to work swamp material by a continuous process, is now in operation in two localities. By this machine the swamp material, mixed with water, is raised by a spiral tube elevator from a sump to which the material has been previously conveyed. To the end of the tube elevator beaters are attached for the purpose of stirring up the material in the sump. After being elevated the material passes into a chain disintegrator, with the object of breaking up the soil without unduly crushing the gum. From the disintegrator the material passes into a series of three horizontal cylindrical screens of diminishing mesh, the finest being a 64 slotted mesh. All the material retained by the screens which passes through a seven-eighths mesh, after being dried in the air, is put through a large winnowing-machine, provided with screens which divide the material into different sizes, consisting of nuts, chips, seeds, and dust.

This machine was first used by the Mangatara Syndicate on its property near Dargaville, and is the invention of Mr. C. Suttie. The results of analyses made from waste material passing through the 64-mesh screen show that a smaller amount of gum is lost in the tailings than in the case of any other machine in use. The swamp being worked at present by the syndicate, besides containing an unusually large amount of woody and fibrous material, also contains a large admixture of foreign matter which it is difficult, if not impossible, to separate from the gum by any winnowing process; and we are convinced that on other fields visited in the course of our travels much better results could be obtained by the use of this machine than are realized where it is at present working. The Mangatara Syndicate is entitled to the highest commendation for the enterprise it has shown in pursuing its investigations and the success already attained. In addition to the type of machine above described, the syndicate has also evolved a smaller portable machine, suitable for use by parties of two or more men.

The Parenga Oilfields (Limited) has recently erected a large steam plant at Poroporo, capable of rapidly treating large amounts of swamp material. By means of efficient pumps a head of sea-water derived from the harbour is use to sluice the swamp material into a sump, from which it is raised by means of an hydraulic elevator to a fluming, from which it passes to a series of three concentric cylindrical screens of diminishing mesh. No additional device, such as a chain disintegrator, is used to break up the soil material, and no special process of drying has been installed. Provision has not yet been made for further separation of the gum from the large amount of foreign matter still associated with it.

No account of gum-winning plants would be complete without reference to the operations carried out by Mr. F. V. Raymond and those associated with him near Awanui, where a dredging plant was installed. In consequence of a series of difficulties and misfortunes, the undertaking has not up to the present been a commercial success.

Even the plants established on a commercial scale are largely of an experimental nature, and considerable improvements are still necessary before the best results can be obtained.

In recommending how the methods of recovering kauri-gum from the gum-bearing soils may be improved we suggest—

(1.) That it is necessary to lessen the cost of digging and handling the swamp material before treatment. The most efficient method at present in use is the hydraulic process at Poroporo, as described above. This method, however, can only be used where there is an ample supply of water.

(2.) A thoroughly efficient small washing plant, such as can be operated by two or three men, is required in place of the somewhat primitive tub processes at present in use. As mentioned above, Mr. C. Suttie is at present engaged in developing such a plant, with apparently good prospects of success.

(3.) More efficient methods are required of separating the gum from the large amount of dirt and foreign matter in the crude product obtained in the first treatment of the swamp material by the various washing plants. The process of drying and winnowing universally employed on the field is both wasteful and incomplete, as much of the lighter gum is lost and a very large proportion of dirt and foreign matter is retained. More complete separation could probably be effected by water treatment of the wet product before drying. Much of the gum will float on water, and could be removed in a comparatively pure condition. The residue, containing only the denser and harder gum, could, after drying and further washing, be much more effectively winnowed than the original material.

The most efficient practicable method that has so far been evolved for the removal of foreign matter associated with gum is the Maclaurin process. This process is based on the fact that almost all the foreign matter, when freed from air in a vacuum, will sink in brine of specific gravity 30° (Twaddell), whereas the gum will float. The process, which has been fully described in C–12, 1918, page 9, has been in operation on an industrial scale in the Government kauri-gum store in Auckland for two years, and has proved very successful. It is desirable, however, that the commercial efficiency of the process in the treatment of the wet product obtained by the first treatment of the swamp material should be investigated. If the wet product can be profitably treated in this way on the field, the lengthy process of drying and winnowing will be eliminated. It may, however, be found profitable first to remove the lighter gum by flotation on water, as suggested above, and to remove more of the dirt from the residue by washing. Industrial experiments carried out in the first instance in Auckland, making use of the plant installed at the Government kauri-gum stores, would indicate whether the process would be likely to be satisfactory if carried out on the field. If encouraging results were obtained, an experimental industrial plant should be installed on one of the gumfields, preferably at Mangawai or Waiharara, where sea-water could be used as a source of brine.

We are of opinion that the Maclaurin process should be made more easily available to private companies, the present royalty being too high and considerably in excess of that payable by the Government. We recommend that in the event of the process being purchased by the Government it should be made available to private individuals and companies either free or on the payment of a very small royalty.

(4.) In order to encourage private enterprise and investigation, bonuses should be offered for improvements and inventions in connection with the kauri-gum industry. We suggest that for this purpose a sum of not less than £5,000 be set aside, to be allocated in various amounts as rewards for such investigations and improvements as shall have proved to be of material advantage to the industry.

Although more than half of the gum-bearing lands belong to the Crown, all the investigations hitherto made have been carried out by private individuals and companies. It is desirable that the Government should in every way encourage such investigation in the interests of the industry, and should also be prepared to make investigations in connection with the extraction of gum from Crown lands.

In addition to the kauri-gum dug from the soil, an appreciable amount of gum is obtained from the living kauri-tree by the process known as "bleeding," or "tapping." This recent gum, however, differs in many respects from the fossil gum.

Many years ago indiscriminating hacking and bleeding of the kauri-trees was permitted, both in the State and privately owned forests, without restriction or control, and as a consequence much injury was done to the trees. When this was realized the practice was put an end to as far as the State forests were concerned, but bleeding was continued and is still carried on in private kauri forests. The

bleeding, however, has in recent years been conducted in a fairly systematic manner and under some sort of control, the method followed being, briefly, as follows: V-shaped cuts are made in the bark of the tree, horizontally across the barrel. The cut is called the "tap," and is deepest at the apex, where it almost reaches the sap-wood. Taps are cut around the limbs and barrel of the tree, and are spaced 18 in. apart horizontally, the interval between such rings of taps being about 6 ft.

Some forests are leased for bleeding purposes shortly before being cut, with the stipulation that no taps are to be made in the barrel of the tree. Others are leased without restriction, and the trees are tapped and bled from head to foot. The former system is called "bleeding heads only," and the latter "bleeding heads and barrels."

After the tapping is completed the tree is left undisturbed for six months, when the crop is collected, and thereafter the gum is harvested every six months.

There is a great diversity of opinion as to whether bleeding is injurious to the growth of the tree and detrimental to the timber when the tree is cut down and sawn into boards, but there is no reliable information available on the subject. No investigations have been made up to the present on the effect of bleeding carried out in a scientific manner, either in so far as it affects the strength and durability of the timber or causes any possible injury to the growing tree.

