

1880.

NEW ZEALAND.

SURVEYS OF NEW ZEALAND.

(REPORT FOR 1879-80).

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

TO THE HON. THE MINISTER OF LANDS.

General Survey Office,

Wellington, 9th August, 1880.

SIR,—

I have the honor to report on the operations of the Survey Department for the twelve months ended the 30th June, 1880.

During the first four months of this period, the late Surveyor-General, Mr. John Turnbull Thomson, continued to direct the surveys. He retired on the 31st October, 1879, at which date you did me the honor of placing the surveys under my charge. In connection with these changes, it ought to be recorded that the organization of the Survey Department and the system of survey are those of Mr. Thomson, which, having received the approval of Government, are still continued without any material change.

In the Appendix will be found a map showing the progress of the surveys up to the 30th June last, with reports from the Chief Surveyors on the surveys in each of the ten land districts of the colony for the twelve months ending on that date. For easy reference these reports are arranged geographically, beginning with Auckland, the most northerly.

The out-turn of work, put in short compass, is as follows:—

Nature of Work.	Area.	Rate per Acre.			Cost.		
		£	s.	d.	£	s.	d.
Major Triangulation ...	566,723 acres	0	0	0·98	2,319	10	4
Minor Triangulation, without Topography ...	1,204,905 „	0	0	1·12	4,822	15	6
Minor Triangulation, with Topography ...	2,379,018 „	0	0	1½	16,125	19	0
Rural and Suburban Section Surveys ...	925,838 „	0	1	3·2	56,180	3	1
Town Section Surveys ...	2,578 allotments	0	16	4·8 (per allot.)	2,136	17	1
Native Land Court Surveys ...	106,803 acres	0	0	2·6	1,102	8	7
Native Land Purchase Surveys ...	939,449 „	0	0	2·2	8,367	14	7
Gold-mining Surveys ...	2,629 „	0	11	11½	1,569	7	3
Road, Railway, and Water-race Surveys ...	709½ miles	9	19	9 (per mile)	7,281	3	0

TRIANGULATION.

Under this designation 4,150,646 acres were completed, and maps and computations returned to the survey offices during the year. The primary object of this work is to furnish starting and closing points for the sectional settlement surveys. As is well known, traverse surveys built on each other, no matter how carefully each individual survey may have been made, lead to accumulation of errors which in large operations soon become uncontrollable and inexplicable. The

minor triangulation prevents this by affording the surveyor a fresh starting and closing point every two or three miles. This localizes the error between these points; and, as the limit of error allowed is 8 links to the mile, it is manifest that if a traverse survey were honestly done, and a clear record kept of the actual measurements and their reductions, it would always be easy to reproduce the survey on the ground within very narrow limits of error, should the sectional-survey marks become obliterated and the boundaries be challenged.

The necessity for accuracy is not only that the Crown lands, which are sold at from 5s. to 40s. an acre, may be handed over to the purchaser to an exact perch, but that the boundaries may be re-established from independent points whenever necessary. Triangulation furnishes these points; its accuracy, therefore, is of the greatest importance; and this is tested by a comparison of the initial and verification bases—that is, the surveyor measures one side of the initial triangle—generally $1\frac{1}{2}$ or 2 miles in length—or breaks down from the side of a major triangle, and then by angular measurements carries a network of triangles over the country, finding the lengths of all the sides by computation at the outer limit of the work, which may be 25 or more miles distant from the initial base. One of the computed sides is measured on the ground, and the degree of accordance between the computed and measured distance proves the character of the work. With a 5-inch theodolite, a close of 2 links to the mile is good work. The closes reported during the year are all under that limit, except in two cases, in which the discrepancy was 3 links; but that was in a mountainous country, where the altitudes of trig. stations varied sometimes as much as 3,000 feet in the same triangle, and the close was on two different surveyors' work.

Minor triangulation, with a closing error under 2 links to the mile, is, for practical purposes of settlement surveys, a very safe basis. It is due to the surveyors who have accomplished these works to acknowledge the skill and care exercised by them; an acknowledgment is also due to Messrs. Troughton and Simms, London, for the excellent 5-inch theodolites they supply to surveyors.

The triangulations are, as has been already fully explained in former reports, each on the true meridian of the astronomical station of the meridional circuit within which it is situate. Thus the triangulations, although primarily designed for the settlement surveys, become as they close up parts of a well-compacted framework on which to map the country.

This has always been kept steadily in view as one of the ultimate objects of the triangulation, and there are now only one or two gaps remaining between North Cape and Stewart Island, which will be filled in during the current year. The principal gap is between the North Island and the Middle Island; but that is nearly disposed of, as Mr. A. D. Wilson, who has been conducting a triangulation on the Marlborough side, reports that he has had preliminary observations from two of his stations to two stations across Cook Strait on the Wellington side. As soon as these connections are made, and the difference of longitude of one or two exterior main stations determined by exchange of telegraphic signals, the department will be in a position to publish a correct map of the country, with all the latest topographical information added.

SETTLEMENT SURVEY.

Of rural and suburban land, 925,838 acres have been surveyed into 6,628 sections, at an average cost varying from 10 $\frac{3}{4}$ d. to 1s. 7d. per acre for each land district except Taranaki, where the cost is 2s. 10d. per acre. In that district the surveys are all in bush, and during last year were nearly all in the country behind Mount Egmont, where there is much rain. Notwithstanding these drawbacks, the surveys are exceedingly well done, and the cost under the circumstances is not unreasonable.

As the aggregate cost of the settlement surveys is much the heaviest item of the Survey expenditure for the year, it will be as well to point out that fully 700,000 acres were arrear surveys—that is, surveys of land sold in former years on the system of selection before survey. In Canterbury, for instance, almost all the surveys were of that order during the past year, and comprised 404,726 acres. In all the other districts except Taranaki and Otago, much the greater part of the

surveys were arrears. About 220,000 acres only were surveys before selection, and of that area 50,000 acres have been surveyed for public bodies; leaving 170,000 acres as the area the surveys of which have been initiated by the Government and the Land Boards. The interest of the public in the surveys centres, as it were, in this 170,000 acres; for included within that area are nearly all the blocks that were offered during the year for selection under the systems of deferred-payment, agricultural-lease, and village-settlement. As yet, only about two-thirds of the 170,000 acres have been offered for selection, and it was taken up, nearly all, as soon as offered. In other words, the rate of settlement very much depends on the area of suitable land the Survey Department can prepare for selection. Thus, in Taranaki and Otago, where the surveys are not any in arrear, but, on the contrary, are kept in advance of the selector, the greatest amount of settlement has taken place. Wherever the land is suitable for occupation the surveys should be pushed on. There is no fear of getting too far in advance of the requirements of the country. The surveys have never yet, in those land districts where the law is survey before selection, got so far in advance of settlement that a time did not soon come when all the land surveyed was taken up. It is quite true that in some blocks there may be a residuum of inferior sections that do not go off for a while, but that is no reason why other blocks should not be prepared.

On the 1st July last there were in arrear 719,075 acres of section or settlement survey, of which 580,000 acres are arrear surveys which must be done to place purchasers in possession. The balance of 139,000 acres are surveys of deferred-payment and other blocks, ordered by Land Boards and Government. The department should pretty well dispose of this area during the current year.

NATIVE SURVEYS

Comprehend 106,303 acres, surveyed in forty-six blocks, for investigation of Native title before the Native Land Courts; and 939,449 acres, surveyed in ninety-three blocks, of lands under purchase from the Natives by the Government. These surveys have all been conducted on true meridian and connected with the triangulation; so that, apart from their utility for the purposes of the Native Land Court, they are valuable as contributions to a correct knowledge of the topography of the country.

GOLD-MINING SURVEYS.

Two thousand six hundred and thirty-two acres were surveyed as quartz-mining leases, cement, special, and sluicing claims. None of these areas exceed $16\frac{1}{2}$ acres, except special claims, which the Governor, in the exercise of his discretion, may grant in greater areas in cases where there are heavy preliminary expenses for bringing in water or opening out ground. Although many of these claims are held only for a short time and then abandoned, it is necessary to have all the mining surveys very carefully done, and connected to an independent point; for, where the ground proves valuable, questions of encroachment are sure to arise, and, unless the original survey can be reproduced on the ground, endless disputes and litigation ensue.

ROAD SURVEYS.

Under this heading are comprehended the survey of roads taken through Native lands and lands which have been Crown-granted subject to a reserve of 5 per cent. for roads, with the right to exercise the selection for fifteen years after the date of grant in the case of Native lands, and for five years in that of Crown lands. There still remains a great deal of this work to be done; it requires to be pushed on before the times elapse, and also for the reason that the longer the road selections are delayed the more difficult it becomes to make them, as fences, homesteads, and other improvements come in the way.

LAND TRANSFER SURVEYS.

These surveys are executed by the private authorized surveyors, but, before passing into the Land Registry, are checked and certified to by the Survey Department. From defects in some of the original surveys, and the meagreness of their records, the satisfactory re-determination of boundaries often proves a

most tedious matter both to the surveyor and the department. The survey of the actual piece of land to be dealt with is in each case but a small part of the work. The survey of surrounding lands becomes necessary to unravel the tangle of uncertainty, and ascertain the relative and actual position of properties. The expense and delays consequent on such investigations make the department appear obstructive to the parties interested; but the duty of check must be thoroughly done, it cannot be slurred over, for the Government guarantee every title under the Land Transfer Act; and it is only a question of time until the whole landed property of the country will have come under this system. Moreover, land is being subdivided and re-subdivided; public bodies, in the matter of taking land for roads, waterworks, &c., are in constant communication with the Land Transfer Department: so that it will be manifest, unless these multifarious transactions are under the control of a clear and definite system, very great confusion will ultimately ensue.

A set of regulations was issued two years ago for the guidance of surveyors furnishing plans under the Land Transfer Act, and the department has established standard points in most of the principal towns and suburbs to which surveys can be referred. In the country the trig. points serve the same purpose. With these precautions, and careful examination of plans, and, when necessary, actual inspection by the department on the ground, the system can continue to be worked without undue risk to the public interest.

PUBLICATION OF MAPS.

In addition to the ordinary sale-maps of settlement survey, the preparation and issue of the survey districts to the scale of an inch to the mile is being pushed on as the survey of each district gets completed. Each of these maps usually represents 100,000 acres—a square of $12\frac{1}{2}$ miles side—and brings together in a handy form the relative positions of roads, railways, and surveyed sections. The maps are either reduced by photography and reproduced to scale, or drawn on stone, so that adjacent maps join together as may be required. The publication of the inch-scale is a great convenience to the public and a saving of expense to Government; for, once a district is published on this scale, there is no further need for tracings from the original plans.

This branch of the department, which is more immediately under the direction of Mr. Barron, has sustained a great loss in the death of Mr. McColl, the chief photographer, in April last. Mr. McColl's skill and thorough acquaintance with every detail relating to the reproduction of maps, and his ever-ready disposition to serve, made him a most invaluable officer. Mr. Ramsay, the assistant photographer, has, unaided, kept up the work very well. With a little assistance and growing experience, he will prove equal to all the practical requirements of the Government. The amalgamation of the Public Works and Surveys Photolithographic Branches has resulted in a saving of about £700 a year, and the work of neither department has fallen in arrear.

DEPARTMENTAL.

On account of the great mass of arrear-work which the department has been bringing up for the last three and a half years, there has been a much larger staff at work than what was requisite for ordinary current requirements. As arrears are now getting worked off, less assistance will be needed, and there will consequently be a diminished expenditure for the current year.

I have, &c.,

The Hon. William Rolleston,
Minister of Lands.

JAMES MCKERROW,
Surveyor-General.

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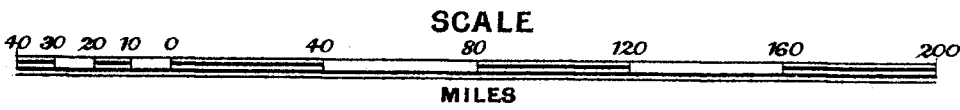
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JAMES MCKERROW
Surveyor General.

INDEX TO THE STATE OF THE PUBLIC SURVEYS IN NEW ZEALAND

June 30th 1880



MIDDLE ISLAND



STEWART ISLAND



REFERENCE

Standard Survey	shewn thus	
Minor Triangulation		
Section Survey under check		
..... built		

RETURN OF FIELD WORK executed by STAFF and CONTRACT SURVEYORS, and of the COST of the SURVEY DEPARTMENT, in the Colony of New Zealand, from 1st July, 1879, to 30th June, 1880.

