1904.

NEW ZEALAND.

INSPECTION OF COAL-MINES REPORT.

("THE COAL-MINES ACT, 1891.")

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

No. 1.

Mr. JOHN HAYES, F.S.Sc., Inspecting Engineer, to the UNDER-SECRETARY FOR MINES.

Mines Department, Wellington, 4th May, 1904.

SIR,—

I have the honour to submit my report, covering the reports of the Inspectors of Mines for the several districts, on the coal-mines of the colony for the year ending the 31st December, 1903.

OUTPUT.

The output of the various classes of coal mined in each district is summarised as under:—

Class of Coal, &c.	Northern District.	West Coast District.	Southern District.	Total.
	Tons.	Tons.	Tons.	Tons.
Bituminous and semi-bituminous coal ...	101,519	778,372	...	879,891
Pitch-coal	...	...	21,116	21,116
Brown coal	108,276	2,660	330,878	441,814
Lignite	...	...	77,372	77,372
Oil-shale	...	...	36	36
Totals	209,795	781,032	429,402	1,420,229

In comparison with the output of the previous year, the foregoing summary shows a net total increase of 55,189 tons, which is made up as follows:—

Class of Coal, &c.	Northern District.		West Coast District.		Southern District.		Total Increase.	Total Decrease.	Total Net Increase.
	Increase.	Decrease.	Increase.	Decrease.	Increase.	Decrease.			
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Bituminous and semi-bituminous coal	8,758	...	26,087	...	...	...	...	...	...
Pitch-coal	...	...	...	...	...	4,129	...	...	...
Brown coal ...	8,992	...	1,129	...	4,521	...	...	...	...
Lignite	...	...	...	...	12,133	...	...	...	...
Oil-shale	...	...	...	...	...	2,302	...	...	...
Totals ...	17,750	...	27,216	...	16,654	6,431	61,620	6,431	55,189

The approximate total quantity of coal, &c., raised from the several mines throughout the colony up to the 31st December, 1903, is 18,577,825 tons.

The total number of mines at work is returned at 178, of which number 23 employ upwards of twenty persons, and require to be under the charge of a manager holding a first-class certificate. The mines which employ more than six, but not more than twenty persons, number 38, and a person holding a mine-manager's certificate of the second class is eligible to take charge. Where not more than six persons are employed the person in charge is required to hold a permit from the Inspector of Mines for the district. It is to be noted that several very small mines included in the total number are merely small lignite pits or quarries supplying fuel for the requirements of the owners only, or the demands of an extremely limited population.

The number of persons ordinarily employed is returned at 717 above ground, including those engaged at opencast lignite-pits, and 2,135 below ground, making a total of 2,852, or a decrease of 33 as compared with the returns for the previous year; and the output shows an average of 497.9 tons per person employed as compared with 473.15 tons for the previous year. Thick seams, machine coal-cutting, and a considerable amount of open quarrying account for the high average attained in this colony.

Accidents.

In connection with the actual working of collieries four persons lost their lives during the year. In each case careful investigation was made, and the Inspectors of Mines do not consider any blame attributable to officers in charge of work. Two other persons employed in construction-work at the surface at different collieries were accidentally killed during the year under conditions incidental to building and quarrying work. I do not therefore include these as coming under the head of mining fatalities for the purpose of striking an average. With this consideration, the number of fatal mining accidents is in the proportion of 1 to every 713 persons employed and 355,057.25 tons of coal produced.

It gives me pleasure to state that I find managers and officials generally solicitous for the safety of the men under their charge. If all workmen would give the same consideration towards their own safety as officials do on their behalf accidents would diminish in number.

Underground mining is necessarily a more or less risky undertaking, and the greatest possible care and precaution will not result in total immunity from accidents. It may, however, be stated that coal-mining work, notwithstanding the drawbacks of the comparatively feeble light under which it is carried on, and the powerful forces of nature which have to be grappled with, compares more than favourably with a very large number of surface occupations in relation to the occurrence of accidents; and, thanks to the provisions for first-class ventilation which are being generally adopted at all the principal collieries, the healthy nature of the coal-miners' work, as compared with that of many other industries, admits of no question whatever.

Prosecutions.

No prosecutions were instituted by the Department during the year.

It is satisfactory to note that some colliery-managers recognise their responsibility in the matter of taking proceedings against employees for breaches of the general and special rules which are framed in the interests of general safety, and that action has actually been taken and convictions obtained against workmen for violation of regulations which might easily enough have led to serious consequences not only to the offenders themselves, but to other persons employed in the mines.

I cannot too strongly impress upon managers the fact that where employees wilfully violate the general or special rules their duty is to take legal action in the matter.

Mechanical Ventilation.

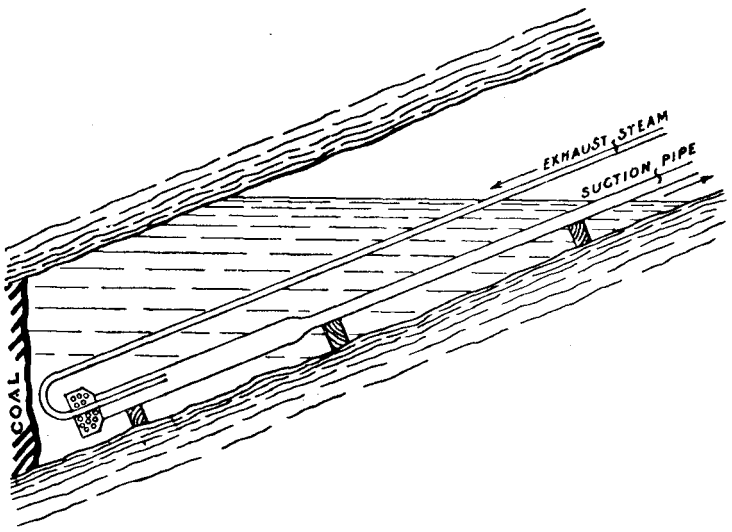
The adoption of fans in place of furnaces for the ventilation of mines is now becoming much more general. In the case of a large colliery, fan-installation is often less costly than that of a furnace, whilst it is much less expensive to maintain, is infinitely safer, and the air is under better control. During the year a "Hayes" fan has been put to work at Allandale Colliery, Otago, and two others of the same type are being adopted at Point Elizabeth Colliery, Greymouth, whilst a small fan which formerly ventilated a section of the Westport Cardiff Mine will be used, temporarily at least, at Seddonville Colliery, near Westport.

Exhaust Steam in Mine-workings.

In many of the small collieries in the colony steam-pumps—generally of the direct-acting "Duplex" type—are used, and are not, as a rule, of very great capacity. Steam is conveyed to the pump underground from a boiler at the surface, but the exhaust steam often presents a difficulty. If allowed to escape freely into the workings it is very liable to set up conditions inimical to the stability of the roof, besides making everything hot and wet for a considerable area, and therefore the rough-and-ready expedient of allowing the exhaust steam to discharge into the sump-water is frequently adopted. This certainly reduces the nuisance, but at the expense of efficiency, owing to the extra back pressure on the pistons caused by the head of water over the discharge end of the exhaust-pipe.

A very simple method of meeting the difficulty (which not only gets rid of the undesirable conditions entirely, but actually assists the pump owing to the condensation of exhaust steam and the vacuum obtained) has, on my recommendation, been recently carried out at two small mines with satisfaction to the management. The arrangement is as follows: The suction-pipes are laid as usual from the pump into the water-lodge or sump, *but the lowest length of pipe is somewhat larger*

than the pipes above. The exhaust-steam pipe is carried down alongside the suction-pipe and turned into it at the lower end as shown in the sketch. Near the pump a plug tap or cock is placed



on the exhaust-pipe, but between this tap and the pump a short branch-pipe (of the same diameter as the exhaust-pipe) must be connected and fitted with a similar tap. These two taps should be connected to one lever so that the operation of opening one closes the other. Before starting the pump to work, the tap on the main exhaust-pipe must be closed, and that on the branch-pipe opened. On the pump being started this allows the exhaust to discharge into the surrounding atmosphere, but it is desirable to continue the branch-pipe a few feet past the tap and lead the exhaust into a small tank of water. (In the case of small pumps an oil-drum is ample.) When it is ascertained that the pump has got fairly to work on the water, the lever connecting the taps is pushed gently over, and the exhaust steam then passes down the main pipe and into the suction. It is to be remembered that the taps must be reversed by the connecting-lever a few seconds before the steam is shut off from the pump to avoid flooding the cylinders, and also that where leather pump-buckets are used care should be taken not to let the pump get on air before altering the direction of the exhaust steam, otherwise the heat will damage the leathers.

Actual experiments have demonstrated that an increase of 12½ per cent. in the working speed and capacity has been attained by the use of this simple condenser. The method has its limits, but is eminently suited to pumps designed for comparatively low heads.

Coal-cutting by Machinery.

For some years past coal-cutting machinery has been in use at the collieries of the Westport Coal Company (Limited), the type generally used being that known as the "Yoch," a percussive machine mounted on wheels. All classes of coal-cutting machines have their various spheres of usefulness, and so far no one machine can be said to meet the various demands or suit the requirements of the diversified conditions of mining. Both the disc and cutter-bar (rotary) machines are adapted for longwall working (a method little practised in New Zealand), and the percussive type for working in bords at collieries worked on the bord-and-pillar system. A want for a light and handy machine which can be set up quickly, moved about the workings with ease, suited to the driving of narrow places in coal, and which will not smash up an undue proportion of coal into slack has long been felt.

A machine known as the "Champion" Coal-cutter has been introduced into the colony within the last year, and appears to fill the conditions just named admirably. Briefly, it may be described as a rock-drill with a swivelling attachment, and will be readily understood from the illustrations. It will hole or undermine the coal for a depth of 7 ft., and only takes out a cut 3½ in. in height. Holing may also be done in any band of dirt or inferior coal which may occur in the seam being worked. In many places this is a distinct advantage, but a very strong point in favour of the machine is that it will "nick" or "shear" the sides of the working-place as well as do the holing, the breadth of the coal taken out in a "nicking" cut being only 3½ in. The machine can be worked at any angle and in any part of the seam. It can be used for drilling the holes necessary for shot-firing, and also for wedging if required. Compressed air is used for driving, and the amount of air used is not large, the branch supply-pipe being only about ¾ in. diameter.

In actual work at English collieries the new machine has proved of great value in opening new headings in coal, the experiences of eminent mining engineers going to show that the work is performed at from twice to four times the speed of hand-labour (according to local conditions) and at considerably less cost.*

Examination for Mine-managers' Certificates.

The papers used at the examination held during the first week of February, 1904, are appended.

* Further reference to the working of this machine at Westport is made in the article on "Coal-cutting by Machinery," by Mr. J. Dixon, M.E. (See Appendix.)

SCHEDULES.

The list of persons to whom certificates of service and competency as coal-mine managers have been issued is appended, together with the statistics of output, persons employed, &c.

ARTICLES.

I have to express my indebtedness to Mr. Jonathan Dixon, mining engineer, of Westport, for his article on "Coal-cuting by Machinery," and to Mr. Alexander Aitken, C.E., of Kumara, and Mr. R. M. Aitken, of Reefton, for their article on "The Ventilation of Mines," both of which appear as an appendix.

I have, &c.,
JOHN HAYES,
Inspecting Engineer.

The Under-Secretary for Mines, Wellington.

No. 2.

Mr. JAMES COUTTS, Inspector of Mines, Thames, to the UNDER-SECRETARY, Mines Department, Wellington.

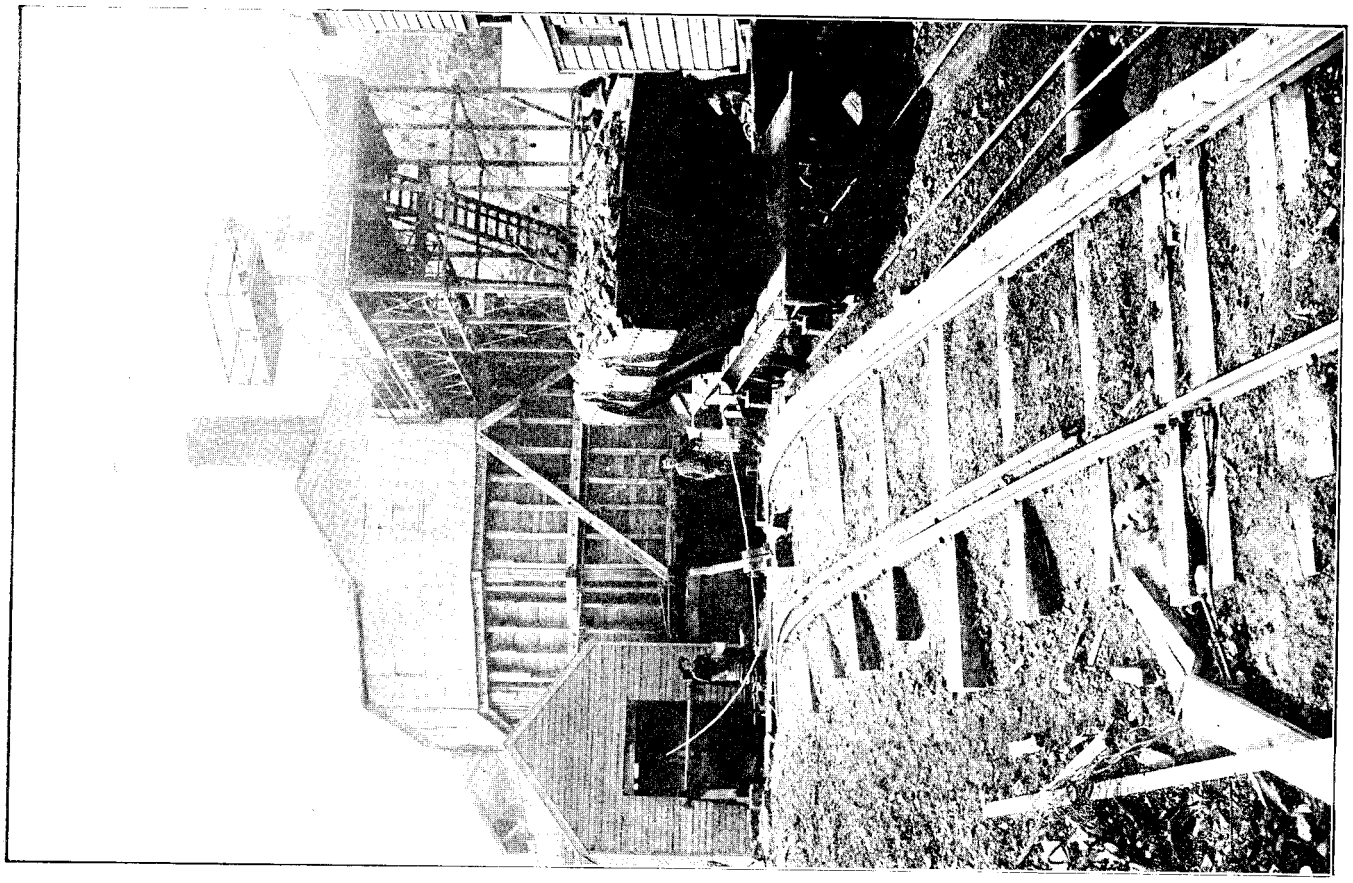
SIR,— Inspector of Mines' Office, Thames, 15th February, 1904.

I have the honour to transmit the following report on the coal-mines in the Auckland District for the year ended the 31st December, 1903, in compliance with section 67 of "The Coal-mines Act, 1891":—

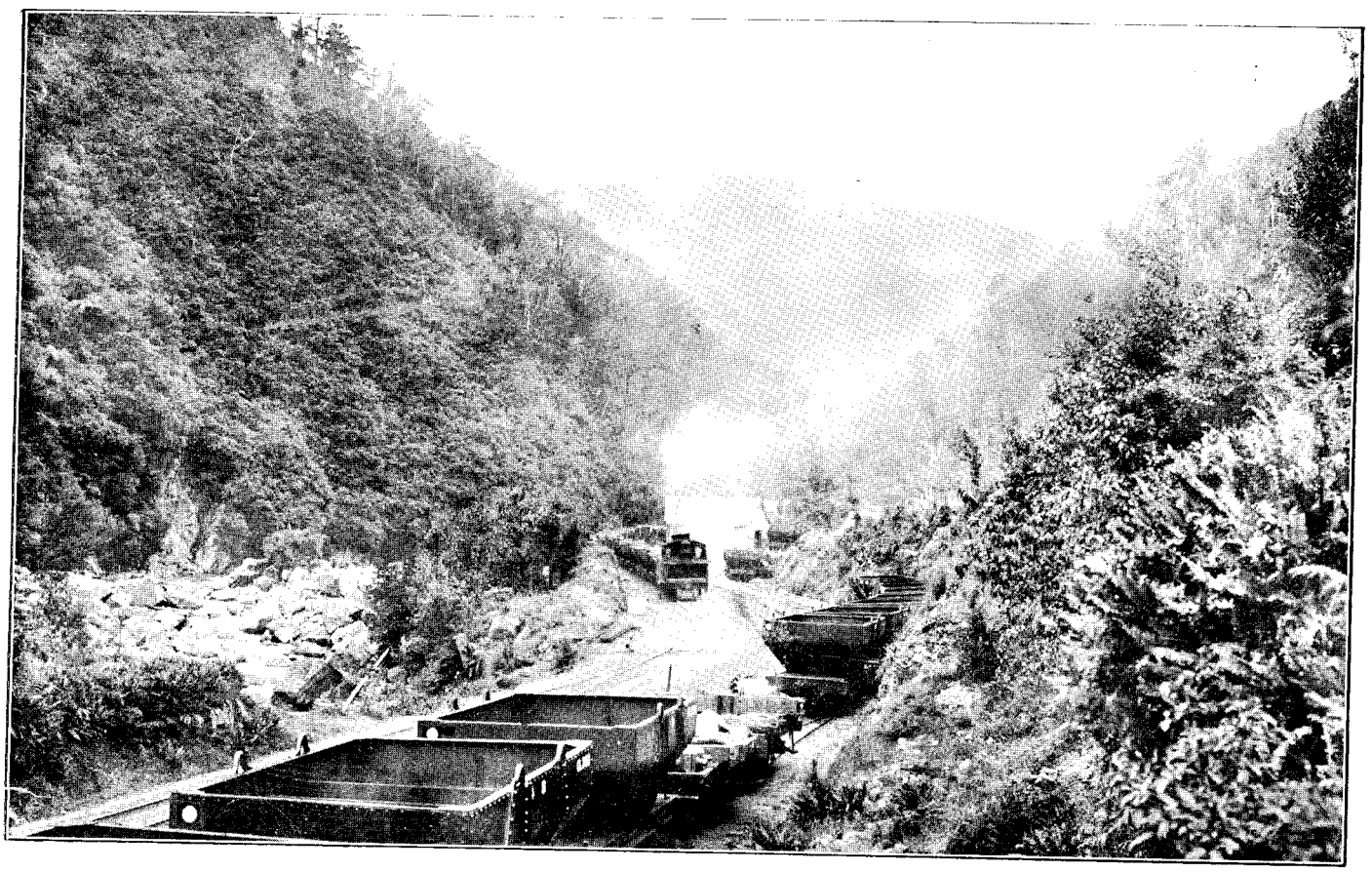
Kawakawa Mine, Kawakawa (John Culley, manager).—There is little change to report from this mine since my last visit; the manager's attention has been directed to working out the small pillars under Carraway's Hill. The work consists in exploring and driving through the ground that has fallen down with the object of finding one pillar at a time, and is like groping in the dark on account of there being no plan of the old workings to show where pillars have been left in, therefore the prospects of finding a pillar at times that will pay to take out are anything but encouraging, and a very large amount of timber is required to keep the workings safe, the sets in the roadway requiring to be continually renewed. For about three months a large amount of water found its way into the workings owing to the incessant rains. This gave considerable trouble, and the manager had to fall back on little pillars that were considered worthless to supply the customers, who in return complained of the poor quality of the coal, and not without good reason. The output of coal for the year was 3,443 tons, which is a slight decrease as compared with the previous year, but was sufficient to supply the local requirements. Should a seam of coal of similar quality to that found in this mine be discovered anywhere in proximity to the railway connecting with the port at Opua, it would be the means of giving a great impetus to this part of the district. The coal being excellent for steaming purposes, a large quantity could be disposed of. Six men were employed during the year.

Hikurangi Coal Company, Hikurangi (T. P. Moody, manager).—The operations in this company's mine are being directed to opening up that portion of their property on the western side of the Government railway which is to the dip of the workings on the east side of the railway. On the east side a level was driven in from the surface which drained off all the water met with in that portion of the mine. From the west-side workings the water has to be pumped out. However, this is not (so far as the seam here has been opened up) a formidable undertaking. Owing to the railway-line running nearly over the centre of the mine, the development in progress is like extra work in consequence of this portion having to be opened up and worked as a separate mine. The strip of coal under the railway cannot be interfered with beyond getting the roadways necessary for haulage and ventilation. It is pleasing to see that the seam of coal here is proving to be better in quality than that to the rise, and is opening to the manager's expectations. The work in hand to the rise of the railway is chiefly confined to taking out pillars. This is being done very effectively, only a very small percentage of coal being lost, a feature no doubt largely due to the thin covering over the coal. When a pillar is taken out and most of the props withdrawn, the covering falls down from the surface, and being of a soft nature it breaks off short at the first pillars adjoining and does not crush the unworked coal. The company has again had a very successful year, enabling the directors to declare the usual dividends, which must be gratifying to the manager of the mine. The output of coal for the year was 39,625 tons, a slight increase as compared with the previous year, and an average of fifty-five men were employed. The mine was inspected three times during the year, the workings each time found to be safe, the ventilation good, and a large supply of props, &c., kept on hand at the mine. An accident happened to a miner named Henry Holton on the 29th October in this mine, the injuries he received being of a fatal character. This was duly reported in the usual way. No blame was attached to any one.

Northern Collieries, Hikurangi (W. R. Dunn, manager).—The operations in this company's mine are chiefly confined to working a patch of coal discovered about a mile in a northerly direction from the first old workings. The seam here varies from 4 ft. to 6 ft. in thickness, and is not so much disturbed by faults as in any of the other places opened out in the property. This favourable condition has enabled the manager to keep up a constant supply of coal to meet the demands, and the prospects at present are most encouraging. A tram-line has been laid from the top of the self-acting incline to this portion of the mine, and the horses that were engaged in drawing the trucks have been dispensed with and a light locomotive put on to do the work, thereby effecting a considerable saving in expense. The present openings are above water-level, which is a matter of great importance in the economical working of the colliery. The mine was in good working-order when last inspected, and as there is little covering on the top of the coal ventilation-openings can



BINS AND SCREENS, DENNISTON COLLIERY.
(WESTPORT COAL CO., LTD.)



AT THE FOOT OF THE DENNISTON INCLINE: TRAIN STARTING FOR WESTPORT.
(WESTPORT COAL CO., LTD.)

Face p. 1.

be obtained at a very small cost wherever required. The output of coal for the year was 22,382 tons, and the average number of men employed thirty-five.

Phœnix Mine, Hikurangi (R. McEwan, manager).—The work carried out in this mine has been very limited. In the early part of the year the operations were mostly confined to taking out pillars which are now exhausted, and the manager's attention is now directed to opening up the mine near the railway, some considerable distance away from the old workings. A small shaft has been sunk to a depth of 40 ft., and a small engine erected to pump the water out. This will drain the dip incline where the coal is to be raised to the surface and then conveyed by a short length of tramway to a hopper on the side of the railway. The prospects of the mine opening out well are more hopeful than have been the case for some time past, the work carried out being of a more satisfactory nature. The output of coal for the year was 6,234 tons, and an average of fourteen men were employed.

Ngunguru Mine, Kiripaka (A. H. Taylor, manager).—The seam of coal in this mine is operated on from three adit levels from the surface, and the workings from each adit level is alphabetically termed the A, B, and C sections. To reach the mine a steep incline tramway is constructed on the surface for a distance of 8 chains in length. This rises to a vertical height of 154 ft., then a short incline with an easy grade enters the A section of the mine, which has been worked for the last eleven years. This section has produced a large quantity of coal, the seam varying from 2 ft. to 6 ft. in thickness. Considerable difficulties have been encountered owing to the number of faults met with. A large quantity of fireclay has been obtained from here, and being of good quality a good price was paid for it in Auckland. This portion of the mine will be worked out in the course of a few months. B section: In the adit incline the seam dipped 1 in 9, and is cut out in the north heading by a fault that throws the coal up 46 ft., and south of the heading the coal thins out to nothing. As there is no solid coal now left the work here is confined to taking out the pillars. C section: An incline of 3 chains in length and a grade of 1 in 4 connects this section with the main tramway. The coal was intersected a few feet in from the entrance to the adit, where it was sunk down on and also driven upon. The seam here has varied from 2 ft. to 5 ft. in thickness and is of good quality, but a succession of faults with little strips of coal lying between them tends to depreciate the value of this section of the property. The company put down two boreholes near the Panipo Coal-mine on the side of the river, and discovered the seam of coal in one bore to be 14 ft. thick and in the other 16 ft. thick; this is some distance away from the present workings. The output of coal during the year was 17,824 tons, a slight decrease on the previous year. An average of fifty men were employed. The ventilation was good and the work generally carried out in an efficient manner.

Kiripaka Mine, Panipo (G. Clemo, manager).—The old mine on the top of the spur was worked out on the 5th May, and just as this was finished coal was discovered at a much lower level near the side of the river, and here a mine has been opened out by adit levels at a very small outlay. The seam at this new opening has varied from 6 ft. to 16 ft. in thickness and is of very fair quality, and the prospects of the company having a good mine are most encouraging. Boring is also being carried on at another portion of the property to the dip of their present workings, and in one borehole the coal was found to be over 12 ft. thick. The output of coal for the year was 12,011 tons, a decrease of 2,127 tons as compared with the previous year; and an average of sixteen men were employed.

Mangapapa (Mokau) Mine.—Operations in this mine are still very limited and the output small. A Sydney syndicate intended to purchase the mine and for some time took an interest in opening it up with a view to increasing the output, and spent a considerable amount of money in the building and purchasing of boats to convey the coal from the mine to the market ports. In this latter scheme they were very unfortunate, as neither the s.s. "Mokau" nor the s.s. "Mangapapa" were suitable for the trade, being either too large for the river or of too great a draught. I understand that in consequence of these drawbacks the syndicate has given up the project. The property is now in the hands of Mr. Stubbs, and the s.s. "Manakau" and s.s. "Ngunguru" are engaged in carrying the coal from the mine to the ports. The operations in the mine generally are being supervised better than formerly. The ventilating-furnace has been further improved, which has left little to complain of on my last visit of inspection. In the main heading—which was extended in a northerly direction—a fault was met which had the effect of throwing the coal down 8 ft. After following down the fault to the depth named it was found that the floor of the coal would come back to the same level as that worked on the south side of the fault and thus be water-level-free. The coal is now being opened up on the north side of the fault, and it will not be necessary to penetrate through the fault as each bord comes up to it, as only a return airway will be put through where required. The output of coal from this mine for the year was 6,150 tons, an increase of 1,900 tons over the previous year. An average of thirteen men were employed.

Taupiri Coal-mines, Huntly (E. S. Wight, manager).—During the past year operations in the different sections of this company's property have been systematically carried on, and although the Kimihia section for the last six months has contributed very little towards the output, yet the amount of coal won from the mines shows an increase of 6,293 tons over the preceding year, the largest tonnage having been obtained from Ralph's section, on which a considerable amount of improvements have been effected, and others are being carried out both on the surface and underground, which will enable the output to be considerably increased if found necessary, and the coal handled more cheaply and expeditiously than hitherto. On the top of the shaft a new set of poppet-legs are being erected to replace the old ones which were found to be inadequate for an increased output. Boreholes, protected by iron tubing, have been put down from the surface and connected with the main underground workings for the purpose of installing an endless-rope system of haulage on the main line towards that portion of the mine under the Waahi Lake. This haulage arrangement will be ready for work in a few months' time. The bottom of the shaft and a portion of the main hauling-road have been lighted up with electricity. This is a great improve-

ment on the lights formerly used. The chamber and main road leading from the shaft (which latter was driven through fireclay underneath the coal) showed signs of considerable pressure being thrown on the timber. This has been enlarged and retimbered with substantial kauri sets, properly secured. On the surface a shaking-screen, making four classes of coal, has been erected; this is equipped with a picking-belt for the house-coal, and is a great improvement on the previous method of hand-picking in the mine, the coal being sent to the market in better condition. At the Taupiri Reserve and Taupiri Extended Mines nothing of interest has taken place. In the former mine only two prospecting headings are being extended, the most of the men that were employed here having been transferred to the Extended Mine. The manager intends shortly to extend the dip northward in the Extended Mine, and will adopt the endless-rope-haulage system to draw the coal broken out from the company's freehold. The output of coal for the year was 95,556 tons, and the total number of men employed 171. The ventilation was good, and the work carried out in a safe and satisfactory manner.

The Union Collieries (Limited), (late Maramarua-Miranda), (W. Tattley, manager).—This mine is now being energetically worked and operations directed to that portion of the property near Foote's old workings, the coal here being of very good quality of its kind. To all appearances there is an unlimited quantity of coal on the property, and with better facilities for getting the coal from the mine to the railway than at present exist it would become a large producer. A contract has lately been entered into with the Waihi Company to supply a stipulated quantity of coal each week, which if continued will mean a considerable increase for the incoming year. The output of coal for the year was 6,570 tons, and the average number of men employed twenty.

There has been a considerable amount of prospecting done in the shape of boring for coal in the Waikato district during the year, and in some cases the operations have been of a satisfactory character, coal having been discovered on different properties which the owners consider will pay handsomely to work. Mr. R. R. Hunt, who had an option over the property known as Hooton's (situated about seven miles north of the Huntly Coal-mines and on the side of the railway-line), has done a good deal of boring, and the prospects met with have been sufficiently encouraging to enable the promoters to form a company for the purpose of raising capital to purchase a pumping and winding plant capable of contending against any water that may be met with and raising a large tonnage of coal from the mine when opened up. This work, I am informed, has been started and will be vigorously carried on. Should the coal be as good as it is said to be its favourable situation should leave no doubt as to its becoming a payable concern.