The bleeding of coniferous trees for resin and turpentine is a great and valuable industry in the United States and other countries, and has been for many years the subject of scientific investigation. Full particulars of these investigations are given in Bulletin 229 of the United States Agricultural Department, 28th July, 1915. With regard to the formation and flow of resin in the living tree, it is stated on page 10 of the Bulletin referred to: "No universally accepted theory dealing with the formation of resin has as yet been advanced. It is generally conceded, however, that resin is formed as a by-product during the transformation of food materials, such as starch, into woody tissue. The resin is stored in two systems of elongated passages or resin-ducts. In one system the ducts are parallel to the pith of the tree; in the other they lie horizontally in radial planes. The ducts form in the growing tissue or cambium layer just beneath the bark, the two systems intersecting to form a continuous network of resin-passages. When the cambium layer is cut the growth of tissues near the wound is stimulated, and the number of resin-ducts, and consequently the amount of resin formed, is considerably increased. The area in which additional or secondary resin-ducts are formed apparently extends from 2 in. to 3 in. above, and to a lesser distance below the wound. The additional ducts require from two to four weeks for their formation full of resin. If a new cut is made just above the old one, after the additional ducts have had a chance to form, the flow will show a large increase over that obtained from the original wound, due to the additional ducts." (For a full description of the methods adopted in climbing and bleeding the kauri-tree see C–12, 1916, pp. 8 and 9.)

Research work in this connection is now being carried out at the Auckland University College on behalf of the Forestry Department. We think it is desirable that this research should be prosecuted vigorously. The results of the investigations may go to show that the kauri should in future be regarded not as a tree for producing building-timber, but, like the rubber-tree, as a source of annual revenue, the gum being taken from it under a proper and scientifically tested system.

A matter affecting the production of gum is the fact that a great many of the Dalmatian gum-diggers have left the gumfields and are returning to their own country. One witness who gave evidence said that their reasons for leaving New Zealand are that they were not given an opportunity of taking up land, and were dissatisfied with the treatment they received. In this connection it may be pointed out that prior to the War Regulations coming into force all naturalized Dalmatians had the same rights as other British subjects to take up land in New Zealand. This is especially the case in regard to the provisions of section 20 of the Land Laws Amendment Act, 1912, under which land in kauri-gum districts may be selected on very easy terms. The departure of these men will no doubt seriously affect the amount of gum produced, as they are strong and vigorous, most of them in the prime of life, and not afraid of hard work. They will also dig in deep ground which older men and the Maoris show a disinclination to tackle.

One of the drawbacks often mentioned in regard to the Dalmatians is the fact that so few of them have become permanent settlers, and that such a large proportion of their earnings has been sent out of the country. It has been mentioned that an appeal has been made to Dalmatians to return to their native country, and it may be that it is in response to this appeal they are going away, and not owing to the fact that they are not able, owing to the War Regulations, to obtain land without a special license. It is suggested that the time may have arrived when the restrictions in regard to the Dalmatians taking up land should be removed.

(4.) *To what extent operations have progressed with regard to the extraction of oils and other valuable products from kauri peat swamps, and what are the best means of advancing the development of this industry.*

The so-called kauri peat differs both in respect to its origin and to its nature from true peat. It is the remains of former kauri forests, and is associated with large roots, trunks, and branches. It yields, on destructive distillation, a greater proportion of oils than any peat used commercially in other parts of the world. It has been shown that only a small proportion of the oils obtained on distillation is derived from the kauri-gum included in the kauri peat.

The remains of kauri forests occur in swamps of former swampy areas, and are, as a rule, covered by a layer, sometimes many feet thick, of a soft black peat, derived not from former kauri forests but from subsequent swamp vegetation. In some places there are remains of more than one kauri forest, separated by black peat.

Various companies have tried during the past twenty-five years to treat peat commercially for the recovery of oils, but without the success which the enterprise appeared to warrant. One of the pioneers in the industry was Mr. Ross Trevor, whose investigations led to the formation of a company in the Northern Wairoa district, more than twenty years ago. Some of the men associated with this company state that they did not profess to obtain oil from kauri peat alone, but largely from kauri-gum riddlings, which had then little or no value for export purposes. Nothing practical resulted from the activities of this company, largely owing, apparently, to the sudden death of its expert.

Subsequently, Mr. A. N. Macnicol, in 1914–15, acting on behalf of a Melbourne syndicate, took careful samples of peat from various places in the Mangonui County. A considerable amount of scientific work was carried out, and a preliminary application was lodged for an area of Government land, but the matter was not followed up.

Later, a company called "Trevor Oils (Limited)" was formed, with the object of distilling peat in the neighbourhood of Kaimaumau, but was absorbed in 1917 by a larger company under the name of "New Zealand Peat Oils (Limited)." This company was granted a long lease on easy terms of 3,000 acres of Crown swamp land at Kaimaumau, on carefully-drawn-up conditions, adequately protecting the interests of the Crown. On behalf of this company samples of peat were taken by Professor F. P. Worley, of Auckland University College, at various depths from the surface, and were analysed by him and by Dr. J. S. Maclaurin, Dominion Analyst. Although the distillations were carried out in different ways by the two investigators, practically the same results were obtained by both. From the overlying black peat taken at different depths, from 20 to 30 gallons of crude oil were obtained per ton of air-dried peat, and from the kauri peat approximately 40 gallons of crude oil. Other products obtained included gas, ammonia, acetic acid, and charcoal. The oil from the kauri peat yielded on fractionation approximately 10 per cent. of oil suitable for motor-spirit, 80 per cent. of heavier oils, and 10 per cent. of pitch.

The New Zealand Peat Oils Company carried out investigations on a semi-industrial scale, in the first instance at Kaimaumau, using a somewhat primitive distillation plant. Here crude oil was produced which was used successfully on the Northern Steamship Company's s.s. "Paroto," on a run from Whakatane to Auckland. Further investigations were carried out in Auckland by this company, with assistance from the Auckland Gas Company. An experimental plant was erected, the peat being distilled in a specially constructed vertical retort. The results obtained with the apparatus were, however, unsatisfactory.

Experiments on a semi-industrial scale, extending over a considerable period, were also carried out in Auckland by Mr. J. M. Steele, who was chiefly instrumental in the flotation of the Trevor Oils Company and the New Zealand Peat Oils Company, and who, by his confidence and enthusiasm, has kept the project alive. Little progress, however, is being made at present by the New Zealand Peat Oils Company.

Subsequent to the formation of the New Zealand Peat Oils Company, distillation-works were established by the Parenga Kauri Oils Company at Red Hill, in the Northern Wairoa district, the chief object being to distil the residue left after the removal of kauri-gum from the swamp material. The technical difficulties in regard to the extraction of oils had, however, not been overcome when the works were destroyed by fire. The expenditure on these works, in plant and experiments, amounted to nearly £14,000. Industrial experiments were made, both on the dry distillation of peat and on the extraction of oils from peat by oil which had previously been obtained by dry distillation. Extensive laboratory investigations were made by the company's chemist, Mr. F. D. H. Ulrich, on the extraction of oils from kauri swamp timber. From wood free from adhering gum he is reported to have obtained from 50 to 60 gallons of oil per ton of dry wood. This oil was fractionated, yielding about 13 per cent. of oil suitable for motor-spirit, 70 to 80 per cent. of heavier oils useful for various purposes, and a residue of pitch.

Finally, in addition to the above investigations, experiments are at present being carried out for the K.G. Company (Limited).

Briefly, this is the story of the investigations made up to the present time. It may be noted that all this experimental work has been the result of private enterprise, and, with the exception of the analyses made by Dr. Maclaurin from time to time, no Government money has been expended. It is safe to say that a sum of £25,000 has been expended by private individuals and companies on investigations connected with the production of oils from kauri peat. Many patents have been taken out during the past few years by various investigators, indicating the interest that is being taken in kauri peat oil.

