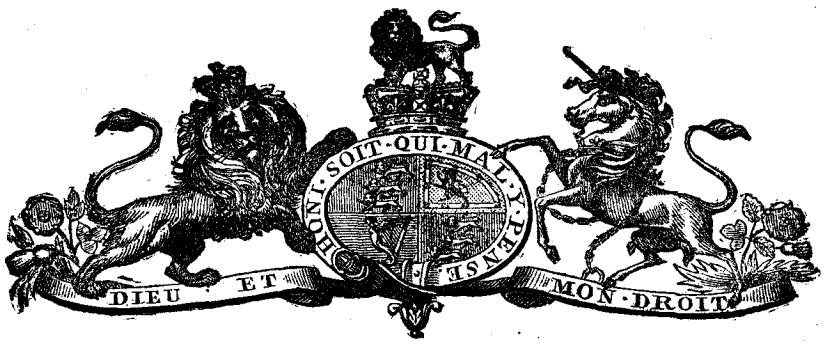
Numb. 1.



THE

NEW ZEALAND GAZETTE.

Published by Authority.

WELLINGTON, FRIDAY, JANUARY 6, 1871.

G. F. Bowen, Governor.

ORDER IN COUNCIL.

At the Government Buildings, at Wellington, this fourteenth day of December, 1870.

Present:

The Honorable Donald McLean, Native and Defence Minister, Presiding, and Members of the Executive Council.

WHEREAS by the sixth section of "The Native Lands Frauds Prevention Act, 1870," it is enacted that if the Trust Commissioner shall be satisfied with the result of such inquiries as by the said Act he is required to make, he shall indorse on the principal or only instrument a certificate under his hand to that effect, in such form as shall be from time to time prescribed by the Governor in Council, and no such instrument shall be registered in any Registry of Land or Deeds, or be received as evidence in any Court of Law or Equity, without such certificate indorsed:

Now therefore, His Excellency the Governor, in exercise and pursuance of all powers and authorities enabling him in this behalf, and with the advice and consent of the Executive Council of New Zealand, doth hereby order that the form of the certificate referred to in the said recited section of the said Act shall be the form set forth in the Schedule hereto.

SCHEDULE.

I, the Trust Commissioner under "The Native Lands Frauds Prevention Act, 1870," for the District of , do hereby certify that I have, with respect to the within written instrument and the alienation thereby witnessed, made the inquiries directed by the said Act, and do certify that I am satisfied with the result of such inquiries.

Dated this day of 187 .

Donald McLean,
Presiding.

Forster Goring,
Clerk of the Executive Council.

G. F. Bowen, Governor.

ORDER IN COUNCIL.

At the Government Buildings, at Wellington, this fourteenth day of December, 1870.

Present:

The Honorable Donald McLean, Native and Defence Minister, Presiding, and Members of the Executive Council.

WHEREAS at a sitting of the Native Land Court of New Zealand at Onake, in the District of Hokianga, Province of Auckland, on the tenth day of October, one thousand eight hundred and seventy, the claim of Rangatira Moetara and others, aboriginal natives of New Zealand, residing at Hokianga, to a piece of land called Waimamaku, situate at Hokianga, in the district aforesaid, was heard, and a certain order was thereupon made by the Court aforesaid: And whereas it is enacted by "The Native Lands Act, 1865," and "The Native Lands Act, 1867," and "The Native Lands Act, 1870," that the Governor in Council may order a rehearing of any matter judicially heard, before the Court aforesaid, and before one or more Judges of the Court, and one or more Assessors, as may be specified in the Order in Council ordering such rehearing, and within such period of time as may be limited in such Order, provided that no such order for rehearing shall be made after six months shall have elapsed from the date of the original decision: And whereas it is expedient that the said claim shall be reheard before the said Court:

Now therefore, His Excellency the Governor, with the advice and consent of the Executive Council of the Colony, in pursuance and exercise of the above-recited power and authority, doth hereby order that the aforesaid claim of Rangatira Moetara and others to the aforesaid piece of land shall be reheard before a Judge of the said Court and one Assessor thereof.

And doth order that such rehearing shall take place before the thirtieth day of June next.

Donald McLean,
Presiding.

Forster Goring,
Clerk of the Executive Council.

G. F. BOWEN, Governor.

ORDER IN COUNCIL.

At the Government Buildings, at Wellington, this fourteenth day of December, 1870.

Present:

THE HONORABLE DONALD MCLEAN, NATIVE AND DEFENCE MINISTER, PRESIDING, AND MEMBERS OF THE EXECUTIVE COUNCIL.

IN exercise of the powers vested in the Governor by "The Native Reserves Act, 1856," and "The Native Reserves Amendment Act, 1862," the Governor, with the advice and consent of the Executive Council, doth order that the land hereafter described, that is to say, All that parcel of land, containing by admeasurement thirteen (13) acres three (3) roods twenty (20) perches, be the same more or less, situated in the District of Motueka, being a portion of Native Reserve Sections Nos. 145 and 146 on the plan of the said district, bounded towards the North, 1,082 links, by a portion of Section 146; towards the East, 1,275 links, by a portion of Sections 145 and 146, of which this forms part; and towards the South and West by high water-mark of the Moutere Mud Flat, being land subject to the operation of the said Acts, shall be sold to the Superintendent of the Province of Nelson, on behalf of the said Province, for the sum of one hundred pounds (£100).

DONALD MCLEAN,
Presiding.

Approved in Council.

FORSTER GORING,
Clerk of the Executive Council.

G. F. BOWEN, Governor.

ORDER IN COUNCIL.

At the Government Buildings, at Wellington, this twenty-first day of December, 1870.

Present:

THE HONORABLE WILLIAM FOX, PRIME MINISTER, PRESIDING, AND MEMBERS OF THE EXECUTIVE COUNCIL.

WHEREAS by "The Arms Act, 1860," it is enacted that it shall be lawful for the Governor, by Warrant under his hand, from time to time, to appoint persons to make and issue licenses in the forms or to the effect respectively set forth in the Schedule to the said Act, which persons are in the said Act designated as Licensing Officers, and any such persons at his pleasure to remove, and that there shall be paid to the Licensing Officer the fees set forth in the said Schedule: And whereas by "The Arms Act Continuance Act, 1861," it is enacted that it shall be lawful for the Governor in Council, in any case when he may think proper, to alter or vary the scale of fees imposed in the Schedule to the said "Arms Act, 1860," provided that they be not so altered as to exceed the amounts thereby fixed: And whereas it is desirable to alter or vary the fees payable to the Licensing Officer as hereinafter declared:

Now therefore, His Excellency the Governor, by and with the advice and consent of the Executive Council of New Zealand, and in exercise and pursuance of all powers and authorities enabling him in this behalf, doth hereby order and declare that the fee payable to the Licensing Officer for a license in form B in the Schedule to the said "Arms Act, 1860," shall be the sum of two pounds, excepting by dealers or persons in the towns of Auckland, Shortland, Grahamstown, Napier, Wellington, Wanganui, New Plymouth, Nelson, Blenheim, Westport, Greymouth, Hokitika, Lyttelton, Christchurch, Timaru, Oamaru, Dunedin, and Invercargill, who shall continue to pay to the Licensing Officer for a license in the said form the fee mentioned in the Schedule to the said "Arms Act, 1860."

WILLIAM FOX,
Presiding.

FORSTER GORING,
Clerk of the Executive Council.

G. F. BOWEN, Governor.

ORDER IN COUNCIL.

At the Government Buildings, at Wellington, this fourteenth day of December, 1870.

Present:

THE HONOURABLE DONALD MCLEAN, NATIVE AND DEFENCE MINISTER PRESIDING, AND MEMBERS OF THE EXECUTIVE COUNCIL.

WHEREAS by an Act of the General Assembly of New Zealand, intituled "The District Courts Act Amendment Act, 1865," it is enacted that the powers conferred on Judges of District Courts in and by the twenty-fifth, twenty-sixth, and twenty-seventh sections of "The District Courts Act, 1858," shall be exercised only within such districts as shall from time to time be named by the Governor, by Order in Council published in the *New Zealand Gazette*, as districts within which such powers may be exercised:

Now therefore, His Excellency the Governor, in exercise of the power and authority so vested in him as aforesaid, doth, by and with the advice and consent of the Executive Council, name and appoint the District of Timaru, as defined in and by a certain Proclamation, dated the fourteenth day of December instant, to be a district within which the Judge of the District Court of Timaru may exercise the powers conferred by the twenty-fifth, twenty-sixth, and twenty-seventh sections of "The District Courts Act, 1858."

DONALD MCLEAN.
Presiding.

FORSTER GORING,
Clerk of the Executive Council.

G. F. BOWEN, Governor.

WHEREAS by "The Colonial Courts-Martial Act, 1868," it is enacted that for the purpose of bringing to justice persons on actual service in the Militia or Volunteer Forces, and persons in the New Zealand Armed Constabulary, employed or on service in Disturbed Districts, proclaimed as such as in the said Act mentioned, who shall offend against the provisions contained in any Act of the Imperial Parliament of Great Britain and Ireland for the time being in force and applicable in New Zealand as aforesaid, for punishing Mutiny and Desertion, and for the better payment of the Army and their quarters, and against the Articles of War made under the authority of any such Act, it shall be lawful for the Governor to authorize any officer holding a command in the Militia or Volunteer Forces aforesaid, or in the New Zealand Armed Constabulary aforesaid, to convene Courts-Martial as occasion may require, for the trial of offences committed by any of the Forces under the command of any such officer, whether the same shall have been committed before or after such officer shall have taken upon him such command, provided that the officer so authorized be not below the degree of a Field Officer of the Militia or Volunteer Forces, or a Commandant in the Armed Constabulary aforesaid, except in detached situations, where a Field Officer or Commandant as aforesaid is not in command, in which case a Captain of Militia or Volunteers, or an Inspector in the Armed Constabulary, may be authorized to convene District or Garrison Courts-

Martial, and that every officer so authorized to convene Courts-Martial may confirm the sentence of any Court-Martial convened by him according to the terms of his warrant:

Now therefore, I, Sir George Ferguson Bowen, the Governor of New Zealand, in exercise and in pursuance of the power and authority for that purpose vested in me, do hereby authorize

ST. JOHN BRANIGAN, Esq., R.M.,

Commissioner of the New Zealand Armed Constabulary, to convene Courts-Martial, as occasion may require, for the trial of offences committed by any of the Forces under his command.

Given under the hand of His Excellency Sir George Ferguson Bowen, Knight Grand Cross of the Most Distinguished Order of Saint Michael and Saint George, Governor and Commander-in-Chief in and over Her Majesty's Colony of New Zealand and its Dependencies, and Vice-Admiral of the same, at the Government House, at Auckland, this twenty-second day of December, in the year of our Lord one thousand eight hundred and seventy.

DONALD MCLEAN.

G. F. BOWEN, Governor.

IN pursuance of the powers in me vested, I, Sir George Ferguson Bowen, the Governor of the Colony of New Zealand, do hereby appoint the following person to be Returning Officer for the Eastern Maori Electoral District:—

SAMUEL LOCKE, Esq., R.M.

Given under the hand of His Excellency Sir George Ferguson Bowen, Knight Grand Cross of the Most Distinguished Order of Saint Michael and Saint George, Governor and Commander-in-Chief in and over Her Majesty's Colony of New Zealand and its Dependencies, and Vice-Admiral of the same; and issued at Wellington, this thirty-first day of December, in the year of our Lord one thousand eight hundred and seventy.

DONALD MCLEAN.

G. F. BOWEN, Governor.

IN exercise and pursuance of all powers in me vested in this behalf, I, Sir George Ferguson Bowen, the Governor of New Zealand, do hereby appoint

TAPUWAEHARURU, Lake Taupo,

as a Polling Place for the Eastern Maori Electoral District, and as a Polling Place for the Western Maori Electoral District, in lieu of

HINEMAIAI or HATEPE, on Lake Taupo.

Given under the hand of His Excellency Sir George Ferguson Bowen, Knight Grand Cross of the Most Distinguished Order of Saint Michael and Saint George, Governor and Commander-in-Chief in and over Her Majesty's Colony of New Zealand and its Dependencies, and Vice-Admiral of the same; and issued at Wellington, this thirty-first day of December, in the year of our Lord one thousand eight hundred and seventy.

DONALD MCLEAN.

G. F. BOWEN, Governor.

IN exercise of the power vested in me by "The Native Schools Act, 1867," I, Sir George Ferguson Bowen, Governor of the Colony of New Zealand, do hereby nominate and appoint

HENRY JOHN TANCRED, Esq., and
The Reverend JAMES WEST STACK,

to be Trustees of the land described in the Schedule hereto, being the Kaiapoi school site.

SCHEDULE.

All that piece of land situate at Kaiapoi, Canterbury, bounded as hereinafter described,—that is to say, twenty (20) acres of land commencing eighteen chains and five links south of a point at which the intersection of a line drawn from Trig. Pole No. 14 with one drawn from the Maori boundary post marked H forms an angle of one hundred and fifty-five degrees fifteen minutes; thence running Easterly a distance of one thousand three hundred and thirty-five links; thence Southerly, and at a right angle with the last line, a distance of fifteen chains; thence Westerly, one thousand three hundred and thirty-five links; and from thence returning to the first point.

Given under the hand of His Excellency Sir George Ferguson Bowen, Knight Grand Cross of the Most Distinguished Order of Saint Michael and Saint George, Governor and Commander-in-Chief in and over Her Majesty's Colony of New Zealand and its Dependencies, and Vice-Admiral of the same; and issued at Wellington, the thirtieth day of December, in the year of our Lord one thousand eight hundred and seventy.

DONALD MCLEAN.

G. F. BOWEN, Governor.

TO ALL TO WHOM THESE PRESENTS SHALL COME, GREETING:

WHEREAS by "The Regulation of Elections Act, 1870," it is enacted that it shall be lawful for the Governor, by Warrant under his hand, from time to time to appoint Polling Places for each Electoral District, within or within one mile of the limits thereof, and to appoint any one of such Polling Places to be the Principal Polling Place for the district, and all or any of such Polling Places from time to time to abolish, and, if he think fit, to appoint other Polling Places in lieu of those abolished, and that every such Warrant shall be published in the *New Zealand Gazette:* Provided always that no Polling Place shall be appointed by the Governor under the said Act unless he shall be first satisfied that the place to be appointed is more convenient than any other for at least twenty electors to record their votes thereat:

Now know ye that I, Sir George Ferguson Bowen, the Governor of New Zealand, in pursuance of the power and authority in me vested by the said Act, do hereby appoint the following places to be additional Polling Places for the Electoral Districts hereinafter specified, for the election of Members of the House of Representatives, namely,—

Coleridge—
Greenstreet's Woolshed, Ashburton.

Grey Valley—
Ryan's Buildings, Half-ounce.
Tramway Shed, Marsden.

Cheviot—
Mr. Robinson's Woolshed, Cheviot Hills.

Given under the hand of His Excellency Sir George Ferguson Bowen, Knight Grand Cross of the Most Distinguished Order

of Saint Michael and Saint George, Governor and Commander-in-Chief in and over Her Majesty's Colony of New Zealand and its Dependencies, and Vice-Admiral of the same; and issued at Wellington, this sixth day of January, in the year of our Lord one thousand eight hundred and seventy-one.

W. GISBORNE.

Colonial Secretary's Office,
Wellington, 4th January, 1871.

THE following Despatches, with Enclosures, from the Right Hon. the Secretary of State for the Colonies, are published for general information.

W. GISBORNE.

Downing Street, 30th September, 1870.

SIR,—With reference to my predecessor's Despatch No. 53, of the 20th May, respecting the guarantee of a loan of one million to be raised by the Government of New Zealand, I have the honor to transmit to you the accompanying copies of an Act passed at the close of the last Session, entitled "An Act for authorizing a Guarantee of a Loan to be raised by the Government of New Zealand for the Construction of Roads, Bridges, and Communications in that Country, and for the Introduction of Settlers into that Country."

You will learn from the second and third clauses the conditions under which Her Majesty's Government are authorized to give this guarantee. It will be a great satisfaction to them if the loan to be raised proves conducive to the pacific advancement of the Colony.

I have, &c.,
KIMBERLEY.

Governor Sir G. F. Bowen, G.C.M.G.,
&c., &c., &c.

An Act for authorizing a Guarantee of a Loan to be raised by the Government of New Zealand for the Construction of Roads, Bridges, and Communications in that Country, and for the Introduction of Settlers into that Country.

[1st August, 1870.]

WHEREAS the Government of New Zealand propose to raise by way of loan a sum not exceeding one million pounds for the purposes of the construction of roads, bridges, and communications in that country, and of the introduction of settlers into that country, and it is expedient to authorize the Commissioners of Her Majesty's Treasury, in this Act referred to as "the Treasury," to guarantee such loan:

Be it enacted by the Queen's most Excellent Majesty, by and with the advice and consent of the Lords Spiritual and Temporal, and Commons, in this present Parliament assembled, and by the authority of the same, as follows:—

Short Title.

1. This Act may be cited as "The New Zealand (Roads, &c.) Loan Act, 1870."

Power to Treasury to guarantee Loan.

2. The Treasury may guarantee, in such manner and form as they think fit, payment of the principal of all or any part of any loan not exceeding one million pounds raised by the Government of New Zealand for the purposes of the construction of roads, bridges, and communications in that country, and of the introduction of settlers into that country, and payment of the interest of any such loan at a rate not exceeding four per cent.

Conditions of Guarantee.

3. The Treasury shall not give any guarantee under this Act, unless and until provision has been made, either before or after the passing of this Act, by an Act of the Legislature of New Zealand, or otherwise to the satisfaction of the Treasury,—

(1.) For raising the said loan, and appropriating the same to the purposes mentioned in this Act:

(2.) For charging the Consolidated Revenue of New Zealand with the payment of the principal and interest of the said loan immediately after the charges on that fund existing at the time of the passing of this Act:

(3.) For payment by the Government of New Zealand of a sinking fund at the rate of two per centum per annum on the entire amount of the said loan, or so much as is raised for the time being, commencing at the date at which the whole of such loan is raised, or at the expiration of ten years from the passing of the Act (whichever date first happens), and for charging the Consolidated Revenue of New Zealand with the payment of such sinking fund immediately after the principal and interest of the said loan:

(4.) For charging the Consolidated Revenue of New Zealand with any sum issued out of the Consolidated Fund of the United Kingdom under this Act, with interest thereon at the rate of five per centum per annum, immediately after the sinking fund of the said loan:

(5.) For rendering to the Governor of New Zealand, for transmission to the Treasury, an annual abstract of the accounts of the expenditure of the money raised by means of the said loan under such heads as the Treasury from time to time desire:

(6.) For remitting to the Treasury the annual sums for the sinking fund by equal half-yearly payments, and for the investment and accumulation thereof under their direction in the names of four trustees nominated from time to time, two by the Treasury and two by the Government of New Zealand.