Papaaroha Coal-mine Company, Coromandel.—This company has now secured the rights over a large area of ground situated between Coromandel and Cabbage Bay, and about two miles inland from the coast. The operations carried on during the year have been confined to prospecting, no work of a permanent nature having as yet been undertaken. Small openings have been made in several places on the side of the spur of the hill, and what appears to be disturbed outcrops of coal met with. The coal formation varies from 2 ft. to 4 ft. thick, but this is mixed with bands of stone, and so far only a very limited amount of coal has been opened up. A parcel of 4 tons was packed out and sent to Auckland, which I am informed gave highly satisfactory results as a steaming-coal.

Prospecting is also being carried on in other parts of the district for coal—namely, near Whangarei, Bay of Islands, Ohinemuri, and Tairua.

The total output of coal from the mines in this district for the year amounted to 209,795 tons, an increase of 17,750 tons as compared with the previous year, made up as follows:—

	Output for 1902.	Output for 1903.
North of Auckland	92,761	101,519
South of Auckland	99,284	108,276
	192,045	209,795

ACCIDENTS.

The following are the names of persons injured in the mines north of Auckland who sent in claims to be placed on the Coal-miners' Relief Fund, the number of days they were absent from work, and the amount of money received: 19th January, H. Hutton, Northern Colliery, 14 days, £1 9s. 2d.; 26th February, James Sillick, Phœnix Colliery, 45 days, £4 13s. 9d.; 20th June, Arthur Callaghan, Panipo Colliery, 24 days, £2 10s.; 31st July, Robert Fife, Ngunguru Colliery, 27 days, £2 16s. 3d.; 17th August, Duncan McDonald, Ngunguru Colliery, 10 days, £1 0s. 10d.; 24th August, John Steel, Hikurangi Colliery, 18 days, £1 17s. 6d.; 31st August, Albert Thomas, Ngunguru Colliery, 23 days, £2 7s. 11d.; 28th October, James Allison, Ngunguru Colliery, 54 days, £5 12s. 6d.: making a total of 215 days, and of £22 7s. 9d.

On the 29th October Henry Holton met with an accident in the Hikurangi Colliery, and died on the 30th, the cause being the effects of the accident. The widow received the prescribed amount of money out of the fund, £25.

On the 15th October George Cooper was injured at the Mangapapa Colliery, Mokau, and was absent from work 152 days, during which he received £5 16s. 8d.

The Waikato Medical and Accident Society had forty-two accidents reported to them during the year. The total number of days the men were on the Relief Fund was 666, and the amount paid out was £69 7s. 6d., this not including that paid out of their own fund.

I know of nothing more that requires special mention.

I have, &c.,
JAMES COUTTS,
Inspector of Mines.

The Under-Secretary, Mines Department, Wellington.

No. 3.

Mr. Robert Tennent, Inspector of Mines, Westport, to the Under-Secretary, Mines Department, Wellington.

Sir,— Inspector of Mines' Office, Westport, 21st March, 1904.

I have the honour, in compliance with section 67 of "The Coal-mines Act, 1891," to report as follows on the West Coast coal-mines for the year ending 31st December, 1903:—

Enner Glynn Coal-mine.—Mr. Gimett has sunk a shaft to the depth of 180 ft. in the vicinity of the old mine, but when lately visited operations were suspended pending the raising of further capital.

Prospecting at Belgrove.—Mr. Morrison, landowner, was driving a low level in his spare time, but the prospects so far attained cannot be regarded as promising.

Motupipi Coal-mine.—There was nothing done at this mine during the year.

Shakespeare Bay.—Further prospecting in this locality is abandoned at present.

Taitapu.—Mr. N. L. Buchanan, attorney for the Taitapu Gold Estates (Limited), is awaiting instructions from the London office before commencing to extend development further.

Pakawau Coal-mine.—(11/9/1903): With the exception that a general survey of the property is being made by Mr. James Bishop, to locate a low level through Mr. Shaw's land in order to attain more favourable loading facilities at deep water, all works are suspended.

Puponga Coal-mine (owners, Puponga Coal- and Gold-mining Company (Limited); Mr. Sydney George Hayward, attorney for the company).—(12/9/1903): As stated in my report of last year, Mr. James Bishop, consulting engineer and acting-manager for the company, had drafted plans and estimates for the construction of haulage tram-line and loading-jetty. These works are now in a forward state, and the management anticipate that shipment of coal will commence in April next. The 2 ft. gauge tram-line, fitted for locomotive power, gravitates slightly in favour of the load, with a measured length of one mile and a half, while the jetty extension gives an additional 39 chains. Storage-capacity is being amply provided to facilitate loading and enable ships to be despatched with a minimum loss of time. The maximum depth of water at the jetty at high spring tides is about 14 ft. With reference to the mine-developments, the aggregate cutting and drivings amounts to 2,000 ft., of which 96 ft. is driven dipwards from the low level. The general haulage of the mine will be controlled by a steam-driven 20-horse-power engine suitably placed on the surface, the fittings for which are now nearing completion. Storage-bins, screens, and picking-belts are in course of construction, but slackness in the forwarding of material is a source of delay much felt. The underground developments are securely timbered and well ventilated. There are thirty-five men employed on the works.

Mokihinui Coal-mine.—(21/12/1903): The co-operative party working this mine has opened a new section of working adjoining the western boundary of the Seddonville Colliery (New Zealand State Coal-mines). Development so far as extended has been chiefly of a prospecting character; the thickness and quality of coal-seam being features not according to anticipations. A rock tunnel, 9 ft. by 6 ft. in the clear, recently started from near the landing of the main surface incline, is rising on an easy gradient to tap the rise level at a calculated distance of 6 chains. When completed, a direct intake and haulage-way will be provided to win the rise coal. Timbering has been made a speciality, and ventilation is well maintained from the openings made on the outcrops. Reports are kept to date, while ropes and all working-material are kept in good order and condition.

The only change noticeable in the burning mine is that smoke is now rising from the north end of Knight's heading, where the original fire broke out.

Seddonville Colliery (New Zealand State Coal-mines—Thomas Murray, mine-manager).—(21/12/1903): The varied works relative to the operative development of this colliery have been actively pushed. In conjunction with, and to further hasten completion of, the rock-driven adit tunnel, a securely timbered ventilation-shaft, 12 ft. by 8 ft. in the clear, was sunk on the 22-chain peg to a depth of 149 ft., from whence a level rock crosscut was driven westward to connect and open out two faces on the line (previously determined) to hole the adit. This work was most efficiently carried out, and reflects great credit on the skill of the local engineer. The necessary connections with the shaft having been successfully completed, to insure free ventilating-currents two parallel winning-levels were driven westward, between two fault-lines, from the face of the adit tunnel in the direction of Borehole Creek. This development has now attained considerable dimensions, and is capable of maintaining a fair output, while further extension of the rock tunnel is operative towards Grant's Face district. Haulage is effected by a steam-driven endless-rope installation, working direct from the adit terminal to the storage-bins. The completed distance is 111 chains on varied grades, which effect a total vertical fall of 454 ft. from the mouth of the adit. The storage-bins have a capacity of 900 tons, and are suitably worked by travelling tipplers, which are singularly suited to minimise the breakage of coal. Loading facilities have also received attention by the construction of a loop-line forming a back shunt for the supply of empty wagons to the bins to replace those loaded as they are shunted out to the railway siding. Stability is the general feature observed in the completed works, while the timbering and line of the rock tunnel represent excellent samples of engineering ability and skilled workmanship. Ventilation is temporarily maintained by a powerful steam-jet pending fan-installation. Reports and other provisions of the Act are strictly observed. A labourer named John Edgar was accidentally killed by falling from a beam while the storage-bins were under construction.

Millerton Colliery (owners, Westport Coal Company; George Fletcher, mining manager).—(21/12/1903): Double shifting continues to be actively maintained, while the output of 313,584 tons, of which 6,005 tons were used at the colliery for steaming purposes, shows an increase of 36,834 tons as compared with the preceding year. Efficiency in general working-

conditions and colliery-equipment is strictly observed, and all material is kept in good order and condition.

East Dip section: Pillar-extraction was successfully carried out to the close of the year, when it was considered advisable in the best interests of the property to suspend operations in this direction in view of protecting the main haulage-road leading to Mine Creek district, as further pillar-working would entail danger to this important road. Meanwhile this district is efficiently sealed off with brick stoppings, fitted with locked man-doors at suitable centres, while a strong concrete dam is built in the drainage-adit to raise the mine-water over the exhausted ground.

Mine Creek section: Since this extensive section of the property was opened in 1900 the principal developments advanced comprise the main south heading, or extension of the main haulage-line, which is driven a distance of 31 chains from the present terminal; the east crosscut, 32 chains; and the west heading, 16 chains. These united drivings have opened out an unbroken face-line, extending over 84 chains of hard and excellent coal. To further effect a more approved and efficient system, and to provide against the possibilities of spontaneous ignition and "creep" during the removal of pillars, the panel system now adopted provides precautions by which the various districts are separated by solid parallel barriers, and can be easily cut off without incurring permanent danger to any other section of the mine. As a means to further insure safety, increased stability, and higher percentage of round coal during total exhaustion, the size of pillars has been further increased (2 yards each way). Referring to my report of last year that tenders had been accepted for the construction of a new haulage-road leading from the big brake to ultimately connect with Mine Creek workings, it may be noted that this work is in active progress. To simplify and hasten completion it is being done in various sections. The rock tunnel, 11 ft. by 7 ft. in the clear, intersecting the hill country reflects credit on workmen and officers alike. Timbering is a special feature. Ventilation is efficiently maintained by a powerful exhaust water-blast, supplemented by a strong jet of compressed air should water become insufficient. To effect natural drainage prior to the extraction of pillars from this section of the mine, a rock adit 6 ft. by 5 ft. is under construction, and when completed will drain the deepest levels of this extensive basin. Drainage is effected at present by a small pump driven by compressed air. Preparatory to removing the hydraulic-brake installation situated at Mine Creek terminal, permanent concrete foundations are being more suitably constructed on the low level. The position selected is calculated to more evenly distribute the strain of the rope over the surging drum. The general ventilation is efficiently maintained, and is strictly kept on the working-face. The timbering of roadways and faces is carefully observed, and judicious care exercised in the various examinations required under the Coal-mines Act. The result of such examination is duly reported. The power-station has been further supplemented by a fourth Babcock and Wilcox boiler. Spinal injuries to a miner named William Danks were the result of the only serious accident reported from this mine. There were six inspections made.

Denniston Collieries (owners, Westport Coal Company; J. Dixon, mining manager).—These collieries have creditably maintained their productive capacity and general working efficiency during the year under review. The output, 251,608 tons, shows an increase of 8,262 tons.

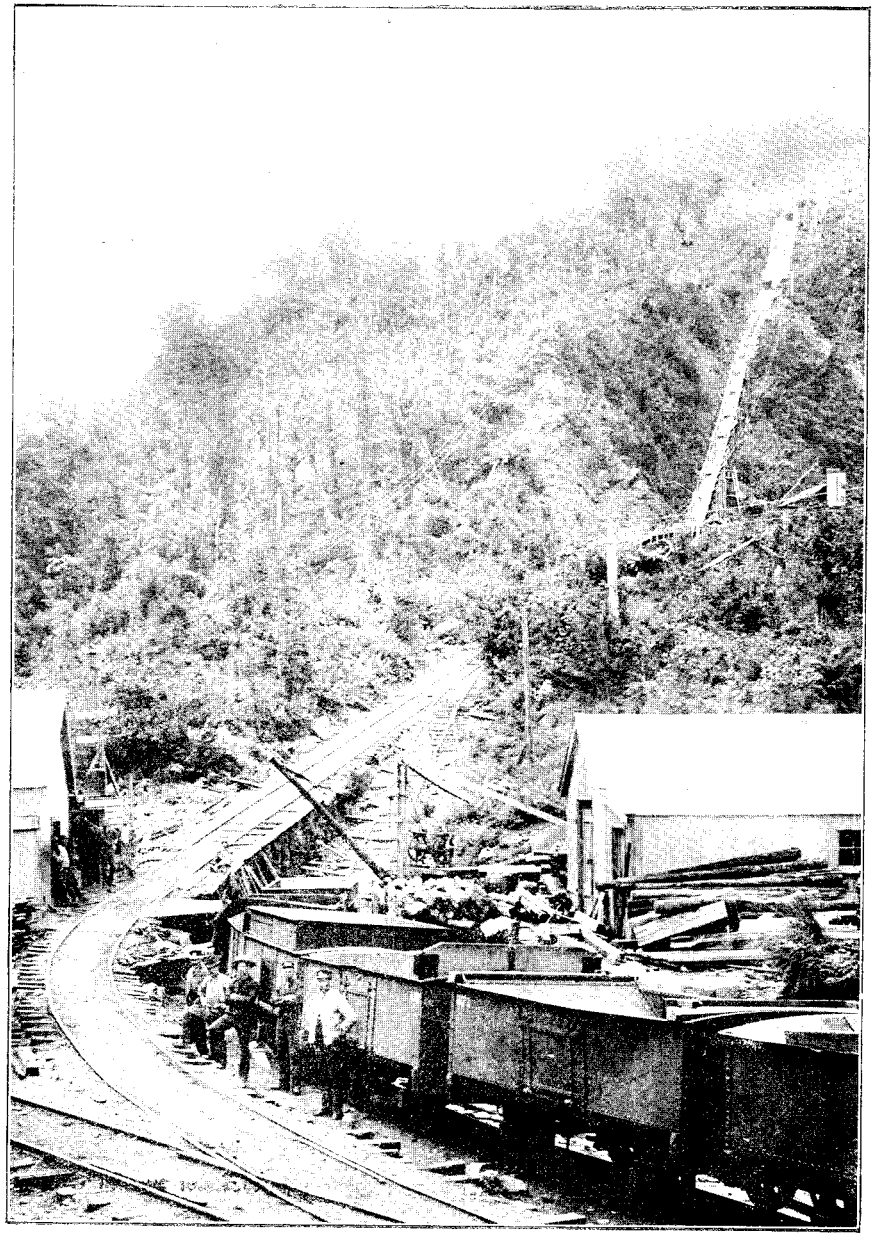
Coalbrookdale Mine (3/11/1903): Reference was made in my report of last year to the manner in which the coal-seam in the West Cascade of working was diminishing in thickness. This thinning continues to extend eastward, but new developments have shown that the upper coal-seam overlaps a considerable area of the disturbed country, and the discovery of a valuable area that will add materially to the life of the mine is fully anticipated. Coal-cutting machinery is now withdrawn from this district, and hand-labour substituted. In winning the Cascade area dipwards towards the outcrop, the coal maintains excellent quality and hardness, with an average thickness of 12 ft. to 18 ft. To meet with the increasing requirements for ventilation, a new return airway, traversing a considerable area of troubled ground, has been driven from the extreme rise direct to the fan, thus the air-travel is shortened materially, and the air-volume increased by 20,000 cubic feet per minute, making a total volume of 50,000 cubic feet.

East Cascade: The extension of this district has always been much hampered by a continued series of minor fault-lines, associated with a troubled and friable roof. Fortunately this difficulty is practically overcome, and with the advanced development now in progress, together with an improved quality of coal, the future prospects of the field are more promising. The increasing demands on the colliery having received full consideration, it was finally decided to extend the main haulage-road dipward to Cascade Creek outcrop. As this work entailed considerable engineering ability in order to accomplish it without affecting the regular haulage, driving was determined and commenced from a given point to the outcrop to finally connect with the present terminal. This drive, now nearing completion, has intersected an important section of valuable coal, and the 90 ft. fault-line met with in the original drainage-adit is proved to split and diminish in magnitude as its course extends north-east.

Munsie's section: So far as the dip heading has developed north-east, a considerable acreage has been opened out, giving employment to a fair number of hand-pick men. Hauling and pumping are effected by compressed-air power. A ventilating-shaft 8 ft. in diameter and 125 ft. deep is newly sunk in a suitable position, and at the time of writing the fan is in full operation.

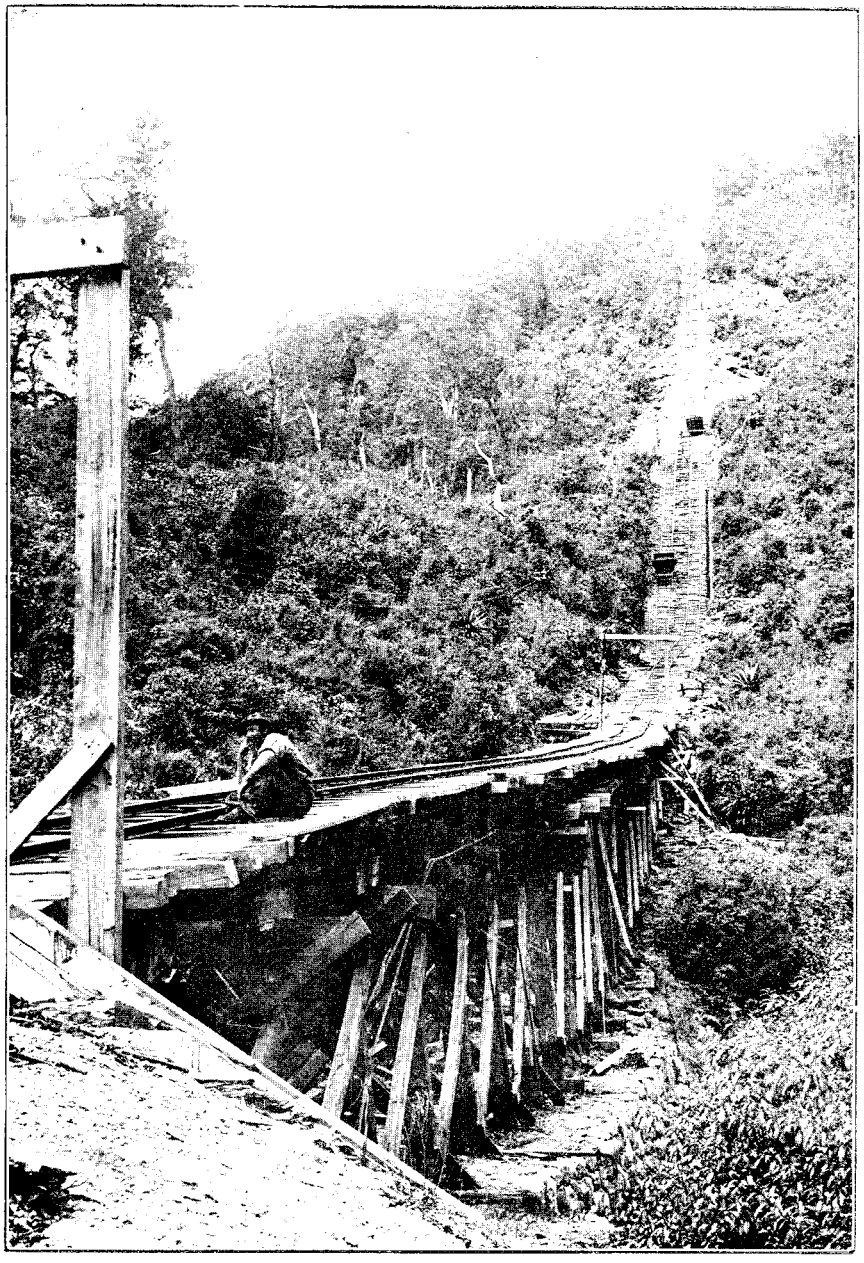
Ironbridge Mine (4/11/1093): The Dundee dip section of solid working continues promising as operations extend towards Mount William. Faulting was a source of trouble for some time past, but the natural structure of the coal-seam and uniformity of quality has become more decided as operations advanced. This district of working maintains a creditable standard of efficiency in the Denniston field.

Big Pillar district: Extraction of these high pillars has, in a general way, given very gratifying results, both from the percentage of coal won and freedom from serious accidents, conditions which are alike creditable to the officers and to the approved workmen employed, the



THE LOWER INCLINE, DENNISTON
(WESTPORT COAL CO., LTD.)

Face p. 8



THE UPPER INCLINE, DENNISTON.
(WESTPORT COAL CO., LTD.)

former for the care exercised by them and the latter for their judicious display of practical knowledge. The "Scheile" exhaust-fan installed on the new ventilating-shaft has fully maintained ventilating requirements of the Dundee solid working. This shaft, from its central position, has also been utilised to connect the compressed-air pipe-main directly with the active working length. The friction of pipe-main is thus greatly lessened.

Kiwi district is being further developed by hand-labour. Ventilation and other working conditions are good.

The deviation to junction the Ironbridge haulage-road with the Coalbrookdale main line has a completed length of 24 chains. The principal works included comprise 5 chains of rock tunnelling and two steel-girder bridges which span the southern branch of the Waimangaroa River. This altered route maintains satisfactory results, while the underground haulage engine and boiler, which were formerly a source of danger from spontaneous heating, are now in absolute disuse.

Continuation of the haulage dipwards into the active centre of Dundee working was further extended 21 chains during the Christmas holidays. These alterations and extensions establish a permanent and economic haulage system, calculated to thoroughly exhaust this section of the property and cut off all subsidiary machinery formerly in use.

New Deviation of Main Haulage-line: The tunnelled section of the present main haulage-line having become partly endangered by slide movement between Burnett's face and the Brake-head, it was decided to build a more reliable outlet on the surface to enable the output of the mines to be permanently maintained without risk. These works, now actively pushed, will, when completed, comprise a total length of 120 chains. This includes 6 chains of tunnelling 10 ft. by 6 ft. in the clear, rising on a gradient of 1 in 5 from near the loading-terminal. Leading outward from the tunnel (now holed) a series of heavy cuttings, met with in crossing the plateau, are nearing completion, while the line grading down the cliff to meet with the level of the Brake-head terminal is passed over iron trestle and girder bridging 340 ft. in length on a falling gradient of 1 in 5. This work is also practically finished, and it is expected that the whole scheme will be operative some time during 1904.

Shots Fired: Mr. Dixon kindly furnishes the following: According to the official record kept at the collieries there were 54,895 shots fired during 1903. This total, calculated on the gross tonnage, gives an average yield of 4.77 tons per shot, and proportioned to the working-days is an average of 206.4 shots per day. Miss-shots were in the ratio of 1 in every 359, and comparing the percentage of miss-shots against the large number of separate shots fired the results may be taken as satisfactory evidence of the care exercised in the performance of the work. In addition to the foregoing there were used for other work, principally the construction of the new surface tramline, 9,600 lb. of gelignite and 180 boxes of detonators.

Prosecutions: There were nine prosecutions at Denniston J.P. Court for breaches of "The Coal-mines, Act, 1891." (1.) Attempting to withdraw a charge where nitro-compounds were used: fined 10s. and costs. (2.) Trespassing on the rope-road while the rope was in motion: fined 10s. and costs. (3.) Two miners charged with holing without sprags: fined 5s. each and costs. (4.) Five workmen charged with trespassing on rope-road when rope was in motion: three dismissed with a caution, and two fined 6s. each and costs.

Coal Creek Coal-mine, Buller Road (Geo. Walker, lessee).—(31/10/1903): Regarding the working of this mine there is little change of importance to note, other than that the brothers Fleming, who work this property on behalf of the lessee, make special effort to keep roadways and working-faces in an efficient state of safety. They produce a superior coal suitable for steaming and household purposes. In the early development of the new mine the adit was intersected by a peculiarly formed fault-line, which shortly afterwards changed its course in favour of the level without effecting any particular change in the working.

Whitecliffs Coal-mine, Buller Road (Job Lines, owner).—(31/10/1903): This property is worked by one man, chiefly to supply steaming-coal for the Old Diggings dredge. The quality is softer than that of Coal Creek coal, and it is not so much sought after. The working is securely timbered.

Flaxbush Coal-mine.—(9/6/1903): Owing to the soft character of this thin and highly inclined coal-seam it is suited only for steaming, and is chiefly used on the Buller dredges. The in-bye working having become nearly exhausted, a new face was recently opened from the adit, and will meet all requirements and provide a better trucking-road. From the special care taken to timber the ground efficiently the miners are able to exhaust the coal-seam without loss. Air is kept continuously on the face from the open outcrop.

Langford.—Nothing further has been done at this mine.

Bourke's Creek Coal-mine, Reefton (owners, Cairns and McLever).—(5/10/1903: Driving east and west from the bottom of the dip inclined rock tunnel comprises the chief centre of operations. The old creek-bed having unfortunately intercepted further extension westward, it was decided to pick out a few pillars near the old mine-mouth which were formerly abandoned. However, conditions eastward are more favourable, for the thinning and troubled coal met with in the upper level does not appear to affect the bottom, as the seam is opening out well with usual thickness and quality.

Archer's Freehold, Capleston (F. W. Archer, owner).—(30/9/1903): The output from this mine has considerably increased, owing chiefly to the extra demand for steaming-coal made by the recently built dredges on the Boatman's Creek. The adit line having recently been cut off by a large fault-line near the boundary of the holding, operations are confined to the removal of pillars from the fault direct to the outcrop. Air is well maintained. The Crown-land leasehold lately acquired by Archer is not now working.

Coghlan's Freehold, Capleston (J. Coghlan, owner).—(30/9/1903): This adit level is also cut off by a strongly defined fault-line. The coal won was taken from rising on the outcrop.

Murray Creek Mine, Reefton (J. Billett, owner).—(5/10/1903): This openface property continues to supply a superior steaming-coal to the Consolidated Goldfields' Murray Creek battery. The leasehold was further extended during the year, and work is now proceeding to open out the coal-seam. Scarcity of water for the stripping-off of the surface cover has been much felt during the very dry season.

Phœnix Coal-mine, Reefton (John Knight, owner).– (5/10/1903): The output has been chiefly supplied from the low-level working adjoining the rise. In view of increased demand for household fuel during the winter months, a new adit is being driven which will facilitate mining and trucking very materially, and also win the coal east from a main faulting. Ventilation is well maintained from the rise level.

Lockington's Leasehold, Bourke's Creek, Reefton.—(5/10/1903): The coal-seam won by the rock adit at 400 ft. showed 7 ft. of fair average coal in the face, but the full thickness was not then fully determined. It is anticipated, however, that coal will be supplied during the winter months. Air is maintained by water-blast.

Blackadder's Leasehold, Reefton Town Belt.—(6/10/1903): The high-level adit originally driven to win the coal-seam, being simply of a prospecting character, was subsequently abandoned and replaced by a larger and more securely timbered low level. Unfortunately, quality has not favoured anticipations, as the large bars of pyritical stone, by which the coal-seam is affected, tend largely to increase cost of production and to reduce the output of round coal.

Lankey's Creek Coal-mine, Reefton.—(2/10/1903): The owners gave notice that operations were suspended during the summer months.

The New Inkerman Coal-mine, Reefton (owners, New Inkerman Mines Company, Limited).—(2/10/1903): This mine is very successfully worked on the stoping system to supply steaming-coal for driving the stamp-mill and air-compressing installations on the company's property. Ventilation is fully maintained through the open outcrops, and through the care taken by the miners in securely timbering the ground the seam is exhausted without loss.

Devil's Creek Coal-mine, Reefton.—The adit has collapsed since the lease was surrendered.

Progress New Coal-mine, Reefton.—(3/10/1903): Steaming-coal for the company's works is supplied from a new mine recently opened on the eastern boundary. The seam is opening out well, and furnishes an average fuel. Working-conditions are good.

Loughnan's Coal-mine, Reefton.—(3/10/1903): This leasehold is practically at a standstill. A new tramway has been laid, but nothing further has been done.

Blackball Colliery (owners, Blackball Coal Company; James Leitch, mining manager).—(29/9/1903): Operations at this colliery have been continuous. The gross tonnage for the year was 88,949 tons, which shows a decrease of 10,648 tons as compared with the preceding year. Deficiency of output is chiefly attributable to restricted demands on the colliery, particularly during the second half-yearly period. Efficiency in working-conditions has been well maintained, considering the complicated difficulties experienced in the removal of pillars. The unfavourable conditions which follow a soft roof and floor necessitate the exclusive use of set timbering, while the necessary factors accessory to spontaneous ignition are constant. Successive walling off of the exhausted ground has, however, proved eminently effective in suppressing the resultant gases exuding from the smouldering fires located in the abandoned and exhausted workings. The excessive inflow of surface water through the open fissures occasioned by broken overlying strata has proved a source of hindrance to haulage traffic during very wet seasons. According to calculations made on the further productive capacity of the rise pillar working, the output is not anticipated to extend beyond the current year, but in this event trade requirements will be fully maintained from the new dip development. The No. 2 rock tunnel, 10 ft. by 7 ft. in the clear, dipping at an angle of 10 degrees, tapped the bottom coal-seam at a driven distance of 568 ft. 6 in. from day. The formations pierced comprised a continued series of hard sandstone and grits, heavily watered from open fissures, which during driving operations necessitated the continuous use of steam-driven pumps. East and west heading levels, branching from the bottom of the stone drift, are actively pushed. Electric-pumping installation is in active progress to meet existing requirements, pending the completion of the drainage-adit which at time of writing is driving from Ford's Creek. The calculated length of this adit will be 1,260 ft. The Robey engine newly installed for dip haulage is now raising coal on a single line from the new works. It is expected that a Capel fan of large capacity, under order from Britain, will shortly be erected to replace the furnace now in use. Haulage and electric plants are in good order and condition. Reports and other provisions of the Act are strictly observed. There were no accidents of a serious nature. Six inspections of this mine were made during the year.

