

1915.
NEW ZEALAND.

DRAINAGE OPERATIONS IN HAURAKI PLAINS :

REPORT FOR THE YEAR ENDED 31st MARCH, 1915; TOGETHER WITH STATEMENT
OF ACCOUNTS.

*Presented to both Houses of the General Assembly pursuant to Section 10 of the Hauraki Plains
Act, 1908.*

SIR,—

Department of Lands and Survey, Wellington, 1st June, 1915.

I have the honour to submit herewith the report on the drainage operations in the Hauraki Plains for the past year in accordance with the provisions of the Hauraki Plains Act, 1908.

During the past year some 6,444 acres were subdivided into sixty-seven farms, &c., the valuation of same amounting to £65,601, making a total of 38,994 acres, valued at £243,851, now drained, settled, and revenue-producing. There are some 294 settlers in possession. I am advised that probably only a very small area will be ready for settlement during the coming year, as the schemes of roading and drainage are each year becoming more difficult. However, development is being actively carried on.

The total expenditure under the Act has now been as follows:—

				£	s.	d.
For the year ended 31st March, 1908	...	...	...	5,070	0	0
" " 1909	...	...	...	11,672	5	6
" " 1910	...	...	...	22,235	2	11
" " 1911	...	...	...	32,103	14	0
" " 1912	...	...	...	40,084	13	1
" " 1913	...	...	...	26,608	1	3
" " 1914	...	...	...	21,467	18	2
" " 1915	...	...	...	20,399	10	4
 Total	...	...	...	<u>£179,641</u>	<u>5</u>	<u>3</u>

Quite recently I made a comprehensive inspection of the Hauraki Plains, visiting both the settled country and also that under development. I also visited the works and operations in progress. The settlers have made great headway, and many of the farms are looking like old-established places. I feel assured that the Hauraki Plains will mean much to the produce of the Dominion in the future, as without doubt it does at the present time. I particularly noted that the officers of the Land Drainage Branch were, wherever possible, doing everything they could to help the settlers, and generally I am of opinion that their interests are well looked after by this Department. As is also the case with the other big reclamation scheme (Rangitaiki Plains), the various works are being economically administered, and the dredgers are quite a feature in both instances.

As it is about nine years since I visited the plains, and as the gross area affected by the drainage is about 90,000 acres, the whole inspection was a revelation to me. From being then a dismal swamp, looked upon as practically undrainable, it has changed into a prosperous farming district, with comfortable farm homesteads, and with schools coming into view. My remarks regarding the Rangitaiki Plains administration apply equally in this case. The Chief Drainage Engineer, Mr. J. B. Thompson, is in charge, whilst his chief assistant for the works is Mr. R. G. MacMorran, who takes local control of engineering and land surveys, as also the drainage and road-construction works. I am satisfied that everything is proceeding satisfactorily, and that both officers and men are pulling well together. I am retiring shortly

Details are not available of the value of cream produced, but the totals must be well over £30,000.

In addition, the fattening of stock has been pursued, and likewise this has been very successful. In spite of the dry summer recently experienced, there were very few instances of stock having to be sold or sacrificed through a shortage of feed.

Taking the plains from end to end, the settlers have made very good progress, and the older-settled portions are now assuming the look of farms.

It is very pleasing to record the fact that a large area of the peat country is now being brought into good grass, and it is generally admitted that this country in future will be quite as valuable as any other.

The metalling of the roads that has been carried out during the last two years has revolutionized the whole appearance of the country, as well as improved the access to the plains.

During the next year the area to be thrown open will be very small, as it is unreasonable and unwise to place settlers on land of this class without the chance of a fair access-road within a short period of their taking up the land.

Details of each work are described under the different headings as at 31st March, 1915, and in most cases totals of the works that have been carried out since the inception of the scheme are appended.

PRIESTMAN DREDGERS.

Both dredgers No. 1 and No. 2 have been employed during the past year on various works between Kerepehi and Patetonga Landing, a total of 176,196 cubic yards being dredged and deposited on the banks along the side.

The total cost of this work was £1,962 16s. 3d., which gives an average cost per yard of 2·677d. This cost includes all wages, running-expenses, repairs, &c., but not depreciation.

The work carried out comprised the widening of the Piako River, improvements at Patetonga Landing, deepening of portion of the Waikaka Canal, and the commencement of the Ngarua Canal and also the Awaiti Canal. All these works are treated separately under the different headings.

No. 1 dredger excavated for the year 85,746 cubic yards, at a total cost of £970 14s. 6d. for the year, averaging 2·727d. per cubic yard; whilst No. 2 dredger excavated 90,450 cubic yards, at a total cost of £992 1s. 9d., averaging 2·63d. per cubic yard.

The dredgers are both in very good order, and the expenses during the coming year for maintenance should not be above the average.

During the greater part of last year's operations the coal had to be punted some distance, and in some cases transhipped, which necessitated a higher cost of working. This state of affairs will apply to both dredgers during the coming year, as at present both are dammed in so as to obviate the rise and fall due to tidal influences.

Both dredgemasters deserve great credit for the excellent manner in which their work has been carried out, as well as for the low running-costs.

PIAKO RIVER IMPROVEMENTS.

In 1912 a vote of £2,000 for two years was passed for improving both the Piako and the Waitoa Rivers. During the year ending 31st March, 1913, £465 was spent on these works; during the following year, £2,073 13s. 5d.; and this year the sum of £1,044 15s. 4d. was spent.

All this sum was expended in widening the Piako River between Kerepehi and the Waikaka Canal, a distance of nearly five miles. Throughout this distance the river has been widened, on an average, 20 ft., so that throughout it is at least 66 ft. wide. The effect of this dredging has been beneficial both to the drainage of the land and to some extent to the navigation of the river.

Although there has not been a fresh since the work was completed, I am certain that this is partly due to the fact of the cross-section of the river being improved. Of course, it is admitted that the past year has been remarkably dry, but during last March 10·67 in. of rain were recorded at Kerepehi, and in spite of the fact that practically all the rivers in the district were in fairly high flood the Piako only rose a few feet at Kerepehi.

During the coming year it is intended to dredge portion of the Waitoa River to the south of the junction with the Piako River, as in this particular locality there are several bars and banks that prevent the even flow of the river. In addition, the water-weeds have grown very prolifically, and need to be removed by the roots.

PATETONGA LANDING.

At this point in the Piako River launches and larger boats had great difficulty in lying alongside the wharf when the river was low. The berth, as well as the approaches to the berth, were dredged down to the level of the centre of the river, and there is consequently a decided improvement. In addition, a short cut of about 9 chains was excavated parallel to the approach to the wharf. This not only provided a turning-basin for the larger boats, but also provided spoil for the road-formation in the vicinity. In carrying out this work 12,730 cubic yards were excavated.

WAIKAKA CANAL.

The lower end of this canal was deepened for a short distance, as at this particular point there had been a bar left when the canal was originally dredged.

In this work 1,410 cubic yards were removed.

NGARUA CANAL.

This canal leaves the Piako River about midway between the Waikaka Canal and the Puhanga spillway. At this particular point the Ngarua Creek joined the river, and meandered towards the hills for a distance of over two miles, where a large lake was situated.

A new channel has been cut, using the old course where possible, but several large deviations were made. The work was commenced in May, and since then this cut has been completed for a distance of 125 chains, the amount of spoil excavated being 79,707 cubic yards.

Owing to the cut being subject to the tide a dam was constructed behind the dredge so that the water-level would be stationary.

The first part of the cut, a distance of 55 chains, was through very hard country, with occasional patches of timber, but after that the country was much softer.

This cut should be completed in June, 1915.

As the dredger returns down the cut several low places in the spoil-bank will be raised, as this spoil-bank will form a through road so as to give connection between Ngarua and the Piako River, thence to the Orchard and Kerepeehi.

This work has been carried out by means of a special grant voted last year, and to date the expenditure has been £449 8s. 6d.

AWAITI CANAL.

This canal leaves the Piako River about 10 chains north of the Ngarua Canal, and runs due east towards the Awaite Stream.

The idea of this canal is to assist in the reclamation of 2,200 acres of first-class country that lies to the north of the canal, between the Piako River and the Awaite Stream. This area is of excellent quality, and the deepest peat is only 3 ft.

So far the canal has not been excavated to its final depth, owing to the soft nature of the country, but later on another few feet will be excavated. The spoil excavated has been deposited on the north side, so as to form a combined stop-bank and road.

As this cut was also tidal, a dam was constructed near the Piako River end. Since this canal was commenced—about the middle of July—62,465 cubic yards have been excavated, the distance covered being 94 chains. The total distance to the Awaite Stream is 185 chains, so that this point should be reached about the end of November.

STOP-BANKS.

A distance of 100 chains of stop-bank along the Waitakaruru Stream was constructed during the year, making the total length of stop-bank within the Hauraki Plains area 28 miles 70 chains.

The only case of damage to the stop-bank occurred along the Waitakaruru Stream, where it was broken in the flood of March, 1915. It had, however, not been completed to its full height and width, and this is one of the works that will be placed in hand at once.

On the Piako River the banks have not been subjected to a test during the year, as no floods have been experienced. All stop-banks have been straightened when found necessary, but in most cases they are now quite solid.

FORMED ROADS.

The total length of formed cart-roads—in nearly every instance with a drain on each side—is 58 miles 14 chains, the distance of new formation for the year being 4 miles 16 chains.

Within the Waitoa Block about 1,000 cubic yards of sand were used in raising portions of the roads and forming about 12 chains of the Paeroa-Tahuna Road. These roads are now all in first-class condition, and in common with roads through peat country will require attention every year for some time to come.

In 1913 a special vote of £1,595 was passed to assist in the formation of the Waikaka Tramway Road, the expenditure to date being £1,652 9s., of which £1,250 9s. was spent during the past year. Owing to the soft nature of the peat, fascines were laid for over two miles, 12,843 fascines being supplied for the purpose. The tram-line has been shifted to the centre of the road reserve, and has now been ballasted right up to the wharf. During this year this road will be widened so that it can be used by vehicles.

The Patetonga Road has now been completed throughout, and is now used quite as much as the main road.

In February the drays were shifted to the Ngarua Road, where they are carting spoil, and this road will eventually be continued to the Piako River.

As usual the roads have been maintained in very fair order.