The Treasury shall not guarantee in any one year a larger sum than two hundred thousand pounds; and the Treasury, before guaranteeing any portion of the loan after the first, shall satisfy themselves that the portion of the loan already raised has been or is in the course of being spent for the purposes mentioned in this Act.

Application of Sinking Fund.

4. The said sinking fund may be invested in such securities as the Government of New Zealand and the Treasury from time to time agree upon, and shall, whether invested or not, be applied from time to time, under the direction of the Treasury, in discharging the principal of the said loan; and the interest arising from such securities (including the interest on any part of the loan discharged by means of the sinking fund), and the resulting income thereof, shall be invested and applied as part of such sinking fund.

Alteration of Act relating to guaranteed Loan.

5. Every Act passed by the Legislature of New Zealand which in any way impairs the priority of the charge upon the Consolidated Revenue of New Zealand created by that Legislature of the said loan and the interest and sinking fund thereof, and the sums paid out of the Consolidated Fund of the United Kingdom and the interest thereon, shall, so far only as it impairs such priority, be void, unless such Act contain a suspending clause providing that such Act shall not come into operation until Her Majesty's pleasure thereon has been publicly signified in New Zealand.

Issue out of Consolidated Fund.

6. The Treasury are hereby authorized to cause to be issued from time to time, out of the growing produce of the Consolidated Fund of the United

Kingdom, such sums of money as may at any time be required to be paid to fulfil the guarantee under this Act in respect either of principal or interest.

Certificate of Amount paid out of Consolidated Fund.

7. The Treasury may from time to time certify to one of Her Majesty's Principal Secretaries of State the amount which has been paid out of the Consolidated Fund of the United Kingdom to fulfil the guarantee under this Act, and the date of such payment. Such certificate shall be communicated to the Governor of New Zealand, and shall be conclusive evidence of the amount having been so paid, and of the time when the same was so paid.

Accounts to be laid before Parliament.

8. The Treasury shall cause to be prepared and laid before both Houses of Parliament a statement of any guarantee given under this Act, and a copy of any accounts received by them respecting the expenditure of the said loan, and an account of all sums issued out of the Consolidated Fund of the United Kingdom for the purposes of this Act, within one month after the same are so given, received, or issued, if Parliament be then sitting, or if Parliament be not sitting, then within fourteen days after the then next meeting of Parliament.

CIRCULAR.

Downing Street, 17th October, 1870.

SIR,—In his Circular Despatch of the 3rd of September, 1867, the Duke of Buckingham and Chandos communicated to you, for the consideration of your Government, a copy of the Imperial Act 30 and 31 Victoria, cap. 84, for amending and consolidating the law relating to vaccination in England. It is well known that that Act was enacted for England in view of the very remarkable success which had attended the system of compulsory vaccination introduced into Ireland by Sir Robert Peel's Act of 1863. Since the date of the Duke of Buckingham's Despatch the progress made in stamping out small-pox in Ireland has been still more remarkable than in previous years; and I think it may be well to put you in possession of the facts of the whole case.

In the year 1851 an Act of Parliament was passed, called "The Medical Charities Act (Ireland), 1851," by which it was made part of the official duty of every Dispensary Medical Officer in Ireland to vaccinate, gratis, all persons coming to him or brought to him for that purpose. In the ten years previous to the passing of this Act, the deaths from small-pox in Ireland had averaged 3,800 a year; in the seven years subsequent to the Act, from 1851 to 1857, they averaged about 1,500 a-year.

In 1858, Lord Mayo carried through Parliament an Act providing that the Poor Law Medical Officers should receive a gratuity of one shilling for every successful vaccination performed. Owing to the impetus given to vaccination by this latter Act, the deaths from small-pox, in the years from 1858 to 1863, did not average more than 1,000 a year. On the 1st of January, 1864, commenced the operation of the Act of 1863, which rendered vaccination compulsory, and which, it should be observed, continued the provision in Lord Mayo's Act whereby the Medical Officers had been given a pecuniary interest in the efficiency of the system they were called on to administer. The effect of the Act of 1863, in stamping out small-pox, is shown by the following table of deaths resulting from that disease, in the years since its enactment:—

1864	... ...	854 deaths.
1865	... ...	347 „
1866	... ...	187 „
1867	... ...	20 „
1868	... ...	19 „
1869	... ...	1 death.

The man who died in 1869 was a Swedish sailor, who came to Ireland with the disease already on him.

In 1870, as far as the returns have been ascertained, only one man has died of small-pox, and only 48 cases of it have been treated, and of these 32 are referable to contagion imported from England, Scotland, and Norway; and in no case of outbreak did the disease become epidemic.

The Poor Law Commissioners for Ireland give it as their experience, that whilst it is undoubtedly the case that vaccination does not in every instance render the person vaccinated proof against the disease, yet it does so in a very large proportion of cases; and when the disease does attack those who have been vaccinated, it comes in a modified form, and is far less fatal, as will be perceived from the following table, which has been compiled by Mr. Simon, Medical Officer of the English Privy Council.

Table showing the proportion of cases of Small-pox ending fatally amongst persons wholly unvaccinated and persons more or less efficiently vaccinated.

			Per cent. of cases end in death.
CLASS I.	Amongst persons unvaccinated ...		35½
CLASS II.	„ „	stated to have been vaccinated, but bearing no vaccine scar ...	21¾
CLASS III.	„ „	having one vaccine scar	7½
CLASS IV.	„ „	having two vaccine scars	4⅛
CLASS V.	„ „	having three vaccine scars	1¾
CLASS VI.	„ „	having four or more scars	¾

I need only further observe that the efficient working of a compulsory Vaccination Act must be wholly dependent on an efficient registration of births. Such success as has been attained in Ireland cannot be looked for if any appreciable number of the infant population are left unvaccinated, and this cannot be guarded against unless the registration of births is as nearly perfect as may be. In Ireland, Parliament has done the utmost that can be done to prevent any thing of the kind, by combining the duties of Registrar with those of Medical Officer and Public Vaccinator; those who have a pecuniary interest in the extension of vaccination being thus put in a position to know of every case in which it may be performed.

You will communicate this Despatch to the Legislature of the Colony under your government, at the same time bringing the Act forwarded to you by the Duke of Buckingham again under its notice, unless the Colony has adopted the compulsory system; but in any case, it will be useful that the remarkable facts as regard small-pox in Ireland should be made publicly known.

I have, &c.,
KIMBERLEY.

The Officer Administering
the Government of New Zealand.

Colonial Secretary's Office,
Wellington, 31st December, 1870.

HIS Excellency the Governor has been pleased to appoint

HANSON TURTON, Esq.,

to be the Patent Officer under "The Patents Act, 1870."

W. GISBORNE.

Colonial Secretary's Office,
Wellington, 4th January, 1871.

HIS Excellency the Governor has been pleased to appoint

THOMAS MEREDITH SMITH,

of Dunstan, to be an Inspector of Weights and Measures in the Province of Otago, *vice* Thomas Neil, resigned.

W. GISBORNE.

Colonial Secretary's Office,
Wellington, 4th January, 1871.

IT is hereby notified, that, in conformity with clause 133 of "The Municipal Corporations Act, 1867," the names of the under-mentioned persons have been sent in to this office by the several Town Clerks as the names of those who have been elected Mayors for the Boroughs set opposite their names:—

JAMES PURVIS JAMESON, Esq., City of Christchurch.
HARRY ALLWRIGHT, Esq., Lyttelton.
EDMUND WICKES, Esq., Greymouth.
HENRY CAIN, Esq., Timaru.
JAMES MIDGLEY HIGGIN, Esq., Hokitika.
CHARLES DUDLEY, Esq., M.D., J.P., Kaiapoi.

W. GISBORNE.

Colonial Secretary's Office,
Wellington, 4th January, 1871.

HIS Excellency the Governor has been pleased to grant Letters Patent, under "The Patents Act, 1860," dated 22nd December, 1870, in favour of

JAMES RUSSELL RICHARDSON,
Blacksmith, and
WILLIAM HAMBLETON,
Millwright, both of Oamaru, in the Province of Otago, for an Invention of an "Improvement in Presses for Wool, Cotton, or other compressible matter."

W. GISBORNE.

Colonial Secretary's Office,
Wellington, 4th January, 1871.

HIS Excellency the Governor has been pleased to grant Letters of Registration under "The Patents Act, 1860," dated 27th December, 1870, in favour of

GEORGE MILNER STEPHEN,
of Sydney, in the Colony of New South Wales, Barrister-at-Law, of Letters of Registration granted in the Colony of New South Wales, dated 29th April, 1870, for an Invention of a "Gold and Diamond Cradle Amalgamator."

W. GISBORNE.

Colonial Secretary's Office,
Wellington, 4th January, 1871.

HIS Excellency the Governor has been pleased to grant Letters of Registration under "The Patents Act, 1860," dated 30th December, 1870, in favour of

ROBERT WILLIAM THOMSON,
of Edinburgh, in the Kingdom of Great Britain and Ireland, Civil Engineer, of Letters Patent, granted in Great Britain, dated 24th October, 1867, and sealed 21st April, 1868, for an Invention for "Improvements in Wheels for Road Steamers for drawing, carrying, or travelling."

W. GISBORNE.

Colonial Secretary's Office,
Wellington, 4th January, 1871.

HIS Excellency the Governor has been pleased to issue Letters of Naturalization under "The Aliens Act, 1866," in favour of the under-mentioned persons, viz.:—

Name.	Residence.	Occupation.
Diedrich Blunk ...	Hokitika, Westland ...	Gardener.
Nicolas Carl Schumacher	Port Chalmers ...	Stevedore.
Louis Julius Weidner ...	Dunedin	Gentleman.
Louis Gay Tan ...	Naseby, Otago ...	Storekeeper.
Henry Herman Elbeck	Blenheim	Tobacconist.

W. GISBORNE.

Colonial Secretary's Office,
(Judicial Branch,)
Wellington, 27th December, 1870.

HIS Excellency the Governor has been pleased to accept the resignation by

ALEXANDER ALEXANDER, Esq.,
of Whareraugi, Hawke's Bay, of his appointment as a Justice of the Peace for the Colony.

W. GISBORNE.

Colonial Defence Office,
Wellington, 27th December, 1870.

HIS Excellency the Governor has been pleased to make the under-mentioned promotions and appointments, viz.:—

In the Wellington Artillery Volunteers.

Charles France to be Honorary Assistant-Surgeon. Date of commission, 29th November, 1870.

In the No. 1 Company, Wellington Rifle Volunteers.

Nathaniel William Werry to be Lieutenant. Date of commission, 8th December, 1870.

In the Karori Rifle Volunteers.

Captain Walter Woods Johnston (Wellington Militia) to be Captain. Date of commission, 28th November, 1870.

Henry Cook to be Ensign. Date of commission, 28th November, 1870.

In the Wairarapa Cavalry Volunteers.

William Miller to be Cornet. Date of commission, 2nd November, 1870.

In the Canterbury Yeomanry Cavalry Volunteers.

Digby Templeton Brett to be Captain. Date of commission, 4th November, 1870.

William White, jun., to be Cornet. Date of commission, 4th November, 1870.

In the Timaru Artillery Volunteers.

Second Lieutenant Henry Green to be Captain. Date of commission, 4th November, 1870.

Andrew Beldy to be Second Lieutenant. Date of commission, 4th November, 1870.

In the Totara Rifle Volunteers.

Elisha Lockington to be Lieutenant. Date of commission, 21st June, 1870.

DONALD MCLEAN.

Colonial Defence Office,
Wellington, 27th December, 1870.

HIS Excellency the Governor has been pleased to accept the resignation of the commissions held by the under-mentioned Officers, viz.:—

Captain A. H. Nicholson, Lady Bowen Light Horse Volunteers.
Honorary Captain C. P. Powles, Wellington Rifle Volunteer Cadet Corps.
Lieutenant C. C. N. Barron, No. 1 Company, Wellington Rifle Volunteers.
Lieutenant R. Coup, No. 5 Company, Canterbury Rifle Volunteers.
Honorary Lieutenant R. Gibbons, Nelson Rifle Volunteer Cadet Corps.
Ensign J. Dewe, Bruce Rifle Volunteers.
Surgeon D. F. Tyerman, New Zealand Militia.

DONALD MCLEAN.

Colonial Defence Office,
Wellington, 27th December, 1870.

HIS Excellency the Governor has been pleased to accept the services of the under-mentioned Corps, viz.:—

"The Crofton (Wellington) Rifle Volunteer Cadet Corps." Date of acceptance, 21st November, 1870.

"The Marton Rifle Volunteer Cadet Corps." Date of acceptance, 22nd November, 1870.

"The No. 2 Company, Clutha Rifle Volunteers." Date of acceptance, 30th November, 1870.
"The Wanganui Rifle Volunteers." Date of acceptance, 6th December, 1870.
"The Featherston Rifle Volunteer Cadet Corps." Date of acceptance, 8th December, 1870.

DONALD MCLEAN.

Native Office,
Wellington, 3rd January, 1871.

HIS Excellency the Governor has been pleased to authorize

THOMAS MCDONNELL, Esq.,

of Whanganui, to act as an Interpreter under "The Native Lands Act, 1865," and "The Native Lands Act, 1867."

DONALD MCLEAN.

Native Office,
Wellington, 3rd January, 1871.

HIS Excellency the Governor has been pleased to authorize

EDWARD DAVIS,

of Coromandel, to act as an Interpreter under "The Native Lands Act, 1865," and "The Native Lands Act, 1867."

DONALD MCLEAN.

Native Office,
Wellington, 3rd January, 1871.

HIS Excellency the Governor has been pleased to authorize

WILLIAM JOSEPH YOUNG,

of Auckland, to act as an Interpreter under "The Native Lands Act, 1865," and "The Native Lands Act, 1867;" his certificate to bear date the 3rd day of January, 1871.

DONALD MCLEAN.

Native Office,
Wellington, 4th January, 1871.

HIS Excellency the Governor has been pleased to authorize

ROBERT ESTHER MOORE CAMPBELL,

of Cambridge, to act as an Interpreter under "The Native Lands Act, 1865," and "The Native Lands Act, 1867;" his certificate to bear date the 4th day of January, 1871.

HENRY SEWELL
(in the absence of the Native Minister).

Native Secretary's Office,
Wellington, 30th December, 1870.

IT is hereby notified, that the following are the Polling Places for the election of Members under "The Maori Representation Act, 1867."

DONALD MCLEAN.

Northern Maori Electoral District.
Mangonui.
Ahipara.
Parengarenga.
Kororarika, Court House.
Waimate, Court House.
Hokianga, Court House, Herd's Point.
Whangaruru, Hoterini's House, Ohawini.
Kaipara, Court House.
Whangarei, Court House.
Auckland, Supreme Court House.

Southern Maori Electoral District.
Nelson, Court House.
Blenheim, Court House.
Kaiapoi, Court House.
Akaroa, Court House.
Arowhenua, Court House.
Moeraki.
Dunedin, Court House.
Campbelltown, Court House.
Riverton.
Greymouth, Court House.
Ruapuke, School House.

Eastern Maori Electoral District.
Greytown.
Porangahau, Paora Ropiha's House.
Waipawa, Court House.
Napier, Provincial Council Chamber.
Wairoa, Court House.
Taupo Lake District, Tapuwaeharuru.
Turanganui.
Tuparoa.
Waiapu.
Opotiki, Court House.
Maketu, Court House.
Ohinemutu, Court House.

Western Maori Electoral District.
Tauranga, Court House.
Taupo in Hauraki, Court House.
Shortland, Court House.
Coromandel, Court House.
Waiuku, Court House.
Ngaruawahia, Court House.
Raglan, Court House.
Tapuwaeharuru.
Taupo Lake District.
New Plymouth, Court House.
Opunake, Old Redoubt.
Patea, Court House.
Whanganui, Court House.
Otaki, Court House.
Wellington, Court House.

Native Secretary's Office,
Wellington, 31st December, 1870.

IT is hereby notified, that the following persons have been appointed Returning Officers for the Maori Electoral Districts hereinafter specified:—

Northern Maori Electoral District.
ROBERT CLAPHAM BARSTOW, Esq., R.M.

Eastern Maori Electoral District.
SAMUEL LOCKE, Esq., R.M.

Western Maori Electoral District.
ROBERT PARRIS, Esq., R.M.

Southern Maori Electoral District.
ALEXANDER MACKAY, Esq., R.M.

DONALD MCLEAN.

General Post Office,
Wellington, 21st December, 1870.

THE following Notice is published for general information.

By order. W. GRAY
(for the Secretary).

MONEY ORDER OFFICES.
ENGLAND.

On the 1st October last the following alterations were made, viz.:—

1. Money Order Offices were opened in London and its Suburbs at—

	Postal District.
Notting Hill (near Archer Street)	W.
Shooter's Hill	S.E.

2. Money Order business was discontinued at the Elgin Road (Notting Hill), W. Office; and the Ledbury Road, W. Office, was abolished.

3. The following Offices have been closed, as regards Money Order business, viz.:—

Brook Street, Lambeth, S.E.; Cannon Street (No. 33), E.C.; Little Tower Street, E.C.; Lime Street, E.C.; Lombard Exchange News Room, E.C.; and West Kent Park, Forest Hill, S.E.

4. Money Order Offices will be opened in the Country at—

	Head Office.	County.
Clipston	... Northampton	... Northampton
Dwyran	... Bangor	... Anglesea
Eastney	... Portsmouth	... Hants
Gee Cross	... Manchester	... Chester
George Street, R.O.	Plymouth	... Devon
Halliford	... Chertsey	... Middlesex
High Town, R.O.	... Manchester	... Lancaster
Sandgate Road, R.O.	Folkestone	... Kent
Somer's Road, R.O.	Portsmouth	... Hants
The Lew, R.O.	... Tunbridge Wells	Kent
Treforest	... Pontypridd	... Glamorgan
Walter's Road, R. O.	Swansea	... Glamorgan
Waterlooville	... Cosham, R.S.O.	Hants
Weston Point	... Runcorn	... Chester

5. Money Order business is discontinued at the Caldicott (Chepstow) and Mortimer (Reading) Offices.

6. The following changes of designation have taken place, viz. :—

Sutton (St. Helens) will be called Sutton Oak; Southsea (Portsmouth), Wish Street, Southsea; and Cambridge Terrace, Southsea, Palmerston Road (Southsea); Old Beckenham has been changed to High Street, Beckenham.

7. A Money Order Office has been opened at North Street, Middlesbro'. Money Order business has been discontinued at the Kirkham (York) and Porlock (Taunton) Offices. The Money Order Office at Newick is now subordinate to Lewes instead of Uckfield.

SCOTLAND.

8. The designation of the Office at Ferryport-on-Craig has been altered to "Tayport."

IRELAND.