Brunner Mines (R. Allison, mining manager).—(27/9/1903): Regarding the output of coal and fireclay from the rapidly exhausting pillar areas, one is brought to wonder where in this colliery is the coal won that finds so ready a market. The output for the year, 92,280 tons, shows a decrease of 24,434 tons. In framing a report on the rapidly exhausting and varied working of this old mine, it would appear that the necessary material to build such a structure must belong to a past period, as the operative progressive works to maintain output are simply a repetition of opening out and retimbering old headings, which in some instances require great care on account of broken roofs, the result of many years' standing. However, the extended section of dip working recently unwatered has furnished a substantial factor to the life of the mine. With the exceptional care taken by officers and workmen alike to make the most of circumstances, every bit of coal procurable is filled and sent out to bank. Accumulations of silt washed down from higher levels by heavy inflows of surface water during wet seasons have caused considerable work to keep free drainage on the low level. Precaution is taken to filter the loaded water over small temporary dams, from which the slack can be readily filled.

The Ladysmith and Coolgardie districts, being now connected by pony road, are working conjointly, while the coal is run down the Ladysmith self-acting incline to day. Ventilation is induced by fan, and timber is freely used. Reports and other provisions of the law are kept up to date. No serious accident has been reported.

Tyneside Proprietary Company.—(25/9/1903): This property changed ownership as a going concern in the beginning of September last—Robert Allison, mining manager. Operations have been continuous, the output being 17,212 tons. The dip heading driven in a southerly course direct from the winding-shaft has been further extended 5 chains, and directly connected at the face by a parallel return heading, through which free ventilation is efficiently provided. The coal-seam thus developed shows a fair average quality. When working eastward from the dip heading a heavy feeder of water was quite unexpectedly cut in the face, the result being that the pumping installation was taxed to its full capacity. This difficulty, however, was satisfactorily overcome by the construction of a strong frame dam. At the same time, with the additional boiler-power installed, working-conditions assumed a more favourable aspect. Output is chiefly maintained from the west working, which shows more favourable promise in thickness and quality as developments extend. Pumping is the chief item of expenditure. Generally, the mine is well ventilated, and with the natural facilities afforded by the exceptionally strong grit roof overlying the coal-seam it may be fairly accepted that working-conditions are in favour of the miner. Reports are kept to date. Gas was reported once during the year. The workmen travel by adit to the working-face.

Point Elizabeth Colliery (New Zealand State Coal-mines.—A. B. Lindop, mining manager).—(30/12/1903): Respecting the development of this property, progress has been satisfactory. To open out the southern area of the coalfield more expeditiously, driving was continued by three shifts on Nos. 1, 2, and 3 tunnels until the coal-seam was won in each of the drives. In the No. 1 adit the main coal-seam, 16 ft. in thickness, was won at 10.5 chains from day, and has been driven eastward on the level course of the field a distance of 4 chains, and connected with the uprise drift leading to the fan. During development a seam 6 ft. in thickness was recently discovered underlying and separated from the main seam by 12 ft. of strata. So far it has not been determined as to whether it is an independent seam or simply associated with the main one. In the No. 2 adit the coal-seam, 12 ft. in thickness, won at a driven distance of 12.5 chains, was further driven 4 chains on the level course, and rise headings set off at regular distances apart. In No. 3 adit the coal-seam was won at 13 chains, but to simplify and effect a natural ventilating-circuit between the districts a rock crosscut was driven 8 chains to connect with the west level off No. 2 adit. These united drivings have proved a large area of good coal risewards, the outcrop of the Exhibition or main seam being 34 chains to the north. In the No. 4 adit, located on the north bank of the Seven-mile Creek, the 6 ft. seam was tapped at 2.5 chains, and driven on the level course 4 chains. Connection by return back heading is also provided for second outlet and ventilating purposes. Systematic prospecting is now being made to locate the main seam in the Seven-mile Creek. On completion of the railway works, which is expected about the end of March, coal will be early placed on the market from Nos. 1, 2, and 3 adits, the forward state of these mines being now capable of maintaining a fair output. Haulage will be effected by a steam-driven endless-rope system, by which the coal will be conveyed from the terminal of the main tunnels direct to the loading and screening plant, the distance from No. 1 mine being 60 chains on a gravity gradient of 60 ft. Ventilation will be induced by two fans of the Hayes type, 9 ft. 6 in. in diameter, one of which is installed on the mouth of the uprise drift at No. 1, and the other on the mouth of the loop-line drive at No. 3. Guided by the standard of efficiency of this type of fan, ventilation is fully assured. The erection of storage-bins and screening plant will be temporary, until replaced by a modern shaking-screen and belt-picking installation. A well-equipped saw-milling plant has been erected to supply timber for the varied uses of the colliery. Workshops, haulage, and other installations are substantially and carefully built, and are kept in good order and condition.

Burning Coal-seam at Boatman's.—Respecting the progress made to extinguish the burning coal-seam at Boatman's, there is little change of importance to note, owing chiefly to the absolute dearth of water occasioned by the excessively dry season lately experienced on the West Coast.

Accidents and Fatalities.

Coalbrookdale Mine.—(26/1/1903): Robert Smith, pony-driver, was killed by a full race crushing his body against a stop-block after the tail-chain was unhooked. Denniston Surface Deviation Works: J. Allan, contractor, had his little finger blown off while preparing a charge of dynamite. (26/6/1903): E. O. Loughlin, brusher, had small bone of his leg broken by falling from a ladder while setting timber. (24/8/1903): E. McComb was fatally injured while thawing dynamite.

Ironbridge Mine.—(21/9/1903): J. Masterton's (trucker) leg was broken by an empty truck lipping over at jig-head.

Millerton Colliery.—(26/3/1903): John Birch, miner, had his hip dislocated and two ribs broken by a prop falling in the face. (6/3/1903): W. Danks, miner, sustained spinal injuries by a piece of coal striking him while in a stooping position. (15/7/1903): Frank Bradley, lad, had his right hand bruised while spragging trucks.

Seddonville Colliery.—(7/7/1903): John Edgar, labourer, was accidentally killed by a fall from a beam when the storage-bins were under construction.

Puponga Colliery.—(31/7/1903): Lewis Harford bruised his hand while braking loaded trucks. (14/8/1903): Peter Conway sustained an injury to the knee by a fall of stone in the face.

There were two fatal accidents at Denniston, one of which occurred on the surface works, and cannot be regarded as coming under "The Coal-mines Act, 1891." No accident of a serious nature is reported from Brunner, Tyneside, or Blackball Collieries.

GENERAL REMARKS.

The increase of output for the year was 27,216 tons, against 84,281 tons for the year 1902; but the increase for the first half-year exceeded the total increase for the twelve months by 13,699 tons. This shrinkage in the second half-year can be attributable only to the restricted trade demand on the collieries during that period.

FOREIGN TRADE.

Westport Coal Company.—The total tonnage shipped directly from the Port of Westport to ports outside the colony was 53,816 tons. This does not include the coal taken from Wellington to complete the loading of the larger vessels. The increase on the preceding year is 1,076 tons.

I have, &c.,

R. TENNENT,

The Under-Secretary, Mines Department, Wellington. Inspector of Mines.

No. 4.

Mr. E. R. GREEN, Inspector of Mines, Dunedin, to the UNDER-SECRETARY, Mines Department, Wellington.

Office of Inspector of Mines (Southern District), Dunedin,

SIR,— 26th March, 1904.

I have the honour to submit the following report on the coal-mines in the Southern District for the year ending the 31st December, 1903, in fulfilment of the requirements of section 67 of "The Coal-mines Act, 1891":—

CANTERBURY.

Springfield Coal and Pottery Works, Springfield (J. Taylor, permit).—(25/5/1903): Main level now in good order. Working-places standing well, and carefully timbered as required. Ventilation fair throughout the workings. Only a small quantity of coal now sold, bulk of output being used on the premises in the manufacture of pottery and sanitary stoneware from fireclay-seam underlying coal-seam. About 616 tons of fireclay had been produced and worked up during the year.

Victoria Mine, Springfield (Luke Greening, permit).—(25/5/1903): Workings in good order. The mine continues to provide coal for local sales, and fireclay for manufacturing purposes in Christchurch.

P. Campbell and Son, Springfield.—(25/5/1903): Mine now abandoned, coal-seams having proved too thin to be remunerative.

Homebush Colliery, Glentunnel (J. C. Campbell, manager).—(26/5/1903): Pillars to rise continue to be successfully withdrawn. Dip being extended and bords opened off. Coal in dip section very hard and strong, but roof weak on account of partings in the clays overlying coal-seam. Air good throughout the workings. (17/12/1903): Pillars continue to be safely drawn in the old rise and westerly workings. Dip extension now 8 chains to face, bords being broken away and left standing for future requirements. The coal-seam to dip continues good in quality; if anything being an improvement. A cross-measure prospecting-drive from the level is being driven to test the measures overlying main seam.

Brockley Colliery, Glenroy (W. Woods).—(17/12/1903): Mine now closed. The difficulties of working the narrow vertical seam having clay walls, combined with the inaccessibility of the mine, had resulted in financial loss to the lessees.

St. Helen's Colliery, Whitecliffs (H. Levick, permit).—(17/12/1903): Pillaring in 8 ft. seam still proceeding safely; timber freely used. Air good, new air-shaft 90 ft. in depth having been sunk near the face of cross-measure drive. A downthrow fault of 10 ft. has been met in south-going level, main seam.

Gerard's Coal-mine, Snowdon.—(18/12/1903): Level drive in new seam (6 ft.) in about 200 ft. Coal superior in quality to that formerly worked on the terrace. Output required for station purposes only.

Woolshed Colliery, Mount Somers (John Harris, permit).—(22/5/1903): This company recently acquired the lease of the old mine held by the Mount Somers Coal Company. The pillars and head coal towards outcrop having been extensively robbed, attention will necessarily require to be paid to winning coal from the dip.

Mount Somers Coal Company, Mount Somers (J. Gibson, general manager; Andrew Thomson, mine-manager).—(22/5/1903): Old mine sold to Woolshed Coal Company, this company retaining new mine recently opened on the hill. Mine-workings in good order. Ventilation good. New shaft sunk provides return airway and a third outlet.

Waihao Coal-mine, Waihao Forks (A. A. Adamson).—(20/10/1903): Coal-seam 14 ft. in thickness being worked out in small section, and pillars robbed to the last degree with safety. Timber being a scarce commodity in the locality is carefully drawn and used over again.

Waihao Forks Coal-mine, Waihao Forks (D. McPherson).—(20/10/1903): The old pit is full of water. Two men now reopening Morgan's shale-pit—lignite-seam about 6 ft. in thickness having about 1 ft. of shale on top; stripping, 6 ft. of river-gravels.

Elephant Hill Coal-mine, Waihao Downs (A. Adamson, lessee).—(20/10/1903): Timber somewhat inadequate. An accident occurred on the 13th October, 1903, to a man named George Boyce, who sustained injury to scalp by fall of coal at face. Boyce was off work in consequence for twenty-six days

NORTH OTAGO.

Rocky Point Mine, Hakataramea (New Zealand and Australian Land Company, owners).—(12/9/1903): This mine has not been worked during the past season, station-coal having been brought from the Dalgety Mine.

Dalgety Mine, Hakataramea.—(14/9/1903): Seam outcropping on the western bank of the Hakataramea River. Several drives put in for short distances have apparently been robbed and fallen in. A new drive is to be put in behind the old workings and kept within safe working-limits so as not to become lost as former drives have been.

Shank's Pit, Wharekuri (A. Shanks).—(18/5/1903): Work recently confined to dropping head-coal in the upper north level; south upper level, which had been stopped off on account of heating, is still sweating somewhat. Air in north-level face very fair, being conducted to face by brattice. (22/9/1903): No. 2 drive on hill nearly finished, now brushing the road end. Driving from No. 1 to win a piece of solid coal left in between Sutherland's level and Shank's north level. Good air travelling. Heavy leakage of damp from stoppings and joints in coal. Pure air conducted to working-face by brattice.

Awakino Coal-mine, Kurow (George Orr, owner; J. Sutherland, manager).—(18/5/1903): Coal-seam vertical, with clay band in centre, as at Wharekuri. Dip drive in the terrace off the creek-bed sunk 20 ft. on strike of seam. Water percolating freely at the roof and floor.

Otiake Coal-pit, Otiake (William Cunningham, owner).—(18/5/1903): Level at 100 ft. on strike of seam cut into Porter's old workings, which were found all standing. Porter's old shaft, having been retimbered, is now used for upcast air-shaft. Shaft well fenced at surface.

St. Andrew's Colliery, Papakaio (T. Nimmo, permit).—(19/5/1903): Successful pillar-drawing continues. Mr. Nimmo estimates that fully 75 per cent. of the coal-seam is being won. Rows of ash stoppings put in at regular intervals imprison black damp, of which large quantities are generated, thereby keeping down fires which would otherwise inevitably arise. Timber used close up to the men. Supplies of timber and ashes kept on hand ready for immediate use. (25/9/1903): Pillars continue to be well drawn with safety. Air ample, now being conducted to working-face by brattice. Plan and report books to date. Rules posted.

Prince Alfred Colliery, Papakaio (G. H. Willetts, permit).—(25/9/1903): Old mine finished. In new south-going level coal improved in quality, and thickness also increased to 6 ft. at level-face. Workings in good order generally. Ample supply of timber kept on premises. Rules posted.

Allandale Colliery, Shag Point (C. H. Westfield, mine-manager).—(6/5/1903): Breast of work to north, 6 chains in width, being worked longwall, coal having thinned to 3 ft. The 2 ft. band of stone on top of seam provides convenient stowing. Roof bad, and falls heavily where not supported. Traversed main roadways, working-places, and return airways to old mine-mouth and found them in good working-order. (25/8/1903): The bulk of output continues to be obtained from No. 1 seam, north of shaft. Cross-measures stone drive from main haulage-level to No. 1 seam at 110 yards struck the seam, proving an area 65 yards to 75 yards in width by 13 chains in length; average thickness of seam, 6 ft. All timbering in this seam to roof and sides excellently well done. Longwall section: Coal continues thin; good roadways are being maintained through the pack. Two dip drives from north level are proving the seam of good quality and thickness. Air excellent throughout No. 1 seam section. (9/9/1903): Mine in good working-order. Repairs to and straightening of main haulage-road being carried out. A "Hayes" ventilating-fan of the Colonial type, 9 ft. in diameter, designed to meet the requirements of a thin-seam colliery, has been erected. This fan may be run up to 250 revolutions per minute if necessary, but the present requirements are fully met at about one-third of the speed named. (11/12/1903): Volume of air at outlet 12,218 cubic feet per minute; fan making ninety-five revolutions. W.G. ½ in. Roadways and working-places in good order. Ventilation excellent.

Shag Point Colliery, Shag Point (R. Glendenning, lessee; T. Shore, manager).—(6/5/1903): New dip: Levels driven 1 chain north and south, seam being found split by heavy dirt-band. Not working. (25/8/1903): Thin outcrop seams south of main workings being opened up on the sea-beach. The area is considerably disturbed, and apparently in close proximity to the known fault-line on East Coast, near the mouth of Shag River.

SOUTH OTAGO.

Fernhill Coal Company, Abbotsford (James Gray, manager).—(30/12/1903): Mine in good working-order, levels being started to win area of coal behind the old workings.

Freeman's Coal Company, Abbotsford (R. Hill, mine-manager; R. Green, general manager).—(30/4/1903): No. 1 mine: The last of the pillars having been successfully drawn, the rails and plant have been lifted and the old mine is now abandoned. Two shafts, formerly used for ventilating, require to be properly secured. New mine now in 20 chains to level-face. All in coal. Dip and rise crosscuts being driven; seam here troubled with thread faults, roof consequently bad in places. Ventilation natural; air dull in several of the working-faces, some motive power being required. (11/11/1903): No. 1 mine: Proudfoot's and Freeman's shafts, formerly used for ventilating and pumping purposes, have been filled up to the surface for security. New mine: Brick ventilating-furnace has been built at bottom of upcast air-shaft;

volume of air at return 10,500 cubic feet per minute, more than sufficient for requirements. Air, however, inadequately conducted and imperfectly distributed, black damp being found on floor in pillar works adjoining old workings, and in two other advancing places the faces were an unreasonable distance ahead of the nearest stenton. I subsequently wrote the manager under date 16th November, 1903, drawing his attention to these defects, and on revisiting the mine on the 30th December, 1903, I found that they had been remedied, ventilation attended to, and stentons kept well up.

Walton Park Colliery, Walton Park.—(23/11/1903): Mines closed down; nothing doing here now beyond a few trucks of building-sand per week being filled away. An attendant regularly visits the surface plumps and openings for the purpose of trimming down the edges of any recent falls which may have taken place. Underground fires have reached the outcrop, but no harm is being done thereby, all available marketable coal having been extracted. Notice-boards are posted warning persons against trespassing on the property. The local people are well aware of the dangerous nature of the field, and consequently give it a wide berth. Danger lies in the treacherous nature of the outcrops, where masses of smouldering fire are more or less invisible, and depressions may be filled with CO_2 and other gases, a virulent composition generated by fires in the underground workings having been experienced.

Jubilee Colliery, Saddle Hill (Peter Campbell, manager).—(8/5/1903): Present workings to dip from a new opening on the north side of the field. Being in coal with coal roof, places all standing well, very little timber being required. Air conducted by brattice to working-faces. A 2 in. pipe siphon having 14 ft. lift keeps mine drained. (23/11/1903): Ventilation very fair; working-places and roadways in good order, except that accumulations of dross on roadsides increasingly frequent. The manager holds that there has been no heating and consequently there is no cause for alarm. In this connection past experience generally has been that any brown-coal dross stacked in heaps is liable to spontaneous ignition, and if there has been delay in such taking place it has only been because conditions were not favourable to combustion. The subject is one not very well understood, and prevention is at all times better than cure. It only remains to be said that numerous and extensive underground fires due to spontaneous ignition have occurred in several other mines working similar coal in this district.

Saddle Hill No. 1 Colliery (J. Barber, manager).—(2/5/1903): Air dull at face of low level, stentons not having been kept up close enough. Air in mine adequate, a good current circulating. New air-shaft and second outlet duly fenced and provided with ladders. Mine generally in good order. (20/11/1903—J. Kenyon, manager): Mine in good order except that the ventilation was found deficient at several working-faces. A more centrally situated upcast air-shaft is now required, otherwise it may be found necessary to substitute artificial for the natural ventilation now in vogue.

Saddle Hill No. 2 Colliery, Saddle Hill (James Christie, manager).—(8/5/1903): Main south level face now at 20 chains from mine-mouth all in coal, back level being driven on the eastern boundary. New upcast air-shaft provides good ventilation for the mine. Air good. (20/11/1903): As in No. 1 mine, on this date I had to complain to the manager in regard to deficient ventilation at several working-faces. Mr. Christie promised to remedy matters at an early date.

Kirkland's Mining Lease (Alexander Love, manager).—(8/5/1903): Property lying to eastward of Jubilee Colliery. Shaft sunk 80 ft. when water became troublesome; bore sunk 216 ft. to bottom of main seam, which is said to be 12 ft. in thickness. Work standing meantime pending financial arrangements being made.

Burnweil Colliery, Saddle Hill (A. Harris).—(7/5/1903): Mine in good order; air excellent, being well conducted to faces by brattice. A "squeeze" on the second outlet and return airway renders attention to a few sets of timber necessary.

Glenochiel Colliery, Saddle Hill (D. Bryce, permit).—(7/5/1903): Working on pillars and robbing balance of coal left in old mine. Falls to surface provide free ventilation, air consequently excellent.

Mosgiel Colliery, Mosgiel (Sneddon Bros.; J. Sneddon, manager).—(7/5/1903): Old mine abandoned. New drive on western face of Saddle Hill in coal from outcrop. Dip flattened to a roll where coal crushed and bottom soft. Tram-line: 60 chains laid to roadside at Riccarton, 7-horse-power portable engine for haulage. A Deane steam-pump easily overtakes water-growth in mine.

Lauriston Colliery, Brighton Road (J. R. Walker, manager).—(12/1/1903): The tender nature of the roof continues up to the fault. Sufficiency of timber in use with stone buildings to roof at intervals. Air good.

McColl's Pit, Brighton Road (D. L. McColl, owner).—(12/1/1903): The level has tapped and drained the old workings in upper seam, there being 6 ft. of clay between the seams. Second outlet not yet provided. Owner proposes driving a low-level tunnel for drainage and ventilation.

Ferndale (Fairbairn's) Pit, Taieri Beach (Robert Fairbairn, owner).—(17/1/1903): Two parallel drives in about 1½ chains, stentons at intervals. Roof good where coal top left on to prevent overlying gravels running.

Bruce Coal-mine, Milton (A. Young).—(10/10/1903): The mine had been standing a few days when Mr. Young received word that fire had broken out. I visited the mine this day, and found the coal outcrop burning in several places, but the fire was being rapidly smothered by the overlying clay and gravel falling. Owing to the continued dry weather there is no surface water available for extinguishing the fire, which, however, does not appear to be of a serious nature. Mr. Young is of opinion that the mine had been set on fire accidentally by some visitor leaving a candle alight in the mine. At a later visit no smoke was visible, and the fire was evidently overcome, or at least retarded, but the mine may not be opened up for a time, or until a plentiful

supply of water is available. From the records it appears that this area had been on fire ten or eleven years ago.

Fortification Railway and Coal Company, Akatore, Milton (M. Straw, manager).—(1/5/1903): Roadways low; bottom heaving where wet, floor being soft fireclay. A number of crown bars on main road require renewal. Return airway blocked by a fall; air passing, but could not get through ourselves. New roadway, to be finished in three shifts, will restore second outlet. Pillars drawn up to thin coal. North side: A nest of pyrites which had been thrown back among refuse was observed to be heating, when it was filled away to outside. (10/10/1903): Creep now settled, roof and floor having met. Present work being prosecuted in the direction of old mine-workings with intention of recovering pillars left in there. Mine in good order. Air excellent, and roadways well kept. A bore at 240 ft. became lost owing to collapse in a piece of bad ground where hole not tubed. New bore now being sunk is at 120 ft. in an exceedingly hard band of ironstone.

Adam's Flat Mine, Adam's Flat (J. Reid).—Opencast pit supplying neighbouring farmers with fuel for thresning purposes and winter use.

Paskell's Pit, Adam's Flat (J. Paskell).—Stripping now too heavy to pay for opencast working, and seam too thin to be remunerative for underground mining.

Wallsend Colliery, Lovell's Flat (R. Hewitson).—Opencast pit, formerly of large proportions, but only a moderate local trade doing latterly.

Lovell's Flat Colliery, Lovell's Flat (J. Carruthers, manager; R. Glendenning, owner).—(17/3/1903): Pit-head and bank arrangements, which were destroyed by fire, now completely restored, and pit in full working-order again. Air good, and all places well timbered. Coal thinning in dip section, as in north and south sides of work. (23/4/1903): Safety catches fitted to cages, and tested with satisfactory results. Prospecting-bore being sunk eastward of shaft down 100 ft. in clays and gravels. (29/8/1903): Ventilation good, and timber well set close up to faces. Fire stoppings to rise carefully attended to prevent leakage of "damp." Plan and report-books to date; rules posted.

Tuakitoto Colliery, Lovell's Flat (A. Dunlop).—The mine continues to be worked for private use only.

Benhar Coal-mine, Stirling (James McLeod, permit).—The dip is being extended in the middle or 6 ft. seam; bords broken away north and south. Working-places and drawing-roads in good order. Ventilation fair. A new Tangye pump is being placed in the old upper-seam workings to prevent accumulation of water. The larger proportion of coal-output is consumed on the premises in the manufacture of sanitary ware and fireclay goods, for which purpose about 2,000 tons of fireclay, locally obtained, was used during the year.

Mount Wallace Coal-mine, Stirling (James Walls).—Dip drive now 200 ft. to the face. The mine had been flooded during recent wet weather, and operations became retarded in consequence.

Taratu Coal Company, Kaitangata (John Irvine, manager).—(24/4/1903): The colliery is now in good working-order, the natural advantages being such that no mining difficulties have been met with. Drainage and haulage free. Coal-seam thick and strong. Blasting with powder is allowed during working-time, therefore atmosphere occasionally heavily charged with powder-smoke. The manager promised to remedy this. With a view to testing the coal-measures, boring operations had been conducted in the gully east of mine-mouth; at 130 ft. a coal-seam was struck, said to be 27 ft. in thickness, to which a shaft will be sunk at an early date.

Kaitangata Colliery, Kaitangata (Thomas Barclay, mine-manager).—(10/2/1903): North side workings blocked off; McDougall's section nearly finished. Return airways to furnace in good order. The new seam found in stone-drive extension being opened up in readiness for next winter's output. (21/4/1903—R. S. Jordan, mine-manager): New sump in coal at bottom of incline holds four days' water-growth. Timbering being raised and renewed on main stone drive. Brick wall stopping cold, having recently been attended to, and packed with dead ashes. The new seam heading at No. 4 fault ran directly into a 19 ft. seam of coal on the seaward side of the fault. A little gas making in south-going level and in top bord off No. 2 heading, otherwise advancing-places clearer than might have been expected in solid coal. McDougall's and north side sections finished, and permanent outer stoppings now ready to go in. The north level will be stopped off in the solid, out-bye Penman's heading. No. 2 dip section: Workings to dip of top level completely stopped off by five ash stoppings 3 ft. to 4 ft. in thickness. (30/4/1903): On the 29th ultimo three sets of timber had fallen in the main stone drive. The roadsmen were clearing the fall, when a slight ignition of gas occurred, A. Morrison, roadsman, being slightly burnt on arms. It was found that the gas was coming from a hole in the floor, where the crust of roof over No. 2 bord, No. 2 dip, being only about 2 ft. in thickness had collapsed, allowing the sets to fall. From this date Mr. Jordan decided to alow safety lamps only in-bye the cabin at foot of main incline haulage-road. (27/6/1903): Work being presently conducted in Nos. 6, 7, 8, and 9 dips and Nos. 1 and 2 headings, new seam. All roadways, airways, and working-places in good order; fire-stoppings continue to be well attended to. Twenty men on enlarging and repairing airways where necessary. Twenty finger-post notices of second outlet posted in the returns for guidance of workmen. The 9 ft. diameter Hayes ventilating-fan, latterly in use at Orepuki shale-mine, is being erected on surface at the upcast air-shaft to replace the furnace hitherto in use, the power of which had proved inadequate for ventilation of extent of workings now open. Fan to be steam-drven meanwhile, pending erection of electrical generating plant in the main engine-house, when power will be transmitted. (7/8/1903): No. 6 dip and No. 7 dip, 6 ft. seam: Drawing pillars and head coal. Nos. 8, 9, and 10 dips and new-seam workings and returns therefrom in good order generally. (30/9/1903): Fan at 180 revolutions, circulating 26.970 cubic feet of air per minute. W.G. 1.3 in. Development-work advancing briskly, forty-two men being engaged on stonework. Air dull in No. 6 dip pillar workings, the pillars being nearly finished; plant and men to be drawn and the section stopped off. Ventilation good in Nos. 7, 10, and 11 dip sections, also in

new seam and 6 ft. seam workings and in No. 8 dip, where north-going places are driven to No. 4 fault, pillars being left until 6 ft. seam above is worked out. (9/10/1903): This visit was paid in consequence of an accident—fracture of humerus of right arm—to J. Alexander, roadsman and duly appointed shot-firer in the No. 8 dip section. Alexander was preparing to fire a shot, when a stone fell from roof, inflicting injury mentioned. I found that insufficient care had been taken in sounding the roof and in bringing down a loose rock after the previous shot had been fired. The deviation of main stone drive at brick-wall stopping is 300 ft. in length, having, where intersecting coal-seam, a brick arch 60 ft. in length by 10 ft. in width by 6 ft. in height at centre. (3/11/1903): Air-volume at intake, 31,700 cubic feet per minute; the enlargement of airways being responsible for a reduction of W.G. from 1.3 in. to 1.1 in. Working-places, roadways, and return airways in good order. Nos. 1 and 2 headings, new seam: 560 ft. to faces. The Sylvester's patent prop-drawers in use are economizing timber, especially in pillar-workings. (9/12/1903): The fire-stopping at bottom of main incline, north side, is being replaced by a double-walled brick stopping filled in with dead ashes. The stone level cross-measures drive eastward having passed through No. 5 fault, the face is now at 5,123 links from mine-mouth. The upcast air-shaft has been sunk 140 ft. by 7 ft. diameter to connect with the main return on the level, enabling the "tube" section of airway and the old furnace area *viâ* centre heading being stopped off entirely. Brick stoppings have been put in above the tube and at the furnace-site, and a 6 ft. ash stopping at the bottom of the centre heading. The winding-engine bed for second outlet is in course of construction. Gauze shields are in full use for protection to miners' eyes when working in "proud" or flying coal. Safety lamps numbered, and register kept as lamps are served out to the men on each shift. Explosives attended to; tins numbered, and all shots served out by storeman from magazine on surface. Detonators carefully kept underground in separate locked tins. Compressed air is the power used for actuating the main pump and subsidiary pumps underground; also the Uskside and other winches for dip haulage, of which the Uskside type appear to give the most satisfaction. Air-volume at in-take 37,990 cubic feet per minute, fan making 212.8 revolutions. W.G. 1.6 in. Report-books: Underviewers', firemen's, deputies', engine-wrights', and examiners of pumps, winches, and ropes' report-books invariably kept up to date and in order. Extensive detailed surveys of the mine have been made, and new plans are now in course of preparation.

Kaitangata Colliery (Old Mine) (Thomas Barclay, mine-manager).—(9/2/1903): All available coal having been extracted, work is now suspended; plant drawn.