ROAD-BANKS.

The total length of road-banks—*i.e.*, spoil from road drains removed about 4 ft. from edge thereof and spread—is 14 miles 50 chains. Of this distance, three miles are suitable for all traffic, the balance being through peat country, some of which, however, it is not intended to convert into formed roads, as they are not required for settlement purposes.

At Waikaka the length of road-banks is being reduced considerably, and by next year there should be very few peat roads in that locality. The road-banks that provide the largest difficulties to convert are those along the Pouarua Road and the immediate vicinity. Owing to the lack of spoil that can be obtained from the drains the spoil for formation purposes will have to be conveyed from a considerable distance.

DRAINS IN OPERATION.

The total length of drains now in operation is 320½ miles, which total includes all classes of drains constructed by the Department—*viz.*, road, outlet, subdivisional, stop-bank, and service drains. This is an increase of 18½ miles for the year.

SNAGGING.

No work under this heading has been carried out on the Piako River, all work being confined to the Waitoa River.

A contract which was let during December, 1913, for the stretch between the Piraunui and Waihekeau Streams was completed, and in addition a piecework contract was let to snag the portion as far south as the Te Aroha—Morrinsville Railway. This work was all completed in February, and the total distance covered for the year was 329 chains.

In addition, in April, 1914, the Department's plant was engaged in weeding about five miles of the Waitoa River.

The total cost of the above work was £887 ls. 10d., which was defrayed out of a special grant.

WHARVES.

The total number of wharves constructed to date is fifteen, one having been added to the previous year's total. This new wharf was constructed at the south end of the Puhanga Canal, and is extremely useful for several settlers. Moreover, additions were made to two wharves, and in several cases fender piles were driven.

During this coming year it will be necessary to construct a wharf near the mouth of the Ngārua Creek: also, it is evident that a permanent wharf at Waitakaruru will have to be constructed near the mouth of the canal, as it is becoming increasingly difficult to navigate the creek between the canal and the upper landing.

FLOOD-GATES.

The total number of flood-gates now in use is fifty-six, two having been added during the year.

All gates have been inspected at intervals, and maintained in fair order.

In order to complete the scheme there are two gates still to be constructed at Waitakaruru.

BRIDGES, CULVERTS, ETC.

The total number of sill bridges is ninety-five, small bridges on piles ten, two three-span bridges, one two-span bridge, and eight culverts.

The most important bridge built was the permanent structure across the Waitakaruru Canal.

Three concrete culverts were placed in position at points where it is evident that the drains will not require further deepening.

The most important bridge still to be constructed is across the Hopai Creek, on the Hopai-Pipiroa Road.

PRIVATE TELEPHONE TO WORKS.

This line has, as usual, been of great assistance in facilitating the progress of the works, extending as it does from Kerepechi to Waitakaruru, and having, moreover, the right to be switched on to the postal line to Thames.

BUILDINGS.

One small shed was dismantled, leaving a total of thirty-seven buildings that are used as quarters, wharf-sheds, &c. All buildings are in fair order, with the exception of some of the original section huts, which, through rough handling when being shifted, now are fit for little more than providing shelter. Several buildings would be the better for being painted next summer.

FLOATING PLANT.

This plant consists of the following: Two Priestman grab dredgers complete, one steamer, four oil-launches, six pontoons, and several small punts.

Late in March one launch has been transferred to the works, so as to cope with the towing of the metalling-punts to Kerepechi. The launches are distributed as follows: One at the dredges up the Piako River; one in general use; and two, as well as the s.s. "Hauraki," are engaged in towing metalling-punts.

All plant is in fair order.

ARTESIAN BORING-PLANT.

During the year twenty-two bores were sunk by the Department's plant, bringing the total sunk to date to 104. The shallowest bore was 91 ft., while the deepest was 465 ft. The largest flow of water was 114,000 gallons, and the lowest was 3,840 gallons per day, but in no case was pure water obtained, all flows being mineralized. In three cases the water would not rise above the surface of the ground, and required to be pumped either by hand or by a windmill.

During the year the Rev. Mason visited the plains at the request of some of the settlers, and located various points where good flows should be obtained. In due course the wells were sunk, and good flows were obtained in most cases at a shallow depth, but, as stated before, no pure water was obtained.

The cost of this work for the year was £573 15s. 4d., bringing the total spent to date to £2,281 14s. 11d.

Schedules of all bores sunk during the year are attached, and disclose the similarity of the strata in various localities.

The amount spent on the bores is refunded by the settlers either by instalments or when the sections are transferred.

WORKS PERFORMED DURING THE YEAR.

The following works were carried out under either the piecework or co-operative contract systems:—

	M.	ch.
Double drain and road formation	2	50
Deepening and widening drains and spreading spoil	7	68
New drain and road formation	1	46
Clearing and grubbing road-lines	2	42
Cleaning road-drains	54	43
New road-drains	0	78
New outlet drains	8	15
Deepening and widening outlet drains	21	2
Cleaning outlet drains	14	0
Drain and stop-bank	1	20
Deepening stop-bank drains	1	14
Cleaning stop-bank drains	3	3
Removing heavy timber from drains (extras)	2	52
Snagging Waitoa River	2	30
Discing roads	12	0
Distance covered	135	63

Under this heading the following were supplied: Fascines for road purposes, 12,843 bundles; piles for bridges and wharves, 57; sleepers for tramway, 4,547; poles, 100; shingle loaded at Kauaeranga, 5,086 cubic yards; spit shingle delivered, 3,065 cubic yards.

The following works were carried out by day-labour:—

	M.	ch.
New road-drains	1	15
Widening and deepening road-drains and spreading spoil	19	21
Clearing road-lines	3	0
Cleaning road-drains	43	20
Road-formation	3	70
Deepening and widening outlet drains	10	15
Cleaning outlet drains	36	15
Deepening stop-bank drains	0	25
Strengthening stop-bank	4	15
Cleaning stop-bank drains	10	25
Removing heavy log timber from drains	5	0
Weeding Waitoa River	4	40
Metalling (spreading and breaking)	5	40
Discing roads	15	0
Distance covered	161	61

Under the above heading the following works were carried out: Construction of bridges, 7; construction of culverts, 3; construction of floodgates, 2; artesian bores for settlers, 22; spoil removed by dredges, 176,196 cubic yards.

In addition the various roads were maintained by day-labour, and various works that cannot possibly be scheduled were carried out.

FIRES.

In only one block was loss sustained by fires that spread from Crown lands, and this was in the vicinity of Waikaka. Here, in February, a fire crossed the canal and burnt portion of three sections, but not more than 100 acres was burnt, and in some cases this was an advantage.

Until such time as the country is more closely settled there will always be the likelihood of fires spreading and damaging property.

During the year various blocks of Crown land along the Piako River were stocked heavily with settlers' cattle, and consequently no fires started in a locality that usually provided a series of conflagrations.

In last report mention was made of tenders being called for the supply of grass-seed to sow areas at Waikaka and Ngarua that had been just burnt. Unfortunately, the grass-seed did not arrive till June, 1914, which was rather late in the season, but nevertheless it was all sown, and, taken right through, germinated and grew fairly well. Most of the areas sown were subdivided and disposed of during March, 1915.

FLAX AREAS.

Owing to the majority of the easily accessible areas bearing flax having either been burnt or subdivided and disposed of as farms, I am not able to report any dealings in flax.

The mill at Patetonga worked at intervals, and was supplied with flax by the settlers. It is most unlikely that the Department will derive any income of any importance from flax royalties in the future.

METALLING OF ROADS.

During the previous year (1913-14) this work was commenced, and up to date the length of roads metalled is nine miles and a half, the distance for the year being five miles and a half.

Late in March, 1914, the scheme for carrying gravel from the Kauaeranga River, near Thames, with the Department's own plant was inaugurated, and during the year the supply from

this source was 5,086 cubic yards. The cost of this gravel has been considerably less than the shingle supplied by the scows, and basing the cost of this shingle at 8s. 6d., as was the price on the former contract, then the greater part of the cost of the punts built for this work has been repaid.

In addition to this supply, a contract was entered into with the Auckland Shingle Company for a regular supply of their shingle. The supply from this source was 3,065 cubic yards.

At the end of March, 1914, the Pipiroa-Waitakaruru Road was being metalled, and since then this road has been metalled for a further distance of 100 chains, the total distance being three miles and a quarter. After this the plant was shifted to Kopuarahi, where the Kopuarahi-Turua Road and the Kopu Road were metalled. With the former road metalled there is now a metalled road to Turua, and also to the Wharepoa Ferry on the Waihou River. The Kopu Road has been metalled as far as the eastern boundary of the Hauraki Plains, and will later on be continued to the Kopu Ferry site, on the Waihou River.

These two roads, which measured 180 and 148 chains respectively, were completed in March, 1915, when the plant was shifted to Kerepeehi, where the Kerepeehi-Turoa Road is being metalled. This latter work will, however, be shown in the next report.

The proposals for metalling for 1915-16 are as follows:—

- (1.) Kerepeehi-Turua Road.
- (2.) Approaches to Hopai and Rawerawe wharves.
- (3.) Waitakaruru-Pipiroa Road (between canal and stream).
- (4.) Kerepeehi-Kopuarahi Road (portion of).
- (5.) Orchard Road (portion of).
- (6.) Ngarua Road (portion of).

With the Department's own plant the scheme has been pushed on very satisfactorily, and especially is this the case with the tram-line and trucks, which has simplified the haulage of the metal. This plant is all in good order, and will be serviceable for many years to come.

The three punts for conveying the metal are generally in fair order—one, a second-hand one, however, is in bad repair, and a complete overhaul will be required at an early date.

Owing to the extra towing whilst metalling at Kerepeehi, it will be necessary to arrange for either the construction or hire of another punt.

The expenditure was all out of special grants, and the total for the year was £4,229 6s. 5d. Details of this expenditure are as follows: Day-labour, £2,262 6s. 2d.; contract (co-operative), £329 3s. 6d.; contract (special), £1,266 11s. 11d.; material, £371 4s. 10d. As the roads are completed supplies of metal are left at frequent intervals so as to enable repairs to be made cheaply and quickly.

SURVEYS.