9. Money Order Offices have been opened at—

	Head Office.	County.
Cliftonville, R.O.	... Belfast	... Antrim
Donegal Square, R.O.	Belfast	... Antrim
Falls Road, R.O.	... Belfast	... Antrim
Mountpottinger, R.O.	Belfast	... Down
Waring Street, R.O.	Belfast	... Antrim
York Street, R.O.	... Belfast	... Antrim

10. During the past quarter Money Order business has been discontinued at the Kinnegad (Killucan) and Upper Ormond Quay (Dublin) Offices; and a Money Order Office has been opened at "Inns Quay," Dublin.

General Post Office,
Wellington, 30th December, 1870.

NOTICE is hereby given, that His Excellency the Governor has been pleased to appoint the under-mentioned Post Office to be a Money Order and Savings Bank Office for the transaction of Money Order and Savings Bank Business, from 1st February next:—

WAIUKU,

Province of Auckland.

By order.

W. GRAY
(for the Secretary).

Public Works Office,
Wellington, 31st December, 1870.

HIS Excellency the Governor has been pleased to appoint

WILLIAM BALLEY BRAY, Esq.,

a District Engineer under "The Immigration and Public Works Act, 1870." This appointment to date from the 1st of January, 1871.

W. GISBORNE.

Customs Department,
(Marine Branch,)
Wellington, 12th December, 1870.

HIS Excellency the Governor has been pleased to appoint

Isaac James Burgess,
William Ellis,
Thomas Wing,
George Charles Best,
William Butler,
George Prowse Chapman,
Edward Bolger,
H. Kraeft,
John McLaren,
James Smith Cross,
Samuel A. Leech,
John Henry Holford,
Thomas Phillpotts,
John Hadfield Smith,
Frederick Denham Gibson,
William Thomson,
David Dickie,
Thomas Thomson,
Thomas Turnbull,
Patrick James Allardyce,

to be persons to inspect vessels for the purpose of seeing that they are properly provided with Lights, and with the means of making Fog Signals, as required by the Board of Trade Regulations issued in pursuance of "The (Imperial) Merchant Shipping Act Amendment Act, 1862."

JULIUS VOGEL.

Flax Commission,
Wellington, 8th December, 1870.

THE House of Representatives having resolved that there should be an Exhibition in Wellington during the next Session of the Assembly, of all varieties of Flax Fibre prepared in the Colony, Manufacturers are invited to forward to the Flax Commissioners, through the Superintendent of their Province, samples of the Fibre, Rope, Sacking, or any other Material prepared by them from the New Zealand Flax. The samples of fibre should not be less than 20 lbs. in weight, and 10 or 15 fathoms of each kind of rope will be sufficient. It is desirable that a statement of the processes and estimated cost of manufacture should accompany the samples.

JAMES HECTOR,
Chairman.

IN the matter of "The Friendly Societies Act, 1867," notice is hereby given, that a transcript of the By-laws of

"Court Waimea, No. 4,987, Ancient Order of Foresters,"

duly certified, has been lodged with the Registrar of Friendly Societies, registered and recorded in his office under the provisions of "The Friendly Societies Act, 1867."

Dated the 23rd day of December, 1870.

G. S. COOPER
(for the Registrar).

IN the matter of "The Friendly Societies Act, 1867," notice is hereby given, that a transcript of the By-laws of

"The Loyal Lake Wakatip Lodge, No. 5,776, Queenstown, of the Otago District Branch of the Manchester Unity Independent Order of Odd Fellows Friendly Society,"

duly certified, has been lodged with the Registrar of Friendly Societies, registered and recorded in his office under the provisions of "The Friendly Societies Act, 1867."

Dated the thirty-first day of December, 1870.

G. S. COOPER
(for the Registrar).

NEW ZEALAND RAILWAYS.

TENDERS are invited by the Colonial Government for the construction of Section No. 1 of the Otago Southern Trunk Railway, extending from Dunedin to Caversham, a distance of about two miles.

Drawings and Specifications may be seen on and after Wednesday, the 18th proximo, at the office of the undersigned, where tenders will be received until noon of Wednesday, the 18th February.

The lowest or any tender not necessarily accepted.

W. N. BLAIR,
Engineer.

Dunedin, 30th December, 1870.

Office of Registrar of Joint Stock Companies,
Auckland, 17th December, 1870.

I, JOHN MUIR WAYLAND, Registrar of Joint Stock Companies for the Provinces of Auckland and Hawke's Bay, in the Colony of New Zealand, do hereby notify that I have registered a Memorandum of Association, with Articles of Association, establishing a Company, with limited liability of the shareholders therein, entitled

"The Shamrock Gold Mining Company, Limited."

The objects for which the Company is established are—

"1. To carry on mining operations of any kind, upon or within or under certain mining property called the Shamrock Claim, situate on the Waiotahi Creek, at the Thames Gold Field, in the Province of Auckland.

"2. To acquire other land, by purchase or otherwise, and carry on mining operations upon, within, or under the same; to amalgamate with other Claims and Companies.

"3. To enter into arrangements whereby shareholders, or some of them, in other Companies may receive in compensation, or part compensation, for the sale of their interests, paid up or partly paid up or other shares in the Company.

"4. To purchase, erect, work, hire, and let machinery of all kinds connected with the working of mines, and the rendering of the ores therefrom available.

"5. To let, sell, or otherwise dispose of or deal with any property whatsoever of the Company.

"6. And to do all such other things as are incidental or conducive to the attainment of the above objects."

And that, in pursuance of the provisions of "The Joint Stock Companies Act, 1860," I have issued a Certificate of Incorporation of the said Company, bearing date this 17th day of December, 1870.

JOHN M. WAYLAND,
Registrar of Joint Stock Companies.

PUBLIC NOTIFICATION.—Under and in pursuance of the powers vested in me as Commissioner appointed by His Excellency the Governor to carry out the Regulations for the Sale of Lands taken for Settlement under "The New Zealand Settlements Act, 1863," in the Province of Auckland, I do hereby notify that the Town, Suburban, and Special Rural Lands specified in the Schedule hereunder written, will be offered for Sale by public auction, in accordance with the said Regulations, at the Waikato Lands Office, Auckland, at Noon, on Thursday, the 2nd day of February, 1871.

DANIEL POLLEN,
Commissioner.

Auckland, 29th November, 1870.

SCHEDULE.

No. of Lot.	Area. A. R. P.	Upset Price. £ s. d.
Town of Tauranga, Section No. 2.		
388	0 1 0	10 0 0
County of Eden, Suburban Allotments. Parish of Opaheke, Settlement of Maketu, Section 2.		
82	1 3 20	3 0 0
Settlement of Patumahoe, Section No. 2.		
3	10 0 0	12 10 0
5	10 0 0	12 10 0
Settlement of Pukekohe, Section No. 2.		
85	10 0 0	15 0 0
County of Opotiki, Suburban Allotments. Parish of Waioeka.		
1	24 0 0	24 0 0
2	25 1 3	25 5 0
3	25 1 3	25 5 0
4	23 3 0	23 15 0
5	13 0 34	13 5 0
6	10 2 32	10 15 0
7	10 2 11	10 12 6
8	10 2 16	10 12 6
9	23 2 0	23 10 0
10	25 0 0	25 0 0
11	25 0 0	25 0 0
12	14 1 0	14 5 0
13	5 2 35	5 15 0
14	10 0 0	10 0 0
15	10 0 0	10 0 0
16	10 0 0	10 0 0
17	11 1 0	11 5 0
18	44 0 0	44 0 0
19	26 1 12	26 6 0
20	38 0 20	38 2 6
21	21 3 0	21 15 0
22	24 3 22	24 17 6
23	15 1 16	15 6 0
Banks County, Suburban Allotments. Parish of Komakorau, Suburbs of Newcastle.		
41	10 0 24	80 0 0
42	13 3 36	100 0 0
43	15 3 21	120 0 0
44	16 0 0	120 0 0
45	17 1 20	128 0 0
46	13 2 24	100 0 0
86	3 2 37	50 0 0
Subject to £1,200 for improvements.		
County of Eden, Special Rural Land. Parish of Waiuku.		
90	17 2 0	17 10 0
Banks County. Parish of Whangamarino.		
73A	20 0 0	15 0 0
Parish of Kirikiriroa.		
304	40 0 0	40 0 0
County of Waikato. Parish of Te Rapa.		
118	50 0 0	25 0 0
120	50 0 0	25 0 0
121	50 0 0	25 0 0
122	50 0 0	25 0 0
Parish of Puniu.		
206	86 3 0	86 15 0
208	86 2 0	86 10 0
260	70 0 0	70 0 0
Parish of Ngaroto.		
10A	10 0 0	10 0 0
84A	20 0 0	20 0 0
284	50 0 0	25 0 0
285	50 0 0	25 0 0
286	82 0 0	41 0 0
332	50 0 0	37 10 0
Parish of Mangapiko.		
260A	10 0 0	10 0 0
County of Rutland, Parish of Pirongia.		
152A	20 0 0	15 0 0
265	42 0 0	21 10 0

SUPREME COURT OF NEW ZEALAND,
WELLINGTON DISTRICT.

SITTINGS IN BANCO.

NOTICE is hereby given, that the Supreme Court will sit in Banco at the Supreme Court House, Lambton Quay, Wellington, on the following days, at 11 a.m., in the year 1871:—

On the 3rd day of February;
" 17th " March;
" 1st " May;
" 19th " June;
" 7th " August;
" 18th " September;
" 23rd " October;
" 18th " December.

By order of the Court.

ALEX. S. ALLAN,
Registrar.

SUPREME COURT OF NEW ZEALAND,
WELLINGTON DISTRICT.

MINOR JURY SITTINGS.

NOTICE is hereby given, that the Minor Jury Sittings of the Court will be held at the Supreme Court House, Lambton Quay, Wellington, on the following days, at 10 a.m., in the year 1871:—

On the 2nd day of February;
" 2nd " May;
" 4th " August;
" 20th " October.

By order of the Court.

ALEX. S. ALLAN,
Registrar.

SUPREME COURT OF NEW ZEALAND, WELLINGTON DISTRICT.

SITTINGS IN BANKRUPTCY.

NOTICE is hereby given, that Sittings of the Supreme Court for the Wellington District of New Zealand for the despatch of business accruing under "The Bankruptcy Act, 1867," "The Bankruptcy Act Amendment Act, 1868," and "The Bankruptcy Act Amendment Act, 1870," will be holden at the Supreme Court House, Lambton Quay, Wellington, on the following days, at 11 o'clock in the forenoon, in the year 1871:—

On the 4th day of February;
„ 18th „ March;
„ 3rd „ May;
„ 21st „ June;
„ 9th „ August;
„ 20th „ September;
„ 25th „ October;
„ 20th „ December.

By order of the Court.
ALEX. S. ALLAN,
Registrar.

SUPREME COURT OF NEW ZEALAND, WELLINGTON DISTRICT.

SITTINGS UNDER "THE DIVORCE AND MATRIMONIAL CAUSES ACT, 1867."

NOTICE is hereby given, that Sittings of the Supreme Court for the Wellington District of New Zealand, for the despatch of business accruing under "The Divorce and Matrimonial Causes Act, 1867," will be holden at the Supreme Court House, Lambton Quay, Wellington, on the following days, at 10 o'clock in the forenoon, in the year 1871:—

On the 4th day of February;
„ 18th „ March;
„ 3rd „ May;
„ 21st „ June;
„ 9th „ August;
„ 20th „ September;
„ 25th „ October;
„ 20th „ December.

By order of the Court,
ALEX. S. ALLAN,
Registrar.

VICE-ADMIRALTY COURT OF NEW ZEALAND, WELLINGTON.

NOTICE is hereby given, that the Vice-Admiralty Court will sit at the Supreme Court House, Lambton Quay, Wellington, on the following days, at 10.30 a.m., in the year 1871:—

On the 4th day of February;
„ 3rd „ May;
„ 9th „ August;
„ 25th „ October;
„ 20th „ December.

By order of His Honor Mr. Justice Johnston, Deputy Judge of the Vice-Admiralty Court.

ALEX. S. ALLAN,
Deputy Registrar, Vice-Admiralty Court.

STATEMENT of the Affairs of "The All Nations Gold Mining Company, Registered," for the half-year ended 30th November, 1870, in accordance with section 13 of "The Mining Companies Limited Liability Act Amendment Act, 1869."

Name of Company: "All Nations Gold Mining Company, Registered."
When formed, and date of registration: 5th July, 1869; 28th July, 1869.
Where business is conducted, and name of Legal Manager: Shortland Street, Auckland; Charles Tothill.
Nominal capital: £54,000.
Amount of paid-up scrip given to shareholders: £48,600.
Number of shares in which capital is divided: 5,400.
Number of shares taken: 5,400.
Amount of calls made: Nil.
Total amount of subscribed capital paid up: Nil.
Number of shareholders at time of registration of Company: 15.
Amount of cash in hand: Nil.
Whether in operation or not: In operation.
Total amount of dividends declared: £4,860.
Number of shares unallotted: Nil.

15th December, 1870. CHARLES TOTHILL,
468 Manager.

STATEMENT of the Affairs of "The Odd Fellows Gold Mining Company, Registered," for the half-year ended 30th November, 1870, in accordance with section 13 of "The Mining Companies Limited Liability Act Amendment Act, 1869."

Name of Company: "Odd Fellows Gold Mining Company, Registered."
When formed, and date of registration: 22nd January, 1870; 26th January, 1870.
Where business is conducted, and name of Legal Manager: Shortland Street, Auckland: Charles Tothill.
Nominal capital: £3,770.
Amount of paid-up scrip given to shareholders: £2,262.
Number of shares in which capital is divided: 754.
Number of shares taken: 754.
Amount of calls made: £377.
Total amount of subscribed capital paid up: £377.
Number of shareholders at time of registration of Company: 4.
Amount of cash in hand:
Whether in operation or not: In operation.
Total amount of dividends declared: Nil.
Number of shares unallotted: Nil.

15th December, 1870. CHARLES TOTHILL,
469 Manager.

STATEMENT of the Affairs of "The Caledonian Gold Mining Company, Registered," for the half-year ended 30th November, 1870, in accordance with section 13 of "The Mining Companies Limited Liability Act Amendment Act, 1869."

Name of Company: "Caledonian Gold Mining Company, Registered."
When formed, and date of registration: 5th August, 1868; 14th October, 1868.
Where business is conducted, and name of Legal Manager: Shortland Street, Auckland; Charles Tothill.
Nominal capital: £30,960.
Amount of paid-up scrip given to shareholders: £28,380.
Number of shares in which capital is divided: 2,580.
Number of shares taken: 2,580.
Amount of calls made: £5,857.
Total amount of subscribed capital paid up: £5,781.
Number of shareholders at time of registration of Company: 15.
Amount of cash in hand: £1,808 11s. 9d.
Whether in operation or not: In operation.
Total amount of dividends declared:
Number of shares unallotted: Nil.

15th December, 1870. CHARLES TOTHILL,
470 Manager.

STATEMENT of the Affairs of "The Kuranui Gold Mining Company, Registered," for the half-year ended 30th November, 1870, in accordance with section 13 of "The Mining Companies Limited Liability Act Amendment Act, 1869."

Name of Company: "Kuranui Gold Mining Company, Registered."
When formed, and date of registration: 4th January, 1868; 5th August, 1868.
Where business is conducted, and name of Legal Manager: Shortland Street, Auckland; Charles Tothill.
Nominal capital: £127,000.
Amount of paid-up scrip given to shareholders: £101,600.
Number of shares in which capital is divided: 12,700.
Number of shares taken: 12,700.
Amount of calls made: Nil.
Total amount of subscribed capital paid up: Nil.
Number of shareholders at time of registration of Company: 11.
Amount of cash in hand: £950 15s. 3d.
Whether in operation or not: In operation.
Total amount of dividends declared: £11,747 10s.
Number of shares unallotted: Nil.

15th December, 1870.

CHARLES TOTHILL,
Manager.

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Official Agent's Office, Princes Street,
Dunedin, 13th December, 1870.

DISTRIBUTION Schedule of "The Blue Spur Sluicing Company, Registered," published in compliance with clause 36 of "The Mining Companies Limited Liability Act, 1865."

Liabilities.	£	s.	
W. D. Stewart (Law costs)	10	6	4
Advertising Accounts to date (approx.)... ...	12	0	0
	£22	6	4

Assets.	£	s.	d.
Cash in Bank of New Zealand, Dunedin ...	877	18	10
Unpaid Calls	2	0	0
	£879	18	10
Amount available for distribution among Shareholders*	£857	12	
Amount collected	£877	18	10

Mode of Distribution.—The amount available for distribution will be divided amongst the Shareholders in proportion to amount of capital paid up on shares held by them, and will be payable at my Office on Thursday, the 19th January, 1871.

J. AITKEN CONNELL,
Official Agent.

*This amount is liable to some small diminution for charge for Official Audit, advertising, or unforeseen contingencies. When finally adjusted, it will probably be equal to about 6s. in the pound of paid-up capital (£2,840), or £852.

PARTICULARS of the Estates of Deceased Persons which have been placed under the charge of HAROLD HENRY DE BOURBEL, Esq., Curator of the Estates of Deceased Persons, during the Month of November, 1870.

No.	Name of Deceased.	Colonial Residence.	Supposed British or Foreign Residence.	Date of Rule or Order.	Value or Estimated Value of Personal Estate.	Time of Deceased's Death.	Remarks.
...	John Brown ...	Glentanner Run, McKenzie County	Inverness-shire, Scotland	25th Nov., 1870 ...	About £100	Between the 24th August and 4th September, 1870	Deceased was found dead on Glentanner Run, and as there was no evidence to show how he came by his death, the jury returned a verdict of "Died from natural causes." The matter was reported to me on 1st Nov.
...	George White ...	Temuka ...	...	None applied for ...	Under £50	11th September, 1870	The deceased owned one or two horses of very little value, and about £5 in cash. I have ordered the horses to be sold, but have not heard yet what they realized.
...	James Holding ...	Wold's Station, McKenzie County	...	Have not applied for an order yet, as I have not ascertained value.	Probably under £50	13th August, 1870	Deceased died from injuries received from a fall from a horse. I have made inquiries as to the value of the estate, but have not as yet received an answer. From what the police stated, I expect the estate will realize about £40.

Dated the 10th day of December, 1870.

H. H. DE BOURBEL,
Curator.

PARTICULARS of the Estates of Deceased Persons which have been placed under the charge of JOHN T. TYLEE, Esq., Curator of the Estates of Deceased Persons, during the Month of November, 1870.

No.	Name of Deceased.	Colonial Residence.	Supposed British or Foreign Residence.	Date of Rule or Order.	Value or Estimated Value of Personal Estate.	Time of Deceased's Death.	Remarks.
...	Nil.	...	...	...	...	...	...

Dated at Napier, the 16th day of December, 1870.

J. T. TYLEE,
Curator.

ABSTRACT of Meteorological Observations, New Zealand, for the Month of November, 1870.