Castle Hill Colliery, Kaitangata (Thomas Barclay, mine-manager).—(11/2/1903): Gas giving off freely in north level; advancing in solid coal. This and the new seam in stone-drive extension are being stopped to allow gas to drain off. (22/4/1903—R. S. Jordan, mine-manager): Mine in good order. Working-places free from gas. New set of screens have been erected at loading-bank. (26/6/1903): Robbing homeward in main seam towards staple pit, fire here in south side waste being kept well under by liberal use of water. Nos. 4 and 5 cross-cut winch dips being sunk in 11 ft. seam. North side section: Uskside winch engines and drum combined are giving every satisfaction. Ventilation satisfactory. (4/7/1903): Fatal accident: George Hill sustained fracture of skull on the 3rd instant. Hill and McMillan, his mate, were dropping tops. A shot had been fired in head coal; fifteen minutes later deceased was engaged filling a box when a large flake of coal came away from the roof, the edge of the flake striking Hill on the temple. A vertical smooth joint or "sooty back" contributed to the flake coming away; but had deceased sounded the roof carefully before starting to fill he should have discovered the weakness. (21/8/1903): Working-places, return airways, and mine generally in good order, and an adequate supply of air travelling. (2/10/1903): Pillar-robbing to fault in 25 ft. seam, south side. Work north of staple pit in this seam now discontinued and stoppings in. New seam in main extension very steep, the dip being 1 in 1½. Gas given off in advancing heading-faces, and brattice kept close up. (1/12/1903): 11 ft. seam: No. 4 dip crosscut 600 ft. to face. New seam: Pair of parallel headings driven 250 ft. Coal-seam opening up excellently. A level stone tunnel driven with short uprise therefrom to the heading will enable the Jacky pit being dispensed with. Cross-measures-level extension drive-face standing at 4558 links from main entrance. Air-volume at intake 26,750 cubic feet per minute. Report-books well kept and plan to date.

Central Otago.

Coal Creek Collieries Company, Coal Creek Flat (William Barclay, manager; R. Pilling, jun., secretary).—(24/2/1903): Freehold: The prospecting-drive struck main coal-seam at 150 ft. Communication is being made with shaft for ventilation. Leasehold: Output being maintained from pillar-workings. (11/5/1903): New mine-workings and return airway in good order; ladders provided in upcast air-shaft. Leasehold: Overburden of 25 ft. to 30 ft., being stripped with water hired from the Pleasant Valley Gold-mining Company, intention being to work the coal-seam opencast. (12/9/1903—J. Barber, manager): Freehold: Coal being of a tender nature all workings are driven narrow and standing well. Considerable quantities of black damp are encountered, being tapped where breaks occur in the coal-seam. Leasehold: Stripping suspended in the meantime owing to the mining company requiring the water.

McPherson's Pit, Coal Creek Flat (Mrs. McPherson, lessee).—(18/2/1903, 12/9/1903): The drainage-tunnel 300 ft. in length was driven with difficulty through soft and swelling ground; 9 in. diameter pipes were laid in the tunnel and drive subsequently filled in to preserve the pipe-line. A considerable quantity of coal which was formerly below water-level is now available, water-free. This pit is usually kept in good order.

Craig's Perseverance, Coal Creek Flat (John Craig; James Craig, lessee).—(12/9/1903): The main dip having been extended, coal-output is now being won from the third level, 20 ft. of head-coal being left on for roof. The hydraulic hauling and pumping plant continues to act satisfactorily. Workings in good order; free from dross; good air travelling throughout the mine.

Progress Colliery (Gully Pit), Roxburgh (James Bailey, agent for licensee).—(11/9/1903): Stripping, 10 ft.; pumping appliances are required to deal effectively with the water.

Perseverance Colliery, Alexandra (R. W. Findlay, lessee; Andrew Hunter, manager).—(13/5/1903): Old main dip lost and now abandoned; a crosscut is being driven through the pillars to solid coal on the left hand. Pillars being left 20 yards square all work narrow. (18/9/1903): Explosive gas having been found in the McQueenville Colliery adjoining, as a precaution daily examinations with safety lamp are now made before the men are passed into the mine. No firedamp has as yet been reported. However, the practice will be kept up as the floor is broken where "weight" occurred, and roof fallen in bad places to the gravels above the clays overlying coal-seam. Mine-workings and return airway in good order; old workings stopped off. (16/12/1903): To increase ventilation a small furnace has been built at the bottom of upcast shaft; the furnace is well lined with sheet iron and brickwork as a precaution against setting coal-seam on fire. Rules posted; report-books to date.

McQueenville Colliery, Alexandra (R. Lett, lessee; J. Howie, manager).—(13/5/1903): An ignition of explosive gas of a slight nature occurred in this mine on the 7th May. A concrete dam 4 ft. in thickness had been built in to retain an outburst of water with sand from the floor of the rise beyond the trough in dip drive. The face of the dam was being examined frequently by Mr. Howie with his deputy, John Duncan, and the place had been examined with a safety lamp a short time previously and no gas found; but when Duncan went in again the naked light on his head accidentally ignited a small quantity of gas in a cavity between the timbers at the roof of the place a few yards back from the dam-face. Although previously undetected the occurrence of small quantities of firedamp had previously been suspected in this mine, and I had directed the mine-manager's attention to certain indications of gas when examining the mine in the year 1900. Every precaution is being taken by Mr. Howie; mine regularly examined with locked safety lamps, followed by reports duly entered in report-book before the miners are allowed to enter. (8/6/1903): Examined carefully but could not find any trace of gas in the mine, the dip where outburst occurred being perfectly clear. The concrete dam is standing well, being now no doubt well backed with sand from the "blower." (18/9/1903): Mine generally in good order; ventilation good; no trace of firedamp has been detected during past three months. (16/12/1903): A new steam-pump (a Duplex Tangye, capacity 8,000 gallons per hour) now placed at bottom of upcast shaft; steam-pipes are laid from surface steam-boiler down the haulage-dip, discharge-pipes delivering up the shaft. A fall of roof to surface recently occurred in the old upper workings, very little damage being done. Attention is paid regularly to the deposits of dross left on the road sides of bords, but no signs of heating have been discovered so far. However, as a precaution the mine-manager promises to have the thicker heaps turned and split.

Drummey's Coal-pit, Alexandra (J. Drummey, lessee).—(8/6/1903): No one about. Nothing done here since my visit in November last. I have been informed that the coal-seam is stony and inferior, rendering sales difficult.

Alexandra Coal-mine, Alexandra (M. O'Connell, permit; W. A. Thomson, lessee).—(21/2/1903): Mine-workings partially unwatered, dip drive and roadways being cleaned up and put in order; air good. (8/6/1903): Bottom heaving and roof fallen to the parting in places where water was up, and roof of main dip requires constant attention. (18/9/1903): Mine idle. Safety lamp now used for examination of workings. (16/12/1903): Output very much decreased, and not in proportion to the capabilities of the mine. New copies of the general and special rules required.

Alexandra Coal Company, Alexandra (W. Carson, mine-manager; L. Ryan, secretary).—(18/2/1903): Workings all in good order. (14/5/1903): Recent improvements and additions to working plant are a pair of self-contained engines, having two drums, each 4 ft. diameter, fitted with clutch-gear for shaft-winding and rope-haulage down the dips to replace horses formerly in use below. The cage is also fitted with safety detaching-hook and proper covers. Ventilation fair. (17/8/1903—James Pollock, mine-manager): The whole of the workings thoroughly examined: pit in good order, ventilation satisfactory. No perceptible increase of water-inflow which might have been expected as the workings extended, an average of 50,000 gallons per working-day being discharged. Workings duly examined with safety lamps prior to each shift commencing work. (22/9/1903): Ventilation improved by renewal of air-stoppings, brattice-cloth being replaced with wood in stentons on permanent airways. Boreholes 7 ft. in roof at regular intervals of 20 ft. have not so far determined any weakness in the roof or thinning of the coal-seam. The body of the seam appears to have been formed with unvarying regularity, indicating extensiveness of deposit. From twenty to twenty-five men are employed, but there being no second outlet-shaft not more than ten men are allowed down the pit at any one time, as provided by section 40 of "The Coal-mines Act, 1891." As a precaution examinations with safety lamps are duly carried out, but explosive gas has never been seen in the pit. Plan and report-books to date. Rules posted.

Undaunted Coal-pit, Alexandra (D. H. Mathias (permit), lessee).—(14/5/1903): Workings in fair order, dip being extended and bords broken away. (18/9/1903): A wet break from the roof had caused flooding of the dip, but the water-inflow is now pining. (16/12/1903): Working top bords on east side of dip. Negotiations are in hand to equip the pit with steam pumping and winding plant.

Theyer's Coal-pit, Alexandra South.—(8/6/1903): Lease recently determined at owner's request. As in Drummey's pit, a band of stone in the coal-seam rendered work profitless. Bruce's old shaft has been filled up to the surface.

Cambrian's Coal-pit, Cambrian's (C. Dungey, lessee).—Not visited. Opencast pit; output moderate.

Welshman's Gully Pit, Cambrian's (J. McGuckin, lessee).—Opencast pit. Two men usually employed.

Blackstone Hill Pit, Blackstone Hill (R. Thurlow, lessee).—Opencast pit. Water-inflow heavy

Price's Coal-pit, Blackstone Hill (G. Price, lessee).—Coal taken out for private use only.

St. Bathan's Coal-pit, St. Bathan's (J. Enwright, lessee).—Opencast pit; stripping; afterwards blasting down lignite with powder.

Rough Ridge Coal-pit, Idaburn (William Beck, manager; Mrs. M. Beck, lessee).—Opencast overburden stripped. Coal-face 30 ft., being shot down with blasting-powder.

McLean's Pit, Idaburn (Mrs. M. Beck, lessee).—Mrs. Beck has acquired this pit but no coal had been taken out during the year.

Idaburn Coal-pit, Idaburn (J. White, lessee).—Opencast pit; stripping in advance and shooting down lignite face.

Border Coal-pit, Rough Ridge (G. Turnbull, lessee).—Lying as it does in low-lying creek-bed this pit has been inundated by the Idaburn Stream several times during the year to the monetary loss and arduous exertion of Mr. Turnbull.

Gimmerburn Coal-pit, Gimmerburn (C. Docherty).—Coal mined for private use only.

Commercial Colliery, Upper Kyeburn (Christian Archer (permit), lessee).—Seam vertical; worked by levels driven to boundary in solid head-coal, then brought back and roof allowed to fall behind.

McCready and Coombes's Pit, Kyeburn Diggings (W. Coombes, lessee).—A few tons taken out per annum for private use only.

Dairy Creek Colliery, Clyde (J. Robertson, permit; W. J. Tonkin, lessee).—(15/5/1903): The lessee having disposed of his interest in this colliery to the Clyde Collieries Company, the mine is now under control of and is being worked by the latter company.

Clyde Collieries Company, Clyde (G. F. Turner, mine-manager; L. G. Reeves, secretary).—(15/5/1903): This company acquired the adjoining Dairy Creek Coal-pit in March, 1903. Both mines are in good working-order and capable of a much larger output than the present local demands. (24/9/1903): Men now working in Dairy Creek section. Mine in good order. Report-books to date. Rules posted.

Holt's Pit, Shepherd's Flat, Clyde (W. J. Holt, licensee).—(15/12/1903): This mine is being opened solely to supply the Loch Lomond dredge, which is to start work on Shepherd's Flat, Fraser River, at an early date. Several sets of strong timber will be required at mine-mouth before work may be recommenced with safety.

Doolan's Creek Coal Company, Gibbston (A. C. Murray, secretary).—Several hundereds of pounds had been expended in road-making, prospecting, &c., but either the trade requirements of the district or the inaccessibility of the mine, or a combination of both, militated against success. The company is now in liquidation and the area abandoned.

Gibbston Coal Company, Gibbston (J. Hodson, mine-manager; G. R. Cheeseman, secretary).—(6/10/1903): Operations have been continued in the upper workings during the early part of this year until a heavy slip came away from the mountain-side causing their temporary abandonment. A new low level begun in April is now in good coal with considerable area of solid to the rise. Connection for ventilation is made through to the old workings. This mine is situated at an altitude of about 3,500 ft. above sea-level.

Cardrona Colliery, Cardrona (D. Scurr, manager; R. McDougall, lessee).—(22/5/1903): As the coal-seam is removed, heavy hillside slips are becoming more numerous. The water-supply is inadequate to deal efficiently with the heavy material thus brought down into the pit. A new road up the mountain has been formed to the pit for the convenience of heavy traffic, but access to the pit is impossible during winter months, the road and pit being snow-covered and ice-bound. Altitude, about 4,000 ft. The requirements of a large district are supplied from this pit.

Cromwell and Bannockburn Collieries Company, Bannockburn (A. S. Gillanders, mine-manager; T. K. Harty, managing director).—Excelsior Mine: (18/5/1903): As the requirements of the district are easily supplied from the company's other pits, which are more accessible than the Excelsior, operations in this mine are suspended in the meantime. (5/10/1903): Mine shut down after having been worked about four months during winter. (16/11/1903): The mine-manager informs me that the mine is kept unwatered and ready to resume operations, if required, at any time. The coal in north-going places is good, and the roof strong; going southward the coal-seam is thinning, and the roof frets considerably. Bannockburn Mine: (5/10/1903): The main level is now in 400 yards, and the coal-seam continues regular, 6 ft. in thickness. Working-places and roadways in good order, but air rather dull in far-in places. Places being driven narrow and large pillars left, consequently small amount of timber required. Kawarau Mine: (5/10/1903): Shepherd's Creek dip drive: At 360 ft. coal became thin and unprofitable to work, being much broken with soft and faulted coal. A similar result was experienced going northward, and as the dip was bounded on the south by a large downthrow fault, it was resolved to work back on the pillars, of which the area is not large. Prospecting on the north side of Thom's Gully a 14 ft. seam was struck. An inclined drive had been put down a distance of 235 ft., and is capable of extension. Old workings were passed through for a distance of 108 ft. from surface, into which heavy water-drainage percolated from the creek-bed, necessitating the laying-down of a 20-horse-power steam-boiler and Tangye pump of 10,000-gallon-per-hour capacity. The workings are in good order and condition. Later information is to the effect that the Shepherd's Creek Mine pillars are exhausted, and the dip drive is now closed.

Jeffrey's Area, Bannockburn (George Jeffrey, licensee).—(5/10/1903): The several trial-shafts sunk have apparently not been successful in striking coal. Nothing doing on this date. All shafts filled up.

Cairnmuir Pit, Bannockburn (Crow and Anderson, lessees).—(5/10/1903): Sinking in a small way, and a few tons of coal taken out. Further operations are dependent upon the erection of efficient machinery to deal with water met with.

Charles Angel's Pit, Nevis.—(6/10/1903): Opencast. Small quantity of coal for private use taken out.

Nevis Coal-pit, Nevis (C. Scott, lessee—permit).—(11/12/1903: Seam vertical. Opencast working now replaced by driving. Mine in very good order.

Ryder's Coal-pit, Nevis (C. Scott, lessee; Robert Ritchie, manager).—(13/12/1903): Opencast pit. Kept clean and in good order. A face of good hard coal at present being operated on.

Clough and Allen's, Nevis (Mrs. A. Holmes).—(13/12/1903: Nothing done recently in this pit. Mr. C. Scott has purchased Mrs. Holmes's interest—an advantageous arrangement for the district.

Gunion's Pit, Nevis (R. Gunion).—(13/12/1903): Inoperative.

Ritchie's Pit, Nevis (Robert Ritchie).—(13/12/1903): Coal taken out in small quantity for private use only.

SOUTHLAND.

Pukerau Coal-pit, Pukerau (C. O'Hagan, permit).—(1/12/1903): Coal roof and sides very hard and strong. Mine in good order. Report-book to date.

Nelson's Coal-pit, Pukerau (J. H. Nelson).—(1/12/1903): During recent heavy rainfall mine became flooded through the underground drainage-tunnel becoming blocked. Efforts are being made to locate the stoppage.

Mason's Coal-pit Pukerau.—(1/12/1903): Coal taken out for private use only.

Milne's Coal-pit, Pukerau.—(1/12/1903): Coal taken out for private use only.

Whiterigg Colliery, East Gore (John Hartley, permit; W. H. Paterson, owner).—(23/4/1903): Lignite-seam 18 ft. in thickness and strong in nature. Very little timber is used or required in the mine. I drew the manager's attention to the necessity for the provision of a suitable powder-magazine and for proper supervision over it. (5/11/1903): A new steam-boiler and Tangye pump having been installed, output is now being won from the dip. A suitable locked powder-magazine has been provided. Seam, 18 ft.: 12 ft. won, 6 ft. being left on for roof.

Heffernan's Coal-pit, East Gore (J. Hoffman).—(23/4/1903): Working to the rise from water-level. Seam 11 ft. in thickness and strong, 8 ft. being won, 3 ft. left on roof. (5/11/1903): Mine in good order.

Sarginson's Coal-pit, East Gore (A. Reinke).—(23/4/1903): Lignite now being taken out for private use only. (5/11/1903): Pit idle.

P. Healey's Pit, East Gore (P. Healey).—(5/11/1903): This pit was worked for private use, but is now idle.

A. McDonald's Coal-pit, East Gore (George Perry, lessee).—(5/11/1903): Formerly a private pit. Lignite being taken out of a gully. Seam above water-level.

Robert Smith's Coal-pit, East Gore.—Coal continues to be taken out for private use only.

H. Smith's Pit, East Gore.—Opencast. Private pit.

Green's Pit, Gore (James Duncan, manager; J. and J. Smith, lessees).—(2/12/1903): Mine-workings and roadways in good order. Ventilation fair. A new above ground tram-line being constructed to convey output some 60 chains nearer to the town. Powder-magazine above ground required.

Knapdale Coal-mine, Knapdale (R. Irvine).—Seam has been opened up again, and coal is now being sold.

Hoffman's Pit, Chatton (T. Hoffman, lessee).—(1/7/1903): Lignite-pit worked formerly as an opencast by A. Perkins. Main drive 100 ft. in, 20 ft. in width by 12 ft. in height, several bords being broken away to the rise. Water-drainage troublesome. Instructed Hoffman to have two sets of timber put in at mine-mouth. (3/11/1903): Mine-mouth timbered as required.

Perkin's Coal-pit, Chatton (A. Perkins, lessee).—(1/7/1903): Working on boundary to the dip of Pacey's Pit. Stripping 6 ft. to 8 ft. Lignite face 20 ft. (3/11/1903): Pit in good order.

Pacey's Coal-pit, Chatton (R. Pacey).—(1/7/1903): Owing to stripping becoming too heavy a drive 25 ft. in width by 10 ft. in height is being put in. Instructed man in charge to bring down some loose coal on the roof; also to take down overhanging clay at mine-mouth. (3/11/1903): Steam-boiler and centrifugal pump having been procured, stripping and opencast working at lower end of pit have been resumed. Instructed Pacey to provide proper powder-magazine and canisters.

Harvey's Coal-pit, Chatton.—(3/11/1903): Nothing doing.

Otama Coal-pit, Otama.—(12/11/1903): The property on which this pit is situated has been acquired by Cross Bros., owners of the adjacent property. No coal now being taken out of this pit.

Cross's Coal-pit, Otama.—(12/11/1903): Stripping heavy and dangerous. Further supplies will require to be mined.

Hunter's Coal-pit, Otama.—(12/11/1903): Nothing done here since last visit.

Thorndale Colliery, Waikaka Valley (E. C. Orchard).—(23/4/1903): A deep drainage-ditch has been brought in, which avoids necessity for pumping water. Stripping not kept ahead in accordance with safety. (5/11/1903): Stripping ahead still insufficiently attended to, suitable workmen not being available.

Johnston's Springfield Coal-pit, Waikaka Valley.—(5/11/1903): Ten feet of stripping; 7 ft. of lignite. Pit in good order.

Reed's Coal-pit, Waikaka Valley (W. Mitchell).—(5/11/1903): Opencast stripping, 10 ft.; lignite, 15 ft. Stripping not so well attended to as desirable. Scarcity of labour is alleged to be the cause. Proper powder-magazines and canisters required.

Ritchie's Coal-pit, Waikaka Valley.—(5/11/1903): Pit closed. Abandoned, stripping having proved too heavy and seam too thin to pay for driving. Drainage also excessive.

McGill's Glenlee Coal-pit, Wendon Valley (Martin Collins, permit).—(21/4/1903): Formerly opencast, now driving to the rise; heading up 60 ft., being driven 8 ft. high by 10 ft. in width, 6 ft. of coal being left on for roof. (4/11/1903—D. T. McGill, permit): Mine safe and in good order. A suitable powder-magazine has been provided.

McDonald's Coal-pit, Wendon Valley (D. Nicol, lessee; S. Coulter, permit).—(21/4/1903): Coal strong; pit in fair order. Suitable powder-magazine required. (4/11/1903): Mine-workings standing, a dispute as to royalty having arisen between the lessee and the School Commissioners.

Edge's No. 14 Coal-pit, Wendon Valley (A. A. Edge, lessee; S. Coulter, permit).—(4/11/1903): I could see that some very unsafe robbing had been committed in the open face, fortunately without accident. The manager admitted his indiscretion the cause being, he said, inrush of trade orders. Suitable powder-magazine has been provided.

Busbridge's Coal-pit, Wendon Valley.—(4/11/1903): Opencast pit. Supplies fuel to farmers for threshing and winter stocks.

Perkins's Coal-pit, Wendon Valley (George Perkins).—4/11/1903): Coal taken out for private use only.

Henderson's Coal-pit, Wendon Valley.—A private pit.

Stevenson's Coal-pit, Wendon (J. Stevenson).—(12/11/1903): Pit full of water. Apparently very little coal has been taken out.

Radford's Coal-pit, Wendon (E. and P. Radford).—(12/11/1903): After lying idle for some months this pit has recently been reopened.

Waikaia Collieries Company, Waikaia (R. Jones, manager; H. G. Horn, Gore, secretary).—(8/7/1903): Semi-vertical seam 20 ft. in thickness now being won from dip drive, levels being turned north and south. The old dip being in a state of collapse has been abandoned. An adequate plant—viz., steam-boiler, winch, and Tangye pump have been placed in position in expectation of enhanced output due to increased activity in gold-dredging in the Waikaia Valley. (11/11/1903—F. Junker, manager): Coal-seam now tapped from new dip; north level driven 180 ft. in strike of the seam. The level is being driven 10 ft. wide, remainder of seam left in to support the sides. Mine in good order; timber well used, and a good supply on hand for use as required.

McIvor's Coal-pit, Landslip, Waikaia (H. McIvor, lessee).—(8/7/1903): Area, 5 acres. Presently driving out coal pending wet season affording suitable supply of water for stripping. Drew owner's attention to careless handling of a keg of loose blasting-powder.

McIvor's Coal-pit, Waikaia (W. McIvor).—(8/7/1903): Area, 5 acres. R. and W. McIvor having amalgamated are engaged sluicing off stripping, which is 60 ft. in depth, to recover pillars left in 7 ft. seam which had formerly been driven out by underground mining in the usual way.

Muddy Terrace (Shale Pit), Waikaia (T. F. Goldie).—(8/7/1903): Opencast pit. Seam 14 ft., of which about 4 ft. on top may be classed as oil-shale. Meanwhile the shale is mixed with the underlying lignite and used as fuel.

No. 1 Coal-pit, Landslip, Waikaia (A. McKinnon).—(8/7/1903): Mine in good order. Ventilation good.

Argyle Coal-pit, Landslip, Waikaia (J. and T. Baxter).—(9/7/1903): Opencast pit now in fair order. Water is brought in for sluicing the overburden away.

Ed. Vial's Pit, Happy Valley, Waikaia.—(9/7/1903): A drive had been put in on the outcrop of seam, but so inadequately timbered that it had fallen in. No one about at this date.

G. S. Vial and D. Gillespie, Waikaia.—(9/7/1903): This pit has been opened on Robson's Run on eastern bank of Waikaia River, and about six miles above Waikaia Township. Lignite seam 6 ft. in thickness, easily stripped. The road in to the pit is not in good order.

Waimea Pit, Longridge Village, Waimea.—(R. Larson).—(12/11/1903): Apparently very little doing here now, the easily got lignite having become worked out. No one about.

Pyramids Coal-pit, Mandeville (F. Junker).—(12/11/1903): Nothing has been done here for some time, but Mr. Junker will resume operations at an early date.

Waimumu Pit, Mataura (C. P. Sleeman).—(17/4/1903): Stripping, 10 ft. to 12 ft.; thickness of seam, 17 ft. A gang of men kept constantly employed in keeping stripping well ahead of advancing coal-face. The pit is in thoroughly safe order for working. (27/10/1903): Canisters are now provided for use in handling blasting-powder, but the lock has not yet been put on the powder-magazine. Pit in excellent order.

Bogside Colliery, Mataura (Mutch and Hurst).—(17/4/1903): Pit recently reopened and not yet in working-order. The overlying gravel stripping is being utilised on county roads. (27/10/1903): Pit idle on this date; not much doing.

Beattie and Coster's Pit, Mataura (F. Louden, manager).—(17/4/1903): Opencast pit, stripping in advance of the working-face. As in other local pits, the lignite to dip is not being followed owing to stripping and water-drainage becoming too heavy. (27/10/1903): Pit in good order; stripping in benches. Suitable locked iron powder-magazine provided.

McGilvray's (late Mutch's), Mataura.—Lignite taken out for private use only, but continuing to supply the Mataura Paper-mills with about 80 tons of hæmatite per annum.

Duthie's Coal-pit, Waimumu (Williams and Sons).—(18/4/1903): Opencast pit in good working-order. A suitable locked powder-magazine has been provided. (6/11/1903): Pit in good order; stripping well attended to.

Nightcaps Colliery, Nightcaps (J. Lloyd, mine-manager; William Handyside, managing director).—(9/4/1903): At about 8.30 p.m. on the 29th March flames were seen rising from the engine shaft, so-called from an engine and steam-boiler for dip haulage being placed at bottom of shaft. Smoke from boiler and exhaust-steam had been conducted direct into the shaft, which

had been in use some three years. The alarm being raised all hands turned out. Steps were taken to close all openings; stoppings were erected underground, and the several shafts in use were covered or partially filled in, and the fire became damped down. The area affected was isolated and confined to the northern section of workings. The immediate cause of the fire could only be conjectured; the mine was free from dross, and spontaneous ignition had not been anticipated. Mr. Lloyd is of opinion that a spark or other light had communicated itself to the woodwork at bottom of engine shaft, and had been fanned into a flame by the ventilating-current sweeping past on its course through the workings. Arrangements are being made to bring in a large body of water to pour down the shafts. Output being maintained from No. 2 or old mine section pillars, and from the opencast which had fortunately been well developed in readiness for ordinary winter trade. (12/6/1903): Fire area has been sealed up for eight weeks. Plentiful supply of water constantly running into the mine, being directed from the surface as found advisable or necessary to combat the fire at weak points on the line of outcrop in opencast. A plentiful supply of timber in use and on the premises for use as required in No. 2 workings. (19/6/1903): This visit was paid in consequence of a fatal accident to Henry Currie, miner, who was found dead under a fall of coal at the face on the 18th instant. I found a row of props 3 ft. apart on each side of the roadway set close up to face. The block of coal had come away unexpectedly from between two diagonal cross-backs and an invisible smooth parting in the roof ahead. The deputy had been in the place a short time previous to Currie being missed, when he considered the place quite safe. Great attention is paid to the timbering of all working-places in this mine, rendered necessary by the frequency with which cross clay backs occur, particularly so near the outcrop. (21/10/1903): Fire being gradually suppressed, three pipe-lines conveying 40,000 gallons of water per hour being directed on the seat of fire; progress necessarily slow, the air-doors being only opened an hour or two at a time to enable hoses being shifted and fallen stuff removed. It has been found that where the heat had been communicated to the clay band which occurs between the coal-seams, difficulties were increased owing to the clay retaining the heat even when copiously treated with water. Heavy falls from roof have retarded progress, a thousand skips having been filled away from one fall alone. Tracks are being cut through falls in fire area and cooled down with water. No. 2 section: Robbing in the three seams being steadily prosecuted. Timber heavily used along the verge of broken roof in pillars. The opencast workings provide the larger proportion of output. Stripping exceptionally well kept ahead of advancing coal-face with consequent benefit in large proportionate tonnage of coal won. (4/12/1903): Pillaring and dropping head-coal in No. 2 section being well conducted. Air good. Fire now sufficiently overcome to allow of examination around and behind the fire area. The full supply of water, 1,000,000 gallons per diem, continues to be played on remaining falls showing any signs of heat. Tracks being cut through the heaps of fallen roof and sides and the fire area cooling down rapidly.

H.B. Mine, Nightcaps (J. W. Kelly, permit).—(22/10/1903): Underground working suspended in favour of paddocking. Stripping very heavy, consisting of from 10 ft. to 12 ft. of rough shingle. Coal 7 ft. in thickness. Mr. Kelly subsequently notified me that he had abandoned the mine

Hit or Miss Mine, Nightcaps (Alley and Tinker; D. Tinker, permit).—(22/10/1903): Work temporarily suspended owing to Mr. Alley's death. Rearrangement of business interests in hand.

Wairio Mine, Nightcaps (A. McBride).—(22/10/1903): Opencast pit not yet in order after winter season.

Quested's Mine, Nightcaps (J. Quested).—(22/10/1903): Nothing doing at present.

Brighton's Pit, Nightcaps (J. Clarke).—(22/10/1903): Pit in good order. Seam dipping rapidly to westward.

Mount Linton Station Pit, Nightcaps (Mrs. Chalmers).—(22/10/1903): Nothing done here during the year.

Gillies and Rayward's Mine, Clifton, Seaward Bush.—(15/6/1903): Opencast. Stripping 5 ft. to 10 ft. of quartz gravels and clays. Lignite-seam 20 ft. in thickness, of good quality, containing thin seams of resin and shale. Being below country water-level, drainage heavy; kept under by 7 in. lifting-pump, steam-driven. Lignite conveyed on bush horse-tram one mile to district road.

Graham's Coal-mine, Fairfax (P. S. Graham).—(23/10/1903): Drives in good order, timbering being excellently done. Clay roof unbroken, precautions being taken of having timber kept close up to the faces.

Isla Bank Mine, Fairfax (M. Slattery).—(23/10/1903): Stripping heavy, 15 ft.; is kept well back from the face of the coal, which is only 5 ft. in thickness.

Spey Bank Mine, Fairfax (R. Salton).—(23/10/1903): Not working; plant drawn. Mr. Salton, one of the olden school of miners, being now incapacitated for work.