During the year 6,444 acres was subdivided into sections for settlement purposes as well as township allotments. This latter area comprised 130 acres in the vicinity of Kerepeehi, Pate-tonga, and Ngarua, and was subdivided into 216 sections, ranging from $\frac{1}{4}$ acre to 6 acres.

The balance of 6,314 acres was subdivided into sixty-seven sections, ranging from 10 to 234 acres.

In addition numerous surveys were made for various purposes, Native land road deviation, and engineering.

VALUATION.

The area that was subdivided and opened for selection during the year was 6,444 acres, valued at £65,601, which gives a total of 38,994 acres that has been opened for selection to date. The value of this total area at the time of opening for selection was £243,851. These totals are independent of lands that have been utilized as drain and road reserves.

WORKS EXPENDITURE DURING THE YEAR.

Piecework contract absorbed the sum of £6,054 17s. 3d. from the Hauraki Plains Settlement Account, whilst day-labour absorbed the sum of £8,369 9s. 10d. from the same fund. All the above were paid from local imprest.

PRINCIPAL WORKS PROPOSED.

The principal works proposed to be carried out during the next financial year are as follows:—

- (1.) Completion of Ngarua Canal.
- (2.) Continuance of Awaitei Canal and reclamation of adjoining lands.
- (3.) Dredging of Lower Waitoa River.
- (4.) Continuance of cart-road development at Waikaka.
- (5.) General drainage development, mainly at Waikaka.
- (6.) Metalling of main roads.
- (7.) Maintenance of existing works.
- (8.) Formation of access roads to Hauraki Plains, particularly the Pokeno-Waitakaruru Road.

LAND PROPOSED TO BE OPENED.

All the area mentioned in my last year's report as being likely to be opened for selection was balloted for. Owing to the construction of the necessary access roads becoming heavier, it is scarcely likely that areas of any size can be opened this year. A small block at Torehape is, however, likely to be sufficiently advanced for settlement purposes. Further areas, however, at Ngarua and Mangawhero, will not be ready till the following year. This same remark applies to the block between the Awaitei Stream and the Piako River, which is, in my opinion, the best land that the Crown still possesses.

Incidentally I would mention that the area of ordinary Crown land and land-for-settlement land comprising hills and swamp country of some 11,732 acres, situated at Waitakaruru, was completely roaded and bridged, and afterwards balloted for. All the work was done by the staff employed in connection with Hauraki Plains works. This outside area will do much to consolidate the various Crown interests in the district.

GENERAL.

Field, office, and draughting staffs have been exceedingly busy during past year, and a considerable number of engineering, road, and section surveys have been made. No pains are spared to expedite the works in every way, and services have been loyally rendered by my staff. To Mr. R. G. Macmorran, my able assistant, and Mr. H. A. Joyce, Chief Clerk, my special thanks are due for the exceptional manner in which their duties have been performed, and the same applies to all other members of the staff. The attached plan shows the position of the works to date.

I have, &c.,

J. B. THOMPSON,

Chief Drainage Engineer.

James Mackenzie, Esq., I.S.O., Under-Secretary, Department of Lands and Survey.

APPENDIX.

ARTESIAN BORE NO. 83: SECTION 10, BLOCK X, THAMES. (MR. J. G. KNAP.)

Depth in Feet.	Details.	Depth in Feet.	Details.
74	74 ft. clay.	134	15 ft. clay.
77	3 ft. sand.	139	5 ft. sandstone.
83	6 ft. clay.	141	2 ft. rotten timber.
91	8 ft. sand.	149	8 ft. shingle.
98	7 ft. clay.	151	2 ft. rotten timber.
104	6 ft. sand.	164	13 ft. clay.
106	2 ft. rotten timber.	181	17 ft. pumice sand.
119	13 ft. pumice sand.		

Total depth, 181 ft. Flow running, 5,760 gallons per day.

ARTESIAN BORE NO. 84: SECTION 3, BLOCK X, THAMES. (MR. CLARK.)

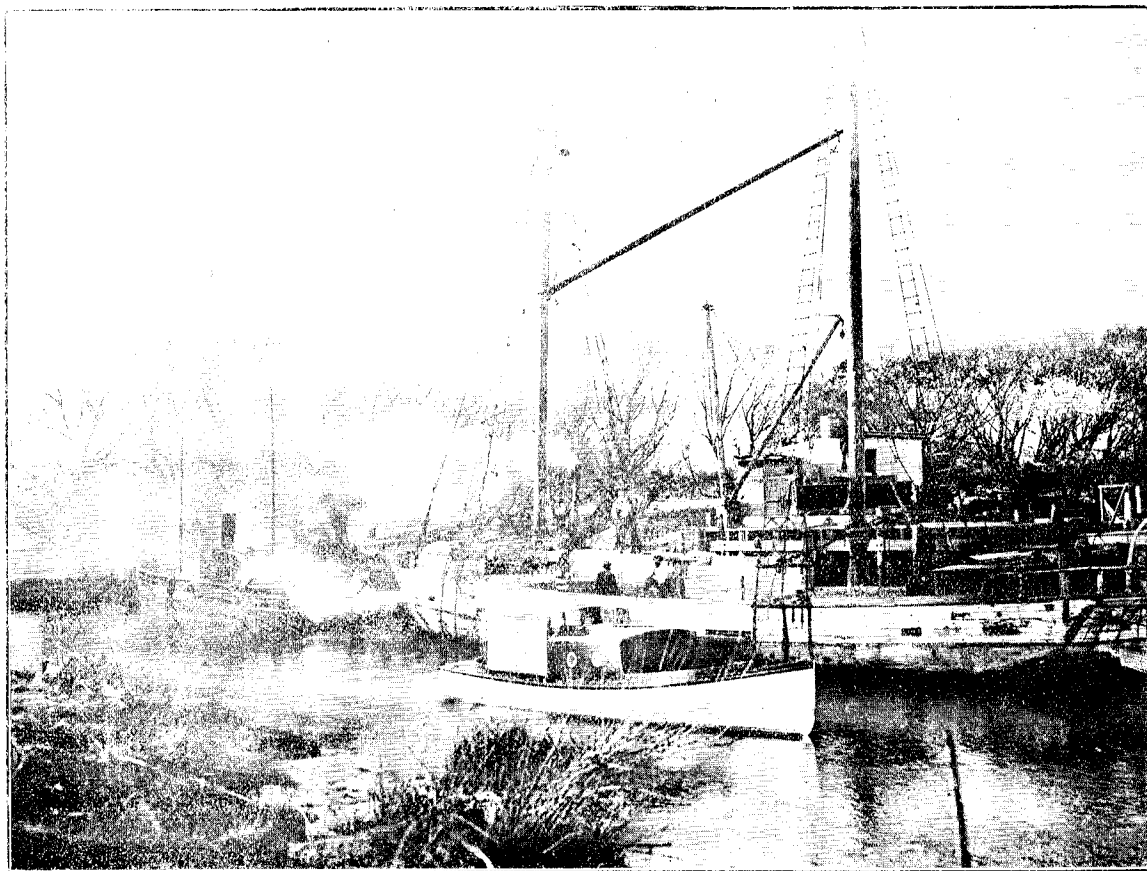
Depth in Feet.	Details.	Depth in Feet.	Details.
85	85 ft. clay.	176	27 ft. clay.
101	16 ft. pumice sand.	180	4 ft. sand.
105	4 ft. clay.	186	6 ft. rotten timber.
115	10 ft. sand.	191	5 ft. clay.
130	15 ft. clay.	228	37 ft. pumice sand.
142	12 ft. sand.	233	5 ft. rotten timber.
146	4 ft. clay.	238	5 ft. clay.
149	3 ft. sand.	246	8 ft. pumice sand.

Total depth, 246 ft. Flow running, 6,720 gallons per day.

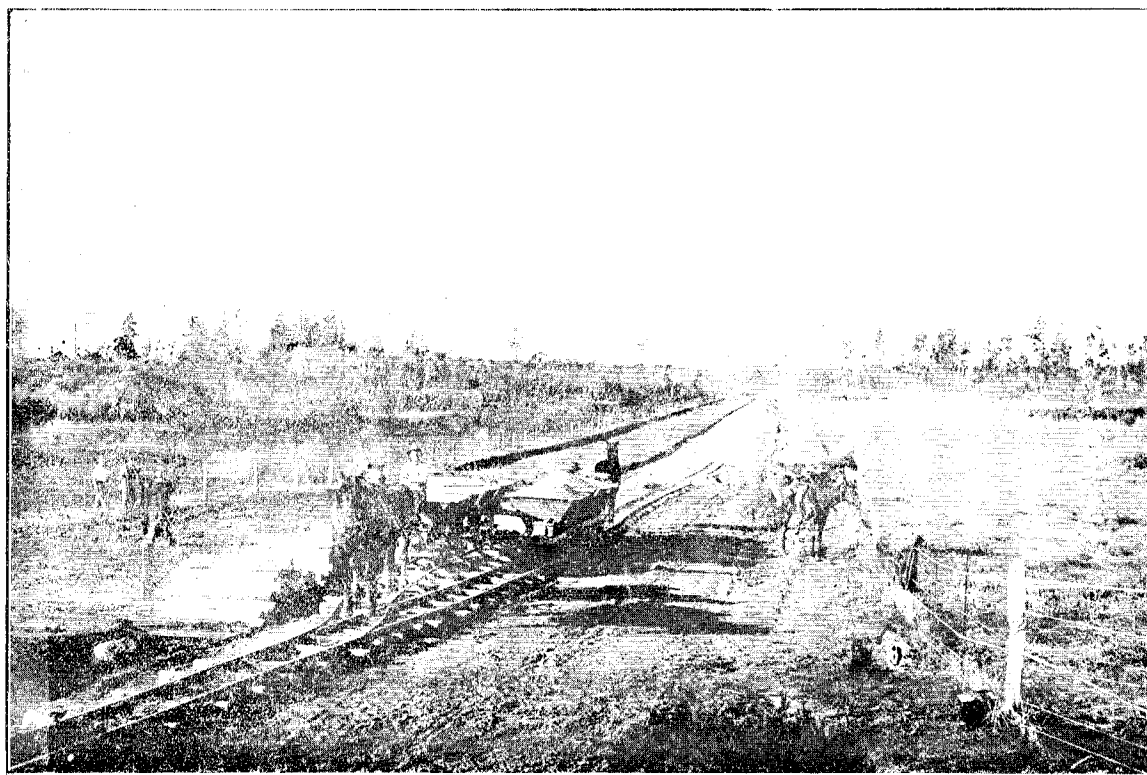
ARTESIAN BORE NO. 85: SECTION 18, BLOCK X, THAMES. (MR. DALGETY.)