PROVINCIAL DISTRICTS (arranged geographically).	Chief Surveyor.	Meridional Circuit, or Major Triangulation.		Minor Triangulation without Topography.		Trigonometrical Surveys with Topography.		Rural and Suburban Section Survey.		Town Section Survey.		Native Land Court Survey.		Native Land Purchase Survey.		Gold-mining Survey.		Road, Railway, and Water-race Surveys.		Miscellaneous Work.		Total Charges against the Survey Votes for Twelve Months.													
		Acres.	Cost per Acre.	Acres.	Cost per Acre.	Acres.	Cost per Acre.	No. of Sections.	Acres.	Cost per Acre.	Acres.	Cost per Acre.	Acres.	Cost per Acre.	No. of Blocks.	Acres.	No. of Sections.	Acres.	Cost per Acre.	Miles.	Cost per Mile.	Cost.	Field Work.	Supervision, Inspection, and Office Work.											
Head Office and General Photo-Litho Auckland	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	£	s.	d.	£	s.	d.							
Taranaki	T. Humphries	50,000	0.84	506,221	1.04	194,992	0.93	57,666	429	1/3.36	249.2	298	15/9	85,825	20	1.85	494,615	47	1.3	172.5	11.18	9.360	19	8	1,460	11	3	15,339	17	3	2,706	4	1		
Hawke's Bay	H. Baker	...	...	69,000	1.43	58,000	1.8	26,555	300	2/10.4	216	298	21/5.66	804	18.94	2	85,800	2	1.85	54	12.8	8	...	...	591	4	0	6,234	2	6	1,862	3	5	
Wellington	J. W. A. Marchant	191,040	0.87	43,000	1.4	491,740	1.33	93,638	394	1/6.4	...	...	...	19,674	13.5	42	349,748	42	3.4	98.62	13.0	0	42	15	0	1,615	8	8	15,022	10	0	6,170	4	11
Nelson	J. S. Browning	...	...	19,707	2	308,460	2.2	83,776	669	1/5.4	120	224	17/6.4	...	...	...	...	...	...	147.5	8	10	0	...	...	694	14	5	11,902	10	7	2,706	4	7
Marlborough	H. Clarke	...	...	156,000	2.07	...	...	1,561	17	1/7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	54	12	7	1,555	18	2	678	0	7
Westland	G. Mueller	325,683	1.07	80,134	2.22	33,418	3.05	19,990	263	1/3.4	155	263	16/1	...	...	...	...	...	...	41.4	19	9	11	...	...	162	8	0	5,051	3	3	2,568	4	4
Canterbury	J. H. Baker	...	...	330,843	1.3	780,468	1.30	404,726	387	1/1.37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1,350	4	3	*29,155	19	1	9,377	17	9
Otago	W. Arthur	...	...	...	...	293,218	1.4	115,276	480	1/0.4	618.4	881	15/10	...	...	...	...	...	...	...	...	...	...	...	...	331	18	5	9,223	12	7	4,060	2	4
Southland	J. Spence	...	...	...	...	115,200	1.45	59,292	492	1/4.4	381	376	11/11.83	...	...	...	...	...	...	...	...	...	...	...	...	155	0	0	5,104	18	7	1,858	17	1
Totals and Averages	...	566,723	0.98	1,204,905	1.12	2,379,018	1.1	925,838	6628	1/3.2	2,040.6	2,578	16/4.8	106,308	46	2.6	939,449	93	2.2	709.5	9	19	9	428	14	8	7,861	0	7	104,148	15	3	46,206	17	11

* Includes £1,080 19s., cost of Standard Survey in and around Christchurch.

STATEMENT of the EXTENT and COST of TRIANGULATION executed in New Zealand up to 30th June, 1880.

District.	Standard Survey.				Minor Triangulation without Topography.	Cost per Acre.	Minor Triangulation with Topography.	Cost per Acre.
	Meridional Circuit.	Cost per Acre.	Major Triangulation.	Cost per Acre.				
	Acres.	d.	Acres.	d.	Acres.	d.	Acres.	d.
Auckland—prior to 1877 ...	...	...	8,060,287	·32	125,000	·25	134,400	1·4
" since 1876 ...	...	...	1,426,696	·3	1,446,717	1·07	1,974,159	·93
Taranaki—prior to 1877 ...	...	...	...	...	20,000	·5	...	...
" since 1876 ...	590,000	1·1	...	...	191,500	1·6	58,000	1·8
Hawke's Bay—prior to 1877 ...	...	...	1,971,120	·4	37,000	1	...	...
" since 1876 ...	...	...	...	...	93,737	2·45	523,322	·96
Wellington—prior to 1877 ...	...	...	3,958,000	·75	1,970,000	1·5	...	...
" since 1876 ...	211,000	·19	191,040	·87	43,000	1·5	1,102,740	1·4
Nelson—prior to 1877 ...	...	...	...	...	...	...	...	...
" since 1876 ...	4,997,120	·125	...	...	99,727	1·36	596,981	2·83
Marlborough—prior to 1877 ...	...	...	...	...	...	...	...	...
" since 1876 ...	3,000,000	·083	...	...	156,000	2·07	...	...
Westland—prior to 1877 ...	...	...	554,160	·8	...	...	100,880	1·8
" since 1876 ...	...	...	957,683	1·31	80,134	2·22	440,176	2·6
Canterbury—prior to 1877 ...	...	...	...	...	*2,818,800	Not known	...	...
" since 1876 ...	6,143,000	·173	...	...	1,478,885	·69	2,216,012	1·65
Otago—prior to 1877 ...	10,300,000	·066	358,400	·5	...	...	6,581,407	1·5
" since 1876 ...	...	...	...	...	20,150	1·9	889,865	1·33
Southland—prior to 1877 ...	2,940,000	·066	...	...	...	...	1,520,000	1·5
" since 1876 ...	...	...	...	...	...	...	324,700	1·41
Total ...	28,181,120	...	17,477,386	...	8,580,650	...	16,462,642	...

* 1,843,700 acres of this either not reliable or stations lost.

ABSTRACT of the COST of the various Classes of Work executed during 1879–80.

District.	Settlement Survey.	Road Surveys and Surveys for Public Works Department.	Gold-Mining Surveys.	Crown Grants, Memorials of Ownership, Leases, &c.	Land Transfer Plans.	Native Land Purchase Surveys and Native Land Court.	Miscellaneous, including Surveys of Education Reserves, County Maps, &c.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Auckland ...	4,466 12 9	2,059 3 9	9 0 8	1,000 0 0	260 0 0	3,410 5 8	1,460 11 3
Hawke's Bay ...	2,830 18 2	608 14 2	...	42 10 0	100 0 0	292 6 4	844 19 0
Taranaki ...	4,125 4 10	671 8 6	...	100 0 0	115 0 0	690 7 4	591 4 0
Wellington ...	7,284 12 6	1,281 15 10	...	463 0 0	64 13 0	5,322 4 5	1,949 18 8
Nelson ...	6,073 13 7	1,254 8 0	529 8 2	250 6 8	153 0 0	...	992 12 8
Marlborough ...	122 19 0	...	25 19 0	18 0 0	...	...	54 12 0
Westland ...	1,292 7 9	793 14 10	110 1 6	37 4 0	128 12 0	...	162 8 0
Canterbury ...	22,707 7 4	...	...	1,398 19 0	1,066 12 10	...	269 5 3
Otago ...	6,827 1 11	375 3 2	770 10 3	500 0 0	400 0 0	...	931 18 5
Southland ...	4,367 4 5	40 10 0	126 9 0	125 0 0	250 0 0	...	155 0 0
Total ...	60,098 2 3	6,584 18 3	1,571 8 7	3,934 19 8	2,537 17 10	9,715 3 9	7,412 9 3

LITHOGRAPHIC PRINTING executed from July, 1879, to June, 1880.

Department.	No. of Separate Printings.	No. of Impressions.	Department.	No. of Separate Printings.	No. of Impressions.
Survey ...	1,009	112,588	Education ...	26	5,775
Crown Lands ...	10	723	Defence ...	6	700
Public Works ...	203	102,237	Justice ...	12	2,260
Immigration ...	5	253	Customs ...	28	1,800
Mines ...	2	50	Railway ...	18	2,690
Native ...	55	5,380	Registrar-General ...	8	575
Patent ...	86	6,522	Treasury ...	6	12,945
Marine ...	8	2,682	Geological and New Zealand Institute	95	251,507
Colonial Architect ...	12	870	Colonial Secretary ...	5	100
Annuities ...	5	2,700	Postal ...	1	3,000
Meteorological ...	6	2,000			
Telegraph ...	28	12,317	Total ...	1,634	529,574

STATEMENT of Work on Hand in the Photo-Lithographic Printing Branch of the Survey Department at 30th June, 1880.

To be Photographed.—14 plans: 1 plate each, 16 x 16 in. *

To be Printed in Silver.—3 sets: 348 prints, 15 x 12 in.

To be Printed from Stone.—Double demy, 500 copies; Imperial, 200 copies; Demy, 13,950 copies; Foolscap, 14,000 copies; Royal, 12,001 copies.

Total number of plans to print, 46.

Total number of impressions, 41,251.

PHOTOGRAPHS taken.

				No. of Plates.					No. of Plates.
Survey	...	...	...	202	Museum	...	...	...	4
Public Works	...	...	...	112	Railway	...	...	...	2
Patent	...	...	...	83	Post Office	...	...	...	1
Telegraph	...	...	...	27					
Marine	...	...	...	3					
Geological	...	...	...	4					
					Total	...	...	...	438

PHOTOGRAPHS OF NEW ZEALAND SCENERY.

9 sets, containing 114 views in set; 178 various views.

ABSTRACT of LITHOGRAPHS Printed.

				No.	Average No. of Copies of each Lithograph.	No. of Impressions.
Head Office	...	...	...	1,634	324	529,574
Auckland	...	...	...	986	108	9,250
Otago	...	...	...	124	250	31,000
Southland	...	...	...	23	155	3,575
Totals...				2,767	837	573,399

ABSTRACT of the SURVEYORS Employed in each PROVINCIAL DISTRICT, and of the WORK ON HAND on the 30th June, 1880.

Chief Surveyors.	Staff Surveyors.	Contract or other Surveyors.	District.	Triangulation	Settlement Survey.	Native Block and Land Purchase.	Railway, Road, and Water-races.
				Sq. Miles.	Acres.	Acres.	Miles.
Smith, S. P.	19	3	Auckland	1,837	56,054	439,497	112.4
Humphries, T.	7	1	Taranaki	...	1,000	...	...
Baker, H.	3	4	Hawke's Bay	52	45,502	24,607	123
Marchant, J. W. A.	14	3	Wellington	1,300	72,428	L.P. 166,000 N.L.C. 103,000	...
Browning, J. S.	9	2	Nelson	...	112,694	...	...
Clarke, H. G.	2	...	Marlborough	...	3,567	...	...
Mueller, G.	5	...	Westland	301	57,496	...	80
Baker, J. H.	17	6	Canterbury	382	252,084	...	...
Arthur, W.	7	3	Otago	...	12,925	...	...
Spence, J.	3	5	Southland	...	105,325	...	...
Total	86	27		3,871	719,075	733,104	315.4

CROWN GRANTS Prepared.

District.	No. of Grants.	Cost.	District.	No. of Grants.	Cost.
		£ s. d.			£ s. d.
*Auckland	979	1,000 0 0	Westland	124	37 4 0
Taranaki	358	100 0 0	Canterbury	1,768	1,998 19 0
Hawke's Bay	85	42 10 0	Otago	399	180 0 0
Wellington	1,067	463 0 0	Southland	635	100 0 0
Nelson	187	77 0 0	Total	5,632	1,716 3 0
Marlborough	30	18 0 0			

* Includes 494 Native titles prepared.

LAND TRANSFER Work.

District.	No. of Plans passed.	No. of Plans placed on Certifi- cates of Title.	District.	No. of Plans passed.	No. of Plans placed on Certifi- cates of Title.
Auckland	66	309	Marlborough	119	65
Taranaki	29	2,583	Westland	251	177
Hawke's Bay	40	...	Canterbury	103	2,095
Wellington	39	675	Otago	47	2,248
Nelson	124	320	Southland	64	932



APPENDIX.

EXTRACTS FROM REPORTS OF CHIEF SURVEYORS IN CHARGE OF SETTLEMENT AND SECTIONAL OPERATIONS IN DISTRICTS.

AUCKLAND.

MAJOR TRIANGULATION.

Only 50,000 acres under this heading have been completed during the year, and that wholly by Mr. Barnard in extension over the mountainous country near the East Cape, to check and aid the Land Purchase surveys. Mr. Barnard met with considerable obstruction from the Natives; and it is due to his perseverance under considerable difficulties that the meridian was sufficiently extended to cover surveys in progress. A major triangulation, covering about 800 square miles, is in progress under District Surveyor Cussen, to cover the country between Cambridge and Taupo, where many surveys are likely to be required during the coming season.

MINOR TRIANGULATION.

The total amount of minor work executed is 506,221 acres, at a mean cost of 1'04d. per acre—a slight increase on the cost for last year, owing to its being more in forest-country. About half of this has been undertaken in the interests of Crown-land surveys, and is principally in the reduction of the major triangles to lengths suitable for section purposes. The sides have invariably been obtained from the major series, generally by the Ray-trace system, which has been found to give very good results, and seems particularly applicable to the class of instruments used—viz., 5-inch theodolites. The average closure on fifteen different triangulations of the past season is 1'52 links per mile, a result which shows the survey to be considerably within the limit allowed, and also gives confidence in the work depending on it.

TRIGONOMETRICAL AND TOPOGRAPHICAL SURVEY.

No survey under this heading has been undertaken specially with a view of delineating the features of the country passed over, but the topography so gained has been incidental to the progress of the triangulation, and, being nearly all open country, has been done cheaply. The mere fact of any country being forest-clad at once precludes any great attention to topography, owing to the difficulty of seeing and recognizing the features from different stations. The larger part has been done whilst triangulating in connection with the exercise of road rights through Native grants, by Mr. Cussen.

RURAL AND SUBURBAN.