George's Mine, Fairfax (James George).—(23/10/1903): Opencast pit recently opened in a gully, where stripping is light.

Naylor's Mine, Fairfax (J. Naylor).—(23/10/1903): Private pit. Coal mined for own use only.

Orepuki Coal and Shale Mine, Orepuki.—(26/10/1903): Mine ceased work on the 17th July last. Shaft and mine-mouth fenced. Oil-works in charge of caretaker. (3/12/1903): Works still standing. Water rising slowly up the incline.

Remarks.

The output of coal, lignite, and shale (Southern District) for the year 1903 amounted to 429,402 tons, an increase of 10,223 tons over the previous year.

Returns of output from the provinces are as follows:—

	Tons.
Canterbury	23,527
Otago	307,562
Southland	98,277
Southland (oil-shale)	36
Total	429,402
Output for previous year	419,179
Increase	10,223

The contributions to the Coal-miners' Relief Fund amounted to £429 13s. 5d., while payments from the Fund to the amount of £314 9s. 10d. have been recommended.

ACCIDENTS.

Seventy-seven accidents—two fatal and seventy-five non-fatal—were reported to me during the year, of which one fatal and forty-eight non-fatal occurred at the Kaitangata Mines, the proportion of accidents to number of men employed being greater at these collieries than at other mines in the district. The non-fatal accidents were principally of a slight nature, and such as appear to be incidental to mining-work.

In all cases the accidents were investigated, and in serious cases reports were furnished to you, while the claims of applicants, together with the interests of the Coal-miners' Relief Fund, had been carefully safeguarded.

The number of eye-accidents has been reduced to eight for the year, a reduction of nearly 100 per cent. over the previous year. Gauze shields for protection of miners' eyes are in general use when working in proud or flying coal.

Falls of coal and stone from roof had been productive of fourteen accidents, two of which proved fatal; and in another instance (Beardsmore) resulted in practical disablement for two years at least.

Fatal Accidents.

18th June, 1903.—Henry Currie, miner, Nightcaps Colliery: A block of coal fell from an invisible parting in roof at face. Due precautions had been taken; double rows of props set close up to working-face.

3rd July, 1903.—George Hill, miner, Castle Hill Mine: While in the act of filling loose coal from a shot fired fifteen minutes previously a loose flake came away from the roof, striking deceased on the temple.

Non-fatal Accidents.

4th March, 1903.—W. Ratcliffe, Fortification Colliery: Neurosis of right radius said to have been caused by injury sustained while carrying rails underground.

6th March, 1903.—J. Beardsmore, miner, Kaitangata Mine: Bruised back, resulting in rotation of two of the vertebræ—fall of stone from roof at face.

29th May, 1903.—John Dick, miner, Kaitangata Mine: Bruises on thigh—struck by runaway box on heading.

6th October, 1903.—J. Alexander, roadsman and duly appointed shot-firer, Kaitangata Mine: Fracture of right humerus—fall of stone from roof.

I have, &c.,
E. R. GREEN,
Inspector of Mines.

The Under-Secretary, Mines Department, Wellington.

APPENDIX I.

COAL-CUTTING BY MACHINERY.

By JONATHAN DIXON, Mining Engineer, Westport Coal Company (Limited).

THE winning of the world's coal-seams by the direct application of mechanical devices to the actual "coal-faces" has been and is, generally speaking, of slow development when comparatively considered with the high standard of machinery efficiency applied to the multifarious requirements dealing with the mineral from the time it leaves the said coal-face until it finally reaches the consumer.

Parallel with all great industries, the coal trade of the world is governed and swayed by political, industrial, and commercial conditions. The two former have such diverse influences upon the latter in the various coal-producing centres of the world that mutability of trade whereby uniform and reasonable benefit to all concerned would be assured becomes purely mythical. It is therefore a grave question at all times and in all countries as to the direct bearing of these conditions on the trade, beneficially or otherwise, of any particular nation. When the conditions are so diverse it is but fair to consider that the obtaining or the maintaining of industrial supremacy is the result of regulative economics judiciously applied to overcome exigencies.

Referring solely to the coal-mining industry, the pride of place so long held by the United Kingdom in the matter of output has now to be ceded to America, and this prestige is considered as principally due to the application of machinery to the actual holing and cutting of the coal-faces. By this means production rapidly increased. In the year 1899, as a result of the extended application of mechanical appliances in direct operation at the coal-face, America outstripped the United Kingdom in output. The following excerpt from the report of C. Le Neve Foster, D.Sc., F.R.S., one of H.M.'s Inspectors of Mines, England, sets forth that the United Kingdom "in the year 1899 gained eighteen millions of metric tons, but the United States' gain was far larger—viz., thirty millions of metric tons. One may well ask how the United States were able in the course of that short period of twelve months to make such an enormous addition to their output. The answer is: Increased use of coal-cutting machinery. The difference between the two great coal-producing countries of the world is very marked indeed, as the United States owe 23 per cent. of their total output to the use of coal-cutting machinery, against 1½ per cent. so won in the United Kingdom." It is just, however, to concede that America has the advantage in very many instances as to thickness of seams and density of same, also relative absence generally of the adverse conditions with which the British mining engineer has to cope. Having this in view, the types of coal-cutting machines which prove successful in America would probably fail in the United Kingdom proportionate to the range of adversely altered conditions.

British mining engineers have during recent years apprehended the necessity of applying machinery to the undercutting and shearing of the coal-faces; consequently exhaustive investigations and trials are continually being carried out with the view of proving and adopting the class of machine best suited to the requirements resulting from existing local conditions. In coal-mining there is practically no similarity in local conditions—that is, judging one colliery with another; hence the prevention of general application of any one type of machine, and therefore, subsequently, the varied nature of the skill required of the mining engineer who has to determine systems and methods most suitable to particular demands. Depths of seams from the surface, thickness thereof, nature of such seams, &c., are all factors from which emanate local conditions so multiform, comparatively, in character that the universal applicability of one set design of machinery to a successful issue is thereby precluded. There are many seams where coal-cutting machines in their present form cannot be profitably substituted for hand-labour. This does not result from the principle of machine-application being wrong, but from the simple fact that the right type of machine is not yet designed or constructed to successfully surmount the particular conditions attached to the working of such seams.

Difficulties in an acute form have presented themselves from time to time in the way of mechanical application to coal-winning, apart from the work at the face, but such have been surmounted with maximum benefit, and this knowledge leads to the assumption that the mechanical skill now being concentrated on this highly important object under review will evolve suitable coal-cutting machinery for all and varied conditions.

This has been very aptly designated as the "mechanical age," from the fact that machinery of suitable design has been invented and applied to practically every ramification of the world's industrial life. The effect upon general production as a result of such mechanical development has been of a phenomenal character.

There are many opponents to mechanical operation when applied in detail, on the assumption that labour is dispensed with to an unwarrantable degree; but the term "labour-saving" as ascribed to machinery should not be taken to literally imply that the number of human operators under any particular system in connection with an industry cease for ever as "workers" because of mechanical installation; rather should it be understood that their energy and skill is requisitioned in other channels wherein greater exercise of brain-power is needed, but concurrent therewith a satisfactory conservation of physical power results.

Adverting to the direct cutting of coal-faces mechanically, it has been known and admitted for many years past that the mechanical engineering of collieries has attained a modern and therefore a high standard of efficiency in the application of machinery designed and utilised in various ways conformable with local conditions, both for underground haulage, surface haulage, drainage of mines, artificial ventilation, winding from depths, and the sorting, grading, &c., of the mineral at the surface; but, strange to say, such application has appeared to cease at the coal-face, the very place where the resulting benefits should be of a marked character. The reason of this anomaly can probably be ascribed to the strongly exhibited prejudices of the coal-hewer against the introduction of coal-cutting machinery, coupled with a lengthy period of apathy on the part of mining engineers adverse to grappling earnestly with the subject in detail—that is, compared with the skill and determination which has characterized the latter in mechanically surmounting various other abnormal difficulties connected with coal-winning. However, amends are being made for apparent delays in connection with this important matter, for the mining records of the day show that the British engineer has determinedly taken the matter in hand. This being so, he will ultimately achieve his object, and thereby in the near future completely revolutionise the present stereotyped methods of coal-extraction.

It is desired in this article to avoid technicalities; likewise it is not attempted to render detailed descriptions of the various types of machines, but rather to give an abridged reference to their principles and forms of construction, with general reference to their application.

The types of machines now in use for coal-cutting may be classed as follows: (1) Disc machines, (2) chain breast machines, (3) bar machines, (4) circular heading machines, (5) pick machines. The types 1, 2, 3, and 4 are distinguished as rotary machines from the fact that they are constructed to perform their work by rotary motion applied in various ways. The No. 5 type operates by impaction; that is, the blow of the pick is delivered direct at the coal-face, and, practically speaking, embodies the principle of attack as made by the coal-hewer's pick.

Of the disc machines, which are claimed to be giving satisfactory results at longwall faces, may be mentioned the Diamond, the Yorkshire Engine Company, the Clarke and Steavenson, the Gillott and Copley, and the Jeffrey machines. Chain machines also in noticeable operation are the Jeffrey, the Morgan-Gardner, and the Mather and Platt. Of the bar type the Hurd, also the Goolden, may be mentioned. The Stanley Header is a machine which as it advances cuts out a circular area of coal. The "header" and cutters can be arranged to excavate diameters varying 5 ft. to 7 ft. When greater width of heading is required than can be cut by the single machine, a double header may be employed. This takes the form of two machines combined, working side by side, which excavate two annular and parallel grooves. From this it can be readily inferred that with sets of cutters having radii of 3 ft. the width of heading will not be less than 12 ft. The percussive pick machines which are so much used in America are known as the Ingersoll-Sergeant, the Harrison, the Yoch, the Leyner, and the Sullivan.

The motive power actuating all the aforenamed types of machines is either electricity or compressed air. The application of electricity to the driving of the percussive type has not hitherto proved successful. Doubtless this is due to the intermittent action of the machine. The blow of the pick is resultant from a direct thrust, and after delivery the piston has to return to a given point preparatory to a repetition of the blow. With machines embodying this reciprocating motion the motive power yielding the most satisfactory results is compressed air. The principle of the other forms of machines is that of continuous action, and they are manufactured to be driven by either power referred to, each motive power having its adherents relative to adoption under certain conditions whereby it may be considered the greater useful effect will be obtained. Electricity has, however, been successfully applied to the driving of the continuous-action machines, and the time is not far distant when its use in that respect will be practically universal. Naturally, mines already equipped with costly and up-to-date air-compressing plants will continue to use the latter with fair efficiency.

In any colliery adopting coal-cutting machinery, when the power to be used is determined upon, it is true economy to instal only modern and thoroughly effective plant, with a good margin of excess power to meet contingencies. By this means maximum benefits will obtain at the machines. In all cases it is a fair deduction to say that where machines are introduced, which from their special construction renders them properly adaptable to whatever local conditions exist, the results will prove satisfactory in comparison with hand-labour. If the comparative results are not as stated, then the right type of machine is not in operation.

The disc machine is rectangular in form, with the cutting-disc set horizontally and at right angles to the framework which carries the driving gear. With some makers the disc is placed at a right angle to the end of the machine; other designers have the disc at right angles to the centre of the machine, with the driving-power equally disposed at each end. The principal mechanical parts are the framework, upon which is placed the motors if electrically driven, or cylinders if actuated by compressed air; also the necessary shafting and gearing for reducing the disc to the second or third motion as desired. There is, further, a small rope drum, which is operated automatically, whereby the machine is moved along the coal-face during the process of undercutting. The disc is strongly bracketed to the side of the machine, and is a bevelled toothed wheel with the spaces between the teeth open right through. By this means the lodgment of coal-cuttings between the teeth is prevented, and clogging of them which would otherwise take place is obviated. This gear is operated by a pinion-wheel vertically arranged in framework. The said bevel wheel has a specially designed periphery, into which the cutters or pick-points are fixed at required distances. These machines are calculated to undercut to depths varying from 3 ft. to 6 ft. One particular aim in their design is that the vertical space occupied shall be such as to admit of application to the winning of extra-thin seams. In this the designers have been very successful. The heights will range from 18 in. to 24 in., with a width, exclusive of disc, approximating 3 ft. 9 in., and a length from 8 ft. to 9 ft. The weights average from 22 cwt. to 2 tons 5 cwt.

HORIZONTAL CUT IN A DRIVE.
ALSO SHOWING OPEN SPACE REQUIRED FOR SWINGING OF MACHINE.
SCALE 1/20.

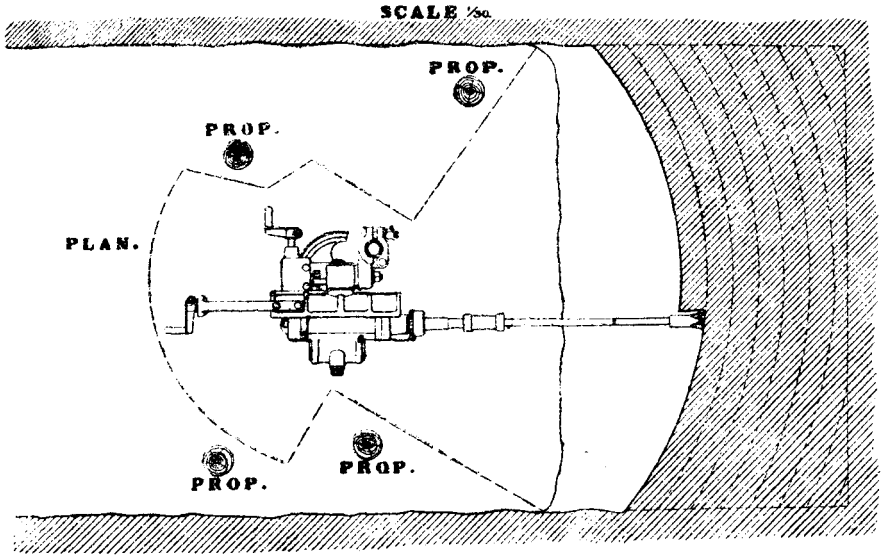


Fig. 1.

MACHINE SET FOR SHEARING.
SCALE 1/20.

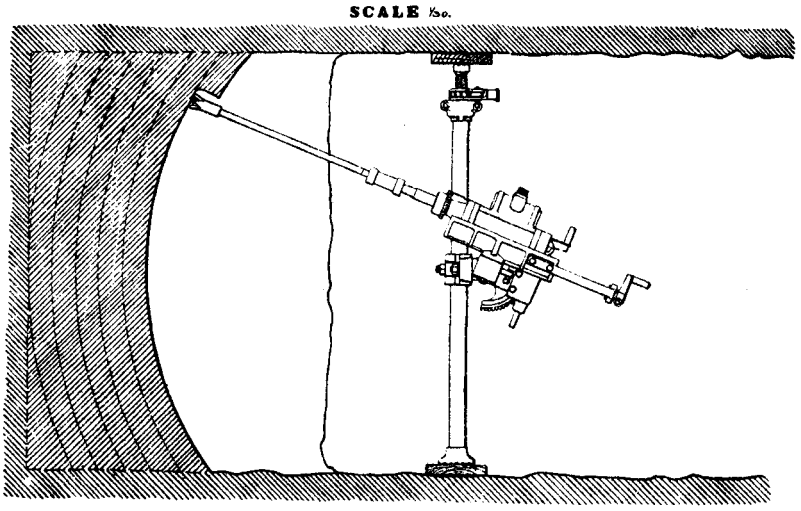


Fig. 2.

HORIZONTAL CUT IN A DRIVE ABOUT HALFWAY BETWEEN FLOOR & ROOF.
SCALE 1/20.

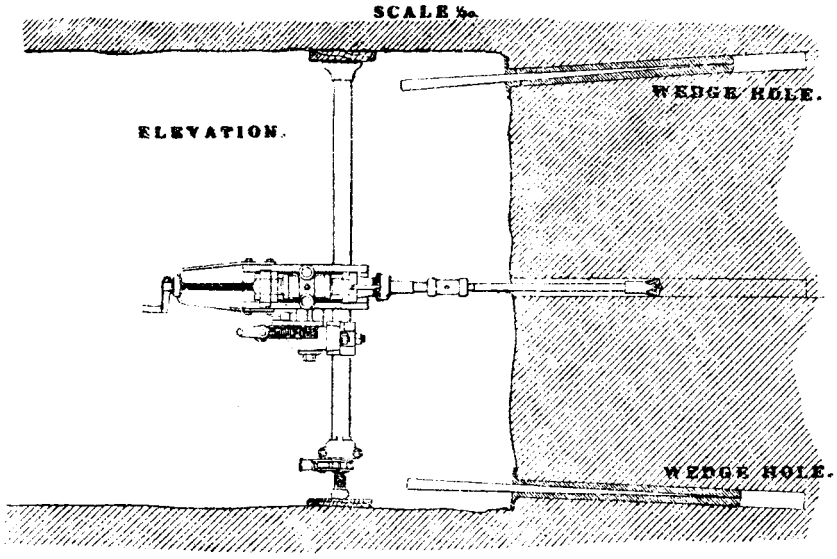


Fig. 3.

CHAMPION COAL CUTTER.

The chain machine is one where the cutters are secured in a desired position on an endless chain, and this machine is being satisfactorily operated. It is claimed that the holings are cleared away very freely with this class of machine. Some of this type are enabled to hole on either side, as the jib carrying the chain can be laterally moved in an arc of 180 degrees. Some are constructed upon wheels, whilst with others the wheels are dispensed with, but these machines are hauled along the working-faces by gearing which is handily under the control of the operator. The height of such machines is about 16 in., which renders them suitable in that respect for winning very low seams. The width varies from 1 ft. 9 in. to 2 ft. 3 in., with lengths from 6 ft. 6 in. to 8 ft. The weights of different sizes range from 22 cwt. to 45 cwt.

The bar machines are so termed from the fact that for holing or undercutting a revolving bar takes the place of the disc at right angles to the framework. In some there is a slight reciprocating motion of the bar, the latter can also be worked in an angle of about 180 degrees, thus enabling it to cut its own entrance into the coal to the necessary depth preparatory to moving forward. As the machine is automatically moved ahead the bar, which is fitted with cutters placed at suitable positions round and along the length of the bar, cuts the coal and thus performs the holing. In addition to the cutters the bar has a spiral arrangement fitted thereon, the purpose of which is to bring the coal-cuttings to the front of the holing, whence they can be readily cleaned away, and the bar is thus allowed freedom of action. The general type of bar used is tapered and it thus forms a cut ranging from about 8 in. at the front to 3 in. or 4 in. at the back of holing. Recently this class of machine has been tried with a bar of uniform diameter, and results are claimed to be equally satisfactory to those obtained with the tapered bar. They are stated to cut from 3 ft. to 6 ft. in depth, and to vary in weight from 1 ton to 2¼ tons.

In connection with longwall work, it is proved, practically beyond question, that, generally considered, machine operations at the coal-face have proved advantageous by proportionately increased output, and in the matter of decreased cost per ton, either directly relative to labour charges, or indirectly by a gain in percentage of large coal. These are factors proving that it is but to operate the right type of machine under particular conditions encountered to ultimately insure coal-cutting by machinery becoming practically universal.

The trend being now in the direction of mechanical coal-cutting, and with a strong belief in the skill of the profession, allied with that of machine-designers, as being quite able to surmount each and every difficulty, it should not appear too optimistic to predict such general application.

It is deemed desirable in this paper to refer to what has been done with respect to coal-cutting by machinery in the Southern Hemisphere.

In connection with the coal-mining industry of New South Wales, and up to the year 1903, no positive attempt has ever been made to introduce coal-cutting machines. At one mine a Stanley heading-machine was operated for a time, about the year 1890, but it was finally dispensed with. Two or three trials with other types of machines were made at certain mines, but under conditions which did not by any means admit of justice to the machines under test; naturally the inevitable result took place—viz., failure. During the year 1903, however, determined action has been taken in the matter of installing machines in connection with some of the large and important mines now developing the future extensive coalfield of New South Wales to the south of the town of West Maitland. These mines approximate some thirty miles from the port of shipment at Newcastle. At this the inceptive stage of the establishment of this industrial enterprise, a great antipathy is being exhibited by the hewers to the innovation, which opposition doubtless will cease or be satisfactorily minimised when they realise that their conservatism must reasonably yield to a more up-to-date system of coal-winning, a system not so adverse to their general interests as appears to them at the outset.

With reference to coal-cutting by machinery in this colony of New Zealand, it is safe to assert that a greater proportion of the total output is so won than is the case in any other coal-producing country of the world. In the year 1902 the quantity produced by coal-cutting machines equalled 37 per cent. of the total output of all classes of coal, and, calculated on the output of bituminous and semi-bituminous coal, 49 per cent. of the tonnage may be credited to coal-cutting machinery. The Westport Coal Company (Limited), of New Zealand, whose base of operations is on the west coast of the South Island, has for many years used coal-cutting machinery. During the period various types are tried; with some of these the results were adverse to their adoption. The class of machine which has so far proved most applicable under local conditions is that of the percussive type actuated by compressed air, therefore these machines are in general use with satisfactory results. A Stanley heading-machine was at one time in operation, but owing to very erratic grades the machine proved too cumbersome and unwieldy to be profitably employed. The conditions were unfavourable, and therefore it would be unfair to condemn the header, which under more suitable opportunities would give satisfactory results. The same remarks are applicable to a Jeffrey chain breast machine, actuated by electricity. This machine when in operation fulfilled all the maker's guarantee in the matter of speed, depth of cut, &c., but the varying and heavy grades were adverse to its being "flitted" without an excessive amount of labour, thus nullifying any other gain attached to its actual work Percussive pick-machines, with electricity as the motive power, were at one time tried exhaustively, but this class of machine was not a success, doubtless attributable to the mechanical action being unsuitable to such a motive power. It might be said that whilst in actual operation good work was performed, but "breakdowns" were the rule instead of the exception, and the loss of time thus occasioned, together with the resultant excessive amount of repairs needed, more than counterbalanced any gain in other directions. These machines have been discarded, and percussive pick machines driven by compressed air have been substituted for some years past. They are practically of one type but by different makers, the one class is called the "Leyner," the other the "Yoch."

There is no difference in the principle of air-driven percussive machines, but in construction makers vary the proportional parts and the mechanism somewhat. The diameter of cylinder is

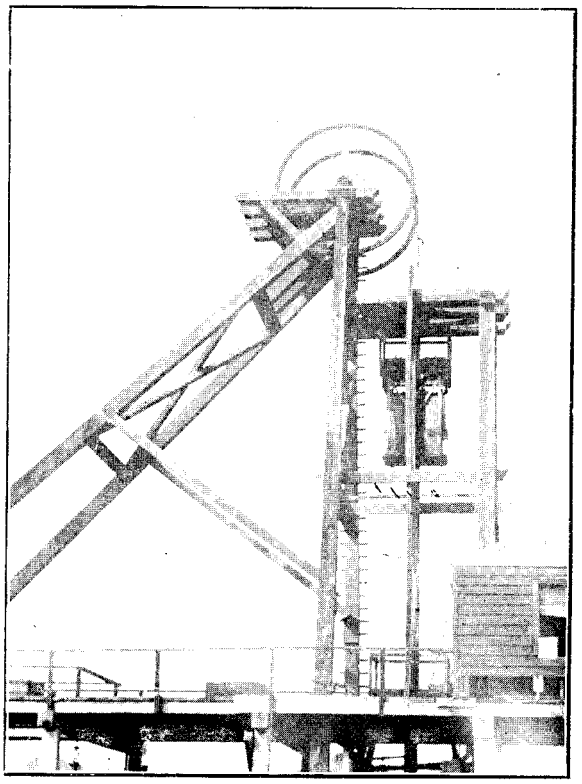
varied, also the length of stroke, likewise the degrees of cushioning; whilst some have a brake fitted, which is actuated by the compressed air at the will of the operator. The purpose of the brake is to check the recoil of the machine after each blow. A typical description embodies the following: Say, a cylinder, 4 in. internal diameter, with a stroke of 12 in.; a valve-chest and valve, the latter being operated by the air-pressure; also cushioning arrangements, a piston and elongated rod with socket attached to the outer end, wherein the picks are placed as needed. To secure uniform alignment with this extra long rod, a guide attachment of proportionate length is fitted on to front end of the cylinder. It is also devised to prevent the rod turning. This insures the cutting-tool striking in the same manner each blow. The said tools or picks are generally sharpened in the form of the caudal-fin of a fish, and the cutting-edge is kept in a vertical position all the time. The height of these machines will range up to 2 ft. 6 in., and the length over all from 7 ft. to 8 ft. The machine is balanced on wheels of 18 in. diameter, thus admitting of its being readily moved about on the platform during holing operations. Suitable handles are fitted at the back end of the machine, and by these the "runner" is enabled to control and direct the machine as he requires. The platforms referred to are specially made of light timber, with a length of from 9 ft. to 10 ft. and width of 3 ft. 4 in. Each setting of the platform enables a radius of 6 ft. to the undercut.

The mode of operation is as follows: After the coal-face is rendered safe, either by trimming off all loose coal or securely timbering it, the operator and his assistant set the platform where required, the front end on the floor close to the face, and the back end raised either on a trestle or chocks of timber whereby to form an inclined plane towards the face. This inclination enables the operator to easily keep the machine to its work, and it also minimises the recoil resultant from each blow. The machine is then mounted on the platform and a flexible air-hose attached, one end to the machine, the other to air-pipes which are arranged in the working-place. It might here be stated that the air is conveyed underground from the compressing plant, which is situated on the surface, by pipes of suitable dimensions, varying in sizes from 5 in. down to 2 in. diameter, with intermediary air-receivers. These pipes are carried through the ramifications of the mines to the active workings; they are fitted with necessary valves and cocks whereby the air can be turned on or off as desired. The working-pressure at the machines is from 75 lb. to 80 lb. per square inch. After the hose is coupled and the air turned on at the pipe all is ready for action. The operator seats himself behind the machine, turns the air on thereat, grips the controlling-handles, and undercutting commences. Whilst holing is in progress the assistant shovels back the cuttings, thus giving the pick freedom of action. The undercut will range from 12 in. to 15 in. at the front, tapering to 2 in. or 3 in. at the back. A fair percentage of the holings are of good marketable size, especially those cut out at each "first stage" of the undercutting. After holing 6 ft. wide and to a depth of 5 ft., the air is shut off. The section just holed is then securely chocked and spragged, the platform is reset where required, and the machine placed thereon to repeat the aforenamed performance. The bords are usually driven 18 ft. wide, therefore three settings of the platform suffice for the holing of one bord. After a place is undercut as described, the machine is placed on a trolly and "flitted" to another bord which is ready to be holed. A general thing is to undercut two places, which means 180 square feet per shift; this does not truly represent the capacity of the machine, nor yet the ability of the skilled "runner," but it can be taken as a gauge of industrial legislative conditions under which the company operates.

A newer type of machine, called the "Champion Coal-cutter," has recently been placed in certain mines of the United Kingdom, after having been tried in Continental mines in "narrow" or winning-out work. The results are claimed as highly convincing. One of these machines is under trial by the Westport Coal Company, and so far the useful effect has been satisfactory. Whilst in actual work the Champion will hold its own with the other machines in the amount of undercutting accomplished in a given time. It is specially adapted for shearing or vertical cutting of the face. Under equal conditions, and all other things considered, such as time required for removal from place to place, the setting ready for work, and the actual work performed, this machine will doubtless, for vertical cutting, outclass any other type at present in operation. Under somewhat adverse conditions in a wet dip heading, the writer has a knowledge of this machine holing 6 ft. in width and 5 ft. 6 in. in depth in sixty-five minutes, and cutting up the face to a height of 7 ft. with a depth of cut 5 ft. 3 in. in forty-eight minutes. Considering the circumstances it was a reasonably satisfactory performance, and compares very favourably with hand-labour.

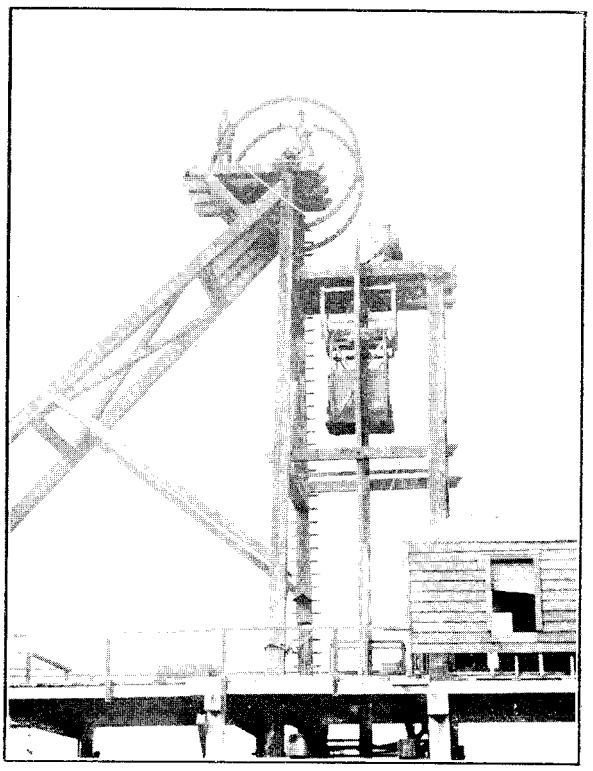
This machine is simply an adaptation of the percussive rock-drill, fitted with suitable lengthening-rods and cutting-tools for coal. The vertical supporting column can be readily fixed at required distances from the face; on the column is a longitudinal sleeve which can be fastened at any given height that it is desired to hole at. A toothed segment fits into the sleeve referred to and in the hub of the segment and axial therewith is a connecting-piece operated by worm gearing. To this connecting-piece the machine is securely fastened, and can be moved in a plane parallel to the segment by means of the worm gearing. When the segment is fixed horizontally the machine acts as a coal cutter or holer, when set vertically it will operate as a coal-shearer or vertical cutter. The air-cylinder is between 3 in. and 4 in. diameter, with a stroke of 8 in. The cutting-tool strikes about three hundred and fifty blows per minute. By means of the extension-rods it can be made to cut into the coal 7 ft. or 8 ft. with comparative ease, either horizontally or vertically. The heaviest part does not exceed 240 lb. in weight, so that it is favourable for "flitting" from bord to bord. Another feature is that this machine can be set to suit any vagaries of grade, or to hole in any height of the seam, it being merely a question of fixing the column at right angles to inclination of the floor, and the setting of longitudinal sleeve where desired on the column. The coal-cutters can be readily removed and drills substituted wherewith shot-holes can be drilled if required. Should the coal be thrown with wedges, the adaptability of the machine is again in evidence, as special wedges can be inserted into drill-holes, and a hammer-head fitted to the

TESTING DETACHING HOOKS.