Depth in Feet.	Details.	Depth in Feet.	Details.
53	53 ft. clay.	251	4 ft. sand.
87	34 ft. drift sand.	261	10 ft. rotten timber.
97	10 ft. clay.	269	8 ft. pumice sand.
111	14 ft. drift sand.	274	5 ft. clay.
117	6 ft. clay.	299	25 ft. drift sand.
125	8 ft. sand.	304	5 ft. rotten timber.
129	4 ft. rotten timber.	310	6 ft. sand.
131	2 ft. sand.	314	4 ft. rotten timber.
134	3 ft. clay.	331	17 ft. sandstone.
143	9 ft. sand.	333	2 ft. rotten timber.
147	4 ft. clay.	345	12 ft. drift sand.
150	3 ft. sand.	355	10 ft. shingle.
158	8 ft. clay.	378	23 ft. drift sand.
163	5 ft. sand.	379	1 ft. rotten timber.
167	4 ft. rotten timber.	385	6 ft. pumice sand.
227	60 ft. clay.	387	2 ft. clay.
230	3 ft. sand.	388	1 ft. sand.
234	4 ft. clay.	394	6 ft. clay.
247	13 ft. rotten timber.	406	12 ft. hard stone.

Total depth, 406 ft. Flow running, 3,840 gallons per day.



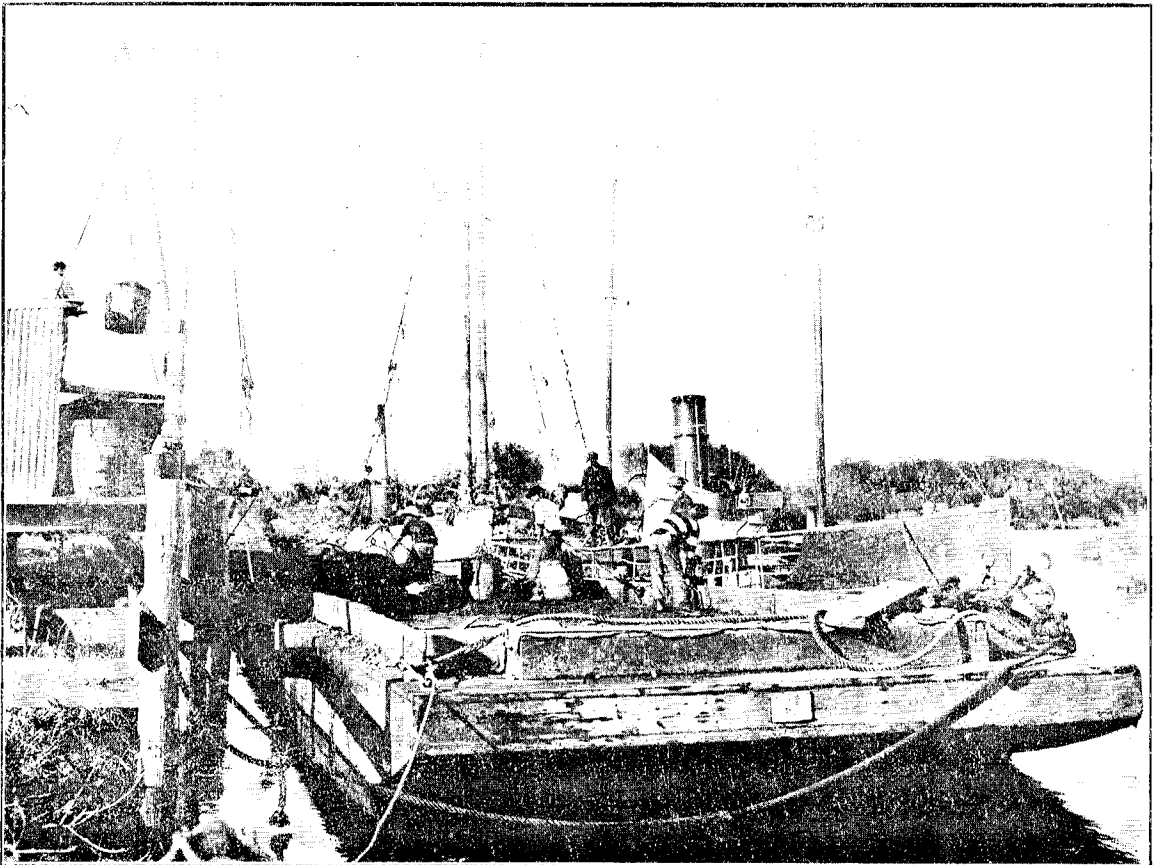
UNLOADING GRAVEL AT KEREPEHI.



TRUCKING METAL, KEREPEHI TURU ROAD. FINISHED ROAD IN DISTANCE.



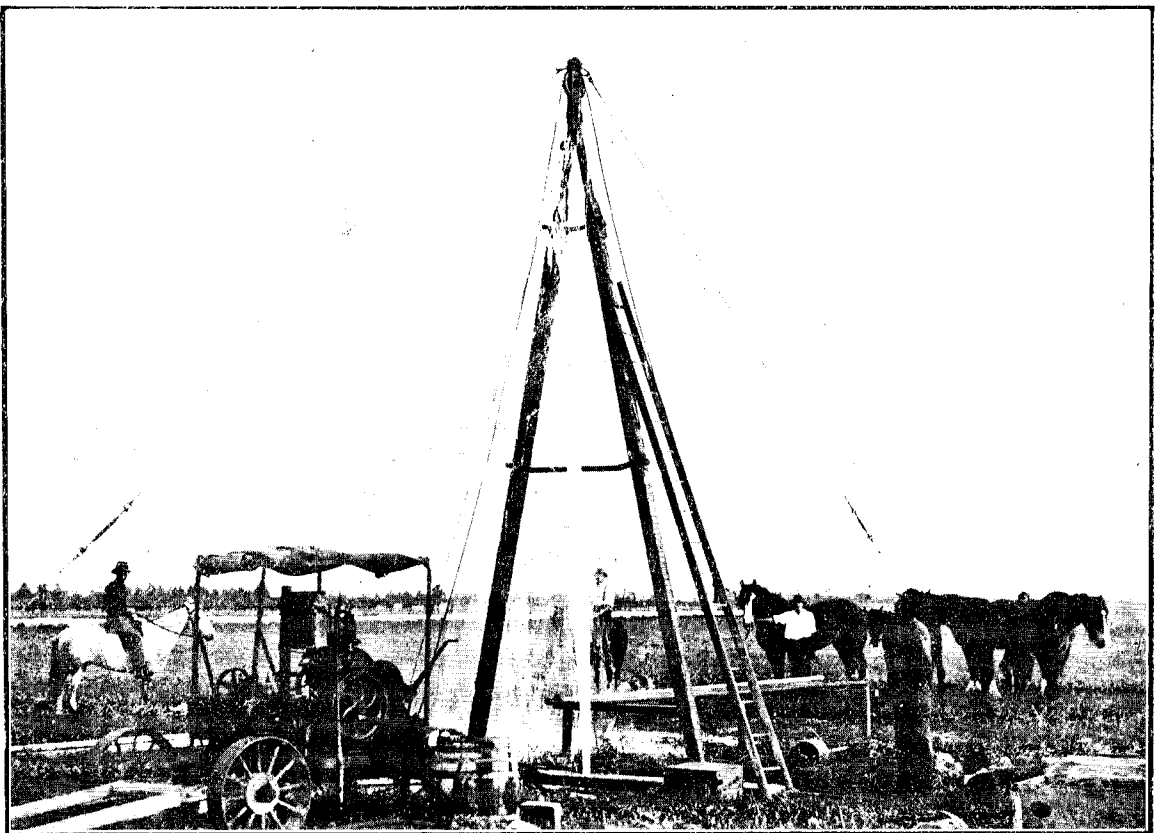
ROAD METALLING AND FORMATION.



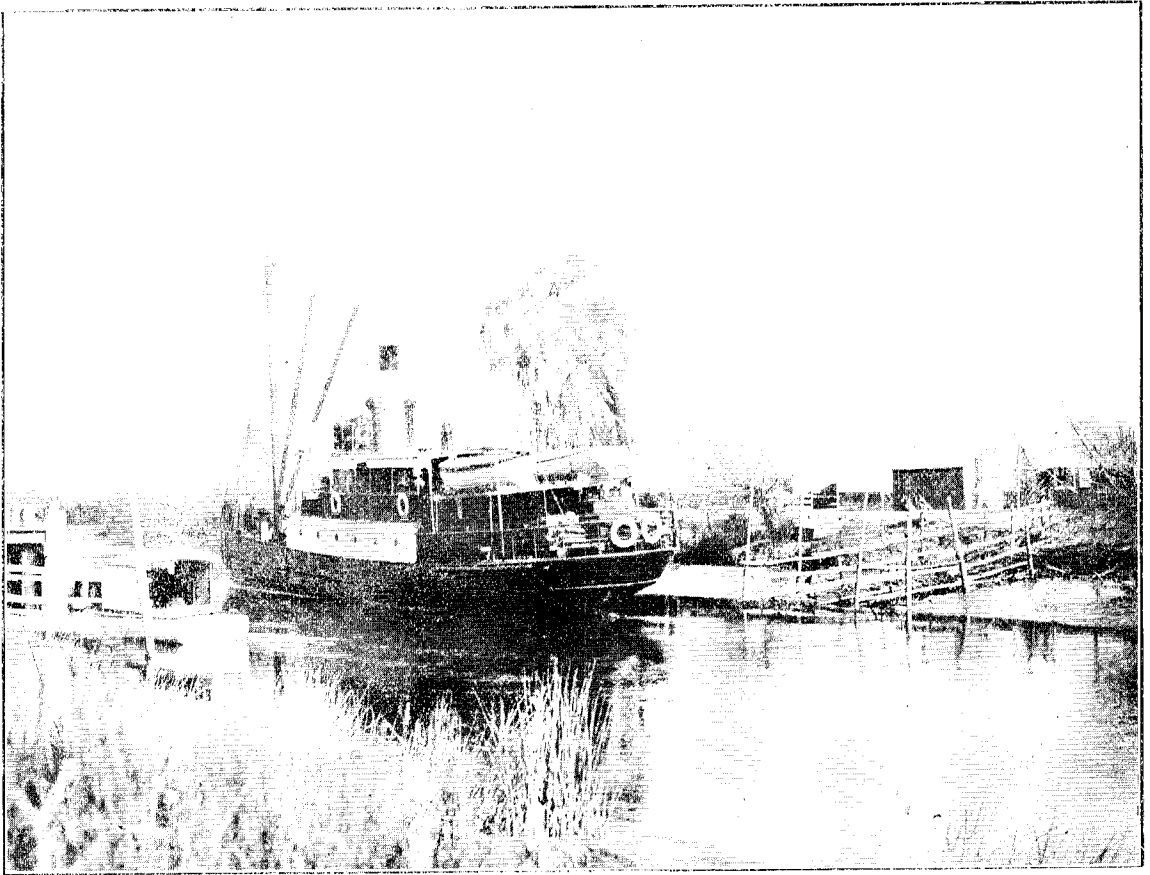
UNLOADING GRAVEL AT KEREPEHU.