Under this head, an area of 57,666 acres, in 429 sections, averaging 135 acres in size, has been surveyed, at a cost of 1s. 3d. per acre, a moderate increase on the mean rate of last year. The cause of this is the fact that a large proportion of the area surveyed is in sections of small size, scattered from end to end of the district, and in localities adjoining or surrounded by old surveys. Whenever this is the case the cost at once rises considerably, as, owing to the exceeding difficulty of finding the old marks, the surveyor has often to survey more than three or four times the area applied for before he can be sure that he is not encroaching on land already granted. This will continue to be the case until the old surveys are surrounded by a fringe of new; and the cost, consequently, will remain at a high rate. A considerable area under this heading may be called revision survey—that is, of lands sold from the old map, but which were found not sufficiently complete to furnish data for the Crown grants. The land laws in this district allow of free selection before survey in any of the Crown lands, in areas of twenty acres and upwards. This is an additional cause of the increased cost of surveys, and, I may add, of discontent on the part of applicants, who cannot understand why their wants are not attended to at once, forgetting that to send a surveyor to mark out a 20-acre section, perhaps fifty miles away from other work, involves a larger cost than the price the land would fetch at auction. As showing that the section surveys are conducted with accuracy, I may state that a mean of thirty-six closures of different lengths gives 2'9 links error per mile.

In addition to the area shown in the return, 51 sections, of 6,230 acres, have been surveyed by authorized surveyors at the cost of applicants, under the homestead clauses of the Land Act. As the fees under this system only cover the cost of surveying the boundaries, it will devolve on the Government to lay out the necessary roads. This is a work that should precede the section survey, as settlers could then arrange their fences in accordance; but, with the amount of work in hand hitherto, it has been found impossible to carry this out.

TOWN SECTION SURVEY.

Under this head, 298 sections, of 249 acres in area, have been surveyed, and two townships—one at Te Aroha and another at Te Puke—are in progress.

NATIVE LAND COURT SURVEYS.

Of the area under this heading, 34,594 acres, in seventeen blocks, have been surveyed for the Natives within the Tauranga confiscation boundary, costing £536; whilst 21,000 acres are in progress in a rough, mountainous country, which will probably cost between £600 and £700 before it is completed. These surveys are made for the Tauranga District Court, who, it is presumed, protect the Government interests by way of lien over the lands so surveyed.

The total area of Native Land Court blocks (including the above) surveyed is 85,825 acres, at a cost of £705 15s. 6d., secured by lien on the lands. Pending more satisfactory arrangements as to recouping the sums advanced on surveys of this nature, I have not considered it advisable to undertake surveys for the Natives except in particular cases. The cost of survey, therefore, of lands for the purpose of the Native Land Court during the past season (exclusive of Land Purchase blocks) has been borne by private individuals, and the work done by authorized surveyors. The area thus surveyed, and the maps received, is 251,443 acres, in 112 blocks, the whole of which has to be checked and recorded in this and the Gisborne office. The cost per acre of these surveys I have no means of arriving at; but feel sure that it is very great, and a heavy burden to the owners. There are many reasons which make it certain that, if the Government had the power of taking *all* these surveys into their own hands, they could be done at once more accurately, and at half the cost involved in private surveys. One thing, however, is essential to this course, and that is, that the Natives themselves should define their own boundaries before the surveyor goes on to the ground, and thus eliminate one of the principal causes of expense now existing—viz., the delay involved in settling disputes arising out of contested boundaries.

LAND PURCHASE SURVEYS.

If to the area of Native lands surveyed at cost of Government and private individuals is added that shown under Land Purchase surveys, a total of 832,283 acres, in 179 blocks, will be shown as lands prepared for the work of the Native Land Court in this district, a large part of which remains adjudicated on. The area surveyed for the Land Purchase Department during last season has been very large—viz., 494,615 acres; out of which, 80,323 acres have been undertaken by surveyors specially engaged for the purpose, and paid for by that department at a cost of £1,614; whilst we have in hand at this time 123,000 acres, all of which is situated in the most broken, mountainous, and difficult part of this Island. A more than ordinary amount of hardship and privation has fallen to the lot of some of the surveyors engaged in this service, more especially Messrs. Martin and Spencer, whose work is situated in the densely-wooded and precipitous mountains of the East Cape. It is to be hoped that these surveys may be shortly finished, when the surveyors may be detailed to the much more remunerative work of preparing Crown lands for sale—a work which has been seriously retarded by five of the staff surveyors having been engaged for twelve months on the surveys for the Land Purchase Department.

GOLD-MINING SURVEYS.

One mining survey, of fifteen acres, represents the total work performed under this head.

ROADS.

A considerable mileage of roads has been surveyed during the year, amounting to 172½ miles, at a cost of £13 per mile, nearly the whole of which has been in exercise of the rights of road through lands granted under the Native Land Acts, and a considerable amount—30 miles—has been surveyed, so that the specifications for contracts could be got out, and for which tenders are now called. The whole mileage, I think, without any exception, has been laid out in conformity with Circular No. 59—*i.e.*, the grades have been limited to one-fifteenth and one-tenth. In addition to the 54 miles surveyed by Mr. Cussen, he has checked and directed the survey of 40 miles more, as laid out by a Highway Board surveyor, in exercise of the road rights.

I have referred in detail in another report to the works of construction carried out by the department; so only note here that 17¼ miles of road have been completed under votes for “opening up lands before sale.” The amount of work before us to exercise the rights under the Native Land Act is enormous, and will take many years to work off with the number of surveyors who can be spared for the purpose, whilst, at the same time, it is a matter of great urgency that it should be done at once, before settlers build, fence, or cultivate, and thus bring upon themselves the expense of altering their fences to suit roads which were not in existence when they commenced. A large number of roads also require to be surveyed before the rights lapse under Crown grants.

DETENTION BY NATIVE OPPOSITION.

Delays caused by Natives in opposing surveys have cost £360; but this scarcely represents the whole amount. Although the suspicion formerly excited by the erection of trig. stations has in a great measure disappeared, it occasionally crops up in a most annoying and vexatious manner. In the unsurveyed Native districts the only way to effectually stop this is not to allow any surveys until the triangulation is completed.

Under other work is included the cost of inspection and such smaller matters of survey as cannot be returned under an acreage heading. I regret that the important matter of field inspection is not carried out in my district to so full an extent as it should be. This has arisen during the past season from the necessity of withdrawing Messrs. Barnard and Hickson—but more especially the latter—from this service, to aid in carrying on the other branches of work required. The work of private surveyors in the Native Land Court surveys is that in which inspection is more especially required. But little has been done during the past season, excepting in Poverty Bay, owing to the cause stated.

LAND TRANSFER SURVEYS.

Although these are not made at the cost of Government, the record and checking of them, before being used as bases of titles by the District Land Registrar, forms an increasing portion of the duties of the office. During the year sixty-six plans have been passed, after being checked by the painstaking draughtsman, Mr. G. Sturtevant, in charge of this branch. I cannot allow this opportunity to pass without noticing the great readiness to comply with my requisitions shown by the private surveyors working under the Act, who, without exception, seem anxious to comply with the regulations made for their guidance.

The first attempt at a city standard survey, made last season, has proved to be of great utility; and every survey now made within its limits is correctly laid down on the 1-inch sheets. A small extension of the survey was made during the year by Mr. Hickson, in a part of the city where the old

grants showed great discrepancies; but its further advance has been delayed for want of an available officer to carry it out. I trust that this will soon be remedied, and that the rest of the city and suburbs will, during the next season, be submitted to this process, without which I feel that the Government are running a very great risk in issuing certificates. A portion of Tauranga has also had standard traverses run along a few of the streets, and applications have been received from the Borough of Onehunga and Town Board of Whangarei to have the system extended to those towns.

During the year standard chain-lengths have been laid down at Tauranga by District-Surveyor Goldsmith and myself, and also at Gisborne and Grahamstown by Messrs. Barnard and Hickson. This was especially necessary at the latter place, for it was found that the old standard there was $1\frac{1}{2}$ inches too long, or 15 links in the mile—a quantity nearly double the limit of error allowed in chain surveys.

OFFICE WORK.

The amount of office work during the past season has been exceptionally heavy, and shows no sign of diminution. The fact of this branch of the department being in more immediate connection with the Native Land Court alone throws on us more work (and that of a peculiar nature) than any other office in the colony; and it is due to the energy and industry of the chief draughtsman, Mr. W. C. Kensington, that we are able to accomplish it. During the last year forty-four sittings of the Native Land Court have been advertised, the large number of maps for which, with few exceptions, have had to be sorted out and compared with the advertised claims by him alone. Up to the present time 577 block sheets have been got out, on which all work as received is plotted; whilst Crown-grant record maps of 404 districts have also been prepared, showing all grants which it is possible to define on them. Many of these, of course, as well as the block sheets, show only a few surveys here and there; for, as I have more than once reported, the attempt to replot the old work in connection with the new has proved impossible in every case. The surveys and plans under "The Public Works Act, 1876," of roads taken and closed by counties and Highway Boards, are now so numerous that their record and check takes up the time of one draughtsman entirely. This work is likely to be greatly increased, for I am of opinion that two miles out of every four of the sectional roads shown on our plans will have to be closed, and others taken in their places; whilst the innumerable roads necessary under the military settlements scheme for dividing the country into 50-acre sections, now that the land is occupied in large farms, have no use, and will also be closed. The correspondence arising out of this is by no means small.

During the year the whole of the surveyed part of the district has been lithographed on a scale of one mile to the inch, besides other maps of towns and rural sections, numbering altogether eighty-six maps, of which 9,250 copies were struck off. The 80 chains to 1 inch maps were specially prepared for the Property-Tax Department; and therefore had to be published in a period so short that it was impossible, with the incomplete records that we have, to avoid a good many errors. Their form also is not generally suitable, otherwise than for the collectors. The cost of lithographing, however, will be recouped to the Government within twelve months by the mere saving in making tracings. The number of Crown grants and memorials prepared during the season will be seen in the returns attached. This branch is under the charge of Mr. A. Morrow, to whose care, and that of his assistants, is due the fact that not one has been returned for correction out of the large number prepared. There are considerable arrears of both grants and memorials, amounting, indeed, to 1,377 plans, to be placed on the forms.

With respect to the work on hand in the field, the principal item, and the one which causes me some anxiety, is the number of applications for surveys of Crown lands for sale. They amount to 135 applications, of 39,000 acres, scattered all over the district in as many localities. The difficulty of getting through with these surveys is contained in the fact that a very large proportion of them are situated within the limits of old surveys, which necessitates more than double the amount of work to complete them. Though the average does not look large, I feel confident that, what with the work for which the surveyors have already received instructions, we shall not get through them under twelve months, without allowing for others that will be received from time to time.

In conclusion, sir, I wish to state my opinion, based on a $3\frac{1}{2}$ -years trial, that the system of survey so ably introduced by the late Surveyor-General, Mr. J. T. Thomson, has been found to work as well in our forest-clad, broken country of the North as in the open plains of the South. Under its guidance a staff of surveyors has grown up whose work will bear favourable comparison with any other of a like nature in the colonizing world, and to whom my best thanks are due for the intelligent and able manner in which they have seconded my efforts to carry out the duties intrusted to me.

S. PERCY SMITH,
Chief Surveyor.

TARANAKI.

MINOR TRIANGULATION.

During the year 127,000 acres have been triangulated, 69,000 acres of which, executed by Mr. W. H. Skinner at a cost of a little over $1\frac{1}{2}$ d. per acre, extend from New Plymouth to Hangatahau. This completes the triangulation of the surveyed and settled districts from Pukearuhe to Okato, and embraces nearly the whole of the old magnetic and unreliable work; so that no further operations of this nature will be required north of Mount Egmont for some time. The remaining 58,000 acres, executed by Mr. H. W. Climie, cover the country lying between Whakamara and the Kaitangiwhenua Block, when it joins a Ray-trace taking an inland course from Waitotara, executed by Mr. Sicely, of the Wellington staff. The closure of the two series of 1.2 links per mile must be considered highly satisfactory, and very creditable to the surveyors employed, considering the bases being 45 miles apart, and the difficulties attending work carried through rough forest-country, where force of circumstances often compels small and ill-conditioned triangles.

SETTLEMENT SURVEYS.

Of these 26,555 acres have been completed. The cost per acre is higher than last year, which is due to several causes: 1st. 25,000 acres of it is in heavily-timbered country, with an absence of triangulation. This means extra labour and care on the block-lines and circuit traverses, as the only safeguard against accumulating error lies in this. 2nd. There has been great loss of time during the wet season, some months showing but very little work. I think I may safely say that in the locality where the section work has been executed there have been at least three wet days to one nearer the coast. 3rd. 22,000 acres have been subdivided into small sections, averaging 74 acres each.

The sectional work on the Mountain Road is complete, and there is now an unbroken chain of settlement through the forest to the eastward of Mount Egmont from New Plymouth to Hawera. Having been careful in selecting land suitable for agricultural settlement, it is readily taken up as fast as our work is completed, and, for forest-land, realizes high prices.

TOWN SURVEYS.

The principal work under this head has been in connection with the laying-down standard marks in New Plymouth, Hawera, and Carlyle. These were found absolutely necessary for Land Transfer purposes, as nearly all original ones were gone, and, the surveys not having been executed with accuracy, disputes were constantly arising. Now all Land Transfer surveyors are enabled to comply with the regulations by connecting their work with these marks, which will prevent confusion and trouble in the future. The survey of Opunake and the village at Mangawhero has been the only sectional work under this head. The expense of the latter, which is in the forest, has necessarily been great.

NATIVE RESERVES, WAIMATE.

Three surveyors have been engaged on this work for the past two and a half months, at an expenditure of £490—the principal work done being the running the seaward boundary of the block set apart for reserves a distance of 13 miles, and two road-lines through it; also the cutting-out of two reserves comprising about 4,000 acres. All road-lines in this work appear in the return of field work under the head of "Roads;" but the other work, with the exception of 1,800 acres at Oeo, has been of such a miscellaneous nature that I have been unable to particularize it in the return. Services to the extent of £191 2s. 6d. have been rendered to the Public Works Department, mainly in connection with the road works by the Constabulary on the West Coast—a surveyor having been employed there laying out the roads, and occasionally engaged in levelling, for about eleven weeks.