Although no practical results have yet been obtained in the way of establishing the industry, this is not necessarily due to the project being economically impracticable. The lack of success of the above companies is attributable to a variety of causes, including unforeseen misfortunes, and the failure of directors to realize the paramount importance, if not the absolute necessity, of complete investigations, both on a laboratory scale and on a semi-industrial scale, before launching out on an industrial undertaking. There is still almost complete ignorance of the nature of the oils produced and of their commercial value. More complete investigations should have been carried out before the formation of companies, whose shareholders are impatient at the necessary slowness of scientific investigations.

Further, the carrying-out of scientific investigations has some disadvantages to a company, inasmuch as no one company has a monopoly of the gumfields, and discoveries made at great expense are available to other companies with which the investigating company may be in competition.

Again, the results obtained by private investigations do not inspire the same confidence in the minds of prospective investors as official results. It is manifest, too, that with independent investigations being carried on with the same object there will be a large amount of waste by overlapping, much unnecessary expense, and probably much incomplete work. Such investigations could obviously be carried out at much less expense and much more effectively by the Government.

If a successful industry can be established, it will undoubtedly become large and important, and of great benefit to the country. We consider that the laboratory experiments, including Dr. Maclaurin's work on samples collected under our direction, and the results of the operations of the various companies, so far as they go, are of an encouraging nature.

With regard to the best means of advancing the development of the industry, we are strongly of opinion that much investigation is still desirable, if not essential, and that in the case of the laboratory researches and semi-industrial experiments the necessary investigations should be carried out by the Government in the manner suggested below in regard to clause 9 of the order of reference. In addition to

experimental researches on the quantity and chemical nature of the oils obtainable from the peats of different localities, and from swamp timber, full information should be obtained on the extent and nature of the peat deposits, on the commercial value of the oils, and on the various types of distillation apparatus used for similar purposes in other countries. We consider, further, that the failure of companies from other causes than the economic impracticability of the project has a serious effect on the development of the industry, and that for this reason such assistance as is reasonably possible should be given to companies engaged in pioneering work.

(5.) *The durability of kauri swamp timber, and its value for fencing, building, and other purposes.*

A large amount of evidence dealing with this question was taken in the course of our inquiry, and inspections were made of the kauri swamp timber in the various localities visited by us.

At Papakura, near Auckland City, we had an opportunity of inspecting houses built of this timber, which had been taken from a swamp nearby and sawn up at a local mill. Some of these houses, which were built about ten years ago, are in first-class condition, and the timber shows no sign of deterioration from dry-rot or other causes. This remark applies even to one of the oldest of the houses mentioned, in spite of the fact that it has received only one coat of paint since its erection.

Kauri timber is found in the swamps at various depths, and in some cases only partly buried. Its quality varies in different localities. This may be due either to a difference in the quality of the original trees, or to the fact that the timber is from different varieties of kauri. The general opinion of witnesses in some districts was that this timber is hardly worth consideration for fencing or building purposes, while in other districts we had evidence of a contrary opinion. At Mangawai there are fencing-posts of kauri swamp timber which have been in the ground for seven years, and are still perfectly sound, showing no signs of decay. It is generally recognized that the sap-wood from the swamp timber is useless for either fencing or building purposes.

Where the timber is used it is necessary that after the logs are taken from the swamp they should be seasoned, either in the whole or cut into flitches, before being sawn into boards. Where the timber is used for building purposes it is important that it should be given a coat of oil or paint as soon as possible. Split heart-wood of this timber is sometimes used in the erection of sheds and other outbuildings, and lasts longer than the sawn timbers. There is a class of timber found in the kauri peat swamps known as "manawau," which is considered to be very durable for fencing purposes.

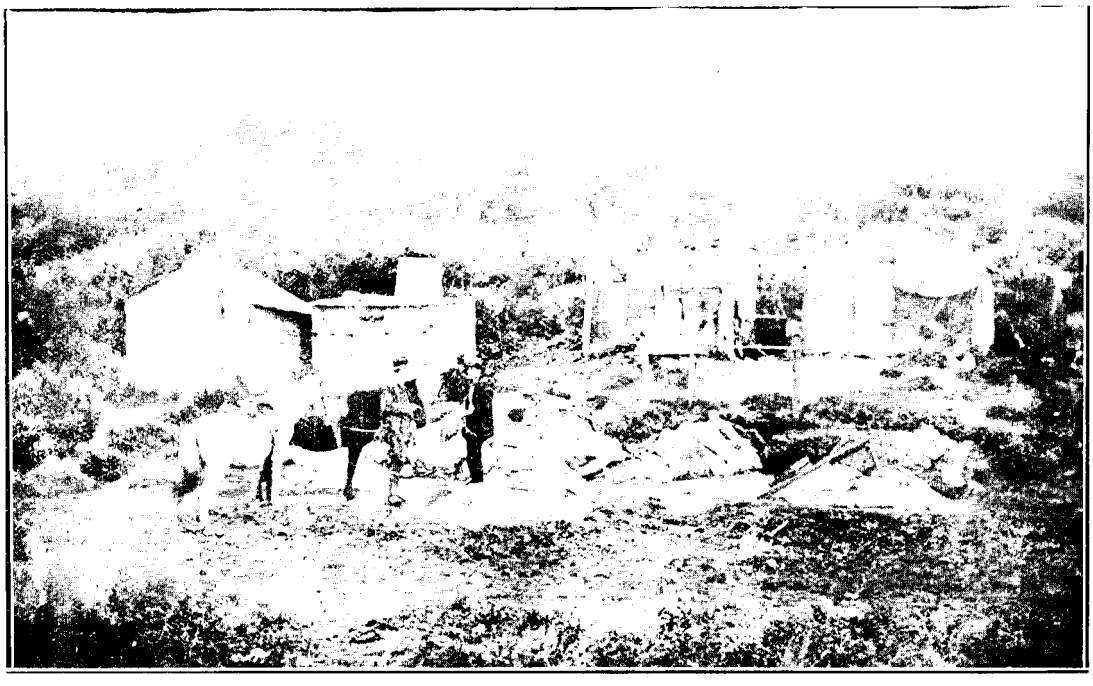
We are firmly of opinion that, apart from its possible uses for fencing and building purposes, none of the kauri swamp timber should be destroyed, as it may be found that it can be profitably treated, as indicated above, for the recovery of oils, charcoal, &c.

(6.) *The best means of treating the kauri-gum lands for settlement purposes generally, and the suitability of such lands for setting apart for occupation under the provisions of section 11 of the Land Laws Amendment Act, 1919.*

We have received much valuable evidence in regard to the best means of dealing with the gum lands from a settlement point of view, and, although we recognize that there are many difficulties to be faced, we are convinced that if the lands are handled in a practical and systematic manner satisfactory results will be attained, and large areas now lying idle will be brought into profitable use.