Stations.	Barometer. Corrected and Reduced to Sea Level.		Temperature from Self-Registering Instruments, Read in Morning for Twenty-four Hours previously.					Computed from Observations.		Rain.		Wind.		Cloud.
	Mean Reading	Extr'me Range.	Mean Temp. in Shade.	Mean Daily Range of Temp.	Extr'me Range of Temp.	Max. Temp. in Sun's Rays.	Min. Temp. on Grass.	Mean Elastic Force of Vapour.	Mean Deg. of Moist. (Saturation =100.)	Total Fall in Month (inches)	No. of Days on which Rain fell.	Average Daily Force in Miles for Month.	Maximum Velocity in Miles in any 24 hours, and Date.	Mean Amount for Month (0 to 10).
Mongonui	29·973	1·247	64·2	14·7	31·0	153·0	43·0	·388	64	7·070	16	154	423, 22d	7·7
Same month previous 5 years	29·904	...	60·8	...	...	...	...	·428	74	4·266	10			
Auckland	30·021	·609	62·8	13·5	28·3	161·0	30·8	·459	80	4·184	12	306	483, 1st	6·1
Same month previous 6 years	29·830	...	61·7	...	...	...	...	·404	73	3·211	14			
Taranaki	29·979	·658	59·9	16·8	36·0	151·0	25·0	·403	79	4·030	10	...	...	6·9
Same month previous 6 years	29·848	...	59·2	...	...	...	...	·414	74	3·743	14			
Napier	29·940	·915	63·7	18·4	41·0	142·0	37·0	·470	80	2·730	12	231	421, 4th	2·0
Same month previous 3 years	29·918	...	60·9	...	...	...	...	·380	71	1·496	3			
Wellington ...	29·795	·881	58·9	11·7	34·0	128·0	34·0	·378	76	3·310	8	231	465, 22d	4·4
Same month previous 6 years	29·782	...	57·3	...	...	...	...	·338	69	3·673	12			
Nelson	29·918	·753	60·3	23·9	37·0	148·0	32·0	·407	78	1·220	2	208	482, 20th	6·1
Same month previous 6 years	29·792	...	57·9	...	...	...	...	·403	74	5·763	8			
Christchurch ...	29·839	·977	59·8	19·1	47·3	152·7	22·1	·379	74	·755	7	160	323, 27th	5·1
Same month previous 6 years	29·713	...	57·1	...	...	...	...	·341	69	2·130	10			
Bealey	29·701	·660	52·9	17·3	37·2	146·5	15·0	·322	81	7·933	14	217	750, 7th	5·8
Same month previous 2 years	29·702	...	50·5	...	...	...	...	·314	77	5·597	18			
Hokitika	29·956	·799	56·1	10·7	27·3	92·8	35·3	·362	86	9·530	15	184	400, 24th	5·0
Same month previous 4 years	29·810	...	54·1	...	...	...	...	·388	88	10·192	19			
Dunedin	29·804	·967	55·2	17·2	42·0	153·0	18·0	·328	75	1·495	11	153	340, 18th	5·0
Same month previous 6 years	29·844	...	52·8	...	...	...	...	·283	70	2·866	18			
Southland	29·785	1·155	55·4	20·9	45·0	166·0	26·0	·312	71	3·240	11	186	590, 24th	4·5
Same month previous 5 years	29·645	...	52·4	...	...	...	...	·281	70	5·156	16			

Altitude above sea, 2,104 feet.

Notes.

Mongonui.—Early part of month fine, dry, and warm; but from the 10th the rain was frequent. Strong wind on 21st from N.E., with heavy rain at night; westerly gale on 25th from S.E., and heavy rain and thunder; thunder also on 12th, 23rd, and 24th; fogs on 9th and 10th; winds moderate, prevailing from S.E. and S.W.

Auckland.—Weather dry and hot during first half of month, and at times oppressive: during the remainder it was cooler and dull, with frequent rain. Strong winds on 3rd and 4th from S.W., on 17th from W. with rain, on 22nd from N.E. with rain, and on 25th from S.W. with heavy showers and thunder; thunder also on 24th; wind variable, but chiefly from N.E. and S.W.

Taranaki.—Tolerably fine up to 16th, the rest of month was showery generally; stormy on 24th, with thunder and rain; winds moderate, chiefly from S.W. Slight earthquake on 29th.

Napier.—Changeable weather, at times very fine, warm, and pleasant, but light rains at intervals during the month; on 30th stormy from N.W., with rain; winds usually light and prevailing from N.E. Slight earthqnake on 2nd at 1 p.m.

Wellington.—Strong N.W. wind on 3rd, with rain; stormy on 6th from N.W.; also stormy on 21st from same quarter; on 23rd, dull, wet, oppressive day, loud thunder and vivid lightning at night, with heavy shower, much cooler after. Otherwise the weather during the month was exceedingly fine, with little rain until the 29th, when there was a heavy fall, which was greatly needed. Slight earthquakes on the 10th and 19th; aurora on 19th.

Nelson.—Remarkably dry and hot weather, only two days of rain,—on the 24th, when 1·02 inch. fell, and a slight fall on 30th; stormy on 3rd from E., and on 5th from S.W.; also on 20th from N., and on 26th from N.W.; prevailing wind from N.W. Slight shocks of earthquake reported at Havelock, Picton, and Blenheim on 19th.

Christchurch.—Very fine pleasant weather during the month, at times very hot, but with occasional light showers; stormy from N.W. on 24th, and on 26th from N.E.; winds generally light, and chiefly from S.W.

Bealey.—Wet, disagreeable, and stormy weather generally; stormy on 5th and 6th from N.W., and on 20th, 21st, and 22nd from same quarter; very heavy rain recorded on 8th, 23rd, and 24th; thunder on 23rd, and snow fell on 18th and 30th. Twenty-six days of N.W. wind.

Hokitika.—Heavy squalls on 4th from N., with rain and thunder; squalls of rain on 8th from S.W.; strong westerly wind on 24th, with showers of rain; heavy thunder with rain on 25th, wind S.W.; fog on 1st, 14th, and 23rd; on the whole the weather was dull and changeable, with frequent rain, though there were some very pleasant days. Prevailing wind from S.W.

Dunedin.—Very fine weather, and warm, with pleasant showers occasionally; light winds principally from W.

Southland.—Remarkably fine, bright, and clear weather throughout month, with pleasant showers at night; sun at times very hot; short but strong gale on 24th from N.W.; thunder on 23rd and 27th, and very heavy on 30th; winds prevailed from S.E., W., and N.W. Aurora on 23rd and 26th; meteor on 20th.

General Remarks.

Generally fine during the month, with the exception of a storm with electrical disturbance that traversed the whole length of the Islands from N. to S. on 23rd and 24th. Temperature considerably over the average for same month in previous years; Rainfall only slightly in excess in the North, but deficient in the South, except at Nelson, where there was a long continued drought with close dull weather, broken only by one day's heavy rainfall on 24th.

James Hector, Inspector.

Printed under the authority of the New Zealand Government, by George Didsbury, Government Printer, Wellington.

PROGRESS REPORT OF THE FLAX COMMISSIONERS.

Dr. Hector to the Hon. the Colonial Secretary.

Sir,— Wellington, 20th December, 1870.

I have the honor to forward to you, for the information of His Excellency, a Progress Report of the Flax Commissioners, with enclosed papers.

I have, &c.,
James Hector,
Chairman.

The Hon. the Colonial Secretary, Wellington.

Progress Report of the Flax Commissioners appointed in accordance with the Resolution of the House of Representatives.

The Commissioners met at Wellington on the 17th November, 1870, and took at once into consideration the appointment of Agents in England. They found it difficult to select competent persons who could be invited to undertake the various duties with only such moderate remuneration as the Commissioners could offer; but they decided, with the consent of the Government, on making use of the services of Mr. John Knowles, the Secretary to the Colonial Commissioners, as it was understood that he would remain for some time in England, and his previous acquaintance with the flax question renders him specially qualified for the office. They have also invited other persons to assist in making inquiries.

As a great proportion of the mills had been closed in consequence of the fall in the price of flax, the Commissioners did not think that the advantage to be gained by visiting all the districts where flax had been manufactured would be commensurate with the expense that would be incurred by so much travelling, and therefore resolved to confine these visits to such places as appeared to call for observation and inquiry. And their attention having been specially directed to the preparation of flax by the Natives by a very favourable report, copy of which is annexed, from the London brokers, Messrs. White, Rennie, and Co., as to the value of a specimen of Otaki flax sent to them by the Hon. Mr. Sewell, Colonel Haultain visited Otaki for the purpose of ascertaining the expenditure of time, labour, and raw material incurred in its production. His report is appended, which tends to show that notwithstanding the high price offered in England, it is doubtful if the Native process can be profitably employed by Europeans; but it clearly indicates that the fibre of properly selected leaves of the common varieties of the flax plant has a high intrinsic value, without the employment of any elaborate chemical or mechanical process in its preparation.

The Commissioners were subsequently favoured with the translation of a circular letter addressed to the Natives by the Honorable the Native Minister (copy attached), recommending them to turn their attention to the cultivation and preparation of flax for the English market, and offering rewards for the best samples; one of the first results of which was, that the Natives at Waikanae, under the direction of Wi Tako, have agreed to supply the Commissioners with half a ton of their best flax for transmission to England.

As bearing on this part of the subject, the Commissioners attach an extract, which has been furnished by a correspondent, from a letter received from a large manufacturing firm in England, which they consider contains a great deal of accurate and very valuable information with reference to the capabilities of the fibre, and the best mode of preparing it for the English market, as they believe it will be read with much interest by all connected with the flax industry. They propose to forward a quantity of the best Native-dressed flax to this firm, for experiment and valuation. The Commissioners have also made arrangements for sending to England, to be placed in the hands of manufacturers and machine makers, samples of one ton each of fibres prepared by the following processes:—

1. Maori-dressed.
2. Machine-dressed (from five different manufacturers), by simple stripping and washing and drying in the sun.
3. Machine-dressed, by rolling or other process, followed by retting or steaming, and chemical bleaching.
4. Chemical process, founded on experiments made in the Laboratory.

Full particulars as to the variety of the plant and mode of dressing have been required in every instance.

Steps are being taken to secure chemical analysis and microscopic examination of the fibre in England; and Dr. Hooker has been requested to select a competent person to conduct the same, and to furnish fresh flax leaves from the Gardens at Kew for the purpose.

Information with reference to the cultivation and mode of dressing the Manilla hemp has been sought from various authorities in England, India, and Manilla, and from the Spanish Government; and samples of all the fibres that can compete with New Zealand flax have been ordered from England for the information of our flax-dressers.

Experiments have been instituted to test the comparative strength and durability of flax rope, and its resistance to the action of sea-water.

A piece of ground has been set apart in the Botanic Garden of Wellington for the cultivation of flax, chiefly with the view of determining whether the varieties of the plant can be raised from seed,

still preserving their distinctive characters, or whether they revert to a common form. Seeds of several varieties have been sown, and plants of *Tihore* and other valuable varieties have been ordered from Taranaki and Wanganui.

The Commissioners attach an extract of a letter from Mr. Rees, of Rangitikei, stating the result of his observations on the growth of flax on land which was burnt nearly five years ago, and particularly invite the attention of manufacturers and other interested parties to this subject, which is one of considerable importance, regarding which further investigation is very desirable. They also append a lecture by Captain F. W. Hutton, which is a valuable *résumé* of one branch of the inquiry, that has not yet appeared amongst any papers published in connection with the subject under the authority of Government.

Lastly, the Commissioners feeling convinced that the only mode of enforcing practical attention to any results that may be obtained by their investigations must be by the exhibition of illustrative samples, have urged upon the Government the importance of organizing an exhibition, such as is recommended in the Report of the Flax Commission Committee, to be held in Wellington during the next Session of the Assembly.

JAMES HECTOR,
Chairman.

Wellington, 26th December, 1870.

APPENDIX.

No. 1.

WHITE, RENNIE, and Co., to the Hon. Mr. SEWELL.

DEAR SIR,— London, 2nd September, 1870.

We have before us your esteemed favour of the 14th June, which we have read with much interest.

The sample of flax which you enclose is of a fibre very different to that of which such large quantities have come to our market, and appears to be capable of being dressed to a remarkable degree of fineness without impairing its strength, which is intrinsically very great. We value it at £65 to £70 per ton, and think we are below the mark in doing so; and that if a moderate supply was offered in our market, and it was well and judiciously manipulated so far as the selling is concerned, it would meet a steady demand at a price above that which we put upon it,—of course for manufacturing purposes. We have just sold two parcels of Algerian flax (which is a new article in our market), the quality of which is very much inferior to yours, at £46 per ton.

We do not advise you to send a very large parcel at first; but if you wish to try the market here, please to avoid sending a small lot, as it would not attract much attention, and country manufacturers would not take the trouble to come and look at it. If you can ship from 25 to 50 tons, we anticipate the best results. Will you also kindly take note that it is highly desirable to sort the flax well, and throw out any inferior, which could be packed separately, and marked with a different mark; and also, that if you will put one mark upon flax of one quality, and maintain the quality of the mark in any subsequent shipment, we should be able to sell with greater facility and increasing value any marks for which we might succeed in establishing a reputation. These are minor points, but we think you will see their importance.

The common brown flax which has hitherto been sent here is coming in in large quantities. The well-cleaned descriptions have found a good market at £28 to £32 a ton; but for the common half-dressed sorts, which are nominally worth £10 to £22, it is difficult to find buyers.

We are, &c.,
WHITE, RENNIE, AND Co.

Henry Sewell, Esq., Wellington, N.Z.

No. 2.

MEMORANDUM by Colonel HAULTAIN on Flax prepared by the Natives at Otaki.

THERE are but two varieties of flax growing on the flat land about Otaki, Manawatu, &c., called by the Natives *Harakeke* and *Whaririki*. The latter is apparently a variety of *Phormium Colensoi*, found on the sand hills near the beach, growing from six to eight feet high, with a palish green leaf, and edges of the same colour, and small flowers with yellowish-green sepals, but as it was not in fruit I could not determine whether the capsules were "twisted" or "drooping." It is not common (I had to walk more than a mile before my guide could show me a plant), and it is rarely cut by the Natives, who say that the fibre is weak and useless. An examination with the microscope proved that the quantity of fibre was very small in comparison with other varieties. The *Harakeke* is abundant, and the leaves are often twelve and thirteen feet long. It grows luxuriantly on any dry ground round the edges of swamps, or when away from stagnant moisture. It is subdivided by the Natives into *Tuhora* and *Tukura*, according to the length of the leaf, the former being the longer; but I could not perceive any difference between the fibres either in strength or in colour. It cannot be stripped without the aid of a shell, in which it differs from the *Tihore*.

There are no Native plantations of flax in this district; the choice leaves of the *Harakeke* are fine and white enough even for their best mats; and any *Tihore* that is wanted for special purposes is brought from the upper part of the Wanganui River or from Kawhia.

In preparing flax for the finer purposes, the Natives select clean unspotted leaves of a year's or eighteen months' growth, and use the upper portion only, cutting off the leaf about six inches below the point where the two blades adhere together, and rejecting the coloured edges and keel also. They strip the fibre from the upper surface only (that surface which is inside when the two blades are together), cutting the under side across, and then, with the round edge of a mussel-shell, tear up the whole row of upper fibres, bringing away the cuticle also, which has to be removed afterwards.

I asked the woman, Annie Kanara, who was working for me, to strip the other side of some of the leaves; she laughed at such an idea, but tried, and after failing several times succeeded with about a dozen leaves, andthen objected to waste time on any more. This under fibre is not as abundant as the other, but extends the whole length of the leaf from the butt to the point; it is equally fine and strong, and there was apparently no difference in the ultimate fibres when microscopically examined, but it is too green in colour to mix with the other, as it is difficult to separate it from the cuticle and surrounding cellular tissue. The breaking strain of the only strands I could prepare was 198 lbs.*

After stripping the fibre of the upper (or right) side, it was well scraped with the edge of the shell to remove as much of the cuticle as possible; and when a small hank of a dozen or twenty leaves had been finished, it was thrown into a tub of water to be kept moist until a sufficient quantity was ready to be taken down to a running stream, where it was washed and scraped with the shell over and over again till all the cuticle, gum, &c., had been removed, when it was hung up to dry, and afterwards worked and twisted with the hand. It took Annie Kanara the greater part of two days to gather leaves and prepare four or five pounds weight, and she would not part with it for less than 1s. per lb.

It was very white and soft and bright, for the leaves had been carefully selected, and the breaking strain was from 210 lbs. to 275 lbs. But what an amount of hand-labour is necessary to produce a ton of this fine quality, and what a waste of fibre! At least one-half the leaf is discarded, and the fibre from one side of the other half is rejected, so that the Maori obtains from each leaf only one-fourth the quantity that would be secured in machine-dressing; and as he would not select more than one in four of the leaves of any full-grown bush, the European mill-owner, who cuts down the whole plant, could in the first year produce sixteen tons of his fibre from the same ground that would give only one ton of fine Native-dressed flax.

In preparing flax for their mats, the Natives take much more time and trouble than has just been described: they soak the fibre in running water for four days, and then beat it with a stone or mallet; and this process is repeated over and over again for four or five weeks, or even for much longer periods. But I have no doubt that this excessive manipulation weakens the fibre, though it makes it very soft and durable.

I dare say that a few tons of the ordinary washed fibre could be procured from the Natives for less than 1s. per lb., but not at Otaki. The Commissioners endeavoured to procure one ton through Mr. Bevan, an old settler and rope-spinner at that place, but he said he could not get it for less than 1s. per lb.; and the Rev. Mr. McWilliam, who kindly assisted me in securing the services of Annie Kanara, said that he had first applied to the Native woman who had lately prepared some for Bishop Hadfield, which was sent to England by Mr. Sewell; but she had refused to work at any more, as she considered she had been insufficiently paid for what she had done. I believe she got 4d. per lb. for it. Annie Kanara got 5s. from me for her two days' work, and would have earned as much if she had been stripping flax for the rope-spinners. These pay 1½d. per lb. (£14 a ton) for fibre that has been merely stripped and tied up into bundles. Of course the Natives take all leaves as they come for this purpose, but they only use the upper portion, as they cannot strip the butts, and the spinners object to longer lengths than 3½ or 4 feet as being unmanageable. I got a sample from Mr. Dodds at Otaki, which he had prepared for rope-making by hand-hackling it, the labour and loss of weight bringing the cost up to £25 a ton (the breaking strain was 188 lbs.). He had sent five or six tons to England, and it sold there at £25 a ton, leaving him to bear the cost of transport to Wellington, £6 a ton, and thence to England, £8 or £9 a ton more.

Mr. Bevan is not making rope at present, as the Natives are demanding 2d. instead of 1½d. a lb. for the flax.

Wellington, 6th December, 1870. T. M. HAULTAIN.

SAMPLES accompanying this Report.