INSPECTION.

During the year I have made twenty-four inspections, and in my field checks have retraversed 1,040 chains of different surveyors' work. In every instance save one (that of a Land Transfer surveyor) the tests applied proved most satisfactory; and I cannot speak too highly of the character of the work done. Closes are within 3 minutes, notwithstanding some of the circuits exceed 9 miles of traverse; and, in my retraverses, bearings in no instance vary a full minute—the greatest difference in our measurements on any work being only at the rate of 2·4 links per mile, the remainder far below. The surveyors are alive to the necessity of very great care in forest-country without triangulation, and are to be commended for the excellence of their work. It is only by the universal adoption of the steel band and wire that these results could be obtained; and there is no doubt that, in ordinary sectional work, at least, the chain should be considered a thing of the past.

The contemplated work for the ensuing year is the survey of the reserves for Natives on the West Coast, and extensive sectional surveys in the same locality. In prospect of these works I see no probability of any reduction in the expenditure, but rather a possible increase on that of last year.

THOMAS HUMPHRIES,

Chief Surveyor.

HAWKE'S BAY.

SECTIONAL SURVEYS.

The area surveyed for settlement is—by staff, 2,616 acres; by contractors, 60,742 acres. The cost of the section surveys varies from 4½d. for large blocks of pastoral land to 5s. per acre for two 40-acre sections of exceptionally difficult forest-country.

The settlement surveys in the Seventy-Mile Bush are not by any means in advance of the requirements of selectors: there need, I feel confident, be no apprehension that these lands will not be taken up within the course of the next two or three years. On instructions received from the Waste Lands Board, 42,544 acres in the Mohaka District have been laid off in large blocks, to be sold on deferred payments as pasture lands, for which purpose alone the country is suitable; but whether the blocks will go off at the present upset price of £1 per acre is very doubtful, more particularly so as the best sites for homesteadings and small paddocks have already been free-selected at 10s. an acre. The method which has been adopted in the settlement of bush-lands—namely, that of opening up the main roads before throwing open the sections for sale—bids fair to become a success, and is certainly the only way to permanently locate people on forest-lands. Recently a block of bush-land was thrown open: the block was hitherto unknown; but during the past year the block has been opened out by roads, the result being that 41 sections, representing an area of 1,763 acres, have been taken up. One township on the railway-line and a village settlement have been laid out.

Two contracts—one for the survey of 11,017 acres of applications, the other for 6,700 acres of settlement-survey—remain unfinished, and will have to be carried forward to next year's work.

ROAD SURVEYS.

The road surveys continue to tax the department, and are likely to do so for some years to come. Formerly, under the system adopted in Hawke's Bay for the settlement and sale of Crown lands, thousands of acres were taken up or surveyed for sale without first laying off the roads. The lands

granted under the Native Land Act have doubled the area through which roads are now required. Up to the present little more has been attempted than to meet present requirements and secure the roads through those blocks over which the rights were about to expire—except in those districts where surveyors have been working. The expenditure on road surveys must be met, and will yet cost the department a large sum. Whilst on the subject of roads, there is one point which demands attention; the present state of the laws relating to roads through Native lands and through lands held under certificate of title or memorial of ownership is not satisfactory. The only solution of the question would seem to be in special legislation; for the mode of procedure for taking roads under the Public Works Act is both cumbersome and expensive.

LAND TRANSFER SURVEYS.

The area surveyed and examined by this office is 18,336 acres, in 40 plans. In the Town of Napier 12 bench-marks have been laid down; from these points all new surveys can be recorded in their true positions on the record maps. The operations of the Land Transfer Department are much retarded on account of the unreliableness of the original surveys, more particularly so in the Town of Napier, where the work of checking the Land Transfer surveys is a most tedious business.

The progress made in the recording of field surveys completed since the formation of the General Survey Department may be briefly summarized thus: Maps prepared—19 triangulation sheets, 20 Crown-grant record maps, and 73 block sheets, on which surveys have been recorded.

HORACE BAKER,
Chief Surveyor.

WELLINGTON.

RURAL SECTIONAL.

Rural sectional surveys, all under forest, include 93,638 acres, at a cost of 1s. 6½d. per acre.

Of the above, 61,536 acres were arrears of survey, or comprised areas which had to be defined in fulfilment of engagements entered into by the Government. Only one new survey of Crown lands was commenced, and that was undertaken under direct orders from the Government.

NATIVE LAND COURT.

Native Land Court surveys comprise 19,674 acres, at a cost of 5d. per acre.

The various surveys under this and the following head have materially reduced the number of incomplete titles under the Native Lands Acts, which were formerly so numerous in this provincial district.

ROADS.

Outside actual sectional surveys roads have been laid off or defined in order that the rights of the public should be preserved. It would be well if this could be more generally attended to in this district.

The total for last year is 98½ miles, at £13 per mile.

MISCELLANEOUS SURVEYS.

Under this head the most important are the Land Transfer, railway, and Native Land Court surveys, paid for by private persons. Of the last, maps were received comprising over 60,000 acres. The field inspection and examination of these surveys have involved a considerable amount of labour.

OFFICE.

Good progress has been made with the Crown-grant arrears, 1,067 draft grants having been passed out of this office. These are recorded on seventy different record-maps of survey districts or towns, nearly all of which maps had to be constructed during the past year.

Under Mr. James Mackenzie's constant and zealous supervision great progress has been made with the compilations of the former settlement and Native surveys.

J. W. A. MARCHANT,
Chief Surveyor and Deputy Inspector of Surveys.

NELSON.

MINOR TRIANGULATION.

The only triangulation completed by the staff during the year has been necessary extension for sectional surveys, amounting to 78,167 acres, at a cost of 1·7d. per acre. This has been executed by Messrs. Sinclair, Thompson, and Lewis, in the Kaiteriteri, Takaka, Pakawau, Aorere, Wairau, Alma, Severn, Tekoa, and Lyndon Districts.

Messrs. Carkeek have finished the triangulation and topography of 250,000 acres in the Motueka, Wai-iti, and Wangapeka Districts. The closes on the bases of verification in the Wangapeka and Waimea Districts were 0·6 and 1·5 links respectively.

Thirty thousand acres in the Grey District, executed by Mr. F. Sewell (who left the service), was found to require revision, which was done by Messrs. Galwey and Smith, at a cost of ¾d. per acre.

A contract for about 60 miles in length of Ray-trace triangulation, to connect Nelson and Canterbury surveys, is in progress by Mr. H. Ellison, and will give starting-points for extension on to large lease surveys during next year in the Nelson and Amuri Districts.

About 208,000 acres is in progress on the West Coast by the staff, necessary to command mining and agricultural-lease surveys there.

SECTIONAL SURVEYS.

The total area surveyed during the year amounts to 83,776 acres, at an average cost of 1s. 5½d. per acre. The cost has been reduced by averaging the larger surveys in the Amuri District with the small section surveys in other districts. The high rate of the latter class of surveys is caused by the difficulties to be contended with in this district (Nelson), which, with a portion of the Amuri only excepted, is rugged, mountainous, heavily-timbered, with dense undergrowth, and along the West Coast exceptionally rainy. The bulk of applications to be surveyed are in isolated sections or in small groups, entailing much loss of time in moving camp, and in many parts only accessible by rough bush pack-tracks. Several of the staff have been hindered during the year in their work by illness.

GOLD-MINING SURVEYS.

Six hundred and twenty-two acres, in small areas, have been surveyed, at a cost of 17s. 0½d. per acre, the total cost of which has been recouped to the Government by the fees paid in to Public Account.

ROADS.

One hundred and forty-seven and a half miles of roads have been surveyed, at a cost of £8 16s. per mile, mostly in bush. This includes traverse and pegging-out of several partially-constructed roads. Some of the lines in hilly bush localities, to give access to new applications, have been intricate, and costly to grade.

Mr. J. Snodgrass has completed the survey of 32 miles of main road in the Upper Buller Valley, principally through gorge and heavily-timbered, surveying applications on the small flats and hill-sides along that distance, and bringing up arrears there to date.

OTHER DUTIES.

Under this head is comprised the various surveys incidental to gold-fields work other than mining leases, such as reconnaissance surveys, underground surveys, encroachments, reports, &c. ; also surveys and reports required by Commissioner of Crown Lands relating to old sectional and lease surveys. There is a large amount of work in progress by the staff not returnable this year, of which the largest item is 312 square miles of triangulation, the field work being nearly completed.

Mr. F. S. Smith has in hand 125 square miles, from Greymouth along the coast to Brighton, connecting the Grey and Buller Circuits. This is probably as broken and difficult a tract of country as would be found anywhere, yet spotted with mining and other surveys.

Mr. J. Montgomerie has in hand 102 square miles, connecting the Reefton and Lyell mining districts, and Mr. J. Snodgrass 85 square miles, from the Matiri junction of the Upper Buller, connecting the Lyell, Reefton, and Buller Districts. There will thus be only a distance of 25 miles to be executed to connect the Nelson District with the West Coast.

The above work, when completed, will enable the various lines of auriferous reefs and leads of gold already known to be accurately laid down relatively to each other ; and, with the topographical information now being collected, will afford most useful and reliable data to the practical part of the mining community, which is constantly sought for in the district offices.

The necessity of establishing these fixed points to which surface boundaries can be accurately referred, was fully proved in a case of underground encroachment between the Energetic and Independent Companies at Reefton. The hillside had slipped, carrying away an original peg ; and, although several surveyors were employed, they could not agree as to its original position : and the Court ruled that mining lessees had no *locus standi* until their properties were so connected, which has now been done.

The officers mentioned above have been very persevering in their efforts to complete this work ; but the continuous bad weather for the last two months has retarded progress. Many of the stations lie at high altitudes, as mining surveys in several localities are 3,000 and 4,000 feet above sea-level, and generally in bush on rugged mountain-sides.

ARREARS OF SURVEYS.

The arrears of applications not dealt with, on 1st July, 1879, were 130,454 acres, and on 30th June, 1880, 113,024 acres. As stated in last year's report, these arrears are a very uncertain quantity, as nearly all applications are recorded for survey or report, and many are ultimately refused, especially applications to lease areas in mining districts. There are now under consideration by the Waste Lands Board and Warden of the district, applications to the extent of several thousand acres, on account of a petition from miners in one district, supported by the County Council. Also, sections leased under the old defective surveys are continually becoming forfeited and reapplied for, necessitating resurvey before they can be accurately marked on the plans, and fresh leases issued.

OFFICE WORK.

The general work of the office has been receiving and recording applications for land, checking plans, traverse reductions, &c., and plotting them on the working plans. Five Crown-grant record-maps have been recompiled, involving a large amount of work, the old ones formerly in use being nearly worn out. The posting-up of county maps to date has occupied considerable time, as many sections held under lease have been cancelled, and are opened again for application.

The district offices have complete sets of application maps, which are kept up to date by the several officers, and enable the Receivers of Revenue in the West Coast districts to receive applications and locate them on the plans at once, which formerly had to be forwarded to the Nelson office with deposit remittances. As these officers are now empowered to receive rents also, a great saving has been effected to the public, and much cause of complaint has been removed.

During the past year sixty-four plans of districts and twelve towns have been lithographed at the Head office, making, with last year, a total of seventy-five districts and twenty-three towns now published and supplied to the public at a small cost. These have proved most useful and a great saving in preparing county maps, and also for Road Board, land-tax, and General Government purposes.

Three hundred and sixty-six leases and licenses have been prepared, for 75,696 acres; and 187 Crown grants, for 8,000 acres; showing an increase of 175 leases and 179 Crown grants over last year's work. The illness of two draughtsmen has much hindered office work, one* of whom is still on sick-leave.

LAND TRANSFER WORK.

Mr. H. Curtis, Land Transfer draughtsman, has prepared 320 certificates of title, and examined and checked 124 plans. This branch has now been got into good working order, but there is still much to be done in compiling record-maps of new districts as surveys are being executed.

Considerable dissatisfaction is often expressed by the public at requisitions being made for surveys, owing to the want of sufficient data on the plans handed in of areas proposed to be dealt with—generally owing to former inaccurate surveys—and also that subdivisions of sections should be marked on the ground at all. It appears rather incongruous that, while one section of the public are complaining of the expense to which they are subjected, on account of defective survey, to secure a clear title for the transfer of land, another section consider the present system as needlessly accurate in putting occupiers in possession—the latter class failing to see, until they propose to deal with the title, that there is no security without an accurate survey, which, if made at first, must be the most economical in the end.

I must again call attention to the urgent necessity of a fireproof safe in Nelson for the preservation of the records of the department, which are rapidly increasing.

JOHN S. BROWNING,
Chief Surveyor.

MARLBOROUGH.

TRIANGULATION.

Of major and minor triangulation combined, 156,000 acres have been completed and mapped.

Of minor triangulation, 55,800 acres, partly observed, the field work of which will probably be finished by the end of July next; and 300,000 acres of major and minor triangulation combined, all the stations of which have been prepared, observing commenced, and, weather permitting, may reasonably be expected, as far as the field work is concerned, to be completed in about three months.

SECTION SURVEY.

Since my last report, which was made up to the 30th of June, 1879, the accompanying returns show that 1,561 acres of section, 25 acres of mining, and 235 acres of revised section surveys have been executed. I may state that the whole has been applied for in small parcels, and adjoining, in the majority of cases, old surveys. This class of survey is necessarily more tedious and expensive than where larger areas are being dealt with, more particularly in those cases where they abut on old surveys, the lines and marks of which, either from defective former survey or lapse of time, have become obliterated, and, having been based originally on independent magnetic meridians, and no fixed points of departure, are very difficult in many cases to be established, involving also much loss of time in searching for indications of old lines and marks.