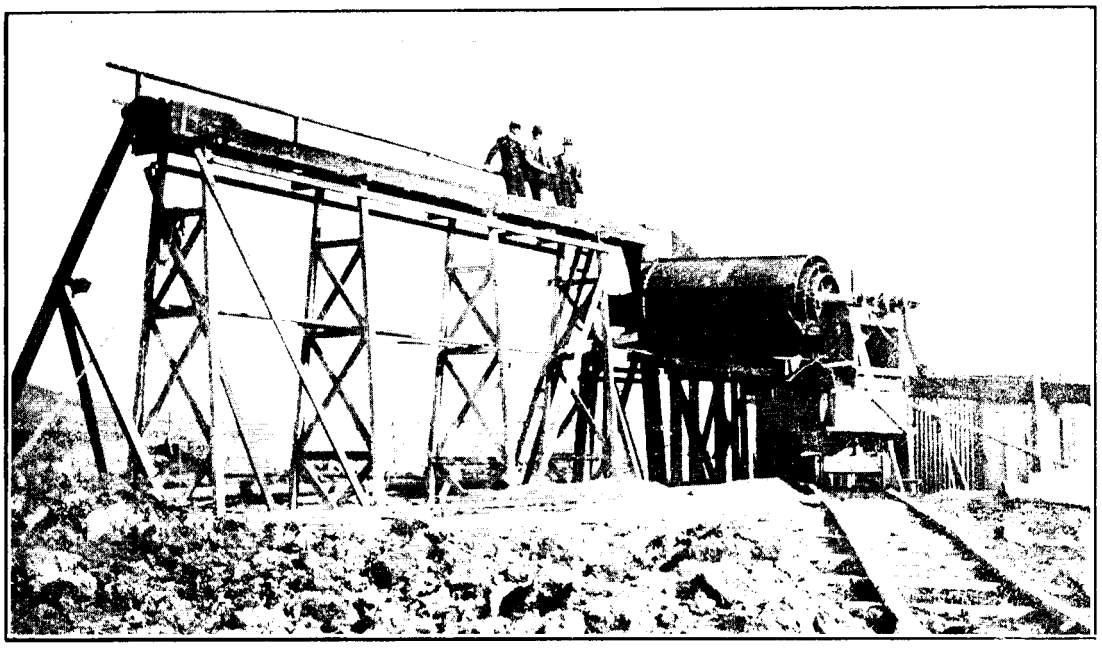
These gum lands vary so much in character that some classification of them is necessary, in order that the methods of treatment may be separately dealt with. With this end in view we have classified them as follows:—

(1.) (*a.*) Land easily ploughable, consisting of heavy clay lands and light sandy loams. (*b.*) Similar lands not easily ploughable, and also lands with pipeclay soils.
(2.) Poor pipeclay lands, lands with ironstone pan, and sandy wastes.
(3.) Swamp lands, including the kauri peat swamps.



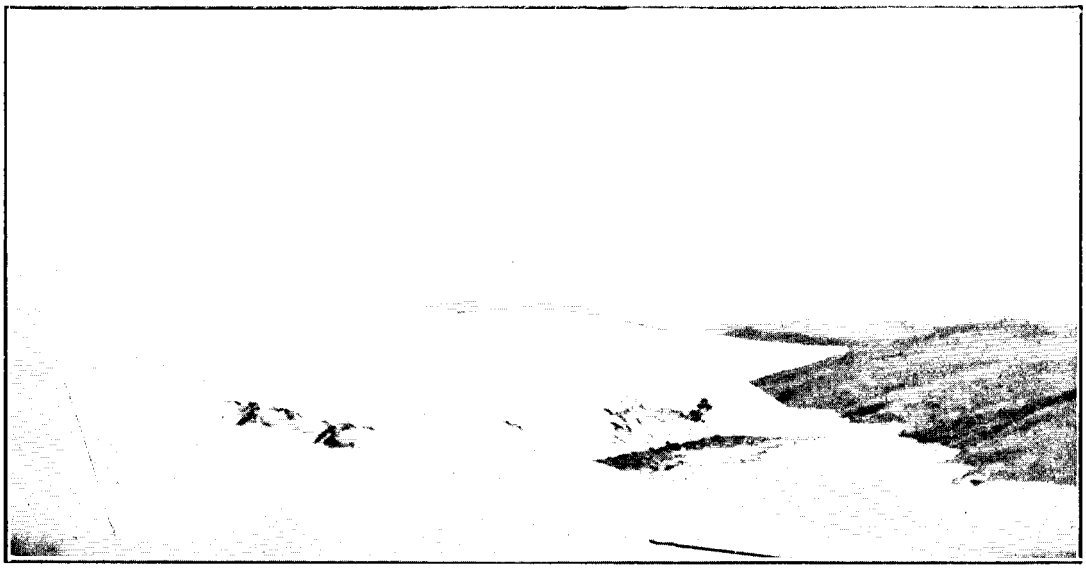
Gum diggers' Camp, Sweetwater (near Waipapakauri).

Digging for Gum in Deep Ground near Waipapakauri.



Parenga Oil Company's Working Plant at Poroporo (Parengarenga).

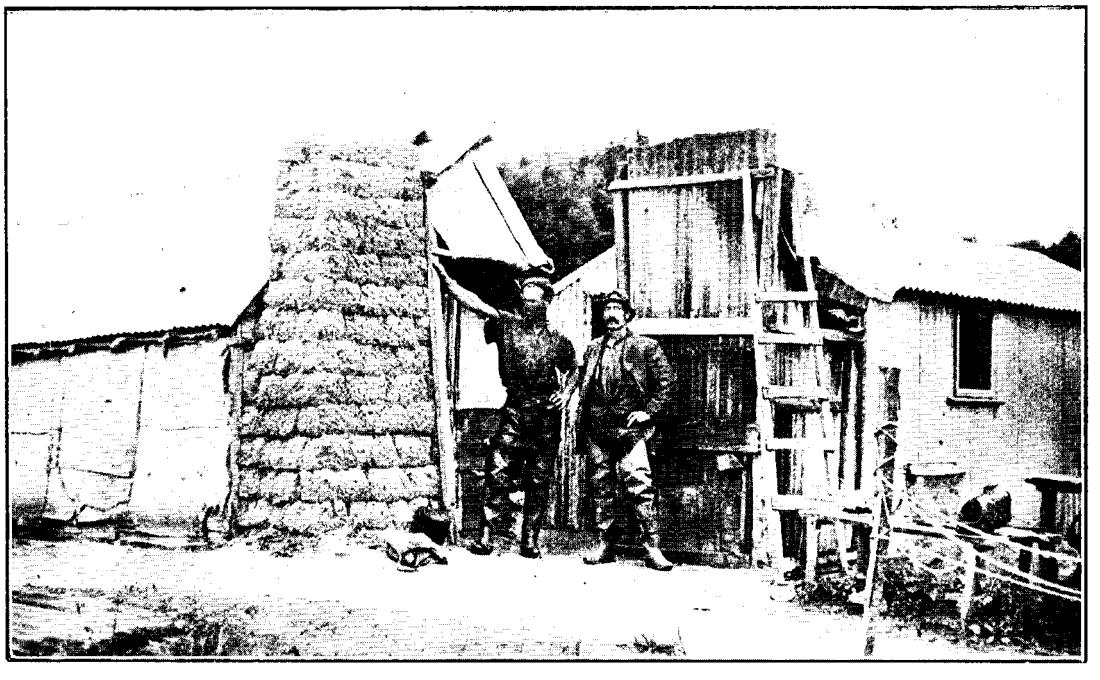
Sluicing Gum Soil at Poroporo (near Parengarenga).



Sand drift at Te Paki, West Coast (near Parengarenga).

Gum-digger's Hut at Ruakaka.