1. *Harakeke* (Tuhora) fibre, washed.
2. *Harakeke* (Tukura) fibre, washed.
3. *Harakeke* fibre, unwashed.
4. *Harakeke* stripped for rope-spinners.
5. *Harakeke* stripped, hackled.
6. *Harakeke* leaves stripped on both sides, showing difference of colour.

No. 3.

CIRCULAR addressed to NATIVES by the NATIVE MINISTER.

To ————. Wellington, 26th September, 1870.

Friend, Salutations to you. The time has now come when the cry of the *rirориro* is heard; I therefore consider it right to give you a few words of advice, lest the *rirориro* should cry in vain.

Pleiades is high in the heavens, the warm season has arrived, and the thoughtful man thinks it is time to cultivate food to enable him to live, and also to extend hospitality to strangers, lest he be in the same case as the thoughtless one who, when the season of the scarcity of food comes round, is in a very helpless condition. In former days all descriptions of food used by the Maoris, such as the kumara, taro, and other things, were largely cultivated; at present the cultivation of these articles of food has decreased. I therefore consider that you ought again to turn your attention to their cultivation lest they disappear altogether, and that the word of the proverb ought to be fulfilled which says, "The fame of a man brave in war is uncertain; but the fame of a man diligent or brave in tilling the ground will always last."

Another work which you are able to do is the preparation of flax. Formerly that was a great

* The breaking strain here given was obtained in the manner described in the experiments performed by Dr. Hector, the results of which were given in the Report of the Flax Commission, 1870.

industry among you, but now it does not exist, and you have allowed the flax to be burnt and to rot, without considering what a source of wealth this plant which is growing is. You know that the Europeans send flax to England to be sold, but owing to the bad quality it commands but a small price. Dr. Featherston has visited the principal towns of England and Scotland where they use flax and other such articles. He took with him some machine-dressed flax, but that did not find much favour. He also took a sample of Maori-dressed flax, which, though not dressed as well as it might have been, excited the admiration of the Europeans on account of its good quality and softness; and they said that if all the flax from New Zealand were as good as that sample of Maori-dressed flax, it would command a high price, and would always find a ready market in England.

Now you, the Maori people, should consider this, that the flax dressed by you is the kind preferred by purchasers, and that the machine-dressed flax is not nearly so good as yours; it therefore seems to me that, if you will turn your attention again to that industry, it will benefit you very much.

You must not forget to cultivate flax, so as to insure obtaining a superior quality to the dressed article.

Now, I have decided to give a prize to the best workman in each district. It will be in this way: the person who grows the best acre of flax in his district will get £10. The person who will produce the best ton of dressed flax in his district will get £10. The way in which a decision will be arrived at as to the best-cultivated flax will be as follows: a European and two Maori chiefs, in each district, will be directed to inspect the various fields of flax, and report to the Government, so that they may know to whom they are to give the before-mentioned prize, viz., £10.

The decision as to the best-dressed flax will be arrived at as follows: the flax will be sent to England, and there sold. The person who has dressed the ton which commands the highest price will receive the money before mentioned, viz., £10.

By and by you will be told the districts in which prizes will be given.

In addition to the above, the Government will give to the person who cultivates the best acre of flax, over all the districts, £50; and to the person who produces the best ton of dressed flax over all the districts, £50.

The above sums of money are only prizes, and are given with a view to ascertaining who can produce the best article. The people must not think that these amounts are the prices which the flax will bring. This matter is arranged in the same way as cattle shows, &c., are arranged, where the Europeans and Maoris send their beasts, &c., to every year.

I know that you, the Maoris, are ignorant of the prices of flax, &c., in England; therefore I think that, if you will again turn your attention to these industries, you will obtain the benefit of prosperity. That is all.

Your friend,
DONALD MCLEAN.

No. 4.

EXTRACT from a LETTER addressed by a large Lancashire and Yorkshire Manufacturer to Major J. A. GRAY, Kaiapoi, dated 16th September, 1870.

I will now give you the result of our numerous experiments, and all the information I can gather.

You are aware we have spent a considerable amount of money in trying to work up the New Zealand flax, and I may at once state that the only lots we have been able to do anything with advantageously are the Native-dressed, and even in those some are much better than others—that is, in the openness of the fibre. In all the Colonial-dressed, even after sorting and cutting and trimming, there is so much left that will resist any bleaching action that does not destroy the fibre, that we can make nothing of it, and it is perfectly clear to me you must do the cleaning part at once in its green state. Whatever means you find for smashing up the leaves and getting rid of the coating, do it if possible in water, but certainly never let it get anything like dry before it is clean. (Would not a common Irish wheel suit well for washing after smashing it up?) If you once let it get dry, no amount of bleaching, scutching, and hackling does it any good, except just to break off the tips and shake out the dust.

You are no doubt aware that the fibre, as it is usually called, is in reality a bundle of very fine fibres, enclosed in a casing. Now this casing must be well broken up, so that the water can get in and clear out the gum, and open the fine fibres; it is only in that state we can make use of it for fine work. You will probably find warm water clean it better than cold, but beware of having it too hot or boiling, for in all the samples that I have seen boiled there is a quantity of the gum or some other impurity, especially at the bottom ends, which is converted into an almost insoluble substance, and resists all the tests I have applied for gum, and cannot well be got rid of. You will notice this in the hard feel and discoloured appearance of the ends of boiled flax.

When you take a bundle of fibres and break it, they ought as it were to draw out, not break short off. If you will take a thread out of a piece of good linen, and take the twist out of it, you can easily draw it asunder. This is exactly what we want in the long fibres, as they are usually called.

With regard to colour, the real fibre is a good white; get it as near that as possible—any shade of brown is a sign of impurity. What bits of scull there may be left on after well dressing and washing, ought to be quite loose; and we would rather see them a green than a yellow colour,—not brown. If you find it requisite to submit it to a retting process, the colour will not of course be so good, but we can easily get that. When you have got it into the state I mention, I should not advise you to scutch or hackle it, for you will lose a great deal of the finest and best fibre; and with wages at one-third of yours, and all the advantages of machinery, we can do that a great deal cheaper than you can.

Don't be led away with the notion that you scutch and cord your flax up like you can the English, unless you get rid of the impurities in the first stage.

I have now told you pretty well what we want for spinning purposes. Now, as to price, if you can get it to the state I recommend, you may safely reckon on as much as the best Irish flax when fit for carding; but my own opinion is that it will ultimately range much higher, on account of

its finer quality. The Native-dressed has been in such uncertain supply, it never fetched anything like what it would if sent in large and regular quantity.

With regard to rope-making, I have to depend on information from others, which I have been at a good deal of trouble to get from the best sources, and the result is, that rope made from fairly good flax will bear as great a strain as any other, and it appears to be wearing well for a time; it then goes all to pieces almost at once, like as if cut up. Whenever a thread gives in a strand, it appears to cut the others right off; and, from microscopic examination of old rope, it appears to be worn more from the casing round the small fibres giving way and cutting the fibres short off than from any other cause; and in salt water this casing seems to dissolve in time, and leave the fibres loose, and the rope, as you may say, rotten. In rope made from flax of the very best quality, in which this casing has been well broken up, the spinning of the yarns, if they are done fine enough, twists the small fibres hard up together, and it then makes a very pliable, strong, and lasting rope; and it is only this kind that will ultimately fetch a price worth troubling about.

Many of the hard-rope makers like the casing unbroken, as it hackles and works easier for them, if perfectly clean from scull, but then they want to buy at a low price.

What ever will be done with the brown hard rubbish you Canterbury people in particular are sending in such profusion, I can't think; the paper-makers say it is not near as good as Esparto grass at £8 per ton.

I should not advise you to send any of the ordinary kinds, unless you can afford to sell a fair quality at from £20 to £25 per ton, and wait your market. Let me strongly advise you to stick to the best qualities, especially that for spinning purposes, if you can manage it; the sale for that will be unlimited. Don't touch the rubbish, either to manufacture or send home; it is a great drug in the market, and will be lower, unless some new use can be found for it.

No. 5.

Extract from a Letter of Mr. J. R. Rees, of Rangitikei, dated 29th November, 1870.

From close observation of this land (clean burnt four years ago last February), I find that each fan has produced two leaves each year, as under:—

Length—First year's growth, 5 ft. 6 in.; leaf now 54 months old.
„ Second year's growth, 5 ft. 9 in.; leaf now 42 months old.
„ Third year's growth, 6 ft.; leaf now 30 months old.
„ Fourth year's growth, 6 ft. 6 in.; leaf now 18 months old.

So that the leaf of only eighteen months old has the advantage over the four-year old leaf. These measurements were taken from the fan as pulled out of the ground, and cut at such distance from the root as would be required for manufacture. The outside leaf on each stem (or four-year old) was very much spotted, and unfit for manufacture. The three-year old was also spotted, and exhibited signs of decay; but the two-year old was a fine strong leaf without blemish, and the sort of leaf we have found it the easiest to prepare. The eighteen-months leaf was hardly fit to work, the fibre being hardly firm enough. In my opinion, the leaf at from twenty-four to thirty months old is in its best stage for manufacture, although leaves of eighteen months' growth make good soft fibre of six feet long, but not so strong.

These observations were made upon medium flax land (wet *toe-toe* flats).

No. 6.

A Lecture on the Manufacture of New Zealand Flax, delivered before the Auckland Institute, July 12, 1870, by Captain F. W. Hutton, F.G.S.

It was not until the year 1869 that New Zealand Flax began to be known in the London market; for although it had been exported to England for many years previously, it was only shipped in small quantities at a time and sold privately, so that few manufacturers knew anything about it except from report. Ever since the foundation of the Colony the value of the plant has been recognized, and many people have spent considerable sums of money in trying to produce from it a fibre that could be sold at a profit. Failure, however, followed failure, until at last, in 1867, a machine was produced which was brought so far towards a state of perfection that it reduced the time and cost of producing the fibre to such an extent that it was apparent that, where circumstances were favourable, *Phormium* fibre could be produced at a profit. I do not here mean to attempt to trace the early history of this manufacture, nor to discuss the question as to whom belongs the credit of inventing the present machine; my object is to look forwards and not backwards—to explain the system at present in use, and to point out where improvement seems most wanted.

All our knowledge is derived from observation and experiment. Observation or the noticing of occurrences, may be either the haphazard observation of things that happen to fall in our way; or it may be the scientific observation of examining closely and minutely those things that we desire to have information about. Experiment, or the noticing of effects produced by causes under our own control, may also be either the haphazard experiment of trying what will be the effect produced by any agent that happens to be easily available; or it may be the scientific experiment where the experimenter has carefully considered what is the effect he wishes to produce, and what is the agent most likely to fulfil his purpose.

In all the arts and manufactures these two methods have been followed, unconsciously perhaps, in arriving at the processes to be employed, in order to produce the best results. Haphazard observation and experiment come first. They are the means employed in the earlier stages, and by all savages and uncivilized nations. Scientific observation and experiment follow after, when civilization has trained the minds of men to inquire more curiously into cause and effect. Haphazard observation, when

extending over a long series of years, may sometimes arrive at processes of such perfection that the best scientific observation and experiment cannot improve upon them. The European flax manufacture furnishes us with a good example. The value of retting flax, or causing it to undergo fermentation, was no doubt discovered ages ago by haphazard observation. Scientific observation has shown that the original object for which flax was retted—namely, the separation of the fibres from the woody tissue—is not in reality so important as its further object of separating the ultimate fibres from one another; and, in order to avoid the delay and loss occasioned by retting, scientific experiment has invented machines to detach the fibre from the wood. But all these machines have proved failures, because science cannot discover any process equal to retting for separating ultimate fibres; all it has done is to improve on the process, and reduce the time required for the operation. On the other hand, science is sometimes able in a few years to arrive at results which would have taken centuries of haphazard observation to accomplish—as in the cotton manufacture, where the processes of carding and drawing out may be instanced as triumphs of scientific experiment; and also in the art of bleaching, where the scientific observation and experiment of a few years entirely altered the whole system. In commencing, therefore, the study of any manufacture with the view of trying to improve it, it is advisable, indeed necessary, to examine carefully the processes which have been formerly used, and try to understand the reasons for each; and, when we turn to the manufacture of New Zealand flax, we find much to guide us in the haphazard observations and experiments of the Maoris, for they produced a fibre from their best plants of a purity of colour that we cannot yet approach; neither are our machines capable of producing a material of that oiliness of feel and glossiness of appearance which is seen in their best hand-prepared *Tihore*.

The Maoris used two different processes for different kinds of flax. With the best kinds (*Tihore*), they simply tore out the fibre, rubbed it together in their hands to open the bundles, and removed the small quantity of tissue that remained by scraping it with their nails. The inferior kinds (*Haro*) they first scraped with a shell, having sometimes previously steeped it in water to soften the skin; they then soaked it in water for from two to four days, then beat it with stones while it was wet, and scraped it again; then soaked it again, and then bleached it and dried it on poles; and they then beat it with sticks to remove the remaining tissue. For this information I am indebted to Mr. Preece's paper in the *New Zealand Church Almanac*, 1848, and to Mr. J. A. Wilson, who has lately taken great trouble to ascertain from the Thames Natives their former mode of preparation. It will thus be seen that the main features of the system they employed for the commoner kinds of flax are very similar to those which we now employ; for in both the fibre is first cleaned by mechanical means from the tissue of the leaf, it is then soaked in water, dried, and beaten before being sent to market; and those mills which depart from this system, either by boiling their flax, or by only rinsing it in a stream, instead of soaking it, produce an inferior quality of fibre. We have, however, no process as yet that answers to beating on stones while wet, and I have not yet satisfied myself as to the object which was intended to be attained by this process. It might have been to break up the fibrous bundles and make them more silky, or it might have been to break up the cellular tissue that remained, so as to allow their contents to escape in the second soaking; or it might only have been to help the removal of the tissue by the second scraping. If the first was their main object, it would be worth while to try to discover a process by which we could also effect it, but in a more economical manner; but if either of the latter was the object, it would be unnecessary for us, as our machines, by one process, clean the fibre much better than both the scrapings of the Maoris.

If, however, science has not as yet improved upon the system, it has greatly improved upon some of the processes that they followed, and the speed with which the fibre is cleared from the tissue has converted an unprofitable employment into a profitable one. There is, however, still a wide field for scientific observation and experiment in the manufacture of *Phormium* fibre, and I propose to-night to lay before you such few observations and experiments as I have made, in the hope that they may be of use to others who have not the same means at their disposal for making a microscopical examination of the fibre, and also with the hope that the facts I shall describe, and the suggestions I may throw out, will give rise in time to practical applications that will improve the process of manufacture; and to this end I also hope that others will make their observations and experiments public also.

One of the most important results of a scientific investigation is to show us what we cannot do, and what, therefore, we should not attempt; and although these results are never so popular as those which show a new and improved way of doing a thing, they probably, on the whole, save as much money to those that will be guided by them as is made by the employers of the new processes. With this in view, I have divided my lecture into two parts, the first of which is more or less scientific, being an endeavour to give you as clear an idea as I can of the plant, fibre, gum, &c., with which we have to deal, and to show to you what appears possible for us to do, and what impossible; while the second part will be more practical, as in it I shall discuss the various operations through which the leaf goes before it is ready to be exported as fibre. But as I do not wish to weary you by making you listen to information that you can get from the *Interim Report on the Growth, Culture, and Manufacture of New Zealand Flax* (Auckland, 1870), and from other easily available sources, I shall avoid touching upon any point on which the information seems insufficient, unless I think that I can throw a new light on it, or that I can correct what appear to me to be errors.

Varieties of Plant.

To a New Zealand audience I shall hardly be expected to give a description of the flax plant itself, for we all know it well; and I shall therefore confine myself to a few remarks on the principal varieties, and on the internal structure of the leaf.

The flax plant is well known to be highly variable, but no attempt has as yet been made to describe these varieties in a scientific manner, and consequently great confusion exists among the names. Much of this confusion appears to me to have arisen by supposing that those varieties which were considered nearly alike by the Maoris, and for which they sometimes used indifferently the same name, are really allied from the scientific point of view, whereas the Maori system of classification was founded on one

feature alone, namely, strength of fibre. All those varieties, the fibre of which was so strong as to enable them to draw it out in long ribbons, without breaking, they called "*Tihore;*" while those inferior kinds which had to be soaked and scraped with a shell in order to get length of staple, they called "*Haro,*" and it is evident that many varieties would thus get grouped together, which, under a better arrangement would be more widely separated. Thus the *Paritanewha,* or yellow hill flax, was called a *Tihore* (*Report on Growth, Culture, and Manufacture of New Zealand Flax*, Appendix p. 13,) although it is much more nearly allied to the common swamp flax, and is very different from the *Oue,* or typical *Tihore.*

At present, the colour of the leaf, and more especially the colour of the midrib and margins of the leaf, have been taken almost exclusively as the distinguishing marks of the different varieties; but these are altogether unreliable, for not only does the colour of the margin differ in old and young leaves, but often different leaves of the same plant, and even different parts of the same leaf, have differently coloured margins. The attempt, for instance, to distinguish *Tihore* by a red or orange margin would certainly lead to many mistakes, as many of the varieties of the common swamp flax have margins identical in colour with the true *Tihore;* and it appears to me that habit of growth, shape of the leaf, size of the flower-stalk, and shape of the seed-pod, are of far more importance than colour of margin, or even colour of leaf.

There can, I think, be no doubt but that at least two distinct species of *Phormium* exist in these Islands. Dr. Hooker, in his *Handbook of the New Zealand Flora,* admits two; although at the same time he expresses an opinion that both are but races of one plant. The opinion of so distinguished a botanist must carry with it great weight, but it is quite possible that even he may have fallen into error through not having had sufficient opportunities of examining the plants in their living state, and by having had dried specimens sent to him with wrong names attached to them. Indeed it seems almost certain that such has been the case, for he describes the pod of *P. Colensoi* as similar to that of *P. tenax*, but smaller. It is of considerable importance that the existence of these two kinds of *Phormium* should be recognized; for, as will be seen, they produce fibre of very different strengths. I must leave to some person better acquainted with botany than myself the difficult task of bringing into order the numerous varieties that are found under various names in different parts of these Islands; but I will briefly describe the two species, and the four most important varieties known to me in the Waikato.

PHORMIUM TENAX, *Forst.*

Seed-pod erect or inclined, 1½ to 3 inches long, straight or curved. Leaves very strong. Flowers red.

1. *Harakeke* (Common Swamp Flax).—Leaves coarse, loose, drooping, point generally blunt. Flower-stalk large—11 to 14 feet high, and 1 to 2 inches in diameter. Pod short, erect. Grows almost everywhere, but attains its largest size (14 or 15 feet) on rich alluvial soil, by the banks of streams. Many sub-varieties are found, some with leaves dark blue-green above, and glaucous below, and some pale olive-green or bronzy. Some varieties have also the butts of the leaves coloured red for some distance up, while others are yellowish green almost to the very base. When the plant is stunted the flower-stalk is also small, and the best characteristic is the blunt point to the leaf.