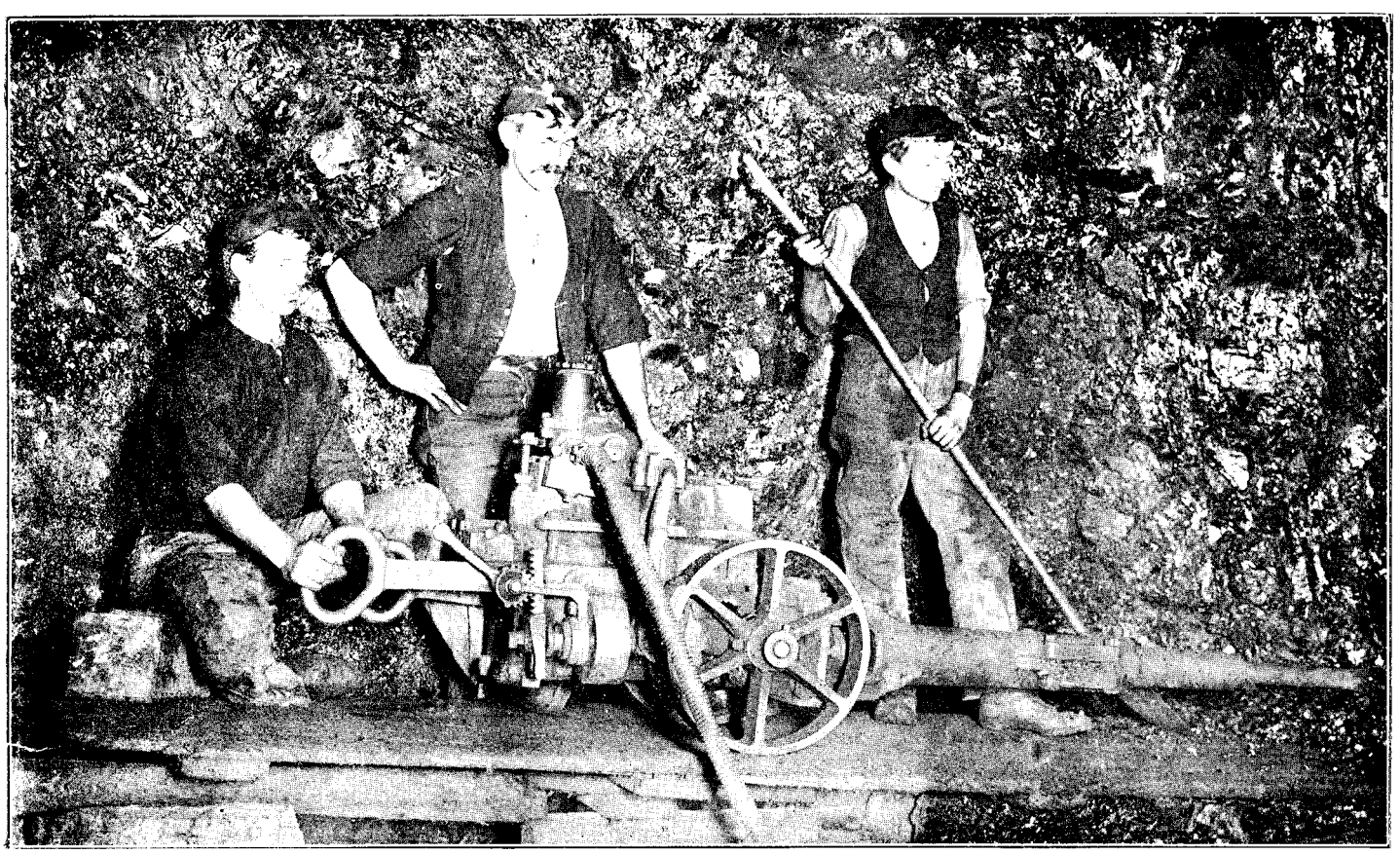


TAUPIRI EXTENDED COLLIERY, HUNTLY.

REATTACHING ROPE TO CAGE AFTER DETACHMENT.



TAUPIRI EXTENDED COLLIERY, HUNTLY.



Face p. 26.

FLASHLIGHT PHOTO. OF PICK MACHINE AT WORK, DENNISTON COLLIERY.
(WESTPORT COAL CO., LTD.)

machine which drives home the wedges in true alignment. This machine is also comparatively economical relative to air-consumption during operation.

When coal is cut by machinery the methods at the face are different from those employed by the coal-hewer. The latter holes, cuts, hews, and fills his own coal, likewise sets the necessary timber to secure safety. Where machines are employed, there are three distinct operations in the production of the mineral, which are designated as follows: First, holing; second, blasting; third, filling. With reference to the first the machines are used, the operators and their assistants holing the places to a depth of 5 ft. These are followed by a shift of men termed "shooters," whose duty it is to effect the second operation by drilling the necessary shot-holes, charging same, and blasting down the coal previously holed. The shooters are succeeded by a shift of men called "fillers" who perform the third stage of the work, their duty being to fill away the prepared coal into the tubs. During the time the machine-operator is holing the coal, he gives the necessary attention to the spragging, &c., of the coal-face. Whilst filling is in progress, special men give attention to the trimming of any loose coal from the faces, likewise the setting of the timber required to render the working-places secure and safe. Apart from this curt reference to the different methods, the rest of the operations governing the transit of the mineral from the face to pit-bank are one and the same.

The seams at Westport collieries are of a richness and quality equalling the best of such in the mining world of to-day, but as the outcome of this there is a friableness which results in an undue percentage of small to large coal. With respect to this it has been claimed by the opponents of machine-application that excess of small is principally attributable to the use of machines. To those conversant with all details, that is known to be not so. As stated, the proportion of small is excessive, but it is not minimised in the tonnage which is hand-hewn, rather is the comparative result in favour of the coal won by machines.

When the method of coal-cutting by machinery is adopted in a mine, with machines of a type which may of themselves be quite suitable for the particular conditions of the seam to be won, there is yet another most important adjunct to their success—viz., "The man behind the gun." A machine-operator requires to be active and energetic, and imbued with a sense of fairness and justice equitable to both his employer and himself. No machine will be successful unless the operator takes an intelligent and conscientious interest in the particular work allotted to him. If he brings such commendable qualifications to bear on his work, he will assuredly give satisfaction to himself and his employer alike.

Another powerful argument in favour of machine-application, and one which should appeal strongly to the most rabid opponents, from a humane point of view, is the immunity from serious accidents at the face, as compared with those occurring to coal-hewers. The reason of this is obvious when it is understood, that much of the coal-miners' work is performed immediately at the face, and under conditions which necessitate his lying under masses of overhanging coal when he is engaged at deep undercutting. The machine performs this work during which time the operator is behind it, many feet distant from the face. This at once suggests the comparative degree of safety to the machine-operator as against the coal-hewer.

In all branches connected with coal-mining, the primitive methods and appliances at one time operative have practically become obsolete, and have been superseded by modern equipments with every success, with one exception—viz., that of the actual hewing of the coal, for which operation methods which can only be called antiquated are still in continuance. This condition must assuredly alter, as economic demands are requiring that improved methods at the coal-face shall supplant the old and arduous system of hand-hewing.

When the number of persons dependent, directly and indirectly, on the world's coal-mining industry is considered, every effort should be put forth to prolong the basis of that dependence, in the matter of improved methods whereby maximum extraction will be consummated, and at the same time the general safety of the worker be enhanced. The adherence to a stereotyped system which should be practically obsolete is to an extent very often continued subordinate to restrictive labour conditions, notwithstanding that such a method conduces to undue waste of wealth, which is diminishing yearly. Such a system and anything derogatory to its abrogation should be condemned. To insure the longest possible life, by winning the fullest quantity of this highly useful portion of the world's wealth from nature's limited storehouse, the old conditions must change, and those interested therein, one and all, should speedily recognise the fact, and without further delay face the situation unanimously and with equanimity on broad national grounds.

APPENDIX II.

THE VENTILATION OF MINES.

By ALEXANDER AITKEN, C.E., Manager Waimea-Kumara Water-races; and R. M. AITKEN, late Director School of Mines, Reefton.

THE following formula, for the calculation of quantities of air carried in air-courses of various lengths, forms, and areas, under different pressures, is a modification of the rules used in the calculation of quantities of water discharged by pipes and watercourses of various lengths, forms, and areas under different pressures and different gradients.

It appears that air can be treated as a fluid, and that the laws regulating the flow of water can be applied to all fluids, with certain modifications rendered necessary by the different character of

the various fluids. In dealing with air we are dealing with a fluid highly elastic, capable of being compressed and expanded to a very large extent, according to the pressures applied and the temperature, while water is practically incompressible, and varies only slightly with the temperature. One feature is, however, common to both water and air. It takes four times the pressure (or gradient) to double the velocity of water in any given pipe or watercourse, and nine times the pressure to give three times the velocity, and the same rule holds good with air in airways. In both cases, in any particular watercourse (or airway) *the velocity of water (or air) will vary with the square roots of the pressures applied.*

The great difference between water and air is, that while with water it requires only four times the power to obtain four times the pressure, with air it requires eight times the power to obtain four times the pressure. Therefore, with air eight times the power gives four times the pressure and four times the pressure gives twice the velocity, or, it requires eight times the power to double the velocity. In like manner air requires twenty-seven times the power to give nine times the pressure, and nine times the pressure gives three times the velocity, or it requires twenty-seven times the power to give three times the velocity. *The velocity of air is proportional to the square roots of the pressures and to the cube roots of the powers applied.*

All that ought to be required to calculate the quantity of air in cubic feet per second or minute, passing through any airway of rectangular form, is the height, width, and length of the airway in feet, and the pressure (or exhaust as the case be) in pounds per square foot or in inches on the water-gauge, or, to put it shortly, sufficient data to obtain the value of A, R, and S, in the following equations:—

AIR FORMULÆ.

Let A = sectional area in square feet.

$R = \text{mean depth} = \frac{\text{area}}{\text{perimeter}}$.

L = length of air-course, in feet.

P = pressure, in pounds per square foot.

$S = \frac{P}{L}$ = pressure divided by length.

V = velocity, in feet per second.

Q = A × V = quantity, in cubic feet per second.

Formula No. 1. $113\sqrt{RS}$ = velocity, in feet per second.

Formula No. 2. $113\sqrt{RS} \times A$ = quantity, in cubic feet per second.

Formula No. 3. In airways having the same areas, perimeters, and pressure, but of different lengths, the quantities of air passing through will be inversely proportional to the square roots of the lengths.

Formula No. 4. In square (or circular) airways having the same lengths and the same pressure, the air-carrying capacity will be proportional to the square roots of the fifth powers of the sides of the respective squares (or diameters if circular).

Formula No. 5. The quantities of air passing through airways of any form (length and pressure being the same) is proportional to the areas of the respective airways multiplied by the square roots of their respective mean depths.

Formula No. 6. The velocity of air in airways (length and pressure being the same) is proportional to the square roots of their respective mean depths.

Formula No. 7. The velocity of air passing through any particular airway is proportional to the square roots of the pressures applied—that is, twice the pressure will give 1.414 times the velocity; three times 1.732 times the velocity; four times twice the velocity; and, of course, the quantities will be in the same relative proportions.

Formula No. 8. The velocity of air in airways (area and perimeter being the same) is proportional to the square root of S, and in all cases where the character of the airways is similar, to the square root of RS.

Formula No. 9. In channels (air or water ways) of any specified area, perimeter, and length, and also of the same character—that is, similarly rough or smooth, similarly uniform in area and perimeter, and similarly straight or crooked—*the same velocity will be produced in air with a pressure equal to 1.5524 in. on the water-gauge as will be produced in water with a pressure equal to 100 ft. of water.*

Formulæ Nos. 1 and 2 are applicable to air only, and the results are actual in ordinary airways. Nos. 3, 4, 5, 6, 7, and 8 are applicable to both air and water. Formula No. 9 is theoretically correct, and in the calculations marked B, where water formula for water and air formula for air are compared, water with 100 ft. of head and air with 1.5524 in. on the water-gauge water and air velocities are practically the same in both cases. In the calculations marked B channels of two different areas, 4 ft. by 4 ft. and 8 ft. by 8 ft., each 1,000 ft. in length, are calculated in both cases by air formula and by water formula, water with 100 ft. of head and air with 1.5524 in. on the water-gauge, and the result shows the theoretical correctness of Formula No. 9. In the calculations marked B the water formula $102{\cdot}76\sqrt{RS}$ with a coefficient of 0·32 has been used, which is about equal to $4\sqrt{2gRS}$ in the "Miners' Guide" formula, because the airways in mines are very rough—not uniform in area and perimeter—and have many bends, so that a smaller coefficient is necessary for airways in mines than for the roughest of watercourses.

In hydraulic calculations the "hydraulic mean depth" means the area of a section of flowing water divided by the perimeter (or wetted border of the sectional area), and represents the depth of water that would cover the perimeter if it were stretched out in a horizontal position. The hydraulic mean depth of a circle is one-fourth of the diameter; of a square is one-fourth the

length of one of the sides; and of a rectangle the area divided by the sum of top, bottom, and sides, in each case the flowing water in contact with and rubbing against the whole of the perimeter. In an open race or watercourse the hydraulic mean depth is the area divided by that portion of the border of the sectional area with which the water is in contact and rubbing against. The hydraulic mean depth in all cases is the depth of water that would cover the wetted border if it were stretched out in a horizontal position.

Now, in the above formula the "pneumatic mean depth" is the depth of air that would cover the perimeter of a section of the airway if such perimeter were stretched out in a horizontal position, and as in airways the flowing air is in contact with and rubbing against top, bottom, and sides, the area of a section of the airway divided by the whole of the perimeter is the pneumatic mean depth.

In Gordon's "Miners' Guide," pages 136, 137, 138, and 139, an illustration is given of 60,000 cubic feet of air passing through four splits of the following sizes and lengths:—

No. 1, 6 ft. by 6 ft., 1,000 ft. long
No. 2, 6 ft. by 5 ft., 800 ft. "
No. 3, 6 ft. by 4 ft., 700 ft. "
No. 4, 5 ft. by 4 ft., 600 ft. "

} Evidently with a pressure of 3·88 lb. per square foot. See pages 138 and 139.

Now, if the proposed formula $113\ A\sqrt{RS}$ is applied, practically the same result is obtained as in the elaborate calculations in the "Miners' Guide."

Formulæ Nos. 1 and 2.

Split No. 1.—6 ft. by 6 ft., 1,000 ft. long; pressure, 3·88 lb. per square foot.

Area = 6 ft. × 6 ft. = 36 = A.

Area divided by perimeter = $\frac{36}{24}$ = 1·5 = pneumatic mean depth = R.

Pressure per square foot divided by length = $\frac{3·88}{1000}$ = 0·00338 = S.

$\sqrt{RS} = \sqrt{1·5 = 0·00338} = 0·0763.$

0·0763
113
2289
763
763
8·6219 = velocity, in feet per second.
36 = area.
517314
258657
310·3884 = cubic feet per second.
60 = seconds in a minute.
18,623·3040 = cubic feet per minute.

"Miners' Guide" gives 18,644 cubic feet per minute.

Formulæ Nos. 1 and 2.

Split No. 2.—6 ft. by 5 ft., 800 ft. long; pressure, 3·88 lb. per square foot.

Area = 6 ft. × 5 ft. = 30 = A.

$\frac{\text{Area}}{\text{Perimeter}} = \frac{30}{22} = 1·36 = R.$

$\frac{\text{Pressure}}{\text{Length}} = \frac{3·88}{800} = 0·00485 = S.$

$\sqrt{RS} = \sqrt{1·36 \times 0·00485} = 0·0812.$

0·0812
113
2436
812
812
9·1756 = velocity, in feet per second.
30 = area.
275·2680 = cubic feet per second.
60 = seconds in a minute.
16,516·0800 = cubic feet per minute.

"Miners' Guide" gives 16,562 cubic feet per minute.

Formulæ Nos. 1 and 2.

Split No. 3.—6 ft. by 4 ft., 700 ft. long; pressure, 3·88 lb. per square foot.

Area = 6 ft. × 4 ft. = 24 = A.

$\frac{\text{Area}}{\text{Perimeter}} = \frac{24}{20} = 1{\cdot}2 = \text{R.}$

$\frac{\text{Pressure}}{\text{Length}} = \frac{3{\cdot}88}{700} = 0{\cdot}00554 = \text{S.}$

$\sqrt{RS} = \sqrt{1{\cdot}2 \times 0{\cdot}00554} = 0{\cdot}0815.$

0·0815
113
2445
815
815
9·2095 = velocity, in feet per second.
24 = area.
368380
184190
221·0280 = cubic feet per second.
60 = seconds in a minute.
13,261·6800 = cubic feet per minute.

"Miners' Guide" gives 13,288 cubic feet per minute.

Formulæ Nos. 1 and 2.

Split No. 4.—4 ft. by 5 ft. 600 ft. long; pressure, 3·88 lb. per square foot.

Area = 5 ft. × 4 ft. = 20 = A.

$\frac{\text{Area}}{\text{Perimeter}} = \frac{20}{18} = 1{\cdot}11 = \text{R.}$

$\frac{\text{Pressure}}{\text{Length}} = \frac{3{\cdot}88}{600} = 0{\cdot}00646 = \text{S.}$

$\sqrt{RS} = \sqrt{1{\cdot}11 \times 0{\cdot}00646} = 0{\cdot}0847.$

0·0847
113
2541
847
847
9·5711 = velocity, in feet per second.
20 = area.
191·4220 = cubic feet per second.
60 = seconds in a minute.
11,485·3200 = cubic feet per minute.

"Miners' Guide" gives 11,506 cubic feet per minute.

The rule given is correct in principle, and if the illustrations given in the "Miners' Guide" are really practical examples, the empirical number 113 in the formula is correct for airways of a similar character to those on which the experiment was made. This number would require to be varied for smoother or rougher airways—smaller if rougher and larger if smoother; or, what would amount to the same thing, the number 113 could be used throughout and a co-efficient used according to the roughness or smoothness of the airways. An example of the vast difference in the carrying-capacity of rough and smooth airways is given in the *New Zealand Mining, Engineering, and Building Journal*, Vol. iii., No. 43, new issue, 23rd July, 1903, last paragraph of page 499 and first portion of page 500. The article in the *Journal* referred to is an article on "Chimney Design and Construction," but the paragraph indicated is peculiarly applicable to airways in mines: "Flue-linings are desirable, not alone for their protection against fire, but because of their smooth surface and their uniform size. In fact, a rough brick flue, 8 in. by 8 in., when lined becomes 6 in. by 6 in., and although the cross-section is not much more than half, the draught is almost equally as good. The shape of the flue must be such as to give a large area, with little friction. Thus a circular flue is better than a square one, and a square better than an oblong rectangle. A triangle is bad, for, with but half the area of a square, it has 85 per cent. of the wall-surface. The corner spaces, moreover, soon fill with soot, so as to reduce the original area

rapidly." The paragraph on page 136, "Miners' Guide," headed "Friction in Ventilation," &c., says the "resistance is also according to the square of the velocity" [which is correct] "and in airways having the same perimeter, pressure, and area, but of different lengths, the quantities of air passing through will be in accordance with reciprocal of square root of the length into 1."

Formula No. 3.

Now, this latter portion would be much clearer and easier worked if it said: "*In airways having the same perimeters, pressure, and area, but of different lengths, the quantities of air passing through will be inversely proportional to the square roots of the lengths.*" The square roots of the lengths given: $\sqrt{200} = 14{\cdot}14$; $\sqrt{400} = 20{\cdot}00$; $\sqrt{600} = 24{\cdot}49$; and $\sqrt{800} = 28{\cdot}28$; and inversely proportional will be—

20 : 14·14 :: 7,071 : 4,999.	In "Miners' Guide" this quantity is 5,000.
24·49 : 14·14 :: 7,071 : 4,082.	" 4,082.
28·28 : 14·14 :: 7,071 : 3,533.	" 3,224.
14·14 : 28·28 :: 3,535 : 7,070.	" 7,071.

The reciprocal of the square root of 800 into 1 $\left(\sqrt{\frac{1}{800}}\right)$ is 0·03535, but it is given in the "Miners' Guide" as 0·03224, and for the 800 ft. length the number of cubic feet passing through should be 3,535.

The calculations given vary slightly, as the decimals are not carried out far enough for more correct work.

At page 141 of the "Miners' Guide" ("Enlargement of Airways") an example is worked out, and the result is apparently wrong: "*Suppose an airway 6,000 ft. long and 5 ft. square was circulating 10,000 cubic feet of air, to what size would it have to be enlarged to pass 20,000 cubic feet, the ventilating-pressure remaining the same?*" Now, the first air-course, 5 ft. × 5 ft. = 25 square feet (according to the "Miners' Guide"), would have to be enlarged to 8·093 ft. square = 65·495 square feet to circulate 20,000 cubic feet, or double the quantity. But an air-course does not require to be enlarged to double the size to carry double the quantity (ventilating-pressure and length remaining the same). Yet the "Guide" makes it out that it requires more than two and a half times the sectional area.

Formula No. 4.

The following rule should be applicable:—

"*In square air-courses having same length and same ventilating-pressure the air-carrying capacity is proportional to the square root of the fifth power of the sides of the respective squares.*"

Then, taking the above question,—

As $10{,}000 : 5^{\frac{5}{2}} :: 20{,}000 : x^{\frac{5}{2}}$

Log. of 5	=	0·6989700
		5
" $5^{\frac{5}{2}}$	=	2)3·4948500
" $5^{\frac{5}{2}}$	=	1·7474250
" 20,000	=	4·3010300
		6·0484550
" 10,000	=	4·0000000
" $x^{\frac{5}{2}}$	=	2·0484550
		2
		5)4·0969100
" x		0·8193820 = 6·5976 side of square.
		2
" x^2		1·6387640 = 43·528 square feet area.

Formula No. 5.

The following rule is applicable not only to square airways, but also to airways of any kind of sectional areas:—

The quantity of air passing through airways of any form (length and ventilating-pressure being the same) is proportional to the areas of the respective airways multiplied by the square roots of their respective pneumatic mean depths.

Taking the examples just given—

Area, 25 square feet × $\sqrt{\text{mean depth}}$: area, 43·528 square feet × $\sqrt{\text{mean depth}}$ :: 10,000 : x quantity.

$\frac{\text{Area}}{\text{Perimeter}} = \frac{25}{20}$ Log. 25 = 1·3979400
„ 20 = 1·3010300

2)0·0969100 = 1·25, mean depth.

0·0484550 = 1·118 $\sqrt{\text{mean depth}}$.

Area, 25 ft. Log. 1·3979400
$\sqrt{\text{mean depth}}$ = 1·118 „ 0·0484550

1·4463950 = 27·951 square feet.

$\frac{\text{Area}}{\text{Perimeter}}$ $\frac{43·528}{26·3904}$ Log. 1·6387640
„ 1·4214394

2)0·2173246 = 1·6494 mean depth.

0·1086623 = 1·2843 $\sqrt{\text{mean depth}}$.

Area 43·528 Log. 1·6387640
$\sqrt{\text{mean depth}}$ 1·2843 „ 0·1086623

1·7474263 = 55·902 square feet.

Now, as 27·951 : 55·902 : : 10,000 : 20,000.

So that both the above rules show that if an airway 5 ft. × 5 ft. = 25 square feet sectional area, and 6,000 ft. long circulates 10,000 cubic feet of air, an airway 6·5976 ft. × 6·5976 ft. = 43·528 square feet sectional area, and 6,000 ft. long will circulate double the quantity or 20,000 cubic feet, always provided that the circulating-pressure is the same in both cases.

The formula 113 A $\sqrt{RS}$ will also show that the larger of the two airways referred to will carry twice the quantity of the others. Airway, 5 ft. × 5 ft. = 25 square feet, 6,000 ft. long, with 2 in. on water-gauge (or 10·4 lb. per square foot).

Formula No. 2.

Area, 5 ft. × 5 ft. = 25 square feet = A.

$\frac{\text{Area}}{\text{Perimeter}} = \frac{25}{20} = 1·25$ „ = R.

$\frac{\text{Pressure}}{\text{Length}} = \frac{10·4}{6,000} = 0·0017333$ = S.

$\sqrt{RS} = \sqrt{1·25 \times 0·0017333} = 0·046547$

$\sqrt{RS}$ = 0·046547 Log. = $\bar{2}$·6678960
113 „ 2·0530784
Area, 25 „ 1·3979400
Seconds in a minute, 60 „ 1·7781513

3·8970657 = 7,889·9 cubic feet.

Say, 7,890 cubic feet per minute.

Formula No. 2.

Airway, 6·5976 ft. × 6·5976 ft. = 43·528 square feet, 6,000 ft. long, with 2 in. on water-gauge (or 10·4 lb. per square foot).

Area, 6·5976 × 6·5976 = 43·528 square feet = A.

$\frac{\text{Area}}{\text{Perimeter}} = \frac{43·528}{26·3904} = 1·6494$ „ = R.

$\frac{\text{Pressure}}{\text{Length}} = \frac{10·4}{6,000} = 0·0017333$ „ = S.

$\sqrt{RS} = \sqrt{1·6494 \times 0·001733} = 0·053469$

$\sqrt{RS}$ = 0·053469 Log. $\bar{2}$·7281033
113 „ 2·0530784
Area, 43·528 „ 1·6387640
Seconds in minute, 60 „ 1·7781513

4·1980970 = 15,780 cubic feet.

15,780 cubic feet per minute.

The carrying-capacity of the larger airway is twice the carrying-capacity of the other.

At page 142 of the "Miners' Guide" a rule is given to find the size of a rectangular airway equal to square airways (that is, equal in carrying-capacity). The question worked out is, What would be the width of a rectangular airway 7 ft. in height equal in carrying-capacity to a square

one having sides 8·093 ft.? Now, the area of an airway 8·093 square feet is 65·496, and this divided by 7, the height of the proposed airway, gives 9·3566, which is only the approximate width of the proposed airway, as, although the areas are equal, the mean depths are not equal, and they would not have the same carrying-capacity. This, however, can be corrected by the rule (Formula No. 5) —*the carrying-capacity of airways is proportional to the areas of the respective airways multiplied by the square roots of their respective mean depths (length and pressure being the same).* Thus—

Proposed Rectangular Airway.

Area, 65·496	Log.	1·8162148
Perimeter, 32·713	„	1·5147204
Mean depth	„	0·3014944
$\sqrt{\text{Mean depth}}$	„	0·1507472
Area, 65·496	„	1·8162148
92·675	=	1·9669620

Airway 8·093 ft. square.

Area, 65·496	Log.	1·8162148
Perimeter, 32·372	„	1·5101695
Mean depth	„	0·3060453
$\sqrt{\text{Mean depth}}$	„	0·1530226
Area, 65·496	„	1·8162148
93·162	=	1·9692374

Now, as 92·675 : 93·162 :: 65·496 : the required area—

93·162	Log.	1·9692374
65·496	„	1·8162148
		3·7854522
92·675	„	1·9669620
65·840	=	1·8184902 required area.

Required area, 65·840
7 × 9·3566 = 65·496

Second area too small by 00·344
$\frac{0·344}{7}$ = 0·0491 extra width.
9·3566 approximate width.
0·0491 extra width.

9·4057 required width.
7

65·8399 required area.

The working-out of this question in the "Miners' Guide" is correct, but the formula is too complicated. The formula here given is more simple, less liable to error, and the result shows it to be practically correct; it also shows the use of the mean depth, and the rules for determining the relative air-carrying capacity of various forms of airways.

NOTES ON MINE-VENTILATION (COMPARING WATER FORMULA WITH AIR FORMULA).

Water Formula.

$\sqrt{\text{RS } 10{,}560}$ = v. theoretical
or 102·76 $\sqrt{\text{RS}}$ = v. „
or 4 $\sqrt{2g\text{RS}}$ = v. practical.

Air Formula No. 1.

113 $\sqrt{\text{RS}}$ = v. practical.

What would be the velocity of water in a waterway 1,000 ft. long, 4 ft. square, with a head of 100 ft. of water?

Area, 4 ft. × 4 ft. = 16 ft. = A.
$R = \frac{A}{P} = \frac{16}{16} =$ 1 ft. = R.
$S = \frac{100·}{1{,}000} =$ 0·1 = S.
Coefficient = 0·32 = C.

Formula $\sqrt{\text{RS } 10{,}560}$ = theo. vel.
= 102·76 $\sqrt{\text{RS}}$.
= 102·76 $\sqrt{0·1}$.
= 102·76 × 0·316 = 32·47216 = theo. vel.
32·47216 × 0·32 = 10·3910912 = vel.

Air-pressure, 1·5524 in. on water-gauge = 8·07248 lb. per square foot.

Area, 4 ft. × 4 ft. = 16 ft. = A.
$R = \frac{A}{P} = \frac{16}{16} =$ 1 ft. = R.
$S = \frac{8·07248}{1{,}000} =$ 0·008072 = S.

Formula 113 $\sqrt{\text{RS}}$ = v.
R × S = 1 × 0·008072 = 0·008072
$\sqrt{\text{RS}} = \sqrt{0·008072} =$ 0·09
0·09 × 113 = 10·17 = vel.