Minor triangulations having been pushed forward during the last year over the principal portion of this district, where lands are open for selection, all the above surveys have been executed under control thereof, and recorded in their respective block and survey districts; one block only (a mining lease) having to be done on magnetic bearing, true bearing not being available.

OFFICE WORK.

In my report of last year a detailed statement was given of the arrears of work necessary to complete the maps and records of the office up to date, and pointing out the difficulty, and, indeed, impossibility, of coping with those arrears unless more assistance was afforded me. The appointment of a second draughtsman, in August last, has enabled me, however, to make considerable progress in this direction.

The reductions necessary for the compilation of the district to the prescribed scale of one mile to the inch have been completed; plans of twenty-nine survey districts, showing all surveyed, leased, and licensed lands, reserves and roads, and other information, prepared and forwarded to head office to be lithographed. Printed copies of ten of these districts are now on sale to the public at this office. These plans are invaluable, supplying at a cheap rate a want much felt by the general public, the various Road Boards, County Councils, Property-Tax Commissioners and Assessors, and General Government, as well as obviating the time of the draughtsmen being taken up in meeting further calls upon them for the above purposes.

Exhibition maps, also to a similar scale, but showing in addition the general topographical features and lands open for selection, are approaching completion, and will be placed in show-cases in the Public Survey Office.

The above, together with the ordinary routine work of the office, checking and recording surveys, preparation of Crown grants, deferred-payment licenses, pastoral and mineral leases, checking and examining deposited plans, description and diagrams on application, transfers and certificates of title for the Land Transfer Department, tracings for field surveyors, and attending to the requirements of the general public and Crown Lands Office, has kept the office staff fully employed.

HENRY G. CLARK,
Chief Surveyor.

CANTERBURY.

The satisfactory progress in the various surveys under my charge for the year ended 30th June, 1880, has, you will be glad to hear, enabled me to reduce to controllable limits the very large arrears

* Mr. Hiller has since died.

that had accumulated when I took charge of this branch of the department in the beginning of January, 1877, and that were augmented by the heavy land sales of that and the following year. The details of the year's operations are as under:—

MINOR TRIANGULATION.

The impracticability of getting reliable sectional surveys done when, as under the Act, land may be selected in the most remote part of the district, has forced the extension of the minor triangulation to cover such purchases. I have thus had to include within my operations nearly the whole of the Mackenzie country. However, an exceptionally fine summer has enabled Mr. Maben and his assistant, Mr. Harper (contractors), to complete 489,842 acres, of which trigonometrical and topographical plans have been sent in. Mr. Maitland (staff) has reobserved 297,774 acres of Mr. Sealey's defective work, extending it to join that of Mr. Maben in the Mackenzie country, covering a further area of 97,280 acres; thus—with the exception of two small pieces of country, one between the Pukaki and Ohou Rivers, and the other at the head of Lake Wanaka—completing all the triangulation likely to be required for many years to come in the southern part of the district. Mr. Welch has sent in plans of 74,542 acres, to be followed in a fortnight by an additional 30,000 acres, when the whole of the Peninsula will be covered with small-sized triangles, on which can be based, and at any time properly checked, all the intricate sectional work. Mr. Brodrick has completed 115,474 acres in the Upper Ashley District, permitting land purchased some years since to be accurately surveyed, and Mr. Pickett has finished a small area on the coast near Christchurch. The total triangulation completed during the year being therefore 780,468 acres and 330,843 acres, with and without topography respectively.

The following table shows all the closures. The greatest mean discrepancy noted between any of the new work is under 1 link per mile, and the mean error of forty-two closures 0.78 links, or about three-quarters of a link in a mile; evincing great care and skill on the part of the surveyors employed.

SECTIONAL SURVEYS.

Under this heading the work done during the year is solely of land purchased from the Crown or reserves of which it was necessary to define the boundaries so that grants could issue. The progress made has been very satisfactory, the contract surveyors having completed 2,019 sections, equal to 281,740 acres, at a cost per acre of 9d.; and the staff 1,368 sections, equal to 122,986 acres, at 1s. 11d. per acre. Maps of the whole are in the office and in process of check prior to the issue of the grants.

I have in previous reports fully discussed the advantages the contractors have over the staff surveyors, and the consequent unfairness of a comparison of prices; but, in addition, the average cost of the staff work is greatly increased by the heavy expense of the Peninsula surveys, equal this year to 5s. 7d. an acre. Better progress has, however, been made than last year, 327 sections, equal to 17,624 acres, having been completed; and, as I am gradually getting the heaviest-timbered land surveyed, there is little doubt that, in another two years, the arrears will be brought up so that attention can be paid to the revision of the old work not yet Crown-granted.

Of the 404,726 acres sectional work completed, 380,069 are entirely new surveys, and 24,657 are revisions of unplotted work that could not be Crown-granted from the old plans. The sectional work completed by the staff is scattered in every part of the province, and caused much loss of time by unavoidable and frequent shiftings of camp.

INSPECTION.

All contracts in progress have been inspected, some of them three or four times, and, with two exceptions, every staff surveyor has been visited, his work checked, and diagrams of said checks, with the Inspector's reports, duly forwarded to Head Office.

THE ARREARS OF SURVEY

Were, on the 1st July, 1879, without taking into consideration any of the revisions that the former system will entail, over 600,000 acres; to which, however, the year's land sales have but added 17,198 acres. The large area of sectional work done during the year just ended has, therefore, reduced these arrears to 3,305 sections or reserves, containing 252,084 acres, which can be overtaken within a reasonable time by the present contractors and officers of the staff.

MAPPING.

During the year 235 large and 159 small plans have been received in the Christchurch office, and, as they are checked by Mr. Shanks, are entered on the block and Crown-grant record-maps. One hundred and two new block-sheets have been started, and more or less work entered on the others; in all 341 are completed or in progress. Twenty-three new Crown-grant record district maps have been commenced, and 6 for town lands, giving a total of 60 for Crown-grant record.

In the reduction office, under the charge of Mr. McCardell, 2 county maps have been constructed and tracings forwarded to head office; 8 new district maps made, and additions to others; 16 district maps traced and coloured for the Land Office; 3 district maps traced and sent to Wellington for lithography, and for the same purpose other 8 are ready, but waiting for new surveys to be checked and entered upon them.

Of the trigonometrical plans 27 have been traced for photo-lithography, giving a total of 40 districts issued for the use of sectional surveyors; in all, the plans of 59 districts are finished, and 18 are in progress and will shortly be ready for issue to the public. Considering, therefore, the arrears with which I had to contend, I think satisfactory progress has been made in getting the office plans into working order.

CROWN GRANTS.

Under this heading the arrears were very great, owing principally to the field surveys having been allowed to accumulate. In addition, however, to checking my own surveys as they came in, I have, as opportunity offered, had as much as I could of the old work plotted and Crown-granted. During the year 1,918 grants have been prepared, embracing 224 town, 2,634 rural sections, and 29 reserves,

In concluding my report I have pleasure in calling attention to the ready and efficient assistance I have received from the Inspector, the officer in charge of the Land Transfer branch, the officers in charge of the plotting and compilation of the block-maps in Christchurch and Timaru, the Chief Draughtsman and the Accountant, and the other officers generally.

JOHN H. BAKER,
Chief Surveyor.

MINOR TRIANGULATION, 1879-80.

Closing Errors.

Survey District.	Lines.	Survey by	Survey by	Difference.	Error per Mile.	Mean Error per Mile.	
Arowhenua ...	D-A	W. Kitson (old work)	H. Maitland.			1.32	
		20,041.6	20,047.8	6.2	2.47		
		A-H	31,855.6	31,851.4	4.2		1.05
Pareora ...	H-J	26,514.3	26,510.2	4.1	1.24	1.32	
		J-S	11,801.4	11,798.9	2.5		1.70
		S-Q	32,859.9	32,860.5	0.6		0.13
Mackenzie ...	Dalgety-E	T. Maben.	W. A. Harper.			0.32	
		31,742.1	31,744.5	2.4	0.60		
		E-G	19,496.1	19,496.0	0.1		0.04
Opawa ...	O-M	27,049.0	H. Maitland.	2.3	0.68	0.44	
		M-K	28,970.8	28,970.1	0.7		0.19
		Burke and Mackenzie ...	B-S	29,536.6	W. A. Harper.		3.0	0.81	0.81
S-U	25,858.6			25,864.7	6.1	1.65	
U-V	25,417.2			25,419.7	2.5	0.79	
Pukaki East and Gladstone	V-DD	20,786.7	20,787.1	0.4	0.15	0.81	
		DD-BB	17,602.9	17,606.3	3.4		1.55
		BB-P	22,663.2	22,666.9	3.7		1.31
		P-Q	30,862.5	30,865.4	2.9		0.75
		Q/-VV	21,879.0	21,878.6	0.4		0.15
		VV-S	12,879.4	12,879.6	0.2		0.12
Christchurch ...	N-M	J. E. Pickett.	J. S. Welch.			0.56	
		10,314.5	10,315.7	1.2	0.93		
		M-A	11,796.0	11,795.7	0.3		0.20
Christchurch ...	P-J	C. W. Adams (Standard Survey).	J. E. Pickett.			1.00	
		10,584.00	10,581.5	2.5	1.89		
		N-O	7,765.12	7,765.0	0.12		0.10
Christchurch ...	Q-N	C. W. Adams (Standard Survey).	J. S. Welch.			0.92	
		17,489.47	17,487.5	1.97	0.92		
		J. E. F. Coyle.	H. Maitland.				
Opuha ...	H-G	26,914.8	26,910.2	4.6	1.37	0.99	
		G-I	34,301.4	34,304.6	3.2		0.75
		I-L	27,162.0	27,162.3	0.3		0.09
Tengawi...	L-M	34,634.3	34,630.9	3.4	0.79	0.99	
		M-W	27,042.2	27,036.4	5.8		1.72
		W-Q	25,528.3	25,524.3	4.0		1.25
Opihi ...	Q-V	H. Maitland.	H. Maitland.			0.58	
		19,354.6	19,352.1	2.5	1.03		
		V-U	22,969.0	22,968.5	0.5		0.17
Opawa and Tengawi	U-R	31,869.3	31,869.4	0.1	0.03	0.58	
		R-S	21,728.3	21,728.2	0.1		0.04
		S-T	25,595.8	25,593.5	2.3		0.72
		T-A	19,747.2	19,746.8	0.4		0.16
		A-C	35,787.0	35,781.8	5.2		1.16
		C-F	17,396.5	17,394.5	2.0		0.92
Burke and Tengawi	F-U	22,201.0	22,198.1	2.9	1.05	0.58	
		U-W	12,184.0	12,184.5	0.5		0.33
		W-O	21,318.7	21,319.1	0.4		0.15
Opawa...	O-U	22,950.2	22,948.4	1.8	0.63	0.58	
		U-A	24,787.0	24,783.4	3.6		1.16

Mean error per mile of the whole of the above = 0.78.

WESTLAND.

The work done during the year ending 30th June, 1880, consists of:—

MAJOR TRIANGULATION.

Total area completed, 325,683 acres, at a cost of 1.07d. per acre.

In my last report I expressed the hope to be able to carry this work to Karangarua River, and to complete 500 square miles, equal to 320,000 acres. As to area, I have succeeded; but the major triangulation does not extend to Karangarua River—it barely reaches Weheka, or Cook's River. The reason is that the services of Mr. Roberts, the officer employed at this survey, were, with your sanction, engaged in carrying the Westland triangulation across the main dividing range into Canterbury *via* head-waters of the Big Wanganui River. Amongst great and exceptional difficulties this was

satisfactorily accomplished; and the area thus added to major triangulation between main dividing range and trig. stations at the gorges of the Wanganui and Waitaha Rivers fully compensated for the loss in area between Weheka and Karangarua Rivers.

MINOR TRIANGULATION.

Area completed, 80,134 acres, at a cost of 2.22d. per acre; consisting of detached pieces, with distances derived by breaking down from major trig. stations.

TOPOGRAPHICAL AND TRIGONOMETRICAL SURVEYS.

Area completed, 93,418 acres, at a cost of 3.05d. per acre, consisting principally of circuit-traverse surveys, &c., within areas over which major triangulation only extended.

RURAL AND SUBURBAN SECTION SURVEYS.

Completed, 19,990 acres, at a cost of 1s. 3½d. per acre. The great difference in the cost of these surveys by different surveyors is due to the system of selection before survey which obtains in West-land. In one case a surveyor has to survey a number of sections contiguous to one another and of comparatively large size: the cost per acre will naturally be small as compared with that of another surveyor whose rural and suburban section surveys are scattered and of less size. It happens that, for the reason stated, in this year's report the greatest cost per acre is returned by the same surveyor whose rural and suburban section survey work ranged lowest in last year's report.

ROADS AND WATER-RACES.

Forty-one and a quarter miles, at £19 9s. 11d. per mile; 40 miles of these (all heavily-timbered country) comprised survey and levelling, preparation of plans, longitudinal and cross sections, preparation of specifications ready for calling for tenders.

PROPOSED OPERATIONS DURING THE YEAR ENDING 30TH JUNE, 1881.

Under this heading special mention need only be made of triangulation, which I purpose extending from Weheka River to base-line in Paringa River Valley. Total area to be covered, 200,000 acres. Closings also with Canterbury triangulation in Rakaia Valley should be effected and distances verified by measuring and connecting with a base-line there.