2. *Paritanewha* (Yellow Hill Flax).—Leaves erect, slightly drooping at the tip, yellowish green, generally with red or orange margins, slightly glaucous below, point acute. Flower-stalk small, 4 to 8 feet high, and ½ to 1 inch in diameter. Pod short, erect. Fibre very good, soft and glossy. Plant seldom more than 5 or 6 feet in height; grows generally on clay hills. Passes into common swamp flax, but best distinguished by its nearly erect acute-pointed leaves. Probably often mistaken for *Tihore.*

3. *Tihore.*—Leaves stiff, erect, narrow, never drooping at the tip, olive-green, glaucous below, points very acute or cuspidate, pink at the butt. Flower-stalk 9 to 10 feet high, and 1 inch in diameter. Pod erect, or inclined; seldom flowers, and still more rarely seeds. Plant seldom over 6 feet in height. Grows in rich dry alluvial land, never in swampy places. I have never seen it except where planted by the Maoris. I have here applied the name to that variety called *Tihore* by the Maoris throughout the Waikato, and which is probably identical with the *Oue* and *Tapoto.* It is best distinguished by its narrow, tapering, sharp-pointed leaves, and erect, close habit. It grows so thickly together that I obtained 186 sets for planting from two bushes.

PHORMIUM COLENSOI, *Hook. f.*

Seed-pod pendulous, 3 to 7 inches long, twisted. Leaves not so strong, sometimes quite brittle. Flowers red, yellow, or greenish.

1. *Whareriki.*—Leaves erect or slightly drooping, generally rich green, not glaucous below, margins and midrib generally green or yellowish white; butt white, never red, point acute. Flower-stalk 9 to 10 feet high, and 1 inch in diameter; flowers red. Plant seldom more than 7 feet high. The best and strongest variety of *P. Colensoi.*

2. There is also a yellow-leaved variety, which has sometimes yellow flowers, with which I am not so well acquainted. Its leaves are very brittle. It grows at Coromandel, between Kapanga and the Waiau.

3. The same or perhaps another variety grows on hills or precipitous places. Its leaves are of a yellow colour, and often so brittle that a man can break a strip more than an inch in breadth with ease.

In the Province of Auckland *P. Colensoi* is rare, in comparison with the abundance of *P. tenax,* but in some parts of the South Island I am informed that the reverse is the case. The Rev. N. Codrington told me that the flax plant in Norfolk Island grows generally on the sea cliffs, and it is therefore possible that it may be *P. Colensoi,* and not *P. tenax;* which would be sufficient to account for the failure experienced in trying to produce fibre from it, for the fibres of *P. Colensoi* break off so short that the Maoris never attempt to prepare it.

In order to ascertain the relative strength of the different varieties, I took strips of one-eighth of an inch in breadth from the middle parts of young but full-grown leaves and broke them, by means of

a spring-balance, which I had previously tested, and the following are the average results of many trials made on the leaves of four different plants of each variety:—

Tihore	broke with a strain of		48 lbs.
Harakeke	„	„	42 lbs.
Paritanewha	„	„	42 lbs.
Whatariki	„	„	34 lbs.

That *Tihore* is stronger than swamp flax is contrary to the opinion of many. Major Heaphy (*Trans. N.Z. Inst.*, Vol. II. p. 116) expresses the opinion that the fibre of the *Oue* (*Tihore*) is of "so brittle a character as to require a mode of preparation in which a knife or scraping instrument may not be used;" but I conceive that the real reason for the difference in the preparation was that the fibre of the *Tihore* is so strong that the Maoris were enabled to pull it away from the tissue so completely, that scraping with a knife or shell was unnecessary. I also made some experiments on the strength of prepared fibre from the different varieties, but found that the small scale on which I was obliged to experiment gave results so discordant that they were of no value. This was probably owing to the difficulty of dividing the strain equally among the different fibres; and useful results can be only obtained by twisting the different varieties up into rope, and then breaking them.

It appears to me, therefore, that *Tihore* is the most valuable variety for all purposes; but the kinds that should be cultivated would depend upon the nature of the soil; for swamp flax of excellent quality could be grown in places where the superior *Tihore* could hardly live. But all the varieties of *P. Colensoi* should be carefully avoided, or, if manufactured into fibre, should not be sent into the market under the same name as fibre from *P. tenax*, or the latter will fall in the estimation of the public, from the inferior strength of the former.

The leaves of the different varieties of New Zealand flax vary from 3 feet to 14 feet in length, and from ½ inch to 5 inches in breadth, in the widest part of the leaf. They appear to grow all the year round, but more rapidly in spring and in summer than in autumn and winter. Swamp flax, that had all the outer leaves taken off in the end of January, had so many young leaves full grown by the end of April that the casual observer would not have known that the plants had been cut at all. The stumps of the leaves that are left on the plant still continue to grow also, but the younger leaves grow quicker than the older ones. Of four leaves cut down in the end of April, the outer one had grown 2 inches by the end of June; the next one to it, on the opposite side, had grown 3 inches, the next 6 inches, and the inside leaf 17½ inches. On those sets of the plant that do not flower, the leaves last probably three or four years and then decay, new ones taking their place; but when a set produces a flower-stalk, the set itself, and all the leaves upon it, die down the following spring.

DESCRIPTION OF FIBRE.

Throughout the whole of the leaf, bundles of fibres are found lying parallel to the midrib. These fibrous bundles are composed of numerous elongated cells, called the ultimate fibres, which lie parallel to one another in the direction of the length of the bundles. These cells are not joined together end to end, but are quite distinct from one another. They are in the form of long, hollow cylinders, gradually tapering towards each end, which is pointed and closed in by the cell wall; they do not vary much in thickness in the different varieties, or in different parts of the same leaf, being from 1-2,500th of an inch to 1-1,500th of an inch in diameter, and from 1-8th to 4-5th of an inch in length; the average length being about 3-8ths of an inch. They lie closely packed side by side, with the ends overlapping each other, and adhere together by means of a kind of gum or cement, which will be more fully mentioned presently. (For further particulars, see *Trans. N.Z. Inst.*, Vol. II. pp. 109 and 111.)

The fibrous bundles differ considerably in size, both in different varieties and in different parts of the same leaf. They are in the form of more or less flattened ribbons, varying from 1-250th of an inch to 1-16th of an inch in breadth, and from 1-250th of an inch to 1-100th of an inch in thickness. The number of bundles in a strip of leaf an inch broad varies from 40 in the coarsest varieties to 66 in the finest, which will give from 150 to 250 bundles in the whole breadth of the leaf. In the upper and narrower parts of the leaf the bundles are nearly together, so that there are nearly as many bundles there as in the broader parts. Besides these ribbons, there are also in the central parts of the leaf about an equal number of small, nearly cylindrical bundles, about 1-350th of an inch in diameter, so that the whole number of fibrous bundles in the central parts of the leaf is from 300 to 500. The fibrous bundles are pure white until the leaves get old, when they turn brown, especially near the butt, or get spotted with brown all over the leaf.

GUMMY PRODUCTS.

I will now pass on to the consideration of the gummy and mucilaginous products that are found in the leaf, and which are generally considered as the chief cause of all our misfortunes in endeavouring to produce a hign quality of fibre. What is ordinarily spoken of as the "gum," is, in reality, at least three different products, viz.:—1. The gum on the outside of the lower parts of the leaf. 2. The bitter principle and mucilage contained in the cells of the leaf, and which, no doubt, is a mixture of several different substances, but which I shall treat as one here. 3. The cement that binds the ultimate fibres together into bundles. And as I go on I shall show that these three substances differ essentially in their chemical properties, and must be carefully distinguished from one another when considering the best processes to be employed in preparing the fibre.

GUM.

Taking first, then, the gum, which is found only on the outside of the inner surfaces of the lower parts of the leaves, we find it to be colourless or pale yellow when pure, semi-solid and viscous. It softens and swells up slightly in cold water, but does not dissolve; soaking in water for an hour or two and exposure to rain for three weeks does not affect it. It dissolves easily in boiling water, and in acids, but not in alkalies. It will not dissolve in alcohol, but neither will alcohol precipitate it from

solution, although, on the addition of large quantities, it turns the solution milky white. It is precipitated by basic acetate of lead, chloride of tin, and by nitrate of mercury, but is not affected by neutral acetate of lead. These reactions show that it is unlike any gum or mucilage hitherto known, but that it has properties intermediate to both. As it occurs only on the outside of the leaves it is easily removed by mechanical means, and does not give the slightest trouble in the present method of preparing the fibre.

BITTER PRINCIPLE AND MUCILAGE.

These are contained in the cells of the leaf, along with chlorophyll, &c. It is well known that all parts of the flax leaf have an intensely bitter taste; and when a bruised leave or broken tissue, knocked off by the machine, is placed in water, this bitter principle is dissolved out, leaving little in the cells but chlorophyll, or the green colouring matter. The solution is brown and turbid, but when filtered is of a deep claret colour, and with a slight acid reaction. On evaporation it yields a thick reddish-brown sticky gum, of bitter taste, and readily soluble in cold water. That this solution contains little or no gum, similar to that found outside the leaf, is shown by its chemical reactions; for no change takes place on the addition of alcohol, neither does any precipitate fall when nitrate of mercury is added, but the solution is rendered turbid. On the addition of neutral acetate of lead, a large brown precipitate is formed, leaving the solution clear and almost colourless. It is also precipitated by chloride of tin, while the solution is left clear and golden yellow; and also by basic acetate of lead. No change takes place on the addition of alkalies, but acids turn it yellow and slightly turbid. It is coloured black by oxide or chloride of iron, owing perhaps to its containing some tannin. These reactions show that this mucilage is essentially different from the gum. In its original state in the cells of the plant it is colourless, but on exposure to water or moisture it rapidly turns reddish-brown, and stains the fibre; it can, however, be entirely removed by soaking the fibre in running water for three or four hours. It must not be confounded with the red colouring matter found in the butts of some leaves, for the two are quite different, as I shall point out when discussing the advantages of soaking flax. The bitter principle might perhaps be used as a dye or stain for wood, for on allowing a strong solution to stand for some days, a brown insoluble substance falls to the bottom much in the same manner as indigo; and if it should prove of any value at all, the cheap rate at which it could be prepared at or near the mills ought to secure it an extensive sale.

CEMENT.

The ultimate fibres are held together by a cement which is quite different from either of the foregoing. It is insoluble in cold water and acids, but dissolves slowly in boiling water, and more quickly in alkalies. Pure soaked fibre, when boiled for three hours in water, yields a perfectly clear pale yellow fluid, with an acid reaction but no bitter taste, and which on evaporation leaves a brownish gummy substance, which is insoluble in alcohol or acids, but dissolves readily in alkalies or cold water. This solution undergoes no change on the addition of alcohol, or of basic acetate of lead, acetate of lead, nitrate of mercury, chloride of zinc, or perchloride of iron. On the addition of chloride of tin, a pale yellow precipitate is formed, and the solution is left perfectly clear and colourless. Alkalies darken the tint of the solution, but acids bleach it.

It is therefore evident that this cement differs entirely from either the gum or the mucilage, but these differences will probably be made clearer to you if I bring together the effects produced by some of the re-agents.

Alcohol has no effect on the mucilage, or the cement, but turns a solution of gum white.

Acids dissolve the gum, and turn the mucilage yellow. They do not dissolve the cement, but bleach it.

Alkalies have no effect on the gum or the mucilage, but dissolve the cement and turn it yellow.

Acetate of lead has no effect on the gum or the cement, but precipitates the mucilage brown.

Nitrate of mercury has no effect on the cement, and only renders a solution of the mucilage turbid, but precipitates the gum yellow.

We can now understand some of the results arrived at by Dr. Hector and Mr. W. Skey (*Interim Report on Flax*, Appendix, pp. 10–13), as for instance the action of alkalies on the fibre, which they showed always weakened it very much; for although they have no effect on the gum they dissolve the cement which binds the ultimate fibres together, and so diminish their coherence; while acids, although they dissolve the gum, do not affect the cement, and therefore do not injure the strength of the fibre unless used in such quantities as to attack the ultimate fibres themselves, or the cement is dissolved by the boiling water.

It will thus be seen that the strength of the fibrous bundles depends entirely upon the cement that holds the ultimate fibres together; and if this is dissolved, either by hot water or alkali, the whole would separate into a mass of fluff, with no coherence or strength, the fibres of which it was composed being under half an inch in length.

Having now, I hope, given you a tolerably clear idea of the structure of the fibre of New Zealand flax, and some knowledge of the gum, mucilage, and cement that are found in the leaf, I will next inquire what are the probable uses to which the fibre can be applied, or, in other words, will it be limited to the manufacture of rope and other articles where coarse fibres are used, or is it capable of being worked up into the finer textile fabrics? I shall probably here be met with the statement that this is already proved, as cambrics and drills have been produced from *Phormium* which rivalled the finest flax in appearance, but at a cost that would not allow of its competing with the European article. Such I know has often been stated, but I am not at all satisfied with the truth of those statements. At the Dunedin Exhibition, in 1865, Mr. J. A. Smith, of Napier, exhibited "beautifully white cambric," "white twilled stuff for cavalry trousers," and "sewing thread," all stated to be made from *Phormium* fibre; and Mr. Murray, of Hull, quotes a Captain Harris that "it (*Phormium*) may be woven into fabrics of any description, and made into lace." Still, however, I am not satisfied, for some white drill, sent to me by Mr. T. Macfarlane, who had received it from Mr. Luke Nattrass, of Nelson,

and which was said to be made from *Phormium*, proved on examination to have been made from flax (*Linum*), or some very similar fibre.

The ultimate fibres of *Phormium* are so like those of Manilla that I do not think it possible to distinguish one from the other by means of the microscope; while jute is also very similar in appearance, but rather coarser, and the central hollow is in places altogether filled up. These three fibres are, however, easily distinguished from flax and hemp. The ultimate fibres of hemp are from 1 inch to 2½ inches in length, and from 1-1,000th to 1-500th of an inch in diameter. They are nearly solid, having only a very small central hollow. The ultimate fibres of flax (*Linum*) are cylindrical tubes, articulated or jointed end to end. They are from 1-3,800th to 1-800th of an inch in diameter, and, like hemp, are nearly solid. I have not been able to ascertain their length with any accuracy, but I have measured several, which, although broken at both ends, were still from 1½ to 2 inches long; and I judge from their taper that they are sometimes twice that length, or from 3 inches to 4 inches.

I found also, on unravelling a piece of calico, that the fibres of the cotton of which it was composed were one or two inches in length; although, as many of them were broken, this is probably an underestimate. We thus see that the ultimate fibres of cotton and flax have an average length from three to perhaps eight times greater than that of *Phormium*. It is the opinion of some that the ultimate fibres of *Phormium* might be separated by retting or some other process, and that they could then be spun like cotton. There certainly would not be much difficulty in reducing it to its ultimate fibres, but I do not think that it would then be possible to spin them together, at any rate with the present machinery, as the thread would probably not have more than a fourth of the strength of cotton.

Mr. Bonser, Manager of the China Grass Company in Wakefield, in a letter to Messrs. Brown, Campbell, and Co., dated 25th September, 1869, says—"I can do nothing with the New Zealand flax. It breaks up indefinitely, and there is no ultimate fibre long enough to be of any use. As soon as it is steeped even in water, the whole strength is taken out of it, and it won't bleach even by the strongest process." Now, I find on examination that the materials of which all textile fabrics are made, that are of a finer texture than bagging, are divided into their ultimate fibres, which have been spun together, and therefore, according to Mr. Bonser, they are beyond the capabilities of *Phormium*. Even if we should succeed in dividing the fibrous bundles mechanically into such delicate threads that they would draw out, and could be spun into the finer numbers of yarn, still the cement would be sure to decompose in the boiling in alkaline lye when bleaching, and, even if the threads did not come to pieces, it would be impossible to get a compact web. I also find that when white soaked flax is boiled in a solution of soap it takes a pale yellow colour, which is not removed by sun-bleaching, so that, if it is not reduced to its ultimate fibres and all the cement removed, this alone would perhaps be sufficient to condemn its use as a substitute for linen, or any white material that requires washing, for it is the cement and not the ultimate fibre that takes the colour. I do not therefore think it likely that *Phormium* will ever be used for the finer textile fabrics, or for any articles that require bleaching, and I quite indorse the remark of the jurors in their report on the fibrous substances exhibited in the New Zealand Exhibition in 1865, "that all attempts to produce an article to compete with European flax will only result in disappointment."* *Phormium*, however, may perhaps be used in the manufacture of articles that do not require bleaching, but in my opinion its principal use will always be for rope, in which manufacture its great strength will make it, when properly prepared, superior both to Manilla and hemp. Of course, if the cement is left in the fibre, decomposition will sooner or later take place, and the rope will rot if kept wet for any length of time; but in this respect it ought to be no worse than Manilla or hemp rope, in both of which the cement is still left in.

The rotting of *Phormium*, especially in sea water, would be a most fatal objection to its coming into general use, and it is of the greatest importance that the subject should be carefully inquired into, and, if found to be true, both with the hand-washed and soaked fibre, every endeavour should be made to discover means for preventing it. At present we are working in the dark, for we do not know whether the fault lies with the cement, or with some azotized substance adhering to, or inside of, the fibres, and which has not been removed by the soaking or bleaching in the sun. If the latter was the cause, some means might be found for removing the substance, or for changing its nature, by heat or fermentation, so as to make it less prone to decay; but if the former, our only resource would be to employ some agent that would preserve the cement from rotting—such as chloride of zinc, or corrosive sublimate. I certainly think that the best possible analyses should be obtained in Europe, not only of the best *Phormium* fibre that we can manufacture, but also of Manilla, so as to ascertain what substances exist in each, and in what the difference consists, that makes Manilla resist the action of sea water better than *Phormium*. I am not aware that it has ever been stated that tarred New Zealand rope rots sooner than tarred Europe rope.

An objection has also been made against New Zealand flax, that it is easily broken when tied in a knot, and Dr. Hector and Mr. Skey have suggested (*Interim Report*, Appendix, p. 13) that this is caused by small sharp pieces of hard dry gum cutting through the fibres like knives; but that this explanation is not the true one may be proved by taking some dressed fibre and steaming it slightly, so as to soften any gum that might be there, when it will still be found to be just as easily broken on the knot as before. Besides, chemical reactions show, as I have already pointed out to you, that no gum remains in properly prepared fibre, for, if any was there, the liquor obtained by boiling it in water would give a precipitate both with basic acetate of lead and with nitrate of mercury, which is not the case. It will be found on trial that coarse fibres from the butt of the leaf are weaker on the knot than the finer ones from the blade, but that if we split up the coarse fibres into fine threads the strength of both will then be equal; and this gives us the clue to the real reason for the weakness on the knot, which is, that the ultimate fibres are cemented firmly together longitudinally without any twist, so that when bent sharply, as in a knot, the outside fibres alone bear all the strain. The remedy for this is a finer division of the fibre.