Water Formula.

$\sqrt{\text{RS } 10{,}560}$ = v. theoretical
or 102·76 $\sqrt{\text{RS}}$ = v. „
or 4 $\sqrt{2g\text{RS}}$ = v. practical.

Air Formula No. 1.

113 $\sqrt{RS}$ = v. practical.

What would be the velocity of water in a waterway 1,000 ft. long and 8 ft. square, with a head of 100 ft. of water?

Area, 8 ft. × 8 ft. = 64 ft. = A. $R = \frac{A}{P} = \frac{64}{32} = 2$ ft. = R. $S = \frac{100}{1,000} = 0{\cdot}1 = S.$ Coefficient = 0·32 = C.

$102{\cdot}76\ \sqrt{RS} = 102{\cdot}76\ \sqrt{2 \times 0{\cdot}1}$
$= 102{\cdot}76\ \sqrt{0{\cdot}2} = 102{\cdot}76 \times 0{\cdot}447$
$102{\cdot}76 \times 0{\cdot}447 = 45{\cdot}93372$ = theo. vel.
$45{\cdot}93372 \times 0{\cdot}32 = 14{\cdot}69$ = $\sqrt{}$vel.

Air-pressure, 1·5524 in. on water-gauge = 8·07248 lb. per square foot.

Area, 8 ft. × 8 ft. = 64 ft. = A. $R = \frac{A}{P} = \frac{64}{32} =$ 2 ft. = R. $S = \frac{8{\cdot}07248}{1,000} = 0{\cdot}008072 = S.$

$113\ \sqrt{RS} = 113\ \sqrt{2 \times 0{\cdot}008072}$
$= 113\ \sqrt{0{\cdot}016144} = 113 \times 0{\cdot}127$
$113 \times 0{\cdot}127 = 14{\cdot}351$ = vel.

Formula No. 6.

This is in accordance with the following rule:—

The velocity of air in airways is proportional to the square roots of their respective mean depths, pressure and length being the same.

It will be seen that the velocity of water under a pressure of 100 ft. is practically the same as the velocity of air under a pressure equal to 1·5524 in. on the water-gauge (or 8·07248 lb. per square foot).

115 $\sqrt{RS}$ = velocity of air would make them more equal.

In the foregoing examples some of the calculations have been worked out in ordinary arithmetic, and some by logarithms, as in ordinary arithmetic. The method of working out the formula will be plainer and more easily understood by those who are not well up in the subject, but there is no doubt the calculations are much better and shorter when logarithms are used. The example given of the working of formula No. 4 by logarithms will show the great difference between the two methods if the same question be worked by ordinary arithmetic.

The formula for air (113 $\sqrt{RS}$ = velocity per second) is a modification of Eytelwein's general formula for water: "The mean velocity (in feet per second) of water in pipes and channels is equal to the square root of *the hydraulic mean depth in feet multiplied by twice the fall (in feet) per mile.*" Eytelwein's formula may also be stated as $\sqrt{R\ 10{,}560\ S}$ (or 10,276 $\sqrt{RS}$ = velocity per second).

Professor Rankine would state the above formula of Eytelwein's as: "The velocity of water (in feet per second) is equal to a mean proportional between the hydraulic mean depth (in feet) and the fall in 10,560 ft.; or thus, Mean depth : velocity : : velocity : fall in 10,560 ft.

Formula No. 1 (113 $\sqrt{RS}$ = velocity in feet per second) would be stated by Professor Rankine thus: "The velocity of air in ordinary mine-airways (in feet per second) is equal to a mean proportional between the pneumatic mean depth (in feet) and 12,769 times the pressure in pounds per square foot divided by the length of the airway (in feet), or R : velocity : : velocity : 12,769 S.

In many instances the calculations vary to a slight extent, as the decimals are not carried out far enough for absolutely correct work; in fact, it is impossible to do absolutely correct work in calculations for the velocity of water and air, as very slight differences in the conditions materially affect the results, but with care the results for all practical purposes will be correct, although not precise.

The whole of the formulæ are new in their application to ventilation of mines, and experts to whom they have been submitted and by whom they have been examined consider the results quite as correct as the more complicated formulæ now in use.

APPENDIX III.

MINE-MANAGERS' EXAMINATION-PAPERS.

QUESTIONS USED IN EXAMINATION OF MINING MANAGERS FOR SECOND-CLASS CERTIFICATES.

SUBJECT No. 1.—*On Prospecting, Shaft-sinking, Tunnelling, and opening out a Colliery.*

1. If placed in charge of prospecting operations in a new district, how would you proceed—
   (*a.*) To ascertain if coal existed on the ground?
   (*b.*) To ascertain the depth from surface, dip, strike, and general character?
2. State your experience in shaft-sinking. Describe the necessary plant required for such work under various conditions, and state usual difficulties met with.
3. How would you proceed to put in a walling curb in a shaft? And what form of cradle would you use in walling a shaft with brick?
4. Describe and show by sketches how you would proceed in driving a tunnel through heavy ground with side pressure.
5. State conditions regulating the size of pillars to be left for supporting colliery-shafts, and make sketch of what you think a good plan for the bottom of a winding-shaft, having in view the rapid handling of tubs.

SUBJECT No. 2.—*On working Coal and timbering underground.*

1. What system of coal-working have you been accustomed to? Describe same, with sketches and also system of timbering.
2. How would you secure a road where the floor lifts and there is heavy side pressure?
3. Many colliers are injured or killed by falls of roof and sides: state what you have noticed to be the principal cause of such accidents, and how, in your opinion, they may be avoided.
4. What is the effect of drawing the back timber when taking out pillars; and what precau tions are required to prevent injury to workmen when doing this work?
5. Give sketches of timbering (suitable) under the following conditions:—
   (*a.*) Good roof, but heavy side pressure.
   (*b.*) How timber set in a pitching seam.
   (*c.*) How chocks should be applied so as to effectually support roof, and be easily removed if necessary.
6. Describe precautions necessary to prevent accidents from blasting; say how, in your opinion, blown-out shots can be prevented.

SUBJECT No. 3.—*On the Gases of Mines, Spontaneous Combustion, and Ventilation.*

1. Describe the gases you have met with in your mining experience.
   (1.) Inflammable gas: If ever you discovered a body of this gas, what was its presence due to?
   (2.) What means would you adopt to remove this gas if you have—
      (*a.*) Furnace ventilation?
      (*b.*) Fan ventilation?
2. Describe the other gases you have met with, and state in what part of the mine they were present and to what their presence was due, and what (if any) means you adopt to remove such gases; also say what effect such gases have on animal life.
3. What has your experience been with the barometer and thermometer; and how do the changes affecting the two instruments affect the mines?
4. If you have a gassy and dusty mine, what arrangement would you make for blasting? Under ordinary circumstances, what rules have you seen applied for blasting?
5. What do you understand is meant by the term "spontaneous combustion"? Describe what steps you would adopt in dealing with an outbreak of fire in underground workings.
6. State conditions under which you would apply—
   (*a.*) Furnace ventilation, and
   (*b.*) Fan ventilation.
7. Which workings are easiest to ventilate, "dip" or "rise"? If any difference, state why.

SUBJECT No. 4.—*On dealing with old Workings and other Sources of Danger.*

1. What are the dangers to be guarded against in reopening old workings which have been sealed off for a length of time?
2. What precautions would you adopt in approaching old workings known to contain water? Show by sketches the plan on which you would carry forward your headings and means adopted to prevent accident.
3. Give sketch of suitable dam to resist a pressure of 100 lb. per square inch. Assume tunnel 8 ft. wide by 6 ft. high, explain how site should be prepared.
4. What dangers are to be apprehended from the existence of an extensive area of goaf or worked ground in a colliery; and what steps would you adopt to guard against accident? Also state whether you prefer goaf to be on the rise or dip side of your workings in a seam giving off firedamp.
5. What are the requirements of the Coal-mines Act regarding duties to be discharged by the manager and under-manager respectively of a colliery?
6. What, in your opinion, is the best explosive for use in coal-mines, having regard to the maximum of safety and effectiveness?

SUBJECT No. 5.—*On Mine Drainage and Haulage and Appliances for same.*

1. Say what experience you have had in the working of pumps for mine-drainage, and describe what, in your opinion, is the safest and most approved pumping-engine.
2. Give sketches of working-part of bucket-lift, naming the several parts.
3. Explain action of siphon and the law which governs its working.
4. Describe any system of haulage with which you have had experience, and give your reasons for preferring any special system.
5. What is the least inclination at which self-acting inclines will run successfully? Give sketch of what you consider a suitable drum and brake for an incline grade 1 in 5, lowering 5 tons of coal each run.
6. Describe what you consider an effective plan for the prevention of runaway tubs on inclines.

SUBJECT No. 6.—*Arithmetic, and a Knowledge of the Coal-mines Act.*

1. For driving a heading 6 ft. wide by 5 ft. high and 150 yards long the men are paid 9s. per cubic yard: how much money will be required to pay for the work?
2. How many gallons will a water-tank hold which is 10 ft. 6 in. long by 3 ft. 6 in. diameter?
3. Having to lay a tram-line 500 yards, double line, rails 20 lb. per yard; grading costs £1 5s. per chain; rails, £8 2s. 6d. per ton; sleepers, 6d. each; fastenings, 2 tons at £15 per ton labour, laying, 6d. per yard: what amount is required to pay for material and labour?
4. What are the rules as to fencing; and where and by whom may safety lamps be opened? What are the rules relating to signals? Describe duties of charge-men in sinking shafts as defined by special rules; also say what is required by special rule as to sprags or holing-props, and what are the duties and responsibilities of a fireman under the Act and special rules.

QUESTIONS USED IN EXAMINATION OF CANDIDATES FOR CERTIFICATES OF COMPETENCY AS FIRST-CLASS MINING MANAGERS.

SUBJECT No. 1.—*On Prospecting, Shaft-sinking, Tunnelling, and opening out a Colliery.*

1. How would you proceed to prospect for coal in a new district, and what are the indications on which you would rely in deciding that coal existed on the ground?
2. In undertaking the development of a coalfield, what are the considerations by which you would be guided in selecting position for shafts or adits?
3. In sinking through alluvial deposits subjacent to surface, say how you would line the shaft, and with what materials, and show by sketches how you would prepare for placing a water ring in shaft on which to start brick lining.
4. Assume a shaft 250 yards deep and seam of coal 8 ft. thick: state size of pillars you would leave to protect the shaft; also chief considerations that would guide you to determine this.
5. What are the necessary precautions required to protect workmen from injury in sinking shafts? State how you would ventilate a shaft during sinking, and the method of shot-firing you would adopt.
6. Describe and illustrate by sketches (giving dimensions) the way you would lay out roads at the bottom of the drawing-shaft of a colliery, the quantity of coal to be drawn being 600 tons per shift of eight hours.
7. Explain by sketches how you would timber a tunnel having bad roof and heavy side pressure; also give sketches showing how you would pick up a heavy fall.

SUBJECT No. 2.—*On working Coal and timbering underground.*

1. Explain, with sketches, the principles which should govern the timbering of working-places and roadways so as most effectually to resist the pressure of the ground.
2. Assume a mine worked on bord-and-pillar system, seam dipping 1 in 4: show by sketch-plan, the arrangements of workings and means used for the conveyance of coal from working-faces to haulage-roads, and state what contrivances and precautions should be adopted to insure safety of workmen.
3. State the considerations which would influence you in deciding on the system of working to be adopted in opening up a new colliery.
4. In working a mine on the long-wall system where the roof is soft and there are numerous breaks, show by sketches how you would timber the working-faces.
5. In removing or drawing timber what precautions are to be observed to avoid accident, and what tools do you consider necessary?
6. What explosives do you consider the best for use in fiery and non-fiery mines? Give the composition of the explosives, and state requirements of Coal-mines Act as to shot-firing and explosives generally.
7. Where gas is given off and the mine cannot be worked without blasting, what arrangements should you make to comply with the Coal-mines Act and to guard against accident?

SUBJECT No. 3.—*On Gases of Mines, Spontaneous Combustion, and Ventilation.*

1. Describe the properties of the different gases met with in coal-mines, how they are produced in the working of mines, and the effect they have on animal life.
2. Proto-carburetted hydrogen gas: What percentage of this gas is required to be mixed with air to enable you to detect its presence on the flame of a lamp, and what proportion of air to this

gas renders the explosive force greatest? What is the weight of this gas as compared with atmospheric air?

3. Describe what gases you would expect to find in the different portions of the mine—viz., in goaves, roads, in the roof or floor of the mine. If gases are found to exist, what part of the Coal-mines Act would you be guided by in dealing with same?

4. What is meant by "spontaneous combustion" or "gob-fires" in a mine? How are they produced? And show how you would deal with a difficulty of this kind.

5. What do you understand by the terms "ascensional" and "descensional" ventilation? Which do you prefer? Give reasons.

6. How many cubic feet of air per minute would, in your opinion, be required for the adequate ventilation of a colliery in which 400 persons are employed underground in one shift? How many splits would you think desirable?

7. Describe the methods adopted for splitting, regulating, and crossing air-currents in mines worked under the long-wall and bord-and-pillar systems.

8. Describe and give sketch of any ventilating-fan of which you have knowledge, and say what system of ventilation you prefer, "fan" or "furnace," and give reasons.

SUBJECT No. 4.—*On dealing with old Workings and other Sources of Danger.*

1. State danger to be guarded against in approaching old workings known to contain an accumulation of water under pressure, and show bb sketches the precautions you would adopt in carrying on the headings.

2. In opening up workings which have been standing idle for some time, what precautions would you take to guard against accident?

3. State requirements of Coal-mines Act as to shot-firing in fiery mines, and say what other precautions you would take, if any. What is a "missed shot" and what is a "blown-out shot"; and how may these be caused and what are the dangers arising from these?

4. How would you construct a dam in a tunnel 10 ft. by 6 ft., to withstand a pressure of 150 lb. per square inch? Give a sketch of same and details of materials to be used.

5. Is it necessary to maintain the ventilation of a mine when the mine is not working? Give reasons for your reply.

6. How may an explosion of coal-dust be caused in a mine, and what steps should be enforced to prevent such?

7. Describe the duties of a fireman under the Coal-mines Act.

SUBJECT No. 5.—*On Steam Boilers and Engines used about Mines.*

1. Describe what you consider the best type of boiler for the safe and economical generation of steam for colliery use; and give sketch showing boiler with fittings in place, with description of same.

2. Assume a Lancashire boiler 25 ft. by 7 ft. 6 in.: give calculation showing thickness of plates and size of rivets required for a working-pressure of 100 lb. per square inch. Fix your own margin of safety.

3. If the safety valve is $4\frac{1}{4}$ in. diameter, and the lever is 30 in. long from centre of valve to centre of weight and $3\frac{3}{4}$ in. from the fixed point to the centre of the valve, and the weight on the lever is 75 lb., what is the pressure per square inch?

4. What is the nominal horse-power of a high-pressure engine the cylinder of which is 18 in. diameter by 36 in. stroke, the initial pressure of steam being 75 lb. per square inch? Fix your own speed.

5. State kind of ventilating-fans you would advise for passing 120,000 cubic feet of air per minute, speed of fan or revolutions, size of engine-cylinder or stroke; also explain how you would test the fan's efficiency.

6. A ventilating-fan running at 45 revolutions per minute produces a water-gauge of 1·75 in.: what will the water-gauge be if the fan-speed is increased to 60 revolutions per minute?

7. What are the principal points to be observed for the safe working of steam boilers and engines? Give these in detail and the steps you would take to have same effectually carried out.

SUBJECT No. 6.—*On Mine Drainage and Haulage, and Appliances for same.*

1. Having to raise 200 gallons of water per minute up an inclined plane 600 yards long rising 1 in 5, what class of pump would you adopt? Give sketches showing style of pump, size of suction and delivery pipes, and state mode of actuating the pump and the pressure of the column of water against which it is required to work.

2. In a shaft where it is required to raise 500 gallons per minute from a depth of 600 ft., describe class of engine you would adopt, give size of the respective sets of pumps, show by sketch their position in shaft, and state horse-power required to do the work.

3. What are the principal purposes for which electricity is applied to the working of coal-mines? State experience you have had (if any) in the use of this power, and what advantages are obtainable by using it.

4. What size hauling-engine would be required to haul 50 tons of coal per shift by direct haulage up an incline 1,000 yards long rising 1 in 10, the effective steam-pressure to be 60 lb. per square inch? Assume you own weight of tubs and ropes.

5. In fitting up a shaft 250 yards deep, from which it is required to raise 500 tons per shift of eight hours, what size of engines and boilers would you erect? Give dimensions of cylinder, drums, head-gear, pulleys, and ropes.

6. State your practical experience in surface and underground haulage. Should you fix the engine or motive power on the surface or underground? Describe the tail-rope and endless-rope systems, and say which you prefer.

7. Describe all the safety appliances and attachments you consider necessary from the winding-engine to the cages, signals, &c., and state what inspections are necessary to be made of colliery machinery. Explain in detail how ropes and chains should be examined.

SUBJECT No. 7.—*On Geology, Surveying, and making Plans.*

1. Give a section of the strata in which coal-seams are found in any New Zealand colliery with which you are practically acquainted, and state your opinion as to the geological period to which the rocks belong.

2. Show by sketches the effect of anticlinal and synclinal folds, and what is meant by "upthrow," "downthrow," and "overlap" faults.

3. Why are coals classified as hydrous and anhydrous?

4. Candidates to produce a plan showing the workings of a colliery with the surface taken up for at least 20 acres in the vicinity of the shaft or adit, and the workings in different-coloured ink. The connection of surface with underground must be shown and described in the event of there being only one shaft. The levels and main headings must have assumed traverse calculated in detail, and showing latitude and departure for each bearing. The plan to be candidate's own work, and to be accompanied by field-book.

5. Sketch as accurately as possible the following bearings, and calculate the latitude and departure, and give the course and length of the 6th set to tie with the start of 1st set:—

1. N. 40° W., 400 links.
2. N. 10° E., 500 "
3. S. 65° E., 400 "
4. S. 10° E., 500 links.
5. S. 40° E., 300 "

6. How would you proceed to make a survey with fast needle? Describe process of plotting same.

7. State what precautions you would take to avoid errors from a variation of the magnetic meridian in extending new work on an old plan.

SUBJECT No. 8.—*Arithmetic, and a Knowledge of "The Coal-mines Act, 1891."*

1. The diameter of a shaft after walling with 9 in. brick is 10 ft.: how many cubic yards of ground will have to be taken out in sinking the shaft to a depth of 150 yards?

2. How many gallons of water will a pump of the following dimensions throw in twelve hours, allowing 10 per cent. for loss: Diameter of pump, 18 in.; length of stroke, 8 ft.; number of strokes per minute, 8?

3. How many feet must a ton be raised in one minute to give 100-horse power effective?

4. How much would be required to pay colliers for hewing 3,325 tons 19 cwt. at 2s. 3½d. per ton? And how much more if compelled to advance hewing-rate 7½ per cent.?

5. State requirements of Coal-mines Act as to—
   (*a.*) The duties and responsibilities of the manager;
   (*b.*) The duties and responsibilities of under-manager; and
   (*c.*) Fireman.

6. State the requirements of the Coal-mines Act as to—
   (*a.*) Fencing disused places;
   (*b.*) Refuge-holes on haulage-roads;
   (*c.*) Safety lamps and signals.

ADDENDA.

List of persons to whom certificates as managers of coal-mines were granted, and who have died since the issue of such certificates:—

First-class Certificates.

Issued under the Coal-mines Acts, 1886 and 1891.

Brown, Thomas, Westport.
Elliott, Robert, Wallsend.
Geary, J., Kamo.
Harrison, Jonathan, Brunnerton.
Louden, James, Green Island.
Redshaw, William, Whangarei.
Richardson, D., Abbotsford.
Shore, W. M., Kaitangata.
Smart, W., Christchurch.

Issued after Examination, under the Coal-mines Acts, 1886 and 1891.

Newsome, F., Denniston.

Issued by Virtue of Office, under the Coal-mines Acts, 1886 and 1891

Gow, J., Dunedin.

Issued on Production of Certificate from Great Britain or other Places outside the Colony, under the Coal-mines Acts, 1886 and 1891.

Garrett, J. H., Auckland.
Lindop, A. B., Springfield.
Nimmo, J., Oamaru.
Proud, Jos., Wanganui.

Second-class Certificates.

Nimmo, G. S., Ngapara.
Roberts, J., Brunnerton.
Ross, J., Kawakawa.
Willetts, John, Papakaio

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APPENDIX IV.

LIST of PERSONS who have obtained CERTIFICATES as MINE-MANAGERS under the Coal-mines Acts of 1886 and 1891.

THE COAL-MINES ACT.

FIRST-CLASS MINE-MANAGERS' CERTIFICATES.

Issued under the Coal-mines Acts, 1886 and 1891.

Aitken, T., Wendon.
Alexander, T., Brunnerton.
Austin, J., Sheffield.
Binns, G. J., Dunedin.
Bishop, J., Brunnerton.
Brown, T., Westport.
Brown, T., Glentunnel.
Cameron, J., Denniston.
Campbell, J. C., Fairfield.
Cochrane, N. D., Dunedin.
Collins, W., Taupiri.
Dando, M., Brunnerton.
Elliott, R., Wallsend.
Ferguson, A., White Cliffs.
Freeman, J., Green Island.
Geary, J., Kamo.
Gray, J., Abbotsford.
Harrison, J., Brunnerton.
Irving, J., Kaitangata.
Jemison, W., Waimangaroa.
Kenyon, J., Shag Point.
Kerr, G., Kamo.
Lindsay, W., Otago.
Lloyd, J., Invercargill.
Louden, J., Green Island.
Love, A., Whangarei.
Mason, J., Nightcaps.
May, J., Greymouth.
Moody, T. P., Kawakawa.
Moore, W. J., Springfield.
Nelson, J., Green Island.
Ord, J., Huntly.
Redshaw, W., Whangarei.
Reed, F., Westport.
Richardson, D., Abbotsford.
Shore, J., Kaitangata.
Shore, T., Orepuki.
Shore, W. M., Kaitangata.
Smart, W., Christchurch.
Smith, A. E., Nelson.
Smith, T. F., Nelson.
Sneddon, J., Mosgiel.
Swinbanks, J., Kawakawa.
Taylor, E. B., Huntly.
Thompson, A., White Cliffs.
Walker, J., Collingwood.
Williams, W. H., Shag Point.

First-class Certificates issued after Examination under the Coal-mines Acts, 1886 and 1891.

Armitage, F. W., Auckland.
Armstrong, J., Brunnerton.
Barclay, T., Kaitangata.
Barclay, W., Kaitangata.
Bennie, Boyd, Waihi.
Carruthers, J., Shag Point.
Carson, W., Kaitangata.
Coombe, J., Waihi.
Coulthard, J., Taylorville.
Dixon, C. W., Granity.
Dixon, W., jun., Kaitangata.
Dunn, Andrew, Denniston.
Dunn, W., Brunnerton.
Dunn, W. R., Thames.
Elliott, R., jun., Denniston.
Fleming, J., Kaitangata.
Fletcher, James, Granity.
Fry, Sydney, Waimangaroa.
Gibson, John, Westport.
Gillanders, A., Shag Point.
Gowans, W., Millerton.
Green, E. R., Abbotsford.
Green, J., Brunnerton.
Herd, J., Brunnerton.
Hill, Robert, Abbotsford.
Hosking, G. F., Auckland.
Hughes, D., Preservation Inlet.
Jebson, D., Canterbury.
Johnson, W. P., Thames.
Leitch, J., Blackball.
Leitch, W., Blackball.
McCormack, W., Denniston.
McEwan, Robert, Coromandel.
McGeachie, J., Mokau.
Milligan, N., Westport.
Morgan, Wm., Waihi.
Murray, T., Westport.
Newsome, F., Denniston.
Newton, James, Brunnerton.
Shore, Joseph, Kaitangata.
Sowerby, H., Denniston.
Tattley, E. W., Huntly.
Taylor, A. H., Waikato.
Turner, G. F., Shag Point.
Westfield, C. H., Fairfield.
Young, James H., Waimangaroa.

Mine-managers' Certificates, issued on Production of English Certificate, under "The Coal-mines Act, 1886."

Binns, G. J., Dunedin.
Black, T. H., Waipori.
Broome, G. H., Ngakawau.
Cater, T., Auckland.
Cochrane, N. D., Dunedin.
Garrett, J. H., Auckland.
Hayes, J., Kaitangata.
Hodgson, J .W., Ross.
Lindop, A. B., Springfield.
Macalister, J., Invercargill.
Nimmo, J., Oamaru.
Straw, M., Westport.
Tattley, W., Auckland.

First-class Mine-managers' Certificates, issued to Inspectors of Mines by virtue of Office, under the Coal-mines Acts of 1886 and 1891.

Coutts, J., Thames.
Gordon, H. A., Wellington.
Gow, J., Dunedin.
McLaren, J. M., Thames.
Wilson, G., Thames.

Mine-managers' Certificates, issued on Production of Certificate from a recognised Authority outside the Colony under "The Coal-mines Act, 1891."

Alison, R., Greymouth.
Dixon, J., Westport.
Fletcher, George, Westport.
Frame, Joseph, Kaitangata.
Goold, A. L., Auckland.
Irvine, James, Dunedin.
Jordan, R. S., Kaitangata.
Kirkwood, D., Coromandel.
Lewis, W., Blackball.
Pollock, James, Green Island, Otago.
Proud, Joseph, Wanganui.
Scott, Joseph, Ngahere.
Tennent, R., Brunnerton.
Twining, C. E., Dunedin.
Wight, E. S., Auckland.

SECOND-CLASS MINE-MANAGERS' SERVICE CERTIFICATES.

Issued under "The Coal-mines Act, 1891."

Carson, M., Kaitangata.
Collier, Levi, Kamo.
Clarke, Edward, Shag Point.
Elliot, Joseph, Coal Creek.
Harris, John, Denniston.
Herd, Joseph, Brunnerton.
Howie, James, Kaitangata.
Leeming, William, White Cliffs.
Lennox, W., Springfield.
Lobb, Joseph, Mokau.
Longstaff, H. C., Kaitangata.
Love, Alexander, Orepuki.
McGeachie, J., jun., Mokau.
McIntosh, Allan, Shag Point.
McLaren, J. M., Thames.
Marshall, J., Ngakawau.
Murray, Thomas, Denniston.
Nimmo, George Stewart, Ngapara.
Radcliffe, William, Reefton.
Roberts, John, Brunnerton.
Ross, John, Kawakawa.
Sara, James, Reefton.
Smith, Charles, Whangarei.
Thomas, James, Springfield.
Wallace, William, Huntly.
Willetts, John, Papakaio.
Willetts, John Morris, Papakaio.
Young, William, Waimangaroa.

Second-class Certificates issued after Examination under the Coal-mines Acts, 1886 and 1891.

Austin, W. B., Sheffield.
Barber, John, Shag Point.
Barclay, T., Kaitangata.
Barclay, Wm., Kaitangata.
Brown, Robert, Kaitangata.
Campbell, Peter, Fairfield.
Cherrie, R. C., Mokau.
Christie, James, Saddle Hill.
Clemo, G., Whangarei.
Craig, John, Coal Creek Flat.
Dixon, W., jun., Kaitangata.
Duncan, James, Kaitangata.
Duncan, John, Lovell's Flat.
Fox, R. A., Blackball.
Harris, A., Saddle Hill.
Hill, R., Abbotsford.
Hodson, John, Kaitangata.
Hunter, A., Southland.
Lindsay, J. B., Orepuki.
McAllister, Neil, Kaitangata.
McLelland, J., Kaitangata.
McLelland, A. C., Kaitangata.
McNeill, D., Fairfield.
Neilson, Moffat, Abbotsford.
Orr, Hugh, Fairfield.
Parcell, W., jun., Bannockburn.
Snow, T., Mercer.
Tattley, F. J., Mercer.
Taylor, Joseph, Collingwood.
Waldie, A. B., Mokau.
Westfield, C., Fairfield, Otago.

APPENDIX V.

Statistics of Workings in Coal-mines, 1903.