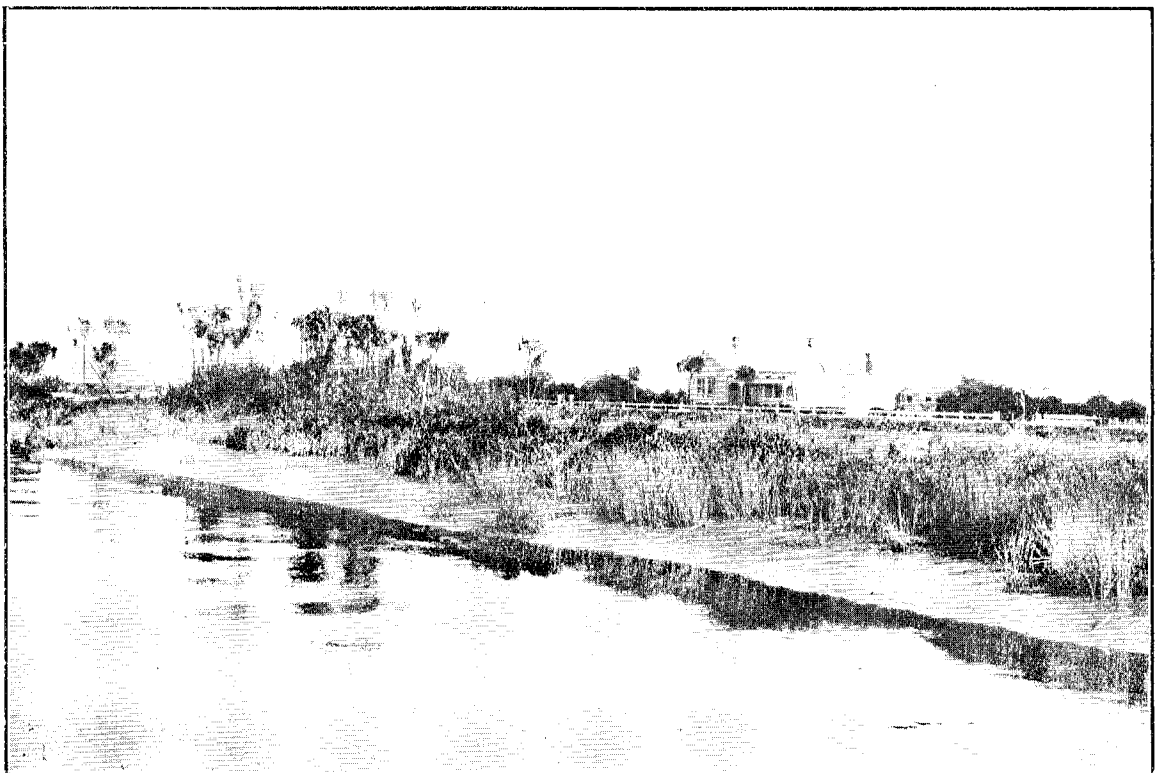
"AUSTIN" ROAD-GRADER FORMING UP ROADS.



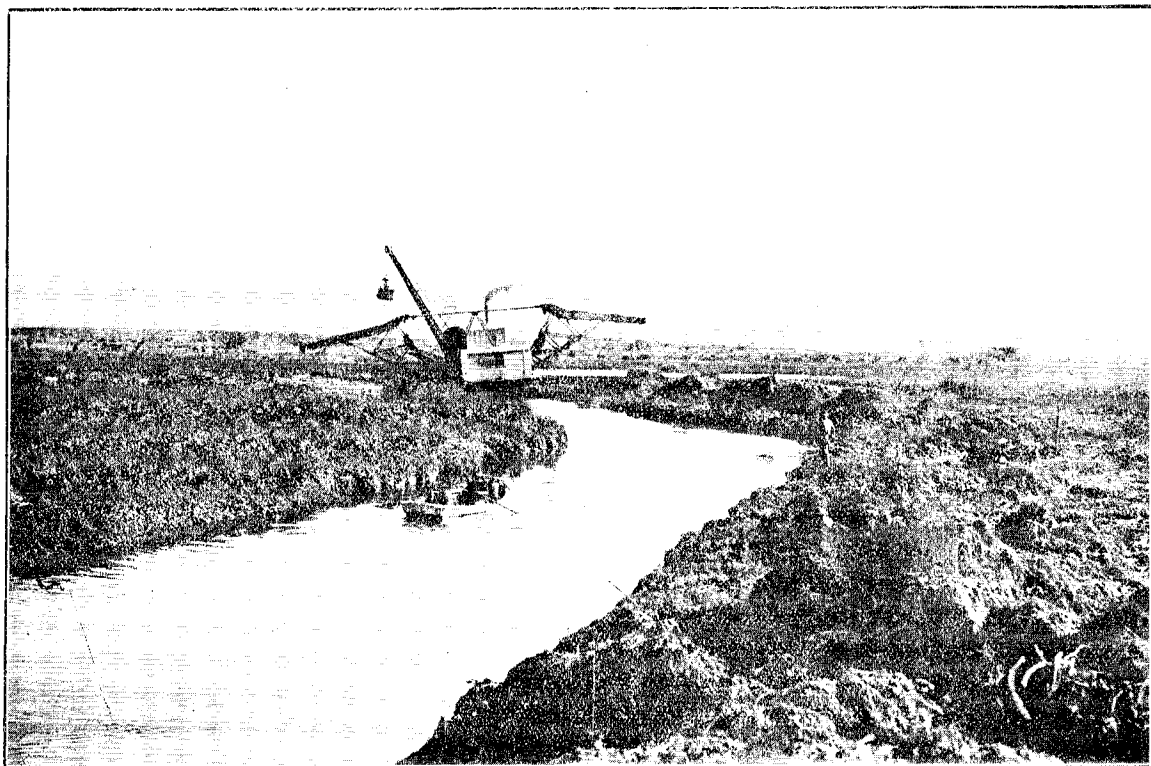
ARTESIAN BORE AND PLANT. BORE SUNK ON MR. BOND'S PROPERTY, KOPUARAHI.
FLOW, 114,000 GALLONS PER DIEM.



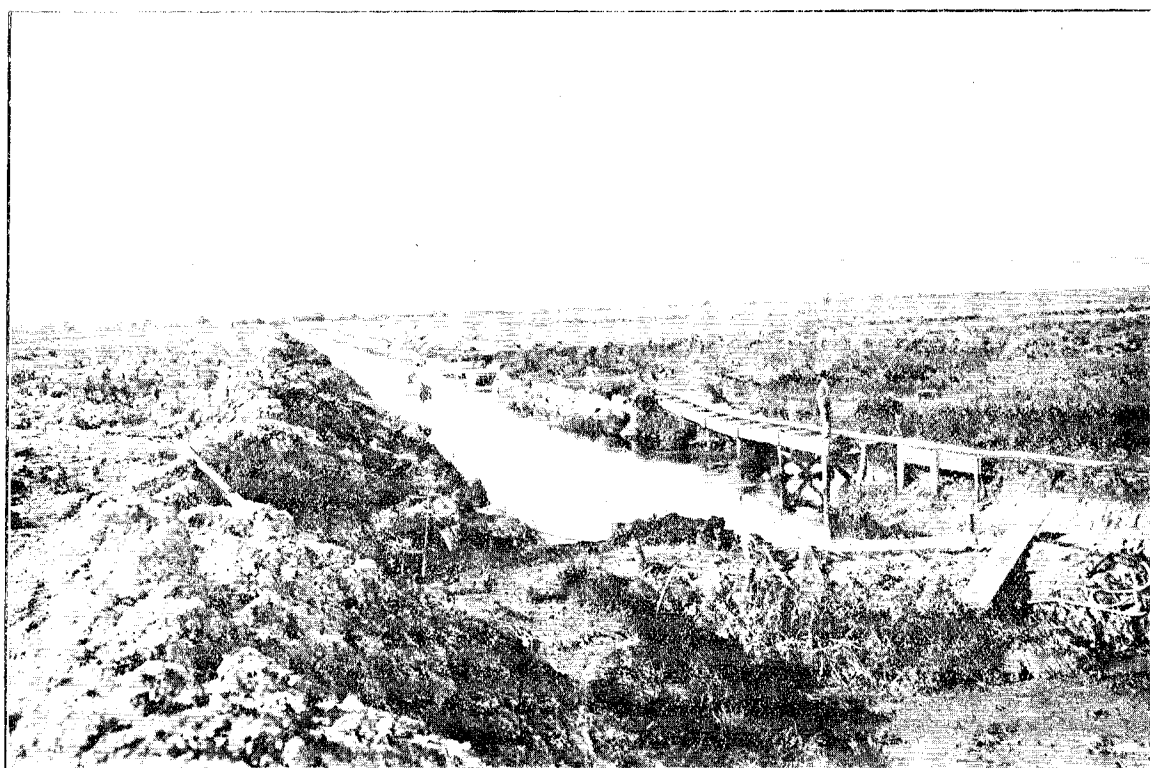
S.S. "WEKA" AT NGATEA, PIAKO RIVER. (LOW WATER.)