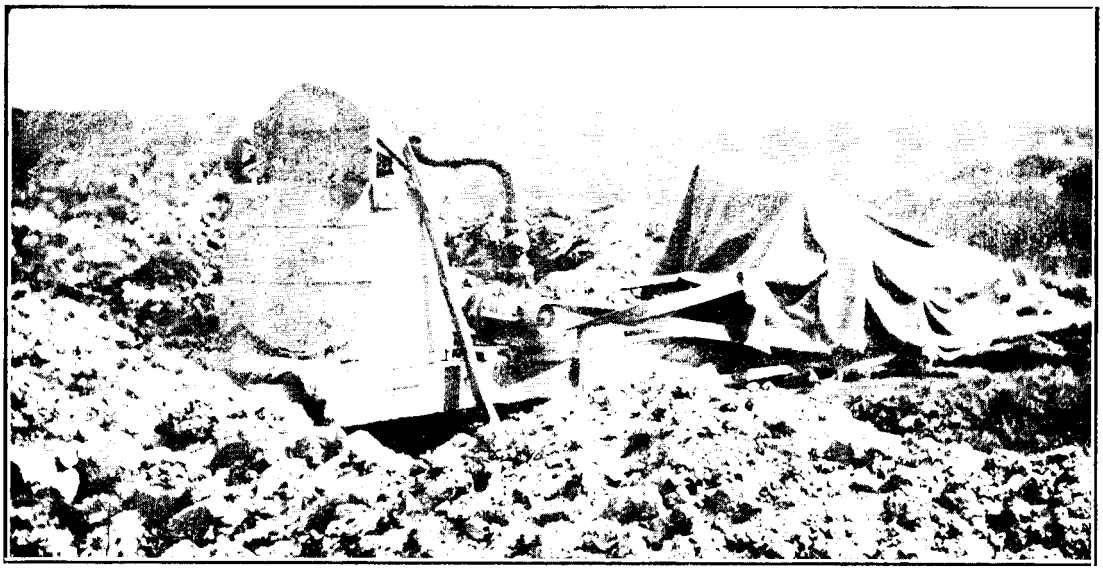
Primitive Method of Winnowing: Lower Ruakaka.



Gum-diggers' Huts on Coal Hill Reserve, Mangawai.

Gum diggers at Lunch.

Primitive Gum-riddling Apparatus.



An Improved Tub Washing machine.

A 16 ft. Gum spear.

Dealing with the lands included in class 1, the treatment recommended for the heavy clay lands is as follows: The land should be first cleared of all scrub which cannot be ploughed in, and all potholes filled in. Where necessary, drains should be cut, and filled in with tea-tree if tiles are not available at a reasonable cost. The land should then be ploughed to a depth of at least 6 in., and afterwards left to fallow for a period of from six to twelve months. After fallowing, it should be well worked down, reploughed, and topdressed with carbonate of lime, if obtainable at a reasonable cost, at the rate of a least ½ ton to the acre. A crop of turnips or some other annual, should then be grown, and when this has been fed off or ploughed in, as may be deemed expedient, the land should be reploughed and left to fallow, and afterwards should be worked again during dry weather, and prepared for sowing down in permanent pasture. The following grasses are considered suitable: Italian rye, perennial rye, cocksfoot, crested dogstail, paspalum, timothy, red clover, alsyke, white clover, *Lotus major*. A mixture of manures at the rate of 3 cwt. to the acre should be sown with the seed. If basic slag can be obtained at a reasonable cost, a quantity of 4 cwt. to the acre gives the best results. Failing this, a mixture of equal parts of bonedust and superphosphate may be used.

For the light sandy loams, the land should be cleared, and the holes filled in as mentioned before, preparatory to ploughing. Shallow ploughing is necessary in breaking in this class of land, and care should be taken not to turn up the subsoil where it is of a sandy nature. An annual crop, either for feeding-off purposes or for ploughing-in, is advisable before laying down in permanent pasture. A suitable mixture of grasses is as follows: Italian rye, brown-top, *Paspalum dilatatum*, *Lotus angustissimus*, *Danthonia pilosa*, red clover, crested dogstail, white clover. Manure at the rate of at least 4 cwt. to the acre, consisting of blood and bone, or bone and superphosphate in equal quantities, should be sown with the seed.

A cheaper method of dealing with these lands is by surface-sowing with danthonia, or a mixture, according to the quality of the land, of danthonia, paspalum, and *Lotus angustissimus*, the grass-seed to be sown soon after burning. To save expense, strips or patches could be sown at short intervals, and by systematic burning every two years the grass will spread rapidly. As the grasses become established the land will carry a certain amount of stock, and steadily become improved, and so in a measure prepared for the more thorough treatment by ploughing and manuring above described. In surface-sowing these lands an important factor is the cost of the seeds at the time. Considering the returns that can be had from the expenditure, it is not considered advisable to sow a mixture of grass-seeds costing more than 15s. per acre.

There was a great diversity of opinion among the witnesses examined with regard to the best methods of treating these lands, not only as to the nature of crops to be grown, but also as to the mixture of grass-seeds and the manures to be used. Several witnesses gave instances of successful results from using the methods advocated by them. There was, however, a general agreement that in working these lands it is necessary that there should be deep ploughing, thorough working, and a long fallow.

With reference to the lands in class 2, which are generally poor, improvement by surface-sowing as described above is the only treatment which at present can be recommended.

With regard to the lands referred to in class 3, there are many areas of first-class swamp land well adapted for farming purposes included in the kauri-gum reserves, as well as large areas of kauri-peat-swamp land. It is very desirable that the best of these lands should be brought into profitable use as soon as possible.

One particular area inspected by us is known as the Motutangi Swamp, situated about five miles south of Houhora, in the far North. The swamp contains an area of four or five thousand acres, most of it excellent raupo country, and in every respect suitable for settlement purposes. This swamp could easily be drained, and there is an urgent demand by the people in the district that Motutangi should be made available for settlement at the earliest possible date. We were informed that certain portions of this area contained gum in payable quantities. If this is

found to be the case, after the swamp has been drained, the land should be dug or otherwise treated in a systematic manner, so that it will be left in a fit state for cultivation.

With regard to the treatment of a swamp area after it has been drained, it is very important in the first place that the greatest care should be taken to prevent damage by fires. It is necessary to see that burning is done only when the swamp is well saturated by the autumn rains, and when there is a good wind, so that the fire will travel rapidly over the area. During burning operations the drains should be blocked up, so as to ensure that the fire does not burn down into the peat. The land should be sown down immediately after the burning with a suitable mixture of grasses. For the peat swamps a mixture of *Lotus major*, soft meadow, and paspalum is recommended. On good swamp land a mixture of English grasses and clover should be sown, consisting of Italian rye, perennial rye, cocksfoot, timothy, red clover, colonial cow-grass, alsyke, and white clover.

We consider the lands in class 1 suitable for settlement on the "homestead system," under section 11 of the Land Laws Amendment Act, 1919. It is open to question, however, whether it would not be advisable to have the whole of the preliminary work of bringing a certain area of the land into cultivation done before the land is disposed of. This course was strongly advocated by Mr. Dibble, of the Department of Agriculture, when giving evidence. The wholesale breaking-in of the country by contract presents many advantages, and would probably result in the work being performed at a lesser cost and more efficiently than if done by individual settlers working independently with their own teams and plant. The method of disposal of these lands under the "homestead system" was given the fullest consideration. The provisional regulations drawn up under the above-mentioned enactment were fully discussed, and were thought to be quite suitable for the purpose for which they had been designed.