Another complaint against New Zealand flax, as at present prepared, is its uneven quality. This is owing to different causes, which will all disappear in time. One of the causes lies in the leaves that

* Jurors' Reports, p. 117.

are used, all varieties being passed indiscriminately through the machines; and young, old, and sometimes half-decayed leaves are mixed up together. This evil will be in great part cured when the whole of the first crop of old leaves has been cut, for then young leaves of from one to two years will alone come to the mill; but it will not be entirely got over until mills are supplied with cultivated flax carefully selected and looked after, and I do not think that it will pay to do this at present. Another source of uneven quality is owing to the various processes employed in different mills to prepare the fibre; but this will also gradually disappear as the subject gets ventilated, and the best method adopted throughout the Islands.

The objection that New Zealand rope easily chafes is one that I am afraid we cannot cure, as it arises from the gradual separation of the ultimate fibres from one another; but the more the cement is removed or weakened by retting, boiling in water or in alkali, the more it will be liable to chafe, and the greater the diameter of the rope the less will be the proportionate wear. I do not, however, see why New Zealand rope should chafe more than Manilla.

One other objection remains to be noticed, namely, the alleged liability of the fibre to spontaneous combustion. Spontaneous combustion is caused by easily decomposable bodies absorbing oxygen under such circumstances that the heat cannot escape as quickly as it is generated, and it accumulates until it is sufficient to set the substance on fire. All organic bodies which contain albumen decompose spontaneously when kept in a moist condition; but those bodies that do not contain nitrogen are much less liable to decay, and therefore to spontaneous combustion. Well-cleaned fibre, quite dry when packed, is not in the least liable to such a change; but badly-prepared or unscutched fibre, packed damp, would probably rot before long, and the heat thus given out might be sufficient to set it on fire. Unwashed flax, which still contained the mucilage and bitter principle, would be still more liable to spontaneous combustion; but as moisture is absolutely necessary before decay can commence, even the unwashed and unscutched fibre, if it was quite dry when packed, and pressed with a pressure of forty or fifty tons or more, would be free from danger, for if the outside got wet afterwards the damp could not penetrate further in than it could evaporate out again; and it is only in the centre of a bale that the heat could accumulate so much as to cause it to catch fire. In my opinion, therefore, any kind of flax, if quite dry when packed, and well pressed, is safe; but any kind, even the best prepared, if packed damp, or loosely pressed, is unsafe, but not nearly so dangerous as wool or hay. The proof of this is the large quantities that appear to be damaged by sea water on its way to England, and yet we have not heard of a single case of heating or spontaneous combustion with Auckland-made flax.

I will now pass on to the second part of my lecture, in which I shall discuss the different processes which are known to me to be employed in extracting the fibre from the leaf, and in preparing it for export. All our accounts from England agree in saying, that what is required is a good white fibre, bright and fresh looking, and well cleaned from the tissue in which it is enclosed; and from what I have said, you will see that, in my opinion, we have to aim at a strong fibre, suitable for the manufacture of rope, and not attempt to produce an article to compete with European flax.

Machining.

In preparing New Zealand flax, whatever may be the subsequent processes followed, the first must always be a mechanical one. This is owing to the tough varnished skin which covers the leaf on both sides, and which prevents solvents or chemicals acting on the mucilage and fibre until it has been broken up; this has been clearly shown by Dr. Hector and Mr. Skey in their paper already referred to. The object, therefore, of this process is to separate as much as possible the cellular tissue of the leaf from the fibrous bundles, and that without cutting or breaking them. Another object is to remove the gum which adheres to the leaf.

Many and various have been the means tried to effect these objects, and large sums of money have been spent in vain endeavours to produce a good fibre that could be sold at a profit. I will not say, however, that these endeavours were fruitless, or that the money was wasted; for out of them have arisen the machines so largely used at present in this Province, and which are certainly capable, with proper management, of producing an excellent article at a sufficiently low price.

It will, I think, be instructive to group together the various methods that have been tried at different times and pronounced failures; for, judging from letters that occasionally appear in the papers, it seems to be very little known in the Southern Provinces how numerous have been the experiments in Auckland, and how many thousands of pounds have been expended in trying them.

Hackling.

This appears to have been the first method tried, for Mr. Holman, of the Bay of Islands, invented a machine on this principle in 1849. Subsequently, Mr. Murray in 1865, and Messrs. Macfarlane and Cox in 1866, all tried different modifications, but without success. Mr. S. Brown, of Newmarket, advocated, in 1867, hackling by hand.

Percussion.

The next principle tried was that of percussion. In 1850, Mr. Dent beat the leaves with flails, and in the same year Baron De Thierry used wooden stampers; while Messrs. Purchas and Ninnis introduced iron stampers in 1860.

Friction.

This principle was tried by Mr. Whytlaw in 1854.

Pressure.

Squeezing the leaves by passing them through rollers under heavy pressure was tried by Baron De Thierry about the year 1856, and subsequently Mr. Honeyman, of Dunedin, introduced fluted rollers.

Scraping.

This was tried by Mr. Cole, of Papakura, in 1860, who used a revolving drum, scraping the leaf against wood. Lastly, in 1866, was commenced the invention of the present machine, which combines

the principles of percussion, friction, pressure, and scraping. In this machine, the leaf is first pressed by iron rollers, then struck by the beaters, which break the skin across and loosen the tissue; then by rapidly changing its direction as the drum revolves, the beater acts as a scraper, while it moves in the direction of the length of the leaf, and tears off the greater portion of the tissue and the whole of the gum, while at the same time the beaters, by their diagonal position, push the loosened fibres first to one side and then to the other, and so open them out. The truth of this can be easily proved in those machines like Gibbons' or Fraser's which admit of experimental plates or bars for beating against being put in. If the face of the plate is made sharp and convex to the beaters, they act only as hammers and break up the tissue, but do not remove it; but if the face is flat, or slightly hollowed, so that it is concentric with the drum, and this flat or hollowed surface has a breadth of two or three times the distance at which the blows are delivered on the leaf, the tissue will not only be broken but almost entirely torn away form the fibre.

The fault of the pressure principle was that the leaves were not sufficiently broken up, especially near the tip; the fault of the hackling and scraping principles was the great wear and tear on the machine, and the hackling principle was also found to tear or cut the fibres across; while the fault of the friction and percussion principles was that the process was too slow to pay. The present machine probably reduces all these faults to a minimum. Pressure is used only to break up the thick butts of the leaves, and to hold them while being scraped by the drum. The wear is reduced by the percussion of the beater first breaking the skin across before the tissue is scraped away, and by dressing the flax between two strong smooth metallic surfaces; while the speed is so great that a single machine can easily dress 5¼ cwt. of green flax, or about 2,000 leaves, in an hour; whilst the fastest hackling machine could only dress 4¼ cwt., and the fastest percussion machine 3 cwt. per hour. The speed with which the leaves can be passed through a machine is of the greatest importance, for the machining is the only process in which each leaf has to be handled separately. In the machines now in use the speed could be greatly increased if mechanical means were devised for taking away the leaves as they pass through and arranging them in hanks, with the butts all laid together. A difficulty consists in the leaves being of different lengths, but this will no doubt be overcome in time. It is thought by some people that machines by some makers can pass more leaves through in a certain time than those of other makers. This, however, is a mistake, if no stoppages occur, as the feed-rollers of any machine can be run at any speed the manufacturer wishes, provided the machine is strong enough to stand the strain. It is simply a question of size of pulleys.

What I have already said about slightly hollowed beating-plates making the best flax, makes me prefer soft iron plates to hard ones, for they quickly wear to the same curve as the beaters follow, which is the best shape they can have, while they also save the wear of the beating-drum. I have kept a soft cast-iron plate in a machine for a week, and at the end of that time it was making just as good flax as when it had been in only for an hour or two. The face, when I took it out, was about five-eighths of an inch in breadth, and hollowed to the curve of the beaters. Of course it will take rather more power to drive a machine with a hollowed plate, but our object is to turn out good fibre. Constant attention is necessary to see that the machines do not get out of adjustment, otherwise an uneven quality of fibre will be produced. I find that when a machine is in proper adjustment, and running with considerable speed, it will strip off nearly the whole of the tissue from the leaf without injuring the fibre, but that if the speed is reduced it will cut the fibre. However, I prefer the fibre being slightly cut to being under-dressed. No doubt there will be greater waste and more tow made, but the remaining fibre will be soft, while, if under-dressed, it will always be harsh and wiry; and manufacturers should never forget that their best policy is to produce as good an article as possible, even if it should be at a less immediate profit. *Phormium* fibre is now suffering an undeserved depression in the London market, owing to the quantity of trash that has been sent there. Badly dressed, badly washed, and badly dried, it looked, when shipped, more like a material for brooms than for ropes, and when landed in England it was fit for nothing but manure. It is the manufacturers of this inferior material who have caused the cry of spontaneous combustion, who have raised freights and lowered prices, and who have caused the strongest and whitest of prepared fibres to be classed with coir and jute.

Soaking.

After machining, the leaves, now reduced to the state of fibre, must be placed in water, but different opinions obtain as to the proper mode of doing this; while in some mills, I believe, the fibre is not washed at all. This, however, is a great, indeed a fatal mistake.

We have seen that the interior cells of the leaf contain a bitter principle which is readily soluble in water, and it is this bitter principle; which, if allowed to dry on the fibres, stains them to a reddish brown. It is found in all parts of the leaf, but is most plentiful in the butts, where larger quantities of cellular tissue exist; and it must not be confounded with the red colouring matter found also at the butts of some leaves, and which can also be removed by soaking in water, but with greater difficulty. The bitter principle is colourless while in the cells of the leaf, but turns reddish brown on exposure to water or moist air, and dries up of the same colour, while the red fluid is red when in the cells of the leaf, but loses its colour when exposed to the air and sun, and dries pinkish-yellow. That such is the case may be shown by taking a quantity of leaves, some of which are red at the butt and some white, running them through the machine, and drying them without any washing, when it will be found that, notwithstanding their different colours when fresh from the machine, they will all dry to nearly the same reddish-brown colour, and this colour will extend more or less to the tips of the leaves; while, if some leaves with red butts are passed through the machine and then soaked in running water until they have no bitter taste, the fibre will be found to dry nearly white, although red at the butt when taken out of soak.

Simply washing, however much the fibre may be manipulated, will not altogether remove this bitter principle; time is absolutely necessary to accomplish it, and, unless it is entirely removed, the fibre will not have that purity and brightness of colour which belong to it when properly prepared.

My experience is that from three to four hours is the best time to allow the fibre to remain in the water. The best test is tasting it, for, as soon as there is no bitter taste on chewing a portion of the tissue still remaining on the fibre, the soaking has proceeded long enough. Less than three hours will scarcely remove the whole of the bitter principle, while twelve hours' soaking takes the gloss off some kinds of flax, and gives it a dull appearance; but I prefer leaving the flax that has been run through the machines for the last two hours of the day, in the water all night, to taking it out of soak too soon.

The water in which flax is soaked should be clear and free from iron, or the flax will turn black; for this reason water running from swamps is inadmissible. Running water is certainly the best, the clear rapid current of the Waikato being admirably adapted for the purpose. I have not tried whether a slight current running through tanks or ponds would be sufficient to remove the colouring matter; but, judging from the large quantity that escapes, I should fancy that the current ought to be strong enough to change the whole of the water in them every five or ten minutes. Of course, loss of weight is experienced by soaking, but the quality of the fibre will be so much improved that this loss will be well repaid.

The beneficial effects of soaking may readily be made apparent, by boiling in water portions of soaked and ordinary hand-washed or rinsed fibre. The former will be found to yield a perfectly clear fluid, of a pale yellow colour, and without smell or taste, while the latter will yield a liquor of the colour of the mucilage or liquid gum sold in shops, of a slightly bitter taste, and smelling when hot something like barley-water. This would be a good test for purchasers.

Besides the bitter principle, a green fluid also escapes while washing or soaking. This, on being examined by a powerful microscope, is seen to be water, coloured by minute granules of chlorophyll (the substance that colours leaves green) floating in it. These granules are so small as to pass through filter-paper, but they are precipitated by chloride of tin and by acetate of lead, the solution in both cases being left clear and colourless. These granules have escaped out of the cells broken by the machine, and this has led Mr. Nottidge, of Canterbury, to object to the Auckland machines, as he supposes that when "the leaf is broken and bruised, the cellular tissue is completely broken up, the fluid contents of the cells set free, and, by the same cause, openings would be forced in the tubular cells of the fibre, whether those cells contained fluid or air, and if they contained fluid some of that fluid would be forced out. The result is obvious—the fluid juices would be drawn into the tubular fibres, and into the minute canals between the ultimate fibres, by capillary attraction, and the tubes being so minute the capillary attraction would act very rapidly and with great force."—*Trans. N.Z. Inst.*, Vol. II. p. 110.) I cannot, however, agree with these opinions, for the following reasons: If a leaf is carefully examined with a microscope immediately after having been passed through the machine, the bundles of fibres will be found quite white and unbroken, if the machine is doing its work properly. Small particles of green tissue will be seen scattered loosely through the leaf, and others will be seen sticking to the bundles. I have often closely examined the ultimate fibres, to see if they contained any chlorophyll, or other colouring matter, and I have cut quite dry dressed fibre across, and plunged the ends into the green fluid, but I have always found the ultimate fibres quite empty, except when broken, in which case they generally contain water. As chlorophyll generally exists in small grains, and always in a semi-solid or viscous state, it could not possibly penetrate through the sides of the fibres; but if the machine was "cutting" it might certainly be possible for small portions to penetrate into the cut fibres; but, as we have seen that these fibres do not average more than half an inch in length, that would be the limit to which it could penetrate. As for the minute canals between the ultimate fibres, I have always failed to see them, and have already suggested (*Trans. N.Z. Inst.*, Vol. II. p. 112) that they do not exist in the leaf, but were made by the knife of the observer when cutting fine sections. If a portion of stained fibre is taken and boiled in water, or in a dilute solution of soda, until the ultimate fibres can be separated as fluff, they will be found to be quite white, although those parts of the fibrous bundles that have not been separated still keep their colour. This shows that it is the cement which binds the ultimate fibres together that is stained by the juices of the plant, and not the ultimate fibres themselves. The fact, also, that no precipitate is produced when neutral acetate of lead is added to the liquor obtained by boiling soaked fibre in water, shows that little or none of the green fluid and mucilage has remained in or on the fibres. I think, therefore, that this objection to the Auckland machines is unfounded, but I agree with Mr. Nottidge that passing a stream of water through the machine is beneficial to the fibre.

Not having experimented myself with steaming flax, nor with iron or india-rubber rollers, I shall say nothing about them, but shall leave it to others to give us their experience.

Retting.

Nothing is more likely to lead to mistakes than to assume, without inquiry, that those processes which have been proved to be best for one manufacture must necessarily be the best for another similar, but not identical, manufacture; and as many people are now advocating the retting of New Zealand flax after it has passed through the machines, I think it may be advisable to make a few remarks on the subject.

Dr. Hector and Mr. W. Skey, in their paper already referred to, describe several experiments that they made on retting, and speak very highly of them; indeed, they say that there can be no doubt as to the success of the process. Although hesitating to express an opinion against such high authorities, I am bound to confess that the few experiments I have made are not at all favourable, for in all cases I found the fibre so discoloured that its value would be greatly deteriorated. I found that pond retting not only blackens the fibre, but that the ultimate fibres rotted as quickly as the cement, so that when broken the ultimate fibres broke off short, and did not pull out, as is the case when the cement is dissolved by an alkali. In fact, the ultimate fibres seemed to get rotten before the retting was sufficiently advanced to produce any useful result. Schenk's process I have not tried, owing to the expense; but I find that any action of hot or warm water on the cement turns it gray; and although Schenk's process may offer advantages over pond retting, I do not think that either can be introduced, unless some means are found for preserving the colour of the fibre. Indeed, *a priori* reasons lead me to think that retting will never be applied to *Phormium* fibre with the same success as it has been to

European flax and hemp. In the first place, the object to be attained in the two cases is different. With flax, the object is to weaken the cement, and to remove a large portion of it; while with *Phormium*, the only object would be to weaken slightly the cement to enable the fibrous bundles to be split up more readily; and it is more than probable that mechanical means will be found for effecting this without weakening the fibre or spoiling its colour.

In the next place, the cell walls of the ultimate fibres of *Phormium* are much more tender than, and not much more than one-half as thick as those of flax or hemp, and they would therefore be more readily weakened in the process; and, further, any colour imparted to flax by retting can be removed by bleaching, while *Phormium* fibre will not stand the boiling in alkali necessary for that operation. Also, the retting of European flax is the first step in its manufacture, and consequently if the crop is spoiled by under or over retting, the loss is as small as possible, but with New Zealand flax we should have had to incur the previous expense of machining, and the chances of spoiling would be greater. However, as I have already hinted, a slight fermentation might be useful as a preservative, if means can be found for accomplishing it without discolouring the fibre, or if a process can be found for bleaching *Phormium* without the use of alkali, or long boiling in water.

BLEACHING AND DRYING.

I have said that the greater part of the tissue, and the whole of the gum, is removed by machining, and the mucilage and bitter principle by soaking. The next step is to remove the green colour of those parts of the tissue that still adhere to the fibre. This is accomplished by sun-bleaching. If the fibre, after coming out of the water, is once dried, without exposure to the sun, it will dry green, which colour it will retain for a great length of time if kept dry. This green colour is, however, no great detriment, as it can at any time be removed by wetting the fibre and exposing it to the sun; and I have not heard of any complaints from England on this score. Still, as it spoils the appearance of the fibre, and as it will have to be removed some time or other, either by the manufacturer or by the purchaser, it is better to do so at once. In summer, this is easily accomplished, by spreading it thinly on grass for four or five days, then turning it over and letting it lie two or three days more; when, if dry, it will be ready for storing; but in winter or in wet weather a much longer time is necessary.

The green colour is removed most quickly by alternately wetting the fibre and letting it dry in the sun several times. In the summer, this is accomplished naturally by the dews. If the fibre has dried green, and there is no moisture, a long exposure to the sun is necessary to bleach it, while on the other hand if it is kept constantly wet it retains its colour much more obstinately than when alternately wet and dry. During the winter months flax never gets thoroughly dry on the ground, even in fine weather; and in wet weather it has often to be left on the bleaching-green for several weeks, and even then green hanks will be found in it. To obviate this, after the fibre has lain for a fortnight or three weeks on the ground, it has to be hung on wires or poles to dry, when the wind, sun, and rain will finish the bleaching nearly as well as in summer. My experience is that well-dressed soaked flax may be safely left out for three weeks without ever getting dry, but that in about five weeks it begins to lose strength. Badly-dressed flax will deteriorate much sooner, for wherever the tissue is left adhering to the fibre putrefaction soon commences.