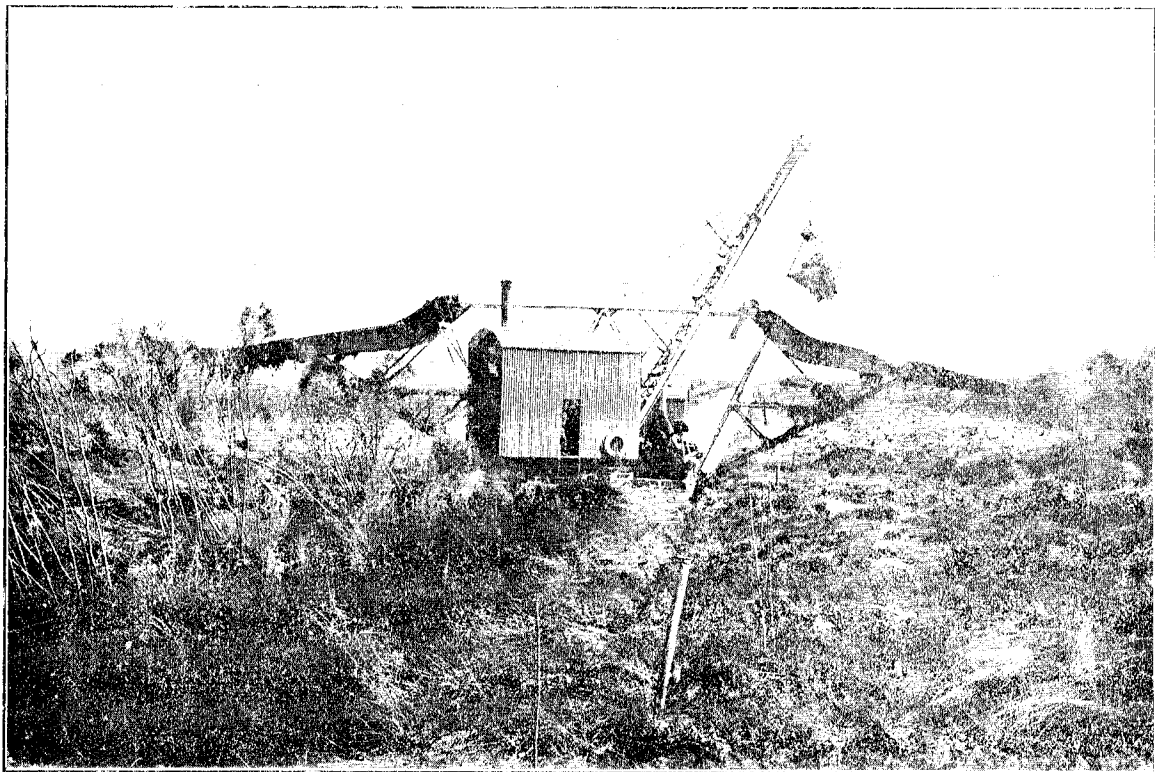
MR. T. LEONARD'S RESIDENCE, NGATEA, PIAKO RIVER.



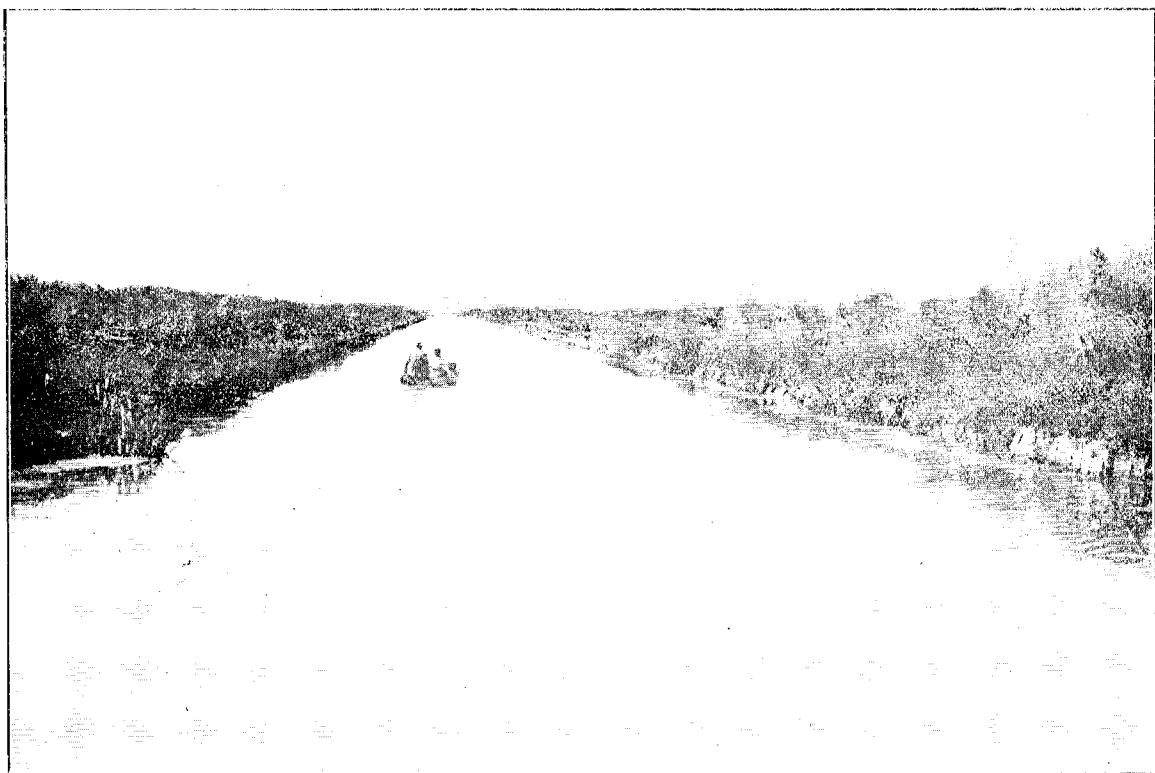
NO. 1 DREDGE, BREAKING INTO NGARPA LAKE FROM CANAL.



PORTION OF NGARPA CANAL.

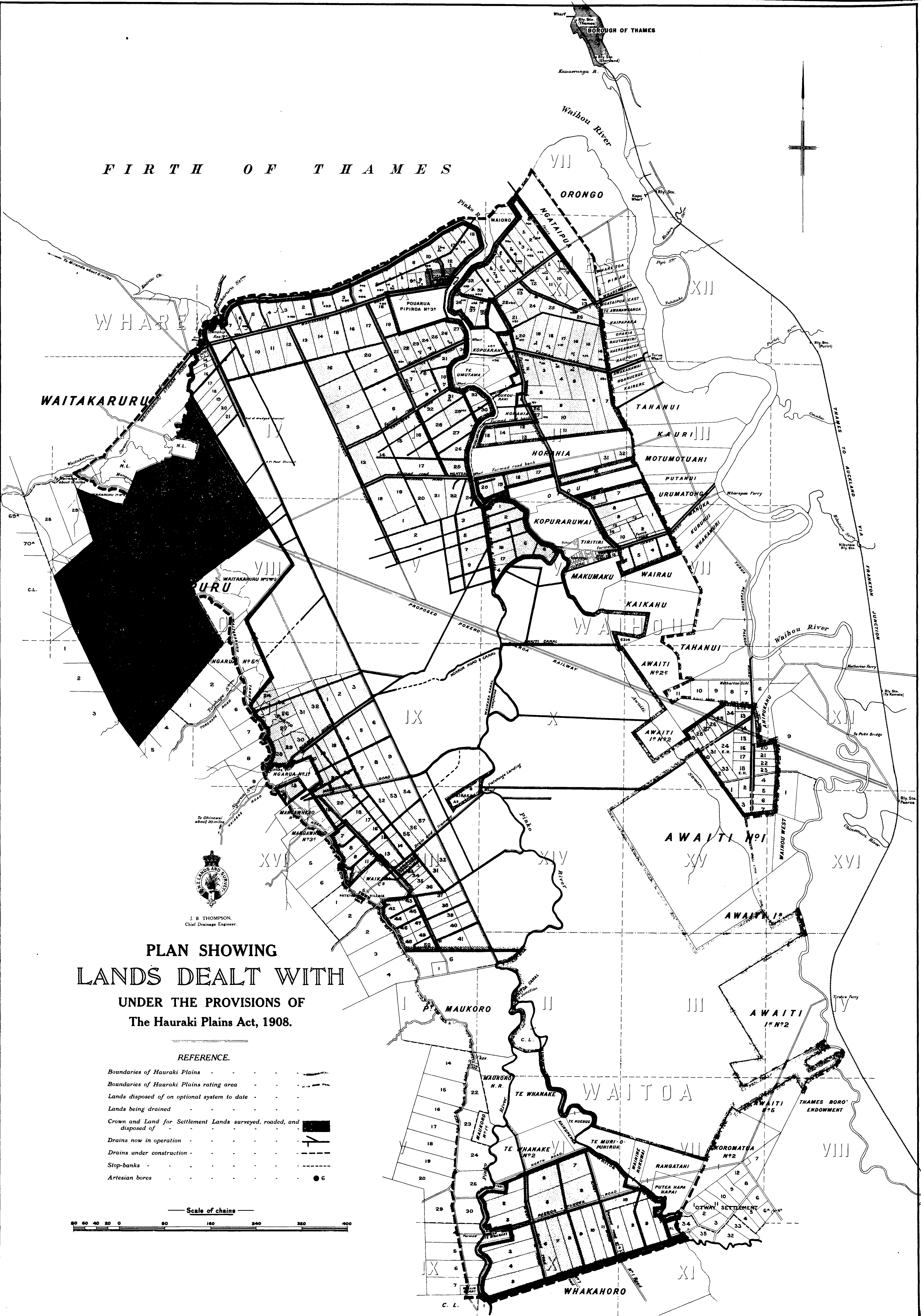


NO. 2 DREDGE EXCAVATING AWAITI CANAL.



A VIEW OF AWAITI CANAL.