Assuming that the land is disposed of under the "homestead system" as provided by the regulations, the first work for the settler would be the building, under proper direction, of his house; then the clearing of the scrub and the filling-in of holes on an area of approximately 50 acres. The ploughing and treatment of the area should next be proceeded with, according to the methods above described. A small area near the site of the settler's house should be set apart and fenced off for home crops and garden, and the balance of the 50 acres should be laid down in temporary pasture, using a mixture of Italian rye, paspalum, *Lotus angustissimus*, and soft meadow. With the grass mixture it is recommended that manures to the value of about £2 10s. per acre be used, consisting of basic slag, or bone-dust and superphosphate, half and half, or other suitable mixtures, and lime if procurable at a reasonable cost.

While we are of opinion that the lands included in class 1 are suitable for settlement under the "homestead system" we think it is highly desirable that opportunity should be afforded to landowners not possessing unduly large areas to take up an area of these gum lands on easy terms, under proper and strict improvement conditions. By these means large areas of these lands could be successfully brought into profitable occupation. One of the greatest difficulties to be faced in dealing with these areas is the fact that there is no starting-off place for the new settler. He has no land on which he can run his teams, or from which he can obtain a livelihood while the holding is being brought into a productive state; whereas in the case of a farmer already established these difficulties do not exist.

We are pleased to note that there is now a disposition on the part of the gum-diggers to make permanent homes on the gumfields, and in several districts selections are being made by them under the liberal provisions of section 20 of the Land Laws Amendment Act, 1912. The conditions on which land can be taken up under the section of the Act referred to are briefly as follow: Allotments not exceeding 200 acres in area may be set apart for disposal to British subjects, either by way of license to occupy, with right of purchase, for a term of twenty-five years, under Part III of the Land Act, 1908, or by license to occupy on deferred payments for a term of fifteen years. No rent is payable during the first five years of the term under a license to occupy with right of purchase, and the first instalment under a deferred-payment license is not payable until commencement of the sixth year from the date of such license. Residence and improvements, which are compulsory, are prescribed by regulations issued under the above-quoted enactment.

Several of the gum-diggers working on the Lower Ruakaka Kauri-gum Reserve, in the Whangarei district, are very anxious to obtain building-sites where they can

establish permanent homes. This matter was brought under the notice of the North Auckland Land Board by the Secretary of the Commission, and we understand that the requirements of the diggers in this respect will shortly be satisfied.

When in the Wairoa district our attention was drawn to the Te Kuri Block, lying on the western side of the Wairoa River. Much of this land was formerly a kauri-gum reserve, and it was urged that large areas could be brought into profitable use here if made available for settlers. It was stated that there are good swamps which could be cheaply reclaimed leading into Waimamaku Bay, Tangatiki Bay, Punahaere Bay, and Kelly's Bay; also that at the frontage of most of these bays a short stop-bank and flood-gate would enable large areas of mangrove swamps and flats behind them to be drained easily and made available for settlement in conjunction with the hill country adjoining; and that there is no gum in these swamps except on the edges where slips have occurred in past years. Certain areas of the gum lands are better adapted for afforestation than for farming purposes, and there are many areas situated near tidal waters where plantations of rapidly-growing trees would in the course of twenty or thirty years show a good return for the expenditure.

(7.) *All aspects of the question with regard to the issue of licenses under the Kauri-gum Industry Act, 1908.*

The licenses which may be issued under the Kauri-gum Industry Act, 1908, are as follow:—

(1.) Gum-digger's license: This may be either "special" license or "ordinary" license.

The special license is issued only to British subjects by birth or naturalization in New Zealand, and entitles the holder to dig for gum on all lands in the special district to which the license applies, on the kauri-gum reserves of such district, and on unoccupied Crown lands not included in the forest reservations.

The ordinary license is issued to diggers who are not British subjects. It entitles the holder to dig for gum in the kauri-gum district for which it is issued, and on unoccupied Crown lands not included in the forest reservations, but does not entitle the holder to dig on the kauri-gum reserves.

(2.) Gum-buyer's license: The gum-buyer's license gives the holder the right to buy gum in a kauri-gum district on his own account. A special condition of the license requires the holder to keep a book giving full particulars of all gum purchased.

(3.) Gum-broker's license: The gum-broker's license empowers the holder to buy or sell gum on commission.

The license fees are as follow: Gumdigger's license—Special, 5s.; ordinary, £5: gum-buyer's license, £1; gum-broker's license, £5.

The kauri-gum license fees are collected by the Police Department, under the direction of the Commissioner of Crown Lands. For the work of collection a commission of 10 per cent. is allowed. All the money collected, after a deduction for administration expenses, is handed over to the local body in whose district the licenses are issued. Other methods of collecting these license fees have been tried, but have not been very successful. Formerly, the local bodies collected the license revenue, but the results were not satisfactory. We suggest that it might be desirable to make other provision than that obtaining at the present time for the collection of these license fees, as it is a general opinion in some districts that a great many men are digging gum without any licenses, and, furthermore, that there is not a proper control exercised over the gum-buyers travelling through the various districts.

The Act above mentioned provides that every license issued, whether a gum-digger's or a gum-buyer's, shall operate over only one kauri-gum district. The following counties are constituted kauri-gum districts: Mangonui, Whangaroa, Hokianga, Bay of Islands, Hobson, Whangarei, Otamatea, Rodney, Waitemata, Coromandel, Thames, Ohinemuri, Katikati; and also a portion of Auckland City, as defined in *New Zealand Gazette* No. 82, page 1766, of the 27th September, 1900.

The owner or occupier of Native or other land within any kauri-gum district, and also his wife and family, may dig for kauri-gum on such land without being the holder of a license, but all other persons employed or authorized by him to dig on such land are required to take out separate gum-diggers' licenses. With the exceptions noted above it is illegal for any person who is not the holder of a license to sell gum.

We recommend—

(*a.*) That the fees for a special and an ordinary license shall remain as at present, and that the form of license now in use in both cases be adhered to.

(*b.*) That every man engaged in bleeding or tapping the kauri-tree for gum shall be required to take out a license, the fees to be the same as in the case of a special or ordinary license; but the holder of such license shall not be entitled by virtue thereof to bleed the kauri-tree, either on private or Crown lands, without the consent of the owner or owners of such land being first had and obtained in writing.

(*c.*) That the gum-buyer's license fee and form of license shall remain as at present, subject to the necessary amendments arising out of the recommendations made below.

(*d.*) That the gum-broker's license fee be increased to £10, and it should be a condition in such license that it shall be operative only in the kauri-gum district in which it is taken out.

During recent years a class of itinerant brokers or dealers in kauri-gum has come into existence. The practices resorted to by some of these so-called gum-brokers in the conduct of their businesses are having a very detrimental effect on the kauri-gum trade, and it is necessary in the interests of the industry that measures should be taken to put an end to the practices referred to. We strongly urge that a gum-broker's license be issued only to men of good standing and repute, and that it be made a condition precedent to the issue of such license that the applicant be required to enter into a bond to the amount of £500 as a guarantee of good faith. Some of the gum-brokers do a turnover of from £20,000 to £30,000 a year, and handle vast sums of trust-money. Furthermore, it is essential that there should be a condition in each gum-broker's license that the holder shall carry on the legitimate business of a broker—viz., the selling of gum on commission. By imposing such a condition the itinerant broker who is part broker, part buyer, and part dealer in gum would be put out of business.