Arrears of rural and suburban section surveys (57,496 acres, inclusive of endowments) to be brought up to date if possible; and circuit traverses, mining and road surveys, to be attended to as occasion requires.

GERHARD MUELLER,
Chief Surveyor.

OTAGO.

The areas of the different classes of survey done during the past year, their average cost per acre or allotment, and total cost, also cost of this office and the branch offices, are as follows:—

	Area.	Cost.	£	s.	d.
Minor triangulation, with topography	293,218 acres	1½ per acre	1,905	14	6
Rural section survey	115,276 "	0¾ "	6,128	2	1
Town allotments (881)	618½ "	10 per allotmt.	698	19	10
Gold-mining surveys	1,604 "	7 per acre	770	10	3
Water-races, roads, &c.	130½ miles	0 per mile	375	3	2
Other works ... ..	...	...	931	18	5
			£10,810	8	3
Less amount paid during last year ... ..	...	...	485	4	4
Total cost of field work for the year ... ..	...	...	£10,325	3	11
Cost of Dunedin and branch offices ... ..	...	...	4,597	10	10
Total cost of district for the year ... ..	...	...	£14,922	14	9

While, however, this sum of £14,922 14s. 9d. appears as the cost for the year ending 30th June, 1880, of the Survey Department in Otago, it really includes the sum of £2,234 15s. 1d., being the expense that this office has been put to in doing work for other departments or public bodies. For the School Commissioners, a survey of 20,000 acres at Wakaia; for the Clutha River Trust, a survey of 15,300 acres in Kuriwao District; for the Balclutha Athenæum, a survey of 600 acres; for the Milton Corporation, a survey of 2,000 acres; for suburban Municipalities, surveys of 5,244 acres; for the Oamaru Harbour Board Trust, a topographical survey of Run 160; together with a good deal of work for the Land-Tax Office, for County Councils and for other offices, have been done. I would draw attention to this fact in connection with the statement recently made public that the Survey Department is a very expensive one. And, while referring to this matter of expense, perhaps I may be allowed to state that there are officers on the staff well qualified, and who have passed both junior and senior Civil Service examinations, whose salaries are not equal to the wages paid to ordinary artisans. Moreover, the life of a field surveyor in this part of the colony, living in a tent all the year, is a hard and very exposed one, cut off as he usually is from the advantages and comforts of city life, and one which results sooner or later in ailments due to exposure. Taking these things into account, there can be no doubt that, so far as this office is concerned, there are none here overpaid, while some are underpaid. Therefore, for these reasons I do not see very well how the cost per acre of survey could be reduced.

MINOR TRIANGULATION AND TOPOGRAPHY.

Of the 293,218 acres under this heading, 23,043 acres were done by Assistant Surveyor Murray, in the Wakaia and Wart Hill Districts 115,875 acres by Contract Surveyor J. Aitken Connell, in the

Upper Waitaki Plains; and 154,300 acres by Contract Surveyor G. M. Barr, C.E., in the Gala and Otematakau Districts, Upper Waitaki. The average cost per acre was 1½d. The triangulations of Messrs. Connell and Barr adjoin one another, and were started from independent base-lines—one measured close to the Omarama Creek, in the Ahuriri District, and the other measured in the valley of the Otematapayo or Gala River, in the Gala District. These base-lines were measured, with the usual precautions, by means of steel bands or tapes 100 links long, referred to the Dunedin standard length laid down at the Customhouse. The angles were observed by 5-inch theodolites, both plain. Mr. Connell's work joined a previous triangulation of his which had been carried from Lake Ohau to Lake Hawea in the year 1873, and showed with that work a difference at the rate of 3·8 links per mile. He also had a junction with above triangulation of Mr. Barr's along the south boundary of Benmore District, which showed a difference at the rate of 0·75 links per mile. Mr. Barr's triangulation showed above difference, of 0·75 links per mile, at its junction with Mr. Connell's triangulation; at its junction with old Kurow triangulation of Mr. Grant's, at the rate of 3 links per mile; and at its junction with Mr. Grant's triangulation on Canterbury bank of the Waitaki River, at the rate of 0·66 links per mile. These results, as between Messrs. Connell and Barr, I consider very satisfactory, more particularly as the start from Mr. Barr's base was awkward, owing to the mountainous character of the country and its peculiar formation, which caused an increase in the number of stations to be observed from, between the base-line and the junction between the two surveys. Mr. Barr's junction, again, with Mr. Grant's work on Kurow was effected under unfavourable and difficult conditions, due to the convex and too-gradually-ascending shoulders of the Kurow Range. The close, therefore, between these two triangulations may be regarded as fair under the circumstances, and showing honest results. These triangulations complete the connection from Observation Point to Lake Ohau by the coast and valley of the Waitaki River, and meet those other triangulations which have been carried round by other routes to Lake Ohau.

During March and April of this year Mr. Wilmot, Assistant Surveyor for Queenstown District, has been engaged exploring the valleys of the Routeburn and Hollyford River to the West Coast, and selecting trig. stations, so as to connect the main system of triangulation which extends to the head of Lake Wakatipu with the isolated triangulation of part of Martin's Bay District. This work is spread over thirty miles of wild Alpine country, full of bush, and intersected by dangerous snow-fed rivers. Provisions, tents, &c., had to be carried on the men's backs for the greater part of this distance, including the crossing of the dividing range at about 4,000 feet above sea-level. Notwithstanding the natural difficulties of the country and that two weeks were lost by wet weather, Mr. Wilmot succeeded in doing his work of selection and setting up flags in seven weeks. I must also add that his method of operations showed good judgment, intelligence, and energy. A full report of this has already been furnished.

RURAL SECTION SURVEYS.

The staff surveyors engaged in this class of work during the year were Messrs. Strauchon, Barron Mackay, Mackenzie, Murray, Edie, Langmuir, Wilmot, Campbell, and Armstrong. Mr. Edie's work was delayed somewhat by his illness, and Mr. Armstrong has only been six months in the field with his party. The total area surveyed under this heading is 115,276 acres, at an average cost of 1s. 0¾d. per acre. This acreage is good as compared with that of last year, because the sections are of smaller average size, and there has been a great deal of travelling about on the part of several surveyors, such as in the case of Mr. Mackay and Mr. Campbell. Mr. Mackay alone has done 980 miles in travelling, occupying about three months of the twelve; this being unavoidable where isolated sections have each to be surveyed separately, under the existing laws. Another circumstance affecting the cost is bush work; a considerable part of Messrs. Strauchon's, Mackenzie's, and Armstrong's being of that nature. In Mr. Strauchon's case, part of the bush survey has been by order of the Waste Lands Board, and part the result of general instructions from your office to get all districts which have been surveyed lithographed as soon as possible; while bush work done by Messrs. Mackenzie and Armstrong has been by instructions of the Waste Lands Board, the result of purchases of land, or of applications to purchase old bush reserves. The Clutha River Trust endowment, surveyed by Mr. Strauchon and Mr. Armstrong, contains a considerable proportion of very good agricultural land.

A survey of 6,700 acres about Livingstone, in the Maruwenua District, was very troublesome and tedious. This was done by Mr. Barron, and contributed largely to making the average cost of his work as high as it is—1s. 6d. per acre. It is due to Mr. Barron that I should point out that much of this ground has been mined over for gold, and is being so worked now; that it is intersected by numerous water-races, having also many mining rights to be protected: so that the actual amount of surveying, pegging, and calculation necessary has been out of all proportion to the value of the land. After all, a large number of sections have had to be put into mining reserves; and the whole question of dealing with this block will be a difficult problem for the Land Board to solve.

There are 20,000 acres of an educational endowment near Wakaia which have been surveyed by Mr. Murray and Mr. John Campbell into sections from 200 to 320 acres. This comprises some of the finest unsold land in Otago, and the climate, the settlers have informed me, is very fine. Bush and firewood are conveniently situated to most of this land, and in general it is well watered.

Mr. Langmuir's work has been such as involved less travelling than that of any other surveyor; which, together with his energy and diligence, have resulted in his surveying 20,817 acres at the small cost of 6·2d. per acre. It must not be inferred from this that other surveyors whose work has cost more have not done their duty; but it shows how cheaply a good staff surveyor can turn out work, provided the conditions are favourable. In this respect Mr. Murray's work is even cheaper; for, although his rate per acre is higher, the allotments laid out by him are smaller, and he had more travelling.

Mr. Edie, who is leaving the service, has just about finished the survey of a "village settlement" near Hindon, and within two miles of the Otago Central Railway line, to which a good practicable dray-road has been surveyed. The land is good and well watered. The area is not included in this year's acreage.

A practicable road-line was, under instructions, found by me across the wild gorge of the Lee Stream, which, though not all that could be desired, will still be a vast improvement on the dangerous pack-horse track hitherto in use between Outram and Hindon. It is now nearly finished; and the worst part of it, at the Lee, will be very little steeper than Pitt Street, Dunedin, or about a grade of 1 in 8. All I claim for it is, that it will be a fair dray-road, and be a great boon to the settlers on "Boyd's Run" (No. 75 on map) and the gold-diggers at Hindon. As this work will only cost the Government the sum of £3,000 voted last session, I deem it well spent in opening up this somewhat inaccessible district. I may also mention, in connection with Mr. Edie's work, that practicable roads have been carefully laid out and graded from the Taieri River up on to the table-land at Hindon. Two of these I personally staked out along with Mr. Gillies, who was then a cadet. Mr. Greenlaw's original line also has been picked up and laid off anew; so that sufficient provision has been made for giving access to the railway-line.

TOWN SECTION SURVEYS.

Of these, 881 sections, at 15s. 10d. each, have been surveyed.

SURVEY PARTIES AND INSPECTION.

During the past year there have been ten survey parties at work. One of these, however, and two contract surveyors, have only been engaged part of the time. I have personally made all the inspections and checks. Sixteen inspections, including two offices, have been made, and twelve checks have been forwarded to Head Office. The effect of the system of inspection, and of check by traverse reductions, is that the average work of the surveyor is of a better class; for he does not know at what particular points check-triangles may be thrown over his work to test it. The selection of practicable road-lines, under the system of observing the grades, is also having good effects generally. But this cannot always be attained—as, for example, where roads have to be continuous, and to be connected to old surveys, or to be taken over very broken country where no choice of routes exists. As a rule, however, very fair lines are got; and where the country is very rough I cause tables of the grades to be sent in by the surveyors along with the maps. The average error in chaining has been 3 links per mile.

GOLD-MINING SURVEYS.

Of gold-mining surveys, 1,604 acres have been laid off, consisting of 98 sections, the average cost per acre being 9s. 7d. This indicates a large increase in mining ventures, as many of the applications are for quartz-reef or cement claims. This description of survey is always necessarily expensive; but the cost per acre is very much less this year than last. I account for this fact chiefly because the greater number of claims laid off were all together or near one another, at Waitahuna, Wetherstone's, and Hindon.

ROADS, RAILWAYS, AND WATER-RACES.

Of these, 130½ miles have been surveyed, at a cost of £2 18s. per mile. The existence of water-races running through nearly every survey in a gold field renders the surveyor's work more tedious and expensive than elsewhere. This is, however, unavoidable, as no proper title can be given by the Crown to land unless the position of a water-race, road, or other reserve has been accurately surveyed and indicated.

DUNEDIN OFFICE WORK.

Land Transfer Branch.—This work increases. Land Transfer plans, 47 in number, have been checked and passed during the year. These are not the work of the staff surveyors, but come in from private surveyors to this office to be passed by me. When passed I deposit the plans finally with the District Land Registrar, so that titles or certificates may be issued from them. I find still that constant watchfulness and care on the part of Mr. Thompson and myself are necessary, in order to secure that these maps conform to the regulations, and are made thoroughly distinct and intelligible. Owners of land, and even many surveyors, I find, do not understand how needful it is that in re-surveys of original sections every care and precaution must be taken to find old pegs, or the identity of position with the line of these of fences which have replaced them. As the Crown guarantees the new title on the faith of the accuracy of the new survey, it is manifest that that survey should be very reliable.

Of the Otago Peninsula, where much confusion has arisen because of the original surveys not having been pegged, plans are beginning to come in in detail. These are chiefly for road-deviations under "The Public Works Act, 1876;" but, as the ultimate destination of such will be the Land Transfer Office, I treat them as to accuracy by the same rules as apply to ordinary surveys for that office. The effect of this detail manner of arranging boundaries will be that each survey will be settled and passed by itself. The question is really more one of title than survey. Of other work there are—examining and checking applications, 191; examining and checking transfers, 1,253; examining and checking mortgages, 1,147; examining and checking draft certificates, 1,124; placing plans on certificates of title, 2,248 (duplicates); engrossing "Pursuant" on same, 2,300; &c.

GENERAL OFFICE WORK.

Mr. Douglas, chief draughtsman, and the staff in this office have been very fully employed during the year. Besides the work of checking maps as they come in from the surveyors, lithographing them, recording them on the Crown-grant record-maps, copying on to Land Office maps, and recording roads on maps, a large amount of work has been done by the draughtsmen of an extra kind, as for the Police Department, Land-Tax Office, Crown Lands Office, Education Office, County Councils, Defence Office, and Marine Department; and there is still, besides the ordinary routine work, large arrears which we are beginning to overtake, as new copies of the original reconnaissance

maps, which were rapidly "waxing old" and getting destroyed by use, (the progress of the survey in producing new maps is not, to my mind, of greater importance than the careful preservation of the old ones in their integrity), working up detached and scattered surveys into compiled block-maps, and constructing new-run maps, showing the new runs as leased. The latter are based on the minor triangulation surveys, the trig. stations and natural features of the country being all accurately shown. By this means not only will the new runs be recorded, but a very useful and interesting map of the country on a comprehensive scale will be gradually got together.