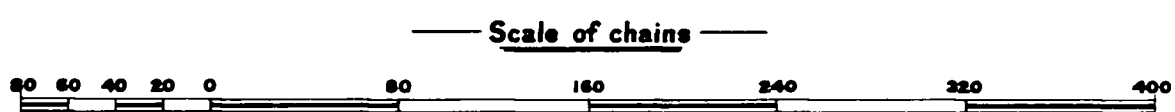
FIRTH OF THAMES



PLAN SHOWING
LANDS DEALT WITH
UNDER THE PROVISIONS OF
The Hauraki Plains Act, 1908.

REFERENCE.

- Boundaries of Hauraki Plains - - - - -
- Boundaries of Hauraki Plains rating area - - - - -
- Lands disposed of on optional system to date - - - - -
- Lands being drained - - - - -
- Crown and Land for Settlement Lands surveyed, roaded, and disposed of - - - - -
- Drains now in operation - - - - -
- Drains under construction - - - - -
- Stop-banks - - - - -
- Artesian bores - - - - -





ARTESIAN BORE NO. 86: SECTION 6, BLOCK X, THAMES. (MR. KEANE.)

Depth in Feet.	Details.	Depth in Feet.	Details.
63	63 ft. clay.	177	2 ft. sand.
87	24 ft. pumice sand.	181	4 ft. rotten timber.
90	3 ft. rotten timber.	186	5 ft. sand.
104	14 ft. pumice sand.	189	3 ft. rotten timber.
107	3 ft. clay.	193	4 ft. pumice sand.
122	15 ft. drift sand.	197	4 ft. rotten timber.
127	5 ft. clay.	205	8 ft. pumice sand.
142	15 ft. drift sand.	230	25 ft. clay.
175	33 ft. clay.		

Total depth, 230 ft. Flow running, 28,800 gallons per day.

ARTESIAN BLOCK NO. 87: SECTION 5, BLOCK X, THAMES. (MR. WALLIS.)

Depth in Feet.	Details.	Depth in Feet.	Details.
67	67 ft. clay.	221	13 ft. clay.
96	29 ft. pumice sand.	225	4 ft. rotten timber.
100	4 ft. rotten timber.	235	10 ft. sand.
114	14 ft. drift sand.	237	2 ft. rotten timber.
117	3 ft. rotten timber.	240	3 ft. sand.
122	5 ft. sand.	242	2 ft. rotten timber.
128	6 ft. clay.	291	49 ft. pumice sand.
136	8 ft. sand.	293	2 ft. clay.
205	69 ft. clay.	304	11 ft. pumice sand.
208	3 ft. sand.		

Total depth, 304 ft. Flow running, 21,600 gallons per day

ARTESIAN BORE NO. 88: SECTION 9, BLOCK X, THAMES. (MR. PORTER.)

Depth in Feet.	Details.	Depth in Feet.	Details.
69	69 ft. clay.	189	6 ft. pumice sand.
88	19 ft. sand.	198	9 ft. clay.
94	6 ft. clay.	207	9 ft. drift sand.
109	15 ft. sand.	209	2 ft. clay.
112	3 ft. solid log.	212	3 ft. rotten timber.
117	5 ft. clay.	260	48 ft. clay.
125	8 ft. shingle.	263	3 ft. sand.
128	3 ft. rotten timber.	265	2 ft. clay.
149	21 ft. drift sand.	269	4 ft. shingle.
151	2 ft. clay.	273	4 ft. clay.
181	30 ft. pumice sand.	295	22 ft. pumice sand.
183	2 ft. clay.	303	8 ft. rotten timber.

Total depth, 303 ft. Flow running, 13,800 gallons per day.

ARTESIAN BORE NO. 89: W.P.N. SECTION 4, BLOCK XI, THAMES. (MR. PUTT.)

Depth in Feet.	Details.	Depth in Feet.	Details.
43	43 ft. clay.	284	8 ft. shingle.
56	13 ft. rotten timber.	290	6 ft. rotten timber.
74	18 ft. clay.	296	6 ft. sand.
77	3 ft. rotten timber.	329	33 ft. clay.
83	6 ft. clay.	348	19 ft. sandstone.
97	14 ft. rotten timber.	364	16 ft. clay.
101	4 ft. sand.	370	6 ft. pumice sand.
118	17 ft. clay.	372	2 ft. clay.
122	4 ft. sand.	378	6 ft. pumice sand.
129	7 ft. clay.	387	9 ft. clay.
141	12 ft. rotten timber.	390	3 ft. rotten timber.
145	4 ft. clay.	409	19 ft. pumice sand.
149	4 ft. sand.	412	3 ft. clay.
155	6 ft. clay.	416	4 ft. pumice sand.
170	15 ft. drift sand.	418	2 ft. clay.
188	18 ft. shingle.	431	13 ft. pumice sand.
228	40 ft. drift sand.	434	3 ft. clay.
241	13 ft. shingle.	437	3 ft. pumice sand.
244	3 ft. rotten timber.	439	2 ft. rotten timber.
248	4 ft. clay.	445	6 ft. pumice sand.
258	10 ft. drift sand.	448	3 ft. rotten timber.
264	6 ft. shingle.	465	17 ft. pumice sand.
276	12 ft. pumice sand.		

Total depth, 465 ft. Flow running, 17,280 gallons per day

ARTESIAN BORE NO. 90: SECTION 22, BLOCK XI, THAMES. (MR. CONNOR.)

Depth in Feet.	Details.	Depth in Feet.	Details.
54	54 ft. clay.	178	14 ft. pumice sand.
60	6 ft. rotten timber.	186	8 ft. rotten timber.
67	7 ft. clay.	194	8 ft. pumice sand.
80	13 ft. sand.	196	2 ft. rotten timber.
84	4 ft. clay.	217	21 ft. pumice sand.
86	2 ft. sand.	219	2 ft. clay.
90	4 ft. rotten timber.	222	3 ft. pumice sand.
95	5 ft. clay.	224	2 ft. rotten timber.
98	3 ft. sand.	234	10 ft. pumice sand.
106	8 ft. rotten timber.	243	9 ft. clay.
130	24 ft. pumice sand.	293	50 ft. pumice sand.
137	7 ft. rotten timber.	295	2 ft. rotten timber.
140	3 ft. pumice sand.	324	29 ft. pumice sand.
144	4 ft. rotten timber.	328	4 ft. rotten timber.
158	14 ft. pumice sand.	363	35 ft. pumice sand.
164	6 ft. clay.	365	2 ft. rotten timber.

Total depth, 365 ft. Flow running, 5,760 gallons per day.

ARTESIAN BORE NO. 91: SECTION 21, BLOCK XI, THAMES. (MR. JAMES.)

Depth in Feet.	Details.	Depth in Feet.	Details.
75	75 ft. clay.	247	8 ft. clay.
79	4 ft. sand.	251	4 ft. sand.
84	5 ft. clay.	253	2 ft. rotten timber.
87	3 ft. sand.	256	3 ft. sand.
91	4 ft. clay.	264	8 ft. clay.
96	5 ft. rotten timber.	268	4 ft. sand.
97	1 ft. sand.	270	2 ft. rotten timber.
101	4 ft. rotten timber.	274	4 ft. sand.
105	4 ft. sand.	278	4 ft. clay.
111	6 ft. rotten timber.	303	25 ft. pumice sand.
132	21 ft. sand.	307	4 ft. clay.
139	7 ft. rotten timber.	310	3 ft. pumice sand.
167	28 ft. pumice sand.	312	2 ft. rotten timber.
172	5 ft. rotten timber.	347	35 ft. pumice sand.
183	11 ft. pumice sand.	351	4 ft. rotten timber.
186	3 ft. rotten timber.	355	4 ft. pumice sand.
197	11 ft. pumice sand.	359	4 ft. rotten timber.
201	4 ft. rotten timber.	386	27 ft. pumice sand.
219	18 ft. pumice sand.	389	3 ft. clay.
233	14 ft. clay.	429	40 ft. pumice sand.
234	1 ft. sand.	433	4 ft. clay.
236	2 ft. rotten timber.	437	4 ft. pumice sand.
239	3 ft. sand.		

Total depth, 437 ft. Flow running, nil.

ARTESIAN BORE NO. 92: SECTION 9, BLOCK XI, THAMES. (MR. HALE.)

Depth in Feet.	Details.	Depth in Feet.	Details.
95	95 ft. clay.	243	2 ft. rotten timber.
103	8 ft. sand.	262	19 ft. pumice sand.
111	8 ft. rotten timber.	278	16 ft. rotten timber.
114	3 ft. sand.	284	6 ft. pumice sand.
118	4 ft. clay.	286	2 ft. rotten timber.
124	6 ft. sand.	294	8 ft. pumice sand.
145	21 ft. clay.	296	2 ft. rotten timber.
157	12 ft. sand.	302	6 ft. drift sand.
163	6 ft. rotten timber.	308	6 ft. shingle.
169	6 ft. sand.	309	1 ft. rotten timber.
173	4 ft. clay.	319	10 ft. sand.
174	1 ft. sand.	321	2 ft. rotten timber.
178	4 ft. clay.	324	3 ft. sand.
182	4 ft. sand.	356	32 ft. clay.
187	5 ft. clay.	376	20 ft. sand.
188	1 ft. sand.	384	8 ft. clay.
201	13 ft. rotten timber.	393	9 ft. sand.
210	9 ft. clay.	400	7 ft. rotten timber.
212	2 ft. sand.	403	3 ft. clay.
217	5 ft. clay.	430	27 ft. sand.
228	11 ft. sand.	434	4 ft. rotten timber.
233	5 ft. rotten timber.	439	5 ft. drift sand.
241	8 ft. pumice sand.		

Total depth, 439 ft. Flow running, small.

ARTESIAN BORE NO. 93: SECTION 3, BLOCK XI, THAMES. (MR. GUNSON.)

Depth in Feet.	Details.	Depth in Feet.	Details.
88	88 ft. clay.	247	4 ft. sand.
95	7 ft. sand.	258	11 ft. clay.
98	3 ft. rotten timber.	260	2 ft. sand.
101	3 ft. sand.	264	4 ft. rotten timber.
111	10 ft. clay.	277	13 ft. pumice sand.
115	4 ft. sand.	282	5 ft. clay.
127	12 ft. clay.	313	31 ft. pumice sand.
129	2 ft. sand.	317	4 ft. rotten timber.
141	12 ft. rotten timber.	365	48 ft. pumice sand.
186	45 ft. pumice sand.	369	4 ft. clay.
197	11 ft. rotten timber.	375	6 ft. pumice sand.
201	4 ft. clay.	377	2 ft. rotten timber.
216	15 ft. pumice sand.	414	37 ft. pumice sand.
220	4 ft. rotten timber.	419	5 ft. rotten timber.
240	20 ft. pumice sand.	429	10 ft. pumice sand.
243	3 ft. rotten timber.		