With regard to the gum-buyer's license, we recommend that the provisions of the Act restricting the operations of such license to one kauri-gum district be strictly enforced, and that in cases where a gum-buyer desires to carry on business in more than one kauri-gum district he shall be required to take out a separate license for each district. We further recommend that such licenses be issued only to men of good standing and repute, who should be required to enter into a bond of £100 as a guarantee of good faith.

The provision of the Act referred to above, making it incumbent upon a landowner to take out a separate license for every person employed by him to dig gum on his land, is considered by many landowners as very inequitable. Now that many landowners are erecting costly gum-producing plants on their lands, and employing a great deal of labour, this license fee, particularly in the case of an alien gum-digger, who has to pay a £5 fee, presses very heavily, and we are of opinion that an amendment of the Act is necessary, and that a new form of license should be issued, which might be called a "landowner's license," and would entitle the holder to sell gum obtained from his own land without any further restriction in regard to taking out a license for each man employed, the fee for such license to be, say, £1 per annum.

(8.) *The best means of preventing damage to kauri-gum lands by fires.*

The best means of preventing damage to the gum lands by fire is to prohibit the lighting of scrub fires during the dry months of the year, and to appoint sufficient rangers to enforce this prohibition. The gum-diggers, and everybody connected or associated with the gumfields, recognize the irreparable damage that has been done by fires in past years, and the loss of wealth that has resulted, and every one is now anxious that effective means should be taken to prevent further damage.

We recommend that it be made illegal to light fires on the kauri-gum reserves for the purpose of burning off the scrub except during the months of May, June, July, August, and September, and that sufficient rangers, as indicated above, should be appointed as soon as possible. The duties of the rangers should be not only to prosecute persons lighting fires in the drier months, but also to take prompt action to put out any fires as soon as they are discovered.

(9.) *The advisability of establishing a laboratory for research in connection with kauri-gum and its products, including kauri peat.*

In spite of the magnitude of the kauri-gum industry, and the length of time during which the industry has flourished, no scientific investigation of the nature of kauri-gum has been carried out in New Zealand, and apparently little of any value or importance elsewhere. We consider that in the interests of the industry various scientific researches in connection with kauri-gum and other products of the kauri forests, both past and present, should be commenced without delay. Such researches should be, in the first instance, laboratory investigations, and could be carried out in one of three ways: (1) By the establishment of a special research laboratory connected with the Kauri-gum Department; (2) by the establishment of a research branch of the Dominion Laboratory in Auckland; (3) by utilizing the existing facilities at Auckland University College.

The establishment of a special research laboratory would entail large expense, would take a considerable time, and would cost a great deal to staff in an adequate way. Besides, the necessary researches would probably be completed in a comparatively short time. We are strongly of opinion that the laboratory researches should be carried out in Auckland, and for preference at the Auckland University College, where laboratory facilities for such research already exist. Much of the essential reference literature is in the College library, and the direction and co-operation of the staff would be available. From the point of view of the College, it would be a source of inspiration to senior and advanced students for such research to be carried on in the College laboratories. Furthermore, as the work developed assistants could be recruited from advanced students.

We suggest that investigation should be commenced on the following subjects:—

(1.) The chemical nature and physical properties of kauri-gum, including bled, fossil, and chalky gum.
(2.) The distillation of kauri peat from various localities, and the chemical investigation of the nature of the products obtained.
(3.) The distillation of, or extraction of oils from, swamp timber, and the nature of the oils produced.
(4.) The refuse products of the kauri-timber industry.
(5.) The method of formation of kauri-gum in the living tree, and the effect of bleeding on the tree.

Of these investigations the first four, and other subjects of research arising from them, would be carried out by the Department of Chemistry. No. 5 is already being investigated by one of the staff of the Department of Biology, with financial assistance from the Government Forestry Department.

Following the laboratory investigation, semi-industrial experiments would in various cases be required. These should be carried out in Auckland, under the direction or with the co-operation of those conducting the laboratory investigations. Arrangements could readily be made for tests to be carried out for kauri-gum exporters at a nominal cost.

If the laboratory investigations and the semi-industrial experiments indicated that profitable industries could be established, private companies would then have little difficulty in raising the necessary funds to establish the industries. It might, however, be desirable for the Government to assist such companies in any further industrial experiments that might be required, provision being made to safeguard the interests of the Crown.

In connection with the various investigations, we consider that in the event of the Government establishing a laboratory, or providing funds for the carrying-out of the necessary researches, regulations should be framed to the effect that all discoveries and inventions arising directly out of work paid for in full by the Government should be the property of the Crown. Any discovery or invention, however, which could not reasonably be regarded as the natural outcome of the particular work for which the investigator is paid should not be regarded as the property of the Crown. We consider that every encouragement should be given to investigators who make useful discoveries, and that even when being paid in full for their work by the Crown they should be eligible for the bonuses recommended in connection with clause 3 of the order of reference.

We recommend that in the first instance a sum of £1,000 a year should be made available for research purposes on a laboratory scale, and that the amount should later on be increased to meet the cost of semi-industrial experiments arising from the laboratory investigations, provided that in assessing such bonus the conditions of the investigator's employment, the salary paid, and the facilities at his disposal for pursuing the investigations should be taken into account.

(10.) *Whether or not any special taxation for the benefit of the local bodies in kauri-gum districts should be placed on kauri-gum production by way of royalty or otherwise.*

(11.) *If the Commission is of opinion that the imposition of such royalty or taxation is advisable, what is a fair and equitable royalty or tax to fix, and in what manner should it be apportioned.*

We are of opinion that special taxation should be placed on kauri-gum for the benefit of the local bodies in the kauri-gum districts, for there is no doubt that these local bodies have not received proper revenue from the gum lands. In the first place there are the privately owned lands, and in the second place the large areas of Crown lands and kauri-gum reserves. With regard to the private lands, the valuation for taxation purposes is assessed merely on the value of the land for farming purposes, without taking into account the value of the gum the land contains. Owing to the difficulty of ascertaining the value of the gum in the land, probably no other system of valuation was practicable. The consequence has been that the value has been assessed on a merely farming basis. The owners of these lands, however, pay rates and taxes, if only on a low valuation, and probably in some cases they pay in addition land and income tax. But in the case of the Crown lands and the kauri-gum reserves the local bodies derive no revenue at all beyond the almost nominal license fee of 5s. per year paid by the gum-digger, which is handed over to the local bodies after the cost of collection has been deducted.

Now, the occupiers of these lands—gum-diggers and others—while enjoying all the benefits of ratepayers in respect to the use of roads and bridges, and the full benefits of hospital and charitable aid, make no contribution towards the cost of local government beyond the license fee just mentioned. This anomalous condition seriously affects the finances of some of the northern counties, owing to the fact that more than half the gum-bearing lands are either Crown lands or included in the kauri-gum reserves.

In view of these facts we consider that some means should be devised enabling the local bodies to obtain a fair revenue from the gum lands, and after the fullest and most careful consideration we recommend—

(1.) That a tax of 1 per cent. be imposed on the declared f.o.b. value of all kauri-gum exported from New Zealand.

(2.) That a royalty of $1\frac{2}{3}$ per cent., or 4d. in the pound sterling, be charged on all kauri-gum dug or otherwise obtained from Crown lands or kauri-gum reserves, such royalty to be based on the price paid for the gum on the field.