Crown Grants.—Of these, you will see from the attached tables, 299 have been prepared and sent from this office, representing an acreage of 51,923 acres; 305 are prepared and ready for issue; and 481 are partly finished. There were 100 licenses for deferred-payment sales prepared; also 274 mining and agricultural leases in duplicate got ready.

Lithographic Work.—In this branch of office work 17,000 copies of block-maps have been printed; traverse forms, 3,000; field sketch-sheets, 2,000; circulars, &c., 9,000; and total maps mounted, 594; all at a cost of £550.

W. ARTHUR,
Chief Surveyor.

SOUTHLAND.

AMOUNT, NATURE, AND COST OF WORK DONE.

Of rural and suburban surveys, 59,292 acres, comprising 492 sections, have been executed at an average cost of 1s. 4½d. per acre. Of town and village surveys, 376 allotments, embracing 381 acres, have been laid off at an average cost of 11s. 11½d. per allotment. Of topographical and trigonometrical survey, 115,200 acres have been surveyed and mapped at a cost of 1½d. per acre. In addition to these, some 15 mining-lease areas have been surveyed on Longwood Reefs at a nearly uniform cost of £8 14s. per application. In judging of the acreage rate for rural and suburban surveys, allowance must be made for the fact that the surveys were largely dispersed, and that some 50 sections, embracing 4,500 acres or thereby, were in bush. Of the town surveys, 150 sections, coming from 80 to 90 acres, were also in bush; and it will be observed that these sections were of unusual size, averaging over an acre each. The gold-mining applications were in densely-timbered broken country; survey fees being deposited for same by applicants.

An analysis of the acreage placed under the head of "rural and suburban surveys" shows the fact that 150 rural sections, covering nearly 27,000 acres, were laid off for purposes of deferred-payment application. This is exclusive of a large number of smaller sections that were surveyed during the year within new townships and village settlements. The amount of land surveyed subsequent to application, and for which fees were deposited, comprises 44 sections, covering an area of nearly 19,000 acres. The timbered areas surveyed for saw-mill purposes were 15, embracing 2,829 acres in all; the survey-fees in these cases being also deposited by applicants. What, therefore, between purchased land, saw-mill areas, mining-lease areas, and municipal endowments (the survey costs in all such cases being borne by the applicants or grantees), the department would be entitled to a credit of nearly £1,500, which amount would considerably diminish the total field cost during the year.

SECTIONAL SURVEYS.

It will thus be seen that considerable progress has been made during the year with the outstanding selections, as also with the subdivision of the deferred-payment blocks, many of which were eagerly inquired after for purposes of settlement. Owing to the absence of triangulation the applications in the Waiiau Valley had for a long time remained unsurveyed; but this desideratum has now been supplied, and the greater bulk of the applications have since been surveyed and sent in. Though somewhat later than several of the provincial districts in using the steel band for chainage purposes, I am glad to state that it is now almost generally used; and as a consequence it may be safely asserted that the character of the field work has considerably improved in accuracy. The liability of the ordinary chain to stretch through both momentary tension and constant use, and the errors that are apt, if not bound, to arise in consequence, have long shown the necessity of a rigid measuring-band, which neither permanent use nor immediate tension could appreciably affect. Hitherto, even more than want of horizontality on the part of the chain, this has been the great source of error; and I would almost go the length of suggesting that the use of the steel band be made imperative on all officers of the staff.

TRIANGULATION.

The chief work under this head executed during the year has been the extension of minor triangulation up the Waiiau Valley. Previous to its being done a blank untriangulated space extended from the Waiiau District northward to Mount York, to which point a Ray-trace had been carried from Lake Wakatipu some years ago. From the base-line (remeasured by the surveyor, Mr. John Hay) of the previously-triangulated district of Waiiau, a distance of some 30 miles intervenes between it and the extreme end of the Ray-trace, near Mount York. A verification base was, however, measured in the valley, some 7 miles south of Mount York; the result being a closure within 34 links in a distance of nearly 3 miles. The closure of Mr. Hay's triangulation with Mr. Anthony Wilson's Ray-trace—which latter was carried from a base-line many miles distant—is, on a long side of a triangle, within the surprising limit of three-tenths of a link. So far as the connection, either of the outstanding or prospective applications, is concerned, the triangulation referred to is, I think, the last that need be done, and for the future the officers will therefore be able exclusively to devote their attention to sectional surveys.

LAND TRANSFER WORK.

A large amount of work has necessarily been thrown upon this branch of the department by the transactions which take place under the Land Transfer Act. During the year 64 plans have been examined and passed. These plans have been found to cover 212 original Government sections, the number of new allotments into which the land has been subdivided being 3,223, and the total acreage embraced being 51,574 acres. At this rate of progress all the freehold land in the district would be

subdivided and change hands in twenty years. The number of plans drawn upon certificates of title during the year has been 932, and the number of Land Transfer record-maps prepared has been 37. This department of the work is likely to increase for some time to come.

CROWN GRANTS.

The number of Crown grants prepared and recorded during the year has been 635. In addition to this 240 were recorded after their return from Wellington, a practice which is now discontinued, the process of preparation and record being now simultaneous. Under this head I might mention that plans (in duplicate) have been prepared for 156 conditional titles or deferred-payment licenses.

LITHOGRAPHS.

During the year 26 drawings have been prepared for purposes of lithography. Three of these drawings were somewhat important and extensive ones, representing as they did the surveyed sections in the districts of Hokonui, Taringatura, and Forest Hill respectively. These districts alone occupy a large space on the provincial district map, covering as they do some 550,000 acres, and comprising some 1,250 surveyed sections. The other drawings were of new townships, village reserves, special-value and deferred-payment blocks, the immediate object of preparation being to guide purchasers and selectors. The greater bulk of the drawings (23 in all) was printed locally, at a cost of £67 15s., the total number of prints being 3,575. The remaining drawings (3 in all) were printed at the head office, Wellington, the total number of prints being 1,250. Were the prints all disposed of at the published price—a contingency which of course cannot arise—the sum realized would be £453.

We have still two or three important districts—particularly Wairoa and Waiau Districts—to draw and print, on the completion of which this office will be in a very fair position at a moment's notice to supply in a published form the information in regard to form, position, and acreage of sections which is constantly required by the general public, and which is so invaluable to the Government and local bodies for Road Board, County Council, property-tax, &c., purposes.

WORK ON HAND.

The progress that has been made with the field work during the past year, joined to the paucity of land-purchasers and the limited character of the land available for selection, would go to show that with the present staff we shall soon be able to give a good account of the outstanding surveys. Outside of purchases there are still, however, some 20,000 acres of deferred-payment land requiring ultimate subdivision; and, in addition to these, 37 reserves have been recommended by the Waste Lands Board as suitable village sites, these sites entailing subdivision at an earlier or later date. The work before the office ere the records and the routine of posting them can be considered satisfactory is still considerable. The current work, including land transfer, Crown-grant preparation, and other pressing and important duties, has hitherto left little or no time to enable the working surveys of the unblocked districts to be compiled on uniform block-sheets; and till this be done the survey data of such districts cannot be looked upon as being in a perfect state. The selection maps to guide the public, however, have been considerably improved during the past year, and, instead of having a dozen or so of small maps (the relative places of which were apt to confuse settlers), we have now one or two large wall-maps, which show a great breadth of surveyed country and the tenure of same at a glance.

JOHN SPENCE,
Chief Surveyor.

HEAD OFFICE.

I have the honor to report that during the past year forty-two survey district maps have been drawn and lithographed on the scale of 1 mile to an inch; two circuit maps, scale 8 miles to an inch; one trig. map, scale 1 mile to an inch; and fourteen survey block-maps, scale 20 chains to an inch.

The land-tenure maps were revised to 30th June, 1879; maps for the annual report and Land Guide were constructed and printed; also maps for the Local Industries and West Coast Commissions.

The miscellaneous work consisted mainly of tracings, compilations, calculations, descriptions of boundaries of districts.

The county maps exhibited in the corridor are now posted up with the land sales as they take place, from the returns of the Receivers of Land Revenue which are sent here by the Treasury for scrutiny and record.

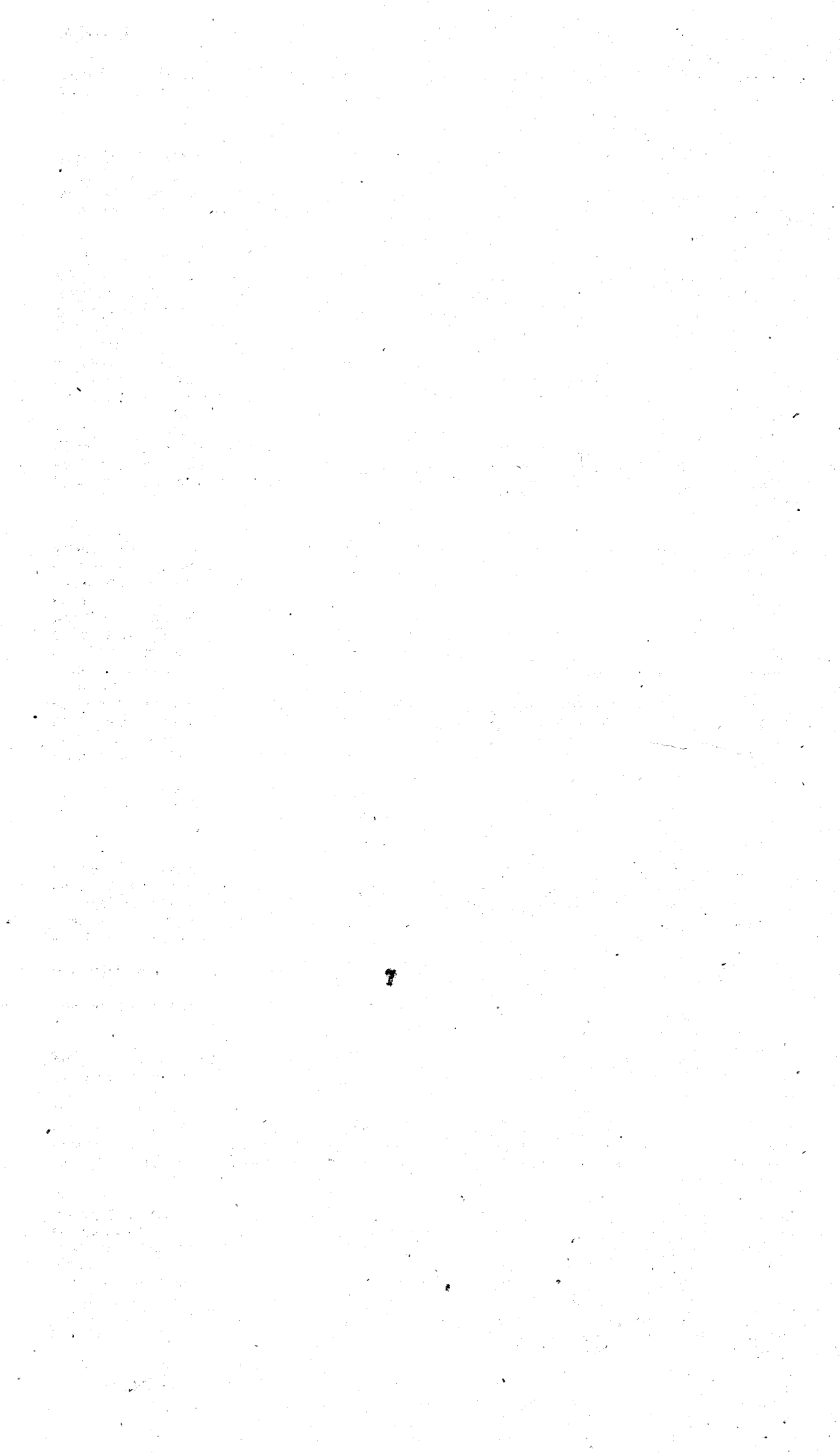
During the year the number of letters received and despatched have been about 6,800. This number gives only a partial indication of the work to be done in conducting such a correspondence, as, this being the Head Office, many of the subjects require careful study.