Each row of wires should consist of three arranged in a triangle, so as to keep the flax open and let the air in. The rows should be ten or twelve feet apart, so as to allow a cart or dray to go between them. I find that a ton of fibre may be spread on about a mile of wires, so that in winter a mill would require a mile and a half or two miles of them, which would cover from two to two and a half acres of ground. In summer they will not be used at all. About fifteen acres of bleaching ground will also be necessary for a mill running three or four machines.

Considerable storage room is absolutely essential to the successful carrying on of a mill, for often, after a succession of wet weather, a few dry days may come, and eight or ten tons or more of fibre may require to be stored almost at the same time; while without large stores the scutching and packing would have to be stopped. In my opinion a mill ought always to have about ten tons of fibre in store, and to do this in winter would require storage room for from fifteen to twenty tons, or about 12,000 cubic feet.

SCUTCHING.

The next process is that of scutching, the object of which is to straighten out and clean the fibre thoroughly from the dry pieces of tissue still remaining on it, as well as from the dust and dirt picked up in the drying-ground. There is perhaps no part of our machinery that wants more improvement than the scutch, for not only do the present ones clean the flax badly, but they also make more tow, or in other words, break more fibre than necessary. The great length of our fibre makes it much more difficult to scutch than European flax, which is only from two to three feet in length; and it would much facilitate the process if the hanks were cut in two, so as to make it into lengths of four or five feet; but I do not know what value is attached to length of fibre in England. The barrel-scutch is much better adapted for our long flax than the arm scutch, and consequently is almost everywhere used. The faults of the present scutches appear to me to be—first, that the hardest blow is delivered in the middle of the hank, where it is least wanted; second, that the ends of the hank hang away from the scutch, and do not get properly cleaned; third, that the ends of some of the fibres get round the arms or beaters of the scutch, and so get drawn out of the hands of the scutcher; and fourth, that the hanks are not sufficiently opened, and the outsides get well beaten while the inside is untouched. To try to remedy these faults, I am having an iron scutch made like a large scraping drum, with diagonal beaters, and I propose to make it revolve the opposite way to the usual one, and scutch over the top.

BALING.

After the fibre is scutched, it is ready for baling at once.

Such is all the information I am able to give about the manufacture of New Zealand flax. The newness of the subject must be my excuse for the many mistakes which I have probably made; and I

wish it to be understood that I have only told my present opinions, which are quite liable to change, for I well know much remains yet to be learnt. But if I have helped to distinguish between the New Zealand flax plants, which produce fibre of such different quality, or if I have helped to dispel any illusions as to the uses to which *Phormium* fibre can be applied, or if I have helped to bring the process of soaking in running water into more general use, I shall be satisfied.

NOTES on Captain HUTTON'S LECTURE on FLAX, by WILLIAM SKEY, Government Analyst.

[Read before the Wellington Philosophical Society, 17th September, 1870.]

IN this interesting and valuable lecture, embodying as it does so much of the practical experience of one occupying the position of a large manufacturer of this fibre, and who is, besides, well qualified by scientific training to observe and to pass opinion upon such a subject, there occur in those portions of it bearing upon the structure of the plant, and the nature of its predominating principles, one or two statements which are, I think, neither supported by the evidence adduced for them in the question, nor can be by any that we are able to gather elsewhere.

With all proper respect, therefore, for Captain Hutton, and with a high appreciation of this lecture generally, I beg to remark upon these statements for the purpose of having them either corrected or substantiated, as nothing would tend to throw us so far back from the attainment of excellence in the manufacture of this fibre as erroneous or uncertain opinions in regard to these points. It will be remembered that Captain Hutton, for the especial purposes of his lecture, distinguishes three or four principles out of the many occurring in this plant; and it is in relation to the chemical properties and reactions he assigns to one or two of those, and especially to the supposed identification of a cement he affirms to exist round the fibres of the plant, that my remarks will mainly apply.

The first principle discussed there is the *gum*, and of this he asserts, from the result of experiments he describes, that "it is unlike any gum or mucilage hitherto known;" but this is scarcely borne out by the actual results of the experiments instanced, for it does certainly comport itself with all those re-agents specified by Captain Hutton, precisely as does common gum or gum-arabic.

Captain Hutton does indeed state that this gum (flax gum), when dissolved in water, is not precipitated by alcohol, a statement which, if correct, would certainly place it in a very different chemical group to that which common gum occupies; in fact, it would not be a gum at all, but rather a resin or something nearly assimilating.

It appears from my own experiments, however, that flax gum *is* precipitated from its aqueous solution by alcohol, and completely, but only if the proportion of alcohol largely preponderates over that of the water retaining it in solution; hence this gum does not differ from others in respect to its comportment with this re-agent.

The next series of Captain Hutton's chemical experiments was performed upon the contents of the cells, for the purpose of ascertaining the nature of the mucilaginous substance.

Under the heading "Bitter Principle and Mucilage," the results of these are detailed; from which Captain Hutton infers that the "mucilage is essentially different from the gum" occurring on the outside of the leaf.

In many respects, however, the reactions are precisely the same as those that are given for this gum; indeed, it is only in regard to its refusal to form precipitates with alcohol and nitrate of mercury, as stated by Captain Hutton, and also its behaviour with neutral acetate of lead, that it appears to manifest any difference to the gum.

But upon repeating these experiments I find that decided precipitates do form when either alcohol or nitrate of mercury are added to this extract in quantity; while, in reference to the precipitate formed with neutral acetate of lead, this is no doubt caused by the presence of the bitter principle alluded to, and there certainly appears to be nothing left among these statements to establish or support any difference between the outer gum of the leaf and the gummy or mucilaginous substance in the cells.

But were these results stated correctly, they would still be of little use, from the circumstances under which they were obtained.

The whole case may shortly be stated as follows:—Two principles, not to mention others, are taken, the properties of neither of which we are perfectly acquainted with. Various re-agents are added to their aqueous solution, and from the reactions manifested is drawn the conclusion that one of these is "essentially different" from some member of its own group occurring, as it happens, in the same plant, and almost in absolute juxtaposition with it. But how do we know what reactions are due to the one and what to the other, or whether some may not be owing to the interaction of these principles themselves upon each other, in presence of the powerful re-agents used.

Clearly the results would be much more valuable and reliable if the several tests were applied to each principle, or at least to each predominating principle separately.

This separation might easily have been effected by means of alcohol, as the bitter principle is soluble in this menstruum (see page 8), while it is a distinguishing character of all gums or mucilages that they are insoluble therein.

In reference to the true character of the mucilaginous portion of this extract, I am inclined to think it is merely the ordinary flax gum in its normal state—that is, as originally produced by the plant; while the bitter principle associated with it in the cells is allied to the soluble resins.

I now arrive at a part which I experience some hesitation in discussing, as to do this properly requires an acquaintance on my part with the intricacies of vegetable structures which I do not possess.

Captain Hutton assumes the presence of a cementing substance in the flax by "which the ultimate fibres are bound together in bundles." To me, these ultimate fibres seem quite free and clear of each other upon their longitudinal surfaces, if only they are taken fresh from the plant and kept moist. However, the determination of this microscopically I leave for others, and I proceed to discuss the supposed chemical identification of this cement. Captain Hutton affirms that "the pure soaked fibre, when boiled for three hours in water, yields a pale yellow fluid, with an acid reaction but no bitter taste, which on evaporation leaves a brownish gummy substance, insoluble in alcohol or acids, but

readily soluble in alkalies and cold water." Now, I obtained an extract having the same chemical properties from Swedish filter paper (which is always held to be pure cellulose), by giving it contact with boiling water for three hours, and this was after well washing the paper first in cold water, so that anything adherent to it accidentally, which could in any way affect the results, would be removed; all the water used had been freshly distilled.

Simultaneously with the colouring of the water, bubbles of carbonic acid gas were evolved from the filter paper; and the same results were observed in the case of the purest flax fibre when thus treated, while its surfaces acquired a distinct pale brown colour.

The fact then appears that the prolonged contact of boiling water with vegetable fibres effects chemical changes upon them, whereby they become more or less coloured, and yield portions of extractive matter to the water employed. It follows, therefore, that the substance extracted by Captain Hutton from the "pure soaked fibre" is not necessarily a cement at all, but might be, and no doubt is, in part or wholly, a product of the metamorphosis of the pure fibre itself. Granting, however, for the moment, that nothing but a cement has been removed in these experiments, I do not clearly see that the reactions, stated to have followed from the additions of the various chemical agents to the solution so obtained, establish anything at all in relation to the nature of such cement.

The effects of prolonged contact with hot water by Captain Hutton's own experiments, exercises such a radical change upon the supposed cement, that it no longer refuses to dissolve in cold water, and has acquired besides a deep brown colour. Clearly, therefore, the reactions cited as belonging to and characteristic of the supposed cement, properly refer to some body or bodies chemically distinct.

Taking all this into due consideration, I am compelled to think that as yet Captain Hutton has neither demonstrated the presence of cement in the flax plant performing the duty he ascribes to it, nor yet, supposing such a cement to exist, that he has informed us anything more of its properties than that it is insoluble in cold water and acids.

In reference to the valuable information on the effects of retting the fibre, conveyed to us in this lecture, Captain Hutton's actual experience shows him that two obstacles exist to prevent the adoption of this process: 1st, the danger or absolute certainty of the ultimate fibres rotting before the retting has so far advanced as to produce any useful effect; 2nd, the tendency of the fibres to blacken, and their refusal to bleach afterwards without seriously weakening them.

As regards the first objection, we all know how important it is to stop the retting at the proper time, in the case of the common flax plant. Obviously, therefore, the hitting the proper time will be of equal or more importance in the case of Captain Hutton's flax, which was so thoroughly opened out before immersion.

Regarding the time which should be allowed for retting, this, too, must be obviously considerably less with a fibre already almost clean, than when mixed up largely with woody tissues, as in the case of the Irish flax. Three or four hours however, to which Captain Hutton generally limits himself, which, for the soaking or retting, is certainly a brief period.

Doubtless many changes have been wrought upon the more insoluble substances present even in this time, besides the removal of the more soluble ones; but I should prefer Captain Hutton's maximum time of twelve hours, but it would be very improper to fix any stated time for this operation, since much will depend upon the quality of the water employed, as also upon its temperature.

As to the next objection,—the discolouration of the fibre,—retting certainly has this tendency; but I can scarcely think this an insuperable obstacle. Very possibly some means may be found for averting this, or for bleaching it afterwards without incurring any serious loss of strength in the fibre. Experiments with this object in view seem very desirable.

I quite agree with Captain Hutton that the softest running water is the best for the steep, and that it is a *fatal* mistake on the part of flax producers to neglect the soaking of their flax in water after the machining.

No. 7.

Dr. HECTOR to the Hon. the COLONIAL SECRETARY.

(No. 41.)

Flax Commission,
Wellington, 29th December, 1870.

SIR,—

I have the honor to forward to you the copy of a letter, with its enclosures, which I have addressed to Dr. Hooker, C.B., F.R.S., Director of the Royal Botanic Gardens at Kew, in continuation of the papers which have already been furnished for His Excellency's information.

I have, &c.,
JAMES HECTOR,
Chairman.

The Hon. the Colonial Secretary.

Enclosure in No. 7.

Dr. HECTOR to Dr. HOOKER, C.B., F.R.S.

(No. 35.)

Flax Commission,
Wellington, New Zealand, 27th December, 1870.

SIR,—

A commission, of which I enclose a copy, has been issued by His Excellency the Governor for the investigation of the New Zealand flax manufacture; and I have been requested to solicit the favour of your valuable assistance towards obtaining the information mentioned in paragraphs 2nd (2,3,4).

The manner in which you can be of special service is in the selection of a person competent to make the required microscopic and chemical examination, and to report thereon, and by procuring for him such fresh leaves as he may require for the purpose mentioned in these paragraphs. The samples of prepared fibres will be furnished to the person you select through the Government

Agent in London, John Morrison, Esq., who is also instructed to defray all fees and charges, the amount of which the Commissioners have left to your discretion.

I beg to enclose you the following documents:—

"Report of the Flax Commissioners on the means employed in the preparation of New Zealand Flax."

"Report of the Joint Committee on Colonial Industries."

"A Lecture on the Manufacture of New Zealand Flax, by Captain Hutton, F.G.S."

"Report from the New Zealand Commissioners relative to the Manufacture of New Zealand Flax."

"Progress Report of Flax Commission, 1870."

Some of these will be, and others may be, required by the person selected to conduct the examination, in order that he may understand the points on which information is chiefly wanted, and his attention should be specially directed to those passages which I have marked, and also to those subjects which I have indicated in the memorandum accompanying these papers.

It would be hardly possible for me to exaggerate the importance to New Zealand of a satisfactory solution of the difficulties which now prevent the full development of this Colonial industry. Extensive fields of the raw material exist; we know that it contains a fibre of great beauty, strength, and value; abundance of coal and water power favour the manufacturer; very large sums of money have been embarked in the construction of mills and machinery, and hundreds of settlers have devoted their entire energies and attention to the subject;—and yet, hitherto, from want of sufficiently authoritative guidance, they have failed to derive those benefits which might reasonably have been expected. Under these circumstances, the Commissioners feel that they need offer no apology for applying to you for aid and co-operation.

I am, &c.,
JAMES HECTOR,
Chairman.

J. D. Hooker, Esq., C.B., M.D., F.R.S.

MEMORANDUM, with Printed Papers, forwarded to Dr. HOOKER.

(No. 38.)

THE accompanying printed papers contain almost everything that is known relative to the *Phormium tenax*, and the various opinions which are held as to the best means for preparing it's fibre are sufficiently stated to guide any one taking up the inquiry afresh.

There is no doubt of the high value of the fibre as prepared by the Natives, and if a mechanical apparatus were contrived, by which their method of preparing the fibre could be inexpensively performed, the chief difficulty would be removed.

The objection to the Native method is its expensiveness, due to great amount of manual labour required, and the loss of raw material.

The essential feature of the method is—that portions of the fibrous bundles are torn from the parenchyma in which they are imbedded, together with the adherent gummy cuticle that covers the inner surface of the blade of the leaf. The Natives in some cases remove this cuticle by steeping, in other cases they merely let it dry, and then brush it off mechanically. The result of both methods of treatment on the fibre is the same—leaving it in a white lustrous condition, possessed of great strength and lasting properties.

The ultimate fibres in good Native-dressed flax are free and comparatively non-adherent laterally, which is the chief distinction between it and fibre dressed by machines that have been invented by Europeans, in which the ultimate fibres are firmly bound together in bundles which break with a short cross fracture.

The reason for this difference is not yet determined, and is in fact the chief point to which it is desirable that the attention of the chemist and microscopist should be directed.

Captain Hutton, in his lecture (p. 8), states that a peculiar cement exists which binds together the ultimate fibres, and argues for the necessity of preparing the fibre by a method that will not injure this cement. Against this view it is urged that the hand-dressed fibre of the Natives which is extracted without chemicals, or even washing, is quite free from this cement, as in it the lateral adhesion of the ultimate fibres is at the minimum, while the longitudinal adhesion of the *fisculi* is at the maximum.

It is of course to be taken into account that the Natives use only a small proportion of the fibre in the leaf, but the quantitity they can extract is greatly increased by the cultivation of the plant and judicious selection of the leaves.

The comparative examination, therefore, of the fibrous bundles which the Natives reject, or in other words those on the back of the leaf, with the fibre they take, is of great importance to the inquiry.

The investigations required may be subdivided under the following heads:—

1. Comparative microscopic analysis of the structure of different parts of the fresh leaf:—*a.* Butt; *b.* blade; *c.* tip; *d.* glossy surface; *e.* bloom surface; in each case showing the relative proportions and arrangement of the various tissues in the various parts.
2. Prepared fibres—microscopic comparison of the varieties of *Phormium* fibre, Manilla hemp, Irish flax, Russian flax,—showing relative form and dimensions of the ultimate fibre, and the mode in which they are in contact laterally.
3. Chemical analysis of the proximate constituents of the different parts of the *Phormium* leaf, for the purpose of determining the chemical reaction of the different gummy and extractive matter, and the relative proportion in which these exist in the butt and blade of the leaves. A most desirable point to determine chemically is whether any change analogous to ripening takes place in the juice of the leaf which would indicate the best period for cutting it.
4. The tables of the relative strength of fibres given in books being defective, it is desirable that a series of experiments should be undertaken to determine the breaking

strain of all the different kinds of fibre in the market, tested both as straight fibre and when twisted into strands.

5. The investigation of the peculiar action of sea water on rope made of *Phormium* fibre, and the reason for its not absorbing tar, as has been alleged, will naturally form part of the third branch of the subject already indicated.

JAMES HECTOR,
Chairman of Flax Commission.

SAMPLES of FLAX, numbered from 1 to 15, accompanying this Memorandum.

Native-dressed.

No. 1. *Harakeke.*—Common swamp flax from Otaki; stripped and scraped with a shell, then washed for a few minutes in running water. Selected leaves of twelve or eighteen months old.

No. 2. The same as No. 1, but not washed at all.

No. 3. From the same plants as Nos. 1 and 2, but stripped from the opposite (or under) side of the leaf. The tissue obstinately adheres to and discolours these fibres.

No. 4. From the same leaves as No. 1, but further prepared for the manufacture of the *Kaitaki* or fine mats, by soaking in running water for several days, and then beating with a stone or mallet.

No. 5. Common swamp flax from Otaki; merely stripped with a shell, as sold to rope-spinners at 1½d. per lb. Neither scraped nor washed.

No. 6. Same as No. 5, but hand-hackled by rope-spinners. Shows that the fibre is discoloured by being allowed to remain in contact with the tissue in which it was embedded.

No. 7. A superior sample from the Waikato, furnished by Sir George Grey five or six years ago. Native-dressed, and further prepared by mechanical or chemical action. Process unknown.

Machine-dressed.

No. 8. Mr. Stonyer, Okoka Mills, Kaiapoi. Passed twice through stripping machine, soaked in water for one hour, sun-dried, scutched, and hackled. (Took first prize of Canterbury Flax Association.)

No. 9. Captain F. W. Hutton, Waikato—Machine-stripped, then washed and sun-dried.

No. 10. T. S. Macffarlane, Auckland—Similar process to No. 9, but with more prolonged washing or steeping, and wet-scutched.

No. 11. G. Booth, Waikoura Mills—Three times passed through stripper, washed, and dried. (See page 53, D. No. 14.)

No. 12. Riky's process—Boiling with wood ashes, and combing when wet; prepared in four hours.

No. 13. McFarlane and Wilson, Whakatane—Stripped by machine, then passed through India-rubber rollers, and bleached by fumigating with sulphur.

No. 14. John Journeaux, Wellington—Steamed, rolled, and fermented. (See page 51, D. No. 114.)

No. 15. C. J. Pownall—Scraping, washing, and sun-drying. (See page 50, D. No. 14.)