(3.) That when valuing private gum lands for rating or taxation purposes the value of the gum in the soil should not be taken into account.

We recognize that exception may be taken to the imposition of an export tax, but we think such a tax is necessary in the circumstances, owing to the difficulty of ascertaining the value for rating purposes of the gum in the soil.

In order to facilitate the collection of the royalty it will be necessary to make it a condition in every license to dig or otherwise obtain gum that when the holder of such license is selling gum he shall declare in writing the locality from which the gum was obtained, whether from Crown land, kauri-gum reserve, or privately owned land, and every gum-buyer's license should contain a condition that the holder must collect from any seller of gum dug or otherwise obtained from Crown lands or kauri-gum reserves above referred to a royalty of $1\frac{2}{3}$ per cent., or 4d. in the pound sterling, based on the purchase-price of the gum in the field. There should also be a similar condition in all gum-brokers' licenses, making the broker responsible for the collection of the said royalty when he receives the gum direct from the fields without the intervention of gum-buyers. In the event of one gum-buyer buying gum from another, the latter should produce a declaration as to the origin of the gum, as provided above. The royalty of $1\frac{2}{3}$ per cent. recommended above has application only to the gum-digger holding a license to dig at will on the kauri-gum reserves and Crown lands open to him, and does not apply to the selector of a gum-chip area who has the monopoly of the particular area to the exclusion of other diggers. In such cases the royalty paid should be determined by the Commissioner of Crown lands according to the circumstances of the case.

The allocation of the royalties collected and of the money derived from the export tax among the various local bodies interested should not be a matter of

great difficulty. The necessary provisions could be made by regulations. Each local body would be entitled to the revenue derived from its district, less administration charges.

We suggest that before such moneys are handed over to the local bodies, proposals setting out the scheme for expenditure of the same should be approved by the Commissioner of Crown Lands, that the procedure adopted in regard to the expenditure of "thirds" and "fourths" under the Land Act be followed as closely as possible, and that consideration should be given to the claims of hospital and charitable aid for a proper contribution of the money so derived.

(12.) *Whether it is advisable, in the event of the Commission recommending the imposition of such royalty or taxation, to apply part of the revenue so raised to research work in connection with the kauri-gum industry.*

While we regard it as of the utmost importance that the recommendations made under clause 9 of the order of reference should be given effect to with as little delay as possible, we are strongly of opinion that financial provision for such research work should be made from the Consolidated Fund, and not from the revenue derived directly from the industry.

Sand-drift.

Although a question outside our order of reference, we feel called upon to draw attention to the serious encroachment of the sand-drift in the far North. It is a matter of urgent necessity that measures should be taken to stop the drift, which if left unchecked, threatens to cover large areas of valuable swamp land.

Although the drift is general throughout the far northern peninsula, extending from Kaitaia to Parengarenga, it is most serious in the stretch of country lying between Waipapakauri and Houhora. A few miles south of Houhora the valuable Motutangi Swamp, above referred to, is seriously threatened by the sand-drift.

We strongly urge that the good work which is now being done in sand-dune reclamation on the Kaipara and Waipu coasts by the Lands Department should be extended, and plantations started this season near the Motutangi Swamp, and to the south of it.

Summary.

The principal recommendations in the previous parts of our report may be here summarized as follows:—

(1.) That it is advisable that there should be a standard grading of kauri-gum for export, and that a Government grader of kauri-gum be appointed.

(2.) That at present there should be no interference with the particular grades put up by merchants for export.

(3.) That it is not at present desirable to compel an exporter to have his gum graded or classified by the Government grader.

(4.) That it should be made unlawful to export kauri-gum having mixed with it any other gum, or any material not naturally associated with kauri-gum in the soil.

(5.) That as soon as it is deemed practicable a regulation should be made fixing the limits of dirt and foreign matter in gum which may be exported without a special permit.

(6.) That the State should not monopolize the export of kauri-gum, but should exercise the measure of control over such export recommended in this report.

(7.) That the methods of recovering kauri-gum from the gum-bearing soils should be improved—

(*a.*) By lessening the cost of digging and handling the swamp material before treatment:

(*b.*) By the introduction of small washing plants capable of being operated by two or three men, instead of the primitive tub methods at present in use:

(*c.*) By the introduction of more efficient methods of separating the gum from the large amount of dirt and foreign matter usually associated with it:

(*d.*) By the general use of the Maclaurin or other equally efficient process for the separation of the dirt and foreign matter from the gum.

(8.) That in the event of the Maclaurin patent process for cleaning gum being purchased by the Government, it should be made available for general use, either free or on payment of a very small royalty.

(9.) That in order to encourage private enterprise and investigation, bonuses should be offered for improvements and inventions in connection with the kauri-gum industry.

(10.) That investigations on the effect of "bleeding" on kauri trees should be prosecuted vigorously.

(11.) That, apart from its possible use for fencing and building purposes, kauri swamp timber should be conserved, as it may possibly be treated profitably for the recovery of oils, charcoal, &c.

(12.) That in the treatment and development of poor gum lands certain methods set out in detail in our recommendations might be adopted.

(13.) That the fees for a special and an ordinary gum-digger's license shall remain as at present, and that the form of license now in use in both cases be adhered to.

(14.) That every man engaged in "bleeding," or "tapping" the kauri tree for gum shall be required to take out a license.

(15.) That the gum-buyer's license-fee and form of license remain as at present, subject to the necessary amendments arising out of our recommendations, and that the licensee be required to enter into a bond of £100.

(16.) That the gum-broker's license fee be increased to £10, and such license contain a condition that it shall be operative only in the kauri-gum district in which it is taken out, and that the licensee be required to enter into a bond of £500.

(17.) That the Kauri-gum Industry Act, 1908, be amended so as to permit of landowners being allowed to sell gum produced from their holdings, on what may be termed a "landowner's license," without the necessity of taking out separate licenses for each gum-digger employed thereon.

(18.) That with the object of preventing damage to gum lands, it be made illegal to light scrub fires on kauri-gum reserves except during the months of May, June, July, August, and September, and that a sufficient number of rangers be appointed to enforce this prohibition.

(19.) That laboratory researches should be commenced without delay in connection with kauri-gum, kauri peat, and all products of the kauri forests, and that financial provision for the same should be a charge on the Consolidated Fund, and not on the revenue derived directly from the kauri-gum industry.

(20.) That a tax of 1 per cent. be imposed on the declared f.o.b. value of all kauri-gum exported from New Zealand.

(21.) That a royalty of $1\frac{2}{3}$ per cent., or fourpence in the pound sterling, be charged on all kauri-gum dug or otherwise obtained from Crown lands or kauri-gum reserves, such royalty to be based on the price paid for gum on the field.

(22.) That the revenue derived from the source mentioned in (20) and (21) be allocated equitably among the local bodies in the kauri-gum districts.

We have now the honour to submit for the consideration of Your Excellency our report, which has been unanimously adopted, together with minutes of our proceedings, and a transcript of the evidence taken during the course of our inquiry.

Given under our hands and seals, at Auckland, this 10th day of June, 1921.

R. P. Greville, Chairman.
Rodney Coates.
F. L. Gribbin.
Ernest Niccol.
John Nicholson.
Fredk. P. Worley.
M. H. Wynyard.

J. R. MacCormick, Secretary.

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