Total depth, 429 ft. Flow running, 19,200 gallons per day.

ARTESIAN BORE NO. 94: SECTION 26, BLOCK XI, THAMES. (MR. BENNETT.)

Depth in Feet.	Details.	Depth in Feet.	Details.
70	70 ft. clay.	114	8 ft. clay.
76	6 ft. sand.	118	4 ft. sand.
83	7 ft. clay.	135	17 ft. clay.
86	3 ft. sand.	139	4 ft. sand.
91	5 ft. rotten timber.	145	6 ft. clay.
95	4 ft. clay.	155	10 ft. sand.
97	2 ft. sand.	177	22 ft. clay.
101	4 ft. rotten timber.	187	10 ft. shingle.
106	5 ft. sand.	227	40 ft. pumice sand.

Total depth, 227 ft. Flow running, nil.

ARTESIAN BORE NO. 95: SECTION 23, BLOCK XI, THAMES. (MR. BUCHANAN.)

Depth in Feet.	Details.	Depth in Feet.	Details.
41	41 ft. clay.	258	7 ft. shingle.
53	12 ft. rotten timber.	261	3 ft. rotten timber.
61	8 ft. clay.	266	5 ft. sand.
65	4 ft. rotten timber.	269	3 ft. rotten timber.
73	8 ft. clay.	277	8 ft. sand.
75	2 ft. sand.	284	7 ft. clay.
81	6 ft. rotten timber.	292	8 ft. sand.
84	3 ft. sand.	305	13 ft. clay.
89	5 ft. clay.	309	4 ft. sand.
121	32 ft. sand.	312	3 ft. rotten timber.
133	12 ft. clay.	317	5 ft. clay.
148	15 ft. sand.	325	8 ft. sand.
151	3 ft. rotten timber.	333	8 ft. clay.
153	2 ft. sand.	343	10 ft. pumice sand.
158	5 ft. clay.	347	4 ft. clay.
169	11 ft. pumice sand.	350	3 ft. pumice sand.
172	3 ft. clay.	356	6 ft. rotten timber.
206	34 ft. drift sand.	401	45 ft. pumice sand.
216	10 ft. rotten timber.	404	3 ft. rotten timber.
238	22 ft. drift sand.	415	11 ft. pumice sand.
245	7 ft. rotten timber.	420	5 ft. rotten timber.
251	6 ft. drift sand.	437	17 ft. pumice sand.

Total depth, 437 ft. Flow running, nil.

ARTESIAN BORE NO. 96: KOPUARAHI BLOCK 3A No. 2. (MR. BOND.) (BORE NO. 1.)

Depth in Feet.	Details.	Depth in Feet.	Details.
27	27 ft. clay.	111	12 ft. drift sand.
33	6 ft. rotten timber.	117	6 ft. rotten timber.
58	25 ft. pumice sand.	129	12 ft. pumice sand.
60	2 ft. rotten timber.	132	3 ft. rotten timber.
75	15 ft. pumice sand.	136	4 ft. clay.
78	3 ft. rotten timber.	141	5 ft. pumice sand.
97	19 ft. pumice sand.	147	6 ft. clay.
99	2 ft. clay.	168	21 ft. pumice sand.

Total depth, 168 ft. Flow running, 114,240 gallons per day.

ARTESIAN BORE NO. 97: KOPUARAHU BLOCK 3A NO. 2. (MR. BOND.) (BORE NO. 2.)

Depth in Feet.	Details.]	Depth in Feet.	Details.
33	33 ft. clay.	242	2 ft. rotten timber.
58	25 ft. sand.	250	8 ft. pumice sand.
62	4 ft. rotten timber.	252	2 ft. rotten timber.
67	5 ft. sand.	259	7 ft. sand.
70	3 ft. rotten timber.	279	20 ft. clay.
73	3 ft. sand.	291	12 ft. sand.
75	2 ft. rotten timber.	318	27 ft. clay.
102	27 ft. pumice sand.	323	5 ft. rotten timber.
106	4 ft. rotten timber.	327	4 ft. clay.
164	58 ft. pumice sand.	328	1 ft. sand.
170	6 ft. rotten timber.	379	51 ft. white clay.
190	20 ft. pumice sand.	390	11 ft. pumice sand.
192	2 ft. rotten timber.	392	2 ft. rotten timber.
203	11 ft. pumice sand.	400	8 ft. clay.
206	3 ft. rotten timber.	405	5 ft. pumice sand.
224	18 ft. pumice sand.	408	3 ft. clay.
227	3 ft. clay.	415	7 ft. pumice sand.
235	8 ft. pumice sand.	418	3 ft. clay.
238	3 ft. clay.	427	9 ft. pumice sand.
240	2 ft. sand.	439	12 ft. clay.

Total depth, 439 ft. Flow running, 33,600 gallons per day.

ARTESIAN BORE NO. 98: SECTION 4, BLOCK X, THAMES. (MR. E. W. HARRIS.)

Depth in Feet.	Details.	Depth in Feet.	Details.
72	72 ft. clay.	135	4 ft. sand.
89	17 ft. sand.	222	87 ft. clay.
91	2 ft. clay.	232	10 ft. sand.
129	38 ft. pumice sand.	235	3 ft. rotten timber.
131	2 ft. rotten timber.	259	24 ft. pumice sand.

Total depth, 259 ft. Flow running, 7,680 gallons per day.

ARTESIAN BORE NO. 99: SECTION 1, BLOCK X, WHAREKAWA. (MR. WINTER.)

Depth in Feet.	Details.	Depth in Feet.	Details.
69	69 ft. clay.	111	5 ft. sand.
84	15 ft. sand.	160	49 ft. clay.
87	3 ft. clay.	164	4 ft. rotten timber.
102	15 ft. pumice sand.	192	28 ft. sand.
106	4 ft. clay.		

Total depth, 192 ft. Flow running, 14,400 gallons per day.

ARTESIAN BORE NO. 100: SECTION 3, BLOCK X, WHAREKAWA. (MR. BIRNEY.)

Depth in Feet.	Details.	Depth in Feet.	Details.
66	66 ft. clay.	91	25 ft. pumice sand.

Total depth, 91 ft. Flow running, small.

ARTESIAN BORE NO. 101: SECTION 2, BLOCK X, WHAREKAWA. (MR. DONAGHY.)

Depth in Feet.	Details.	Depth in Feet.	Details.
68	68 ft. clay.	129	36 ft. pumice sand.
81	13 ft. pumice sand.	144	15 ft. rotten timber.
83	2 ft. clay.	153	9 ft. pumice sand.
87	4 ft. pumice sand.	157	4 ft. rotten timber.
89	2 ft. rotten timber.	168	11 ft. pumice sand.
93	4 ft. pumice sand.		

Total depth, 168 ft. Flow running, 17,280 gallons per day.

ARTESIAN BORE NO. 102: SECTION 6, BLOCK X, WHAREKAWA. (MR. CLOVER.)

Depth in Feet.	Details.	Depth in Feet.	Details.
52	52 ft. clay.	147	2 ft. pumice sand.
70	18 ft. pumice sand.	162	15 ft. rotten timber.
74	4 ft. rotten timber.	168	6 ft. pumice sand.
79	5 ft. clay.	182	14 ft. clay.
89	10 ft. rotten timber.	184	2 ft. sand.
91	2 ft. sand.	194	10 ft. rotten timber.
104	13 ft. rotten timber.	195	1 ft. sand.
108	4 ft. sand.	202	7 ft. clay.
119	11 ft. rotten timber.	210	8 ft. rotten timber.
125	6 ft. pumice sand.	222	12 ft. clay.
128	3 ft. rotten timber.	225	3 ft. sand.
133	5 ft. pumice sand.	256	31 ft. rotten timber.
145	12 ft. clay.	276	20 ft. sand.

Total depth, 276 ft. Flow running, small.

ARTESIAN BORE NO. 103: SECTION 7, BLOCK X, WHAREKAWA. (MR. BUDD.)

Depth in Feet.	Details.	Depth in Feet.	Details.
43	43 ft. clay.	157	2 ft. sand.
46	3 ft. sand.	162	5 ft. clay.
60	14 ft. clay.	167	5 ft. sand.
66	6 ft. pumice sand.	170	3 ft. clay.
85	19 ft. clay.	172	2 ft. sand.
88	3 ft. pumice sand.	174	2 ft. rotten timber.
96	8 ft. clay.	177	3 ft. clay.
128	32 ft. sand.	183	6 ft. sand.
137	9 ft. rotten timber.	191	8 ft. clay.
142	5 ft. sand.	209	18 ft. sand.
144	2 ft. rotten timber.	215	6 ft. clay.
147	3 ft. sand.	227	12 ft. sand.
155	8 ft. clay.		

Total depth, 227 ft. Flow running, 24,000 gallons per day.

ARTESIAN BORE NO. 104: RESERVE, WAITAKARURU.

Depth in Feet.	Details.	Depth in Feet.	Details.
33	33 ft. clay.	173	4 ft. sand.
55	22 ft. pumice sand.	178	5 ft. clay.
67	12 ft. clay.	184	6 ft. pumice sand.
69	2 ft. pumice sand.	190	6 ft. clay.
73	4 ft. rotten timber.	235	45 ft. pumice sand.
78	5 ft. pumice sand.	244	9 ft. clay.
87	9 ft. rotten timber.	250	6 ft. sand.
92	5 ft. pumice sand.	252	2 ft. rotten timber.
97	5 ft. rotten timber.	258	6 ft. sand.
99	2 ft. sand.	260	2 ft. rotten timber.
138	39 ft. clay.	275	15 ft. pumice sand.
148	10 ft. pumice sand.	277	2 ft. rotten timber.
169	21 ft. clay.	302	25 ft. pumice sand.

Total depth, 302 ft. Flow running, 9,120 gallons per day.

Approximate Cost of Paper.—Preparation, not given; printing (1,050 copies, including plan and illustrations), £40.

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