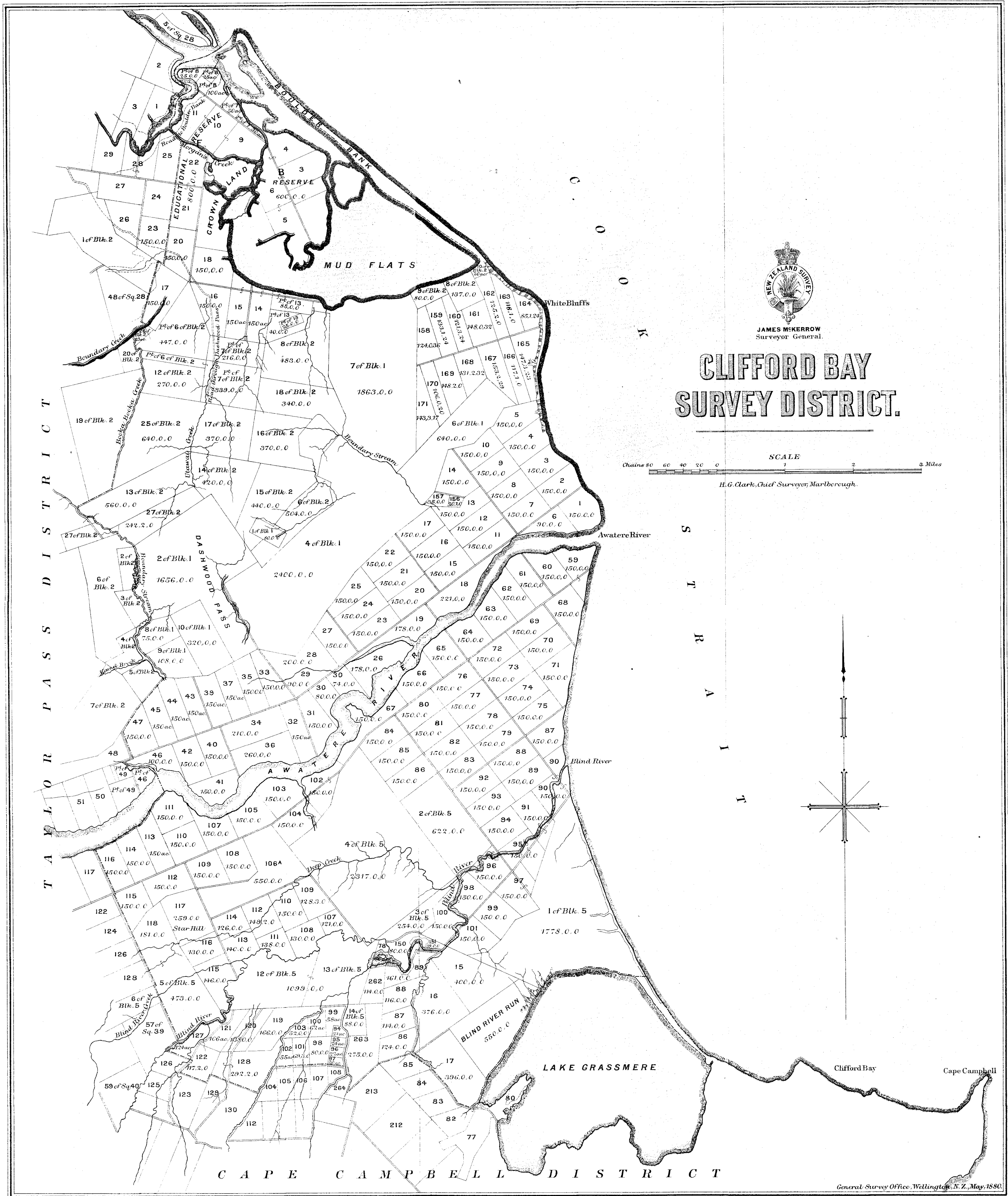
In the photolithographic establishment the service has sustained a very great loss in the death of Mr. Alexander McColl, the chief of that branch of the department; and there is little doubt but that the illness of which he died was contracted by too close attention to his profession and to the experiments which he carried on for developing its utility. His assistant, Mr. Ramsay, has satisfactorily conducted the routine work since Mr. McColl's death.

It will be seen that the quantity of maps and other papers lithographed—viz., 529,574 impressions, in 1,634 separate printings—is nearly double the quantities shown last year. The number of photographs taken—438—is rather less than last year, and is due partly to Mr. McColl's illness and also to the fact that only one photographer has been employed instead of two, as was the case during a part of last season. It is also now partly arranged that such work as can be more efficiently and speedily done by hand is drawn on stone or transfer-paper, thus relieving the photographic gallery of work which is either not suitable for the process or which it would be a waste of means to pass through it.

A copy of one of the survey district maps is appended hereto. This will illustrate the principal work on which the Head Office draughtsmen have been engaged during the past year, and the kind of maps which is being published by the department.

A. BARRON,
Office Surveyor.



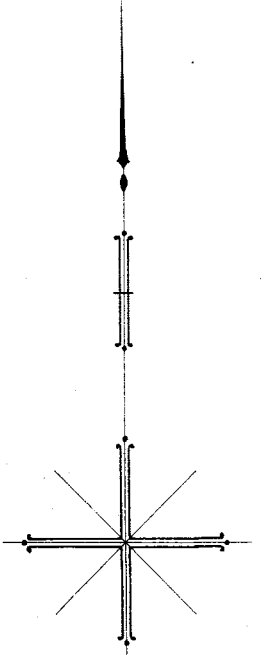


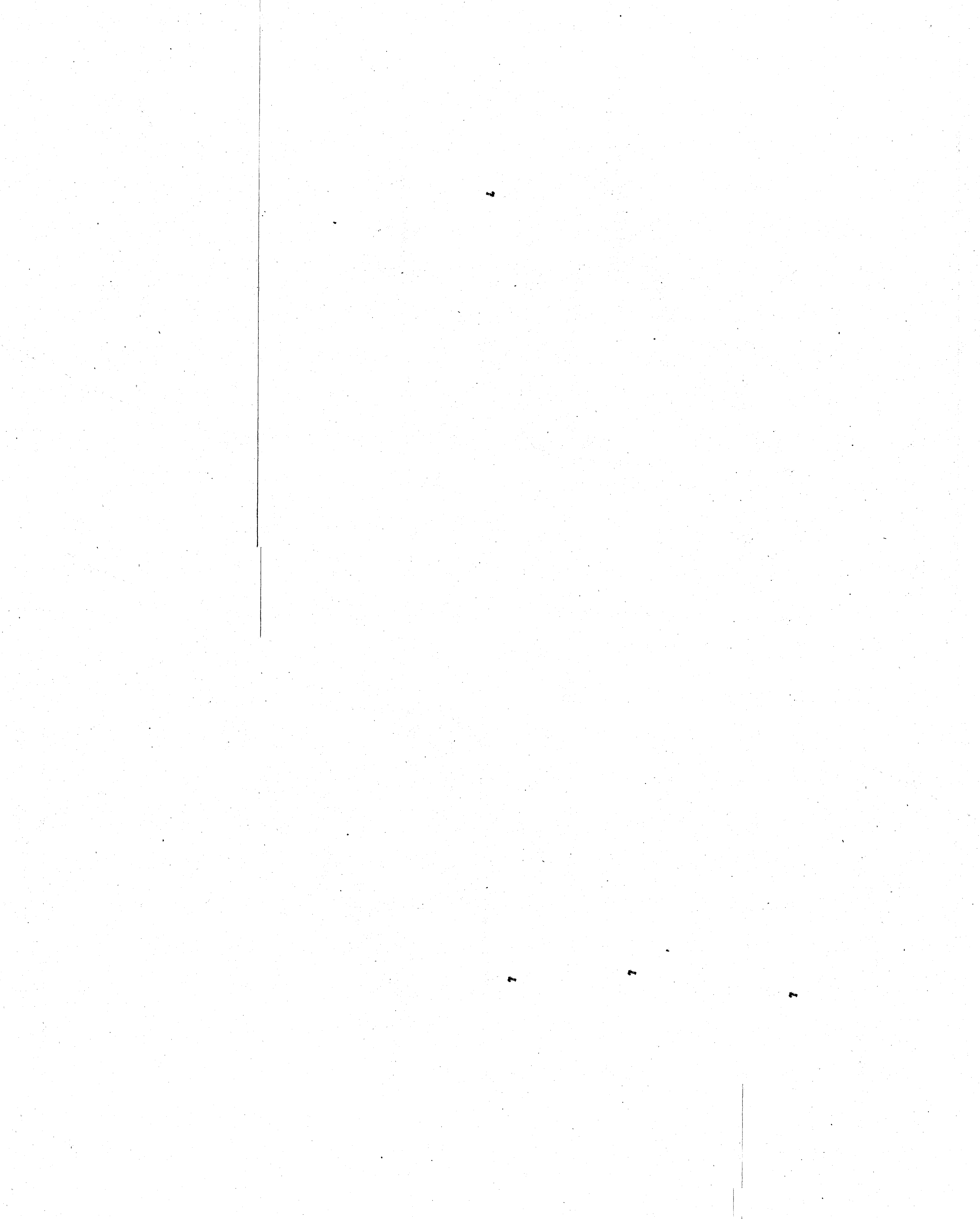
JAMES MEKERRON
Surveyor General.

CLIFFORD BAY SURVEY DISTRICT.

SCALE
Chains 80 60 40 20 0 1 2 3 Miles

H.G. Clark, Chief Surveyor, Marlborough.





RETURN of FIELD WORK executed by STAFF, AUTHORIZED, and SCHEDULE SURVEYORS, from 1st July, 1879, to 30th June, 1880. PROVINCIAL DISTRICT OF AUCKLAND.

Main table for Provincial District of Auckland with columns for Surveyor, District, Major Triangulation, Minor Triangulation, Topographical and Trigonometrical Survey, Rural and Suburban, Town Section Survey, Native Land Court Survey, Native Land Purchase Survey, Gold-mining Survey, Roads, Railways, and Water-races, Detention by Native Opposition or other Causes, Other Work, Total Cost of Surveyor and party from 1st July, 1879, to 30th June, 1880, and Remarks.

Less paid by other departments refund for surveys made, date of lithographs, &c.

2,451 4 5
£15,689 8 8

PROVINCIAL DISTRICT OF TARANAKI.

Table for Provincial District of Taranaki with columns for Staff surveyors, District, Major Triangulation, Minor Triangulation, Topographical and Trigonometrical Survey, Rural and Suburban, Town Section Survey, Native Land Court Survey, Native Land Purchase Survey, Gold-mining Survey, Roads, Railways, and Water-races, Detention by Native Opposition or other Causes, Other Work, Total Cost of Surveyor and party from 1st July, 1879, to 30th June, 1880, and Remarks.

PROVINCIAL DISTRICT OF HAWKE'S BAY.

Table for Provincial District of Hawke's Bay with columns for Staff surveyors, District, Major Triangulation, Minor Triangulation, Topographical and Trigonometrical Survey, Rural and Suburban, Town Section Survey, Native Land Court Survey, Native Land Purchase Survey, Gold-mining Survey, Roads, Railways, and Water-races, Detention by Native Opposition or other Causes, Other Work, Total Cost of Surveyor and party from 1st July, 1879, to 30th June, 1880, and Remarks.

RETURN OF FIELD WORK executed by STAFF, AUTHORIZED, and SCHEDULE SURVEYORS, &c.—continued.
PROVINCIAL DISTRICT OF WELLINGTON.

Main table with columns: Surveyor, District, Major Triangulation, Minor Triangulation, Topographical and Trigonometrical Survey, Rural and Suburban, Town Section Survey, Native Land Court Survey, Native Land Purchase Survey, Gold-mining Survey, Roads, Railways, and Water-races, Detention by Native Opposition or other Causes, Other Work, Total Cost of Survey and party from 1st July, 1879, to 30th June, 1880, Remarks.

* Not included in total. † Native Land Court subdivision.

SUMMARY OF TOTAL EXPENDITURE. £ s. d.
By Survey Vote ... 15,596 19 7
,, Land Purchase Vote ... 3,539 6 6
Total ... £19,136 6 1

PROVINCIAL DISTRICT OF NELSON.

Main table for Nelson with columns: Surveyor, District, Major Triangulation, Minor Triangulation, Topographical and Trigonometrical Survey, Rural and Suburban, Town Section Survey, Native Land Court Survey, Native Land Purchase Survey, Gold-mining Survey, Roads, Railways, and Water-races, Detention by Native Opposition or other Causes, Other Work, Total Cost of Survey and party from 1st July, 1879, to 30th June, 1880, Remarks.

* Boundary lines, Amuri District. † Standard transfer marks, Nelson.

RETURN of FIELD WORK executed by STAFF, AUTHORIZED, CONTRACT, and SCHEDULE SURVEYORS, &c.—continued.
PROVINCIAL DISTRICT OF MARLBOROUGH.

Table with columns: Surveyor, District, Major Triangulation, Minor Triangulation, Topographical and Trigonometrical Survey, Rural and Suburban, Town Section Survey, Gold-mining Survey, Roads, Railways, and Water-races, Detention by Native Opposition or other Causes, Other Work, Total Cost of Surveyor and party from 1st July, 1879, to 30th June, 1880, Remarks.

PROVINCIAL DISTRICT OF CANTERBURY.

Table with columns: Surveyor, District, Major Triangulation, Minor Triangulation, Topographical and Trigonometrical Survey, Rural and Suburban, Town Section Survey, Gold-mining Survey, Roads, Railways, and Water-races, Detention by Native Opposition or other Causes, Other Work, Total Cost of Surveyor and party from 1st July, 1879, to 30th June, 1880, Remarks.

RETURN of FIELD WORK executed by STAFF, AUTHORIZED, CONTRACT, and SCHEDULE SURVEYORS, &c.—continued.
PROVINCIAL DISTRICT OF WESTLAND.

Table with columns: Surveyor, District, Major Triangulation, Minor Triangulation, Topographical and Trigonometrical Survey, Rural and Suburban, Town Section Survey, Gold-mining Survey, Roads, Railways, and Water-races, Detention by Native Opposition or other Causes, Other Work, Total Cost of Surveyor and party from 1st July, 1879, to 30th June, 1880, Remarks.

PROVINCIAL DISTRICT OF OTAGO.

Table with columns: Surveyor, District, Major Triangulation, Minor Triangulation, Topographical and Trigonometrical Survey, Rural and Suburban, Town Section Survey, Gold-mining Survey, Roads, Railways, and Water-races, Detention by Native Opposition or other Causes, Other Work, Total Cost of Surveyor and party from 1st July, 1879, to 30th June, 1880, Remarks.

PROVINCIAL DISTRICT OF SOUTHLAND.

Table with columns: Surveyor, District, Major Triangulation, Minor Triangulation, Topographical and Trigonometrical Survey, Rural and Suburban, Town Section Survey, Gold-mining Survey, Roads, Railways, and Water-races, Detention by Native Opposition or other Causes, Other Work, Total Cost of Surveyor and party from 1st July, 1879, to 30th June, 1880, Remarks.