Name of Mine and Locality.	Name of Manager.	Number of Years worked.	Quality of Coal.	No. of Seams worked.	Thickness of Seams.	Thickness worked.	Dip of Seam.	System of Underground Working.	Number of Shafts.	Dimensions of Shafts.		Output delivered by	Output for 1903.			Approximate Total Output to 31st December, 1902.	Approximate Total Output to 31st December, 1903.	Number of Men ordinarily employed.			Power used for drawing Mineral.	Pumps.			Means of Ventilation.	Date of Inspector's Last Visit.
										Size of Shaft or Adit.	Depth of Shaft or Length of Adit.		Coal.	Slack.	Total.			Above.	Below.	Total.		Stroke.	Size of Barrel.	Height of Column.		
NORTH ISLAND.																										
Kawakawa District.													Tons.	Tons.	Tons.	Tons.	Tons.									
Kawakawa Company (*stopped*)	..	..	semi-bitum.	..	..	..	..	..	..	..	..	..	..	..	..	794,865	794,865	..	..	..	..	..	..	..	..	..
Kawakawa Mine	Culley, John ..	5	ditto	1	5	5′	1 in 7	bord and pillar	1	6′ x 4′	200′	adit	3,443	..	3,443	62,969	66,412	2	4	6	horse	..	..	..	natural	3/11/03
Hikurangi District.																										
Hikurangi Coal Company ..	Moody, T. P. ..	11	"	1	7′ to 12′	7′ to 10′ 6″	1 in 6	ditto	2	6′ x 5′	264′	adits	39,625	..	39,625	275,995	315,620	6	49	55	steam & horse	10″	8″	50′	"	2/11/03
Northern Collieries ..	Dunn, W. R. ..	6	"	1	6′	6′	1 in 8	"	2	6′ x 6′	200′	"	22,382	..	22,382	52,928	75,310	10	25	35	manual	..	..	..	"	2/11/03
Phœnix and West Bryan's ..	McEwen, R. ..	15	"	1	8′ to 11′	8′ to 11′	1 in 6	"	2	6′ x 4′ 6′ x 5′	45′ 200′	"	6,234	..	6,234	63,053	69,287	2	12	14	steam	7½″	4½″	60′	"	2/11/03
Walton and Grahams ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1,210	1,210	..	..	..	..	..	..	..	..	..
Whangarei District.																										
Kamo (*stopped*)	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	225,037	225,037	..	..	..	..	..	..	..	..	..
New Kamo (*stopped*) ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	9,373	9,373	..	..	..	..	..	..	..	..	..
Whauwhau (*stopped*) ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	70,853	70,853	..	..	..	..	..	..	..	..	..
Ngunguru District.																										
Ngunguru Mine	Taylor, A. H. ..	11	semi-bitum.	1	2′ to 4′	2′ to 4′	1 in 9	bord and pillar	2	4′ x 4′ 7½′ x 6′	35′ 924′	adit incline	17,824	..	17,824	150,944	168,768	12	40	52	steam-engine	..	..	..	natural	4/11/03
Panipo	Clemo, George ..	4½	ditto	1	16′	6′ to 12′	1 in 6	ditto	1	7′ x 5′	462′	adit	12,011	..	12,011	42,991	55,002	2	14	16	horses	..	..	..	"	4/11/03
Waikato District.																										
Waikato Mine (*stopped*) ..	..	..	brown	..	..	..	..	..	..	..	..	..	..	..	..	209,089	209,089	..	..	..	..	..	..	..	..	..
Taupiri Extended	Wight, E. S. ..	15½	"	1	30′	20′	1 in 10	bord and pillar	2	10′ dia.	166′	shaft	15,963	2,383	18,346	640,854	659,200	10	43	53	steam-engine	24″	10″	166′	fan	4/9/03
									1	7′	209′											12″	5″	210′		
Taupiri Reserve	"	16½	"	1	10′ to 24′	6′ to 18′	1 in 8	ditto	1	8′ x 6′	50′	adit	15,849	2,268	18,117	261,983	280,100	2	6	8	ditto	12″	7″	220′	steam-pipes	3/11/03
Ralph's Taupiri	"	10½	"	1	30′ to 50′	20′	1 in 10	"	2	9′ 6″ x 5′	190′	shafts	54,436	4,657	59,093	176,485	235,578	20	90	110	"	12″	7″	190′	fan	3/11/03
										8′ 6″ dia.	145′	"									24″	6″	260′		
Ralph's (*stopped*)	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	23,019	23,019	..	..	..	..	..	..	..	..	..
Harrison's (*stopped*) ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	10,622	10,622	..	..	..	..	..	..	..	..	..
Mokau District.																										
Mangapapa	McGeachie, J. ..	19	brown	1	6′ to 8′	6′ to 8′	1 in 10	bord and pillar	1	9′ x 6′	1,000′	adit	4,930	1,220	6,150	29,572	35,722	3	10	13	horse	..	..	..	furnace	16/6/03
Fernside (*stopped*) ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3,265½	3,265½	..	..	..	..	..	..	..	..	..
Co-operative (*stopped*) ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	940	940	..	..	..	..	..	..	..	..	..

MIRANDA DISTRICT.																											
Miranda (*stopped*)	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	20,668	20,668	..	..	..	..	..	..	..	..
Union Collieries	Tattley, William	3	brown	1	50′	12′ to 20′	1 in 6	bord and pillar	1 1	4′ x 4′ 6′ x 6′	90′ 200′	incline adit	6,570	..	6,570	3,923	10,493	8	12	20	steam	12″ 6″	6″ 5″	90′	natural	16/7/03
BOMBAY DISTRICT.																											
Bombay (*stopped*)	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	81½	81½	..	..	..	..	..	..	..	..
Totals North Island	..	..	..	..	..	..	..	..	..	..	..	..	199,267	10,528	209,795	3,130,720	3,340,515	77	305	382							

MIDDLE ISLAND.

NELSON.																											
Enner Glynn (*not at work*) ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1,337	1,337	..	..	..	..	..	..	..	..	..	..
COLLINGWOOD.																											
Pakawau (*not at work*) ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	4,873	4,873	..	..	..	..	..	..	..	..	..	..
Puponga	Walker, James ..	8	bitum.	1	7′ 6″	7′ 6″	1 in 4	bord and pillar	..	8′ x 6′ 6″	200′	adit	1,002	100	1,102	1,000	2,102	20	15	35	steam	..	..	..	natural	12/9/03
Wallsend (*not at work*) ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	47,413	47,413	..	..	..	..	..	..	..	..	..	..
TAKAKA.																											
Mines not at work.																											
Motupipi	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	130	130	..	..	..	..	..	..	..	..	..	..
Takaka	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	70	70	..	..	..	..	..	..	..	..	..	..
WESTPORT.																											
Mokihinui	Ratcliffe, W. ..	23	bitum.	1	5′	5′	1 in 7	bord and pillar	1	7′ x 8′	396′	adit	1,000	..	1,000	79,710	80,710	3	9	12	manual	..	..	..	natural	21/12/03
Seddonville	Murray, Thomas	2	„	1	14′	8′	1 in 5	ditto	1	10′ x 7′	1,650′	„	2,017	..	2,017	120	2,137	15	30	45	steam	..	..	..	steam-jet fan	21/12/03
Millerton	Dunn, William ..	12	„	1	4′ to 40′	approx. 12′	variable	„	3	10′ x 6′	2,178′	„	280,906	32,678	313,584	934,727	1,248,311	105	278	383	gravity	12″	4″	140′	fan	23/12/03
Coalbrookdale	Green, John ..	23	„	2	4′ to 18′	all	„	„	2	8′ x 8′ 9′ x 5′	2,970′ 8,146′ 2,640′	„	89,625	26,771	116,396	3,347,748	3,599,355	20	172	192	steam and compressed air	6″ 10″	3″ 6″	20′ 15′	„ „	.. ..
Ironbridge	Sowerby, H. ..	12	„	2	6′ to 20′	„	„	„	2	8′ x 6′	9,048′	„	104,113	31,098	135,211			14	143	157		12″	5″	25′	„	..
Westport Cardiff (*not at work*)	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	227,441	227,441	..	..	..	..	..	..	..	..	..	..
BULLER ROAD.																											
White Cliffs	Stone, W. ..	9	brown	1	9′	9′	1 in 4	bord and pillar	2	10′ x 7′	200′	adit	277	..	277	1,130	1,407	..	1	1	natural	..	..	..	natural	31/10/03
Rocklands	Walker, George ..	3	„	1	15′	8′	1 in 6	„	2	8′ x 8′	1,190′	„	2,021	..	2,021	1,975	3,996	..	1	1	manual	..	..	..	„	31/10/03
Waitakere (*not at work*) ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	868	868	..	..	..	..	..	..	.	..	..	..
THREE-CHANNEL FLAT.																											
Flaxbush	Smith, Edward ..	2	bitum.	2	4′	4′	1 in 1	stope	..	5′ x 6′	280′	adit	800	..	800	890	1,690	1	2	3	manual	..	..	..	natural	9/6/03
Longford (*not at work*) ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1,830	1,830	..	..	..	..	..	..	..	..	..	..
Alexander (*not at work*) ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	282	282	..	..	..	..	..	..	..	..	..	..
Cocksparrow (*not at work*) ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	959	959	..	..	..	..	..	..	..	..	..	..

Statistics of Workings in Coal-mines, 1903—*continued*.

Name of Mine and Locality.	Name of Manager.	Number of Years worked.	Quality of Coal.	No. of Seams worked.	Thickness of Seams.	Thickness worked.	Dip of Seam.	System of Underground Working.	Number of Shafts.	Dimensions of Shafts.		Output delivered by	Output for 1903.			Approximate Total Output to 31st December, 1902.	Approximate Total Output to 31st December, 1903.	Number of Men ordinarily employed.			Power used for drawing Mineral.	Pumps.			Means of Ventilation.	Date of Inspector's Last Visit.
										Size of Shaft or Adit.	Depth of Shaft or Length of Adit.		Coal.	Slack.	Total.			Above.	Below.	Total.		Stroke.	Size of Barrel.	Height of Column.		
MIDDLE ISLAND—*continued*.																										
													Tons.	Tons.	Tons.	Tons.	Tons.									
BOATMAN'S.																										
Archer's Mine	Archer, F. W. ..	10	bitum.	1	10′ to 14′	9′	1 in 2½	bord and pillar	..	6′ 6″ x 4′ 6″	700′	adit	1,600	..	1,600	3,480	5,080	2	4	6	manual	..	..	..	natural	12/2/04
Coghlan's Mine	Coghlan, J. ..	..	„	1	12′	8′	1 in 3	ditto	..	6′ x 4′	340′	„	120	360	480	710	1,190	..	1	1	„	..	..	..	„	30/9/03
REEFTON.																										
Burke's Creek	Cairns, R. ..	2	brown	1	14′	11′	variable	bord and pillar	1	9′ x 9′	200′	„	362	..	362	5,135	5,497	1	2	3	horse	..	..	..	„	5/10/03
Murray Creek	Morris, J. H. ..	25	semi-bitum.	1	..	..	..	open face	..	..	..	..	320	1,800	2,120	11,949	14,069	..	..	..	..	..	..	..	..	..
Phœnix	Knight, John ..	24	ditto	2	20′	10′	1 in 1	bord and pillar	..	11′ x 10′	1,000′	adit	1,673	..	1,673	17,331	19,004	4	3	7	horse	..	..	..	natural	2/10/03
New Inkerman	Sutherland, B. ..	6	„	1	5′	5′	1 in 1	stope	1	6′ x 4′	420′	„	700	750	1,450	2,255	3,705	..	2	2	manual	..	..	..	„	..
Progress	Cochrane, Thomas	30	„	2	2′ to 18′	all	1 in 2	bord and pillar	1	8′ x 6′	600′	„	2,120	..	2,120	13,806	15,926	2	4	6	„	..	..	..	„	3/10/03
Lankey's Creek	Ellery, John ..	1	„	1	7′	6′	1 in 4	ditto	..	6′ x 4′	400′	„	149	1	150	8,228	8,378	..	2	2	„	..	..	..	„	29/8/03
Reefton	Blackadder, D. ..	1	„	1	12′	8′	1 in 3	„	..	6′ x 3′ 9″	250′	„	228	..	228	40	268	..	2	2	„	..	..	..	furnace	27/9/03
Mines not at work.																										
Barr's Mine	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	35	35	..	..	..	..	..	..	..	..	..
Loughnan's	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1,713	1,713	..	..	..	..	..	..	..	..	..
Devil's Creek	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	40	40	..	..	..	..	..	..	..	..	..
Golden Treasure	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	6,625	6,625	..	..	..	..	..	..	..	..	..
Cochrane's	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	370	370	..	..	..	..	..	..	..	..	..
New Scotia	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	62	62	..	..	..	..	..	..	..	..	..
Sir Francis Drake	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2,173	2,173	..	..	..	..	..	..	..	..	..
Cumberland	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1,070	1,070	..	..	..	..	..	..	..	..	..
Coal Creek	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	67	67	..	..	..	..	..	..	..	..	..
GREYMOUTH.																										
Blackball	Leitch, W. ..	13	bitum.	2	17′	15′	1 in 5	bord and pillar	..	9′ x 6′	1,232′	adit	76,058	12,891	88,949	535,312	624,261	40	141	181	steam	5¾″	6″	90′	furnace	29/9/03
										10′ x 7′	600′										6″	4″	85′		
Brunner	Coulthard, J. ..	39	„	1	10′ to 12′	all	1 in 4	ditto	..	10′ x 7′	800′	„	67,614	24,666	92,280	1,963,160	2,055,440	24	100	124	„	..	..	..	fan	..
Tyneside	Armstrong, James	21	„	1	12′	12′	1 in 4	„	1	10′	90′	shaft	11,391	5,821	17,212	18,681	35,893	6	30	36	„	12″	7″	90′	natural	25/9/03
																						4″	6″			
Point Elizabeth	Herd, James ..	..	„	2	16′ to 12′	8′	1 in 4	development only	4	3 10′ x 7′ 1 7′ x 7	..	adit	..	..	..	..	..	45	51	96	..	..	..	..	fan	30/12/03
Mines not at work.																										
Coal-pit Heath	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	577,190	577,190	..	..	..	..	..	..	..	..	..
Wallsend	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	205,539	205,539	..	..	..	..	..	..	..	..	..

CANTERBURY.																										
Springfield, Springfield ..	Horsley, T. N. ..	27	brown	1	3′ 3″	all	1 in 6	bord and pillar	2	6′ 6″ x 4′	70′	shaft	1,053	..	1,053	87,248	88,301	1	5	6	steam	direct	acting	steam exhaust from pump	25/5/03
Victoria, Springfield ..	Cloudesley, W. J.	3	"	1	4′	"	1 in 6	longwall	1	4′ 6″ x 3′	50′	adit	180	..	180	253	433	..	3	3	horse	..	..	..	natural	25/5/03
Homebush, Glentunnel ..	Campbell, J. C. ..	31	"	2	3′ and 7′	"	1 in 3	bord and pillar	..	6′ x 6′	40 ch.	tunnel	11,235	915	12,150	141,764	153,914	3	25	28	horse & steam	..	..	..	"	17/12/03
St. Helen's, White Cliffs ..	Levick, H. ..	22	"	4	8′ 4′ 6″ 3′ 2′ 10″	"	1 in 3	pillar, stope, and wall	1	4′ 6″ x 3′ 7″	90′ 5 ch.	adit	1,626	..	1,626	10,063	11,689	1	3	4	hand	..	..	..	"	17/12/03
Brockley, Glenroy	W. Woods ..	3	"	1	3′ 6″	"	vertical	..	..	..	..	..	149	..	149	155	304	..	2	2	horse	..	..	..	"	17/12/03
Woolshed Creek Coal-mine Company, Mount Somers*	Harris, J. ..	39	"	1	40′	15′	1 in 9	bord and pillar	..	..	..	adit	2,307	86	2,393	39,238	41,631	..	6	6	"	..	..	..	"	22/5/03
Mount Somers, Mount Somers	Thompson, A. ..	2	"	1	35′	10′	south 1 in 4½	ditto	1	5′ x 4′	25′	..	3,538	273	3,811	5,426	9,237	3	7	10	"	..	..	..	"	22/5/03
Albury, Albury	Willetts, J. M. ..	12	"	1	22′		1 in 1	"	1	4′ x 3′ 6″	68′	adit	892	..	892	4,494	5,386	2	2	4	"	..	..	..	"	..
Waihao, Waihao Forks ..	Adamson, A. ..	14	lignite	1	14′	all	..	"	..	..	..	"	606	..	606	1,285	1,891	1	2	3	hand	..	..	..	"	20/10/03
Waihao Forks, Waikao Forks	McPherson, D. ..	11	"	1	6′	"	..	open	..	..	..	open	40	..	40	226	266	1	..	1	..	..	..	..	..	20/10/03
Elephant Hill, Waihao Downs	Adamson, A. ..	35	brown	1	..	..	..	bord and pillar	..	..	..	..	115	..	115	180	295	..	..	..	..	..	..	..	natural	20/10/03
Private Pits.																										
Dalethorpe, Springfield ..	Campbell, P. ..	9	"	1	6′	all	..	..	..	..	..	..	42	..	42	251	293	..	..	..	..	..	..	..	"	25/5/03
McKenzie's, Castle Hill ..	McKenzie, J. ..	2	"	..	..	..	..	..	..	..	..	..	..	..	..	1	1	..	..	..	..	..	..	..	..	..
Snowdon, Rakaia Gorge ..	Gerard, George ..	18	"	1	14′	8′	..	narrow	1	4′ x 4′	90′	shaft	100	..	100	1,618	1,718	..	..	..	..	..	..	..	natural	18/12/03
				1	6′	all																				
Craigieburn, West Coast Road	Manson, D. ..	7	"	1	..	..	..	open	..	..	..	open	30	..	30	183	213	..	..	..	..	..	..	..	..	..
Springburn Lime Company, Staveley	Scott, R. L., Secretary, Ch'stch'ch	3	"	1	5′	all	vertical	levels	..	5′ x 4′	150 yd.	adit	340	..	340	365	705	..	..	..	..	..	..	..	natural	..
Pits not at work.																										
Wairiri, South Malvern ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1,213	1,213	..	..	..	..	..	..	..	..	..
Acheron, Lake Coleridge ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	503	503	..	..	..	..	..	..	..	..	..
Kowai Pass, Springfield ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	559	559	..	..	..	..	..	..	..	..	..
Glenroy, South Malvern ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	115	115	..	..	..	..	..	..	..	..	..
White Cliffs, South Malvern	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	33,051	33,051	..	..	..	..	..	..	..	..	..
Duke's (Park Gate) Kakahu	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	916	916	..	..	..	..	..	..	..	..	..
Spring Vale, Fairlie Creek ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	200	200	..	..	..	..	..	..	..	..	..
Mount Hutt, Rakaia Gorge ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	155	155	..	..	..	..	..	..	..	..	..
Sheffield, Sheffield	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	52,284	52,284	..	..	..	..	..	..	..	..	..
Hartley, White Cliffs ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1,991	1,991	..	..	..	..	..	..	..	..	..
Campbell's, Springfield ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	110	110	..	..	..	..	..	..	..	..	..
NORTH OTAGO.																										
Dalgety (including Rocky Point), Hakataramea	Drysdale, J. ..	22	brown	1	12′		..	bord and pillar	..	..	..	adit	2,087	..	2,087	180	2,267	..	1	1	..	..	..	..	natural	14/9/03
Wharekuri, Wharekuri ..	Shanks, A. ..	..	"	1	40′	13′	vertical	levels	..	..	..	"	256	..	256	1,368	1,624	1	1	2	..	..	..	..	"	22/9/03
Awakino, Kurow	Orr, George ..	24	"	1	15′	7′	"	stoping	1	6′ x 2′ 6″	53′	"	57	..	57	5,607	5,664	..	2	2	..	..	..	..	"	18/5/03
Otiake, Otiake	Simpson and Cunningham	3	"	1	18′	12′	"	..	..	6′ x 5′	200′	"	174	..	174	80	254	..	1	1	..	..	..	..	"	18/5/03
St. Andrew's, Papakaio ..	Nimmo, T. ..	25	"	1	6′ 6″	6′	1 in 4	bord and pillar	1	4′ x 2′ 6″	60′	"	1,979	..	1,979	31,391	33,370	1	5	6	horse	..	..	..	furnace	25/9/03
Prince Alfred, Papakaio ..	Willetts, G. H. ..	34	"	1	1′ to 9′	all	1 in 9	ditto	1	5½′ x 6′	51′	"	1,174	..	1,174	46,616	47,790	2	3	5	"	..	..	..	natural	25/9/03
Ngapara, Ngapara	Nimmo, W. ..	25	"	1	18′ to 25′	8′	1 in 17	"	1	4′ x 4′	50′	"	1,027	..	1,027	18,939	19,966	1	2	3	"	..	..	..	"	..
Allandale, Shag Point ..	Westfield, C. H. ..	16	pitch	3	4′ to 6′	all	1 in 4	ditto and longwall	2	10′ x 6′ 8′ x 4′	1,00 280′	incline tunnel	13,363	6,752	20,115	190,355	210,470	12	55	67	steam	duplex Tangye	6″	200′	fan	11/12/03
Shag Point, Shag Point ..	Shore, T. ..	33	"	..	..	..	..	"	..	..	..	..	871	130	1,001	401,772	402,773	3	5	8	"	2′	8″	400′	exhaust steam from pumps	..
Pits not at work.																										
Phillips, Kurow	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1,985	1,985	..	..	..	..	..	..	..	..	..
Wharekuri (Collins), Kurow ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1,424	1,424	..	..	..	..	..	..	..	..	..
Rosebery, Otepopo	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1,424	1,424	..	..	..	..	..	..	..	..	..
Earlybank	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	281	281	..	..	..	..	..	..	..	..	..
Cairns, Kurow	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	11,395	11,395	..	..	..	..	..	..	..	..	..

* Woolshed Creek Coal-mine Company having purchased the old Mount Somers Mine.

Statistics of Workings in Coal-mines, 1903—*continued.*

Name of Mine and Locality.	Name of Manager.	Number of Years worked.	Quality of Coal.	No. of Seams worked.	Thickness of Seams.	Thickness worked.	Dip of Seam.	System of Underground Working.	Number of Shafts.	Dimensions of Shafts.		Output delivered by	Output for 1903.			Approximate Total Output to 31st December, 1902.	Approximate Total Output to 31st December, 1903.	Number of Men ordinarily employed.			Power used for drawing Mineral.	Pumps.			Means of Ventilation.	Date of Inspector's Last Visit.
										Size of Shaft or Adit.	Depth of Shaft or Length of Adit.		Coal.	Slack.	Total.			Above.	Below.	Total.		Stroke.	Size of Barrel.	Height of Column.		
MIDDLE ISLAND—*continued.*																										
													Tons.	Tons.	Tons.	Tons.	Tons.									
South Otago.																										
Fernhill, Abbotsford ..	Gray, J. ..	26	brown	1	19′	10′	1 in 10	bord and pillar	1	4¾′ x 4½′	50′	adit	305	2,988	3,293	135,787	139,080	4	7	11	horse	..	..	..	natural	30/12/03
Freeman's, Abbotsford ..	Hill, R. ..	23	"	2	7′ to 14′	6′ to 7′	1 in 7	ditto	3	6′ x 5′ 7′ x 7′	1,400′ 264′	inclined drive & engine plane	12,838	1,444	14,282	264,566	278,848	6	21	27	steam & horse	12″	5″	130′	furnace and exhaust steam	11/11/03
Walton Park, Walton Park ..	Kenyon, J. ..	33	"	1	10′ to 19′	12′	1 in 10	"	3	6′ x 4′ 12′ x 4′	30′ to 170′	tunnel	6,775	..	6,775	565,818	572,593	2	16	18	horse	..	..	..	furnace	23/11/03
Jubilee, Walton Park ..	Campbell, P. ..	6	"	1	12′ to 18′	8′	1 in 10	"	2	6′ x 5′	4 ch.	adit	9,698	1,350	11,048	40,940	51,988	2	16	18	steam & horse	..	..	..	natural	23/11/03
Saddle Hill (No. 1), Saddle Hill	Kenyon, J. ..	31	"	1	20′	8′ to 16′	1 in 10	"	4	5′ 10″ x 4′ 6″	264′	inclined drive	3,452	5,005	8,457	124,698	133,155	2	10	12	ditto	..	..	..	"	20/11/03
Saddle Hill (No. 2), Saddle Hill	Christie, James ..	2	"	..	..	..	..	"	..	..	..	adit	2,220	3,408	5,628	4,491	10,119	6	5	11	"	..	..	..	"	20/11/03
Burnweil, Fairfield ..	Harris, A. ..	12	"	1	20′	10′	variable	"	1	5′ x 3′	30′	incline	1,100	1,406	2,506	21,549	24,055	2	5	7	horse	..	..	..	"	7/5/03
Glenochiel, Fairfield ..	Bryce, D. ..	22	"	1	16′	7′ to 9′	1 in 9	"	3	6′ x 4′	4 ch.	tunnels	..	1,358	1,358	26,756	28,114	3	2	5	"	..	..	..	"	7/5/03
Lauriston, Brighton ..	Walker, James ..	17	"	1	6′	5′ 6″	variable	"	1	..	48′	"	222	55	277	5,637	5,914	1	2	3	"	..	..	..	"	12/1/03
Brighton, Brighton ..	McColl, D. L. ..	15	"	1	6′	5′ 6″	"	"	..	..	..	"	256	..	256	1,303	1,559	1	1	2	"	..	..	..	"	12/1/03
Mosgiel, Mosgiel	Orr, H. ..	19	"	1	8′	7′	1 in 10	"	2	4′ x 4′	14 ch.	"	665	1,298	1,963	92,634	94,597	2	3	5	steam	Deane pump	..	70′	"	7/5/03
Riccarton, Riccarton ..	..	2	"	1	..	..	..	"	..	..	300′	"	..	..	..	3,006	3,006	..	..	..	..	..	..	..	"	..
Ferndale, Taieri Beach ..	Fairbairn, R. ..	20	"	1	10′	8′	..	"	..	10′ x 8′	100′	"	35	..	35	480	515	1	..	1	hand	..	..	..	"	17/1/03
Bruce, Milton	Young, A. ..	36	"	1	15′	9′	1 in 8	"	..	..	..	adit	415	..	415	23,899	24,314	..	2	2	"	..	..	..	"	10/10/03
Strip-and-at-it, Milton ..	Hardwick, N. ..	9	"	1	8′	6′	..	"	..	..	..	"	..	..	..	700	700	..	..	..	"	..	..	..	"	..
Akatore, Milton	Reid, James ..	9	"	1	14′	all	..	"	..	..	..	"	62	..	62	244	306	..	1	1	"	..	..	..	"	..
Fortification, Milton ..	Straw, M. ..	6	"	1	7′ to 14′	5′ to 7′ 6″	1 in 12	"	2	7′ x 6′ 6′ x 6′	4½ ch. 11½ ch.	incline tunnel	5,746	621	6,367	27,389	33,756	4	10	14	steam	6″	4″	30′	exhaust steam from pump	10/10/03
Glenledi, Milton	McGilp, N. ..	3	"	1	22′	all	1 in 8	open	..	..	..	adit and open	295	..	295	2,125	2,420	1	1	2	hand	..	..	..	natural	..
Adam's Flat, Adam's Flat ..	Reid, J. ..	21	lignite	1	14′	10′	..	"	..	..	..	open	30	..	30	2,211	2,241	1	..	1	"	..	..	..	..	..
Wallsend, Lovell's Flat ..	Hewitson, R. ..	33	"	1	20′	all	..	"	..	..	..	"	182	..	182	10,954	11,136	2	..	2	"	..	..	..	..	..
Lovell's Flat, Lovell's Flat ..	Carruthers, James	9	brown	1	5′ to 10′	5′ to 7′	1 in 4	bord and pillar	1	11′ x 5′	470′	shaft	9,649	6,116	15,765	57,806	73,571	12	30	42	steam	16″	6″	480′	furnace	29/8/03
								ditto	1	5′ x 4′	360′															
Tuakitoto, Lovell's Flat ..	Dunlop, A. ..	13	"	1	20′	8′	..	"	..	..	..	incline	25	..	25	3,099	3,124	1	..	1	hand	..	..	.	natural	..
Benhar, Stirling	McSkimming, P.	40	lignite	3	30′ in aggregate	12′	..	"	..	4′ x 4′	..	"	2,471	727	3,198	101,577	104,775	1	5	6	horse	..	..	..	"	..
Mount Wallace, Stirling ..	Walls, James ..	9	"	1	14′	8′ to 10′	..	"	..	..	..	adit	410	..	410	4,146	4,556	..	2	2	hand	..	..	..	"	..
Taratu, Taratu	Irving, John ..	2	brown	1	20′	8′ to 14′	1 in 10	"	..	6′ x 6′	5 ch.	"	5,115	9,993	15,108	2,783	17,891	4	25	29	"	..	..	..	"	24/4/03
Longridge, Kaitangata ..	Mackie, N. ..	2	"	1	4′	all	..	"	..	..	..	..	88	..	88	45	133	..	1	1	"	..	..	..	"	..
Kaitangata and Castle Hill, Kaitangata	Jordan, R. S. (O. G. Lockhart, sec.)	27	"	3	50′ in aggregate	"	1 in 1½ to 1 in 4	"	..	9′ x 7′ 6′ diam.	51 ch. 360′	inclined	85352	37,280	122,632	1,641,257	1,763,889	68	339	407	steam & compressed air	2′ 6″	6″	280′	fan	9/12/03
		10	"	4	50′ in aggregate	"	1 in 1½ to 1 in 4	"	..	11′ x 6′ 6″ 9′ diam.	45 ch. 526′	"									ditto	..	..	500′	furnace	1/12/03
Wangaroa, Kaitangata ..	Smith, J. ..	23	"	1	10′ 6″	8′	1 in 6	"	..	..	..	adit	56	14	70	1,456	1,526	..	1	1	hand	..	..	..	natural	..
Mainholm, Waipahi ..	Lischner, F. ..	18	lignite	1	15′	all	..	open	..	..	..	open	3,368	..	3,368	32,764	36,132	3	..	3	"	..	..	..	..	..

Private Pits.																										
Paskell's, Adam's Flat ..	Paskell, James ..	39	lignite	1	8′	all	1 in 6	open	..	..	..	open	2	..	2	468	470	..	..	..	hand	..	..	..	..	..
Lakeside, Kaitangata ..	Landells, James	3	brown	..	..	..	..	..	..	..	..	..	..	..	..	827	827	..	..	..	″	..	..	..	..	..
Taratu, Kaitangata ..	Frazer, H. H. ..	31	″	1	..	..	..	..	..	..	..	..	2	..	2	218	220	..	..	..	″	..	..	..	..	..
Pits not at work.																										
Record, Kaitangata ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	414	414	..	..	..	..	..	..	..	..	..
Early Rise, Milton ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	15	15	..	..	..	..	..	..	..	..	..
Chain Hills, Abbotsford ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	842	842	..	..	..	..	..	..	..	..	..
Salisbury, Mosgiel ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	4,433	4,433	..	..	..	..	..	..	..	..	..
Bruce No. 2, Milton ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	23,322	23,322	..	..	..	..	..	..	..	..	..
Rigfoot, Stirling	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	5,163	5,163	..	..	..	..	..	..	..	..	..
Morrison's, Stirling ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	646	646	..	..	..	..	..	..	..	..	..
Pomahaka, Pomahaka ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	20	20	..	..	..	..	..	..	..	..	..
Castle Hill No. 1, Kaitangata	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	9,314	9,314	..	..	..	..	..	..	..	..	..
Crofthead, Kaitangata ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	6,713	6,713	..	..	..	..	..	..	..	..	..
Langridge, Kaitangata ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	693	693	..	..	..	..	..	..	..	..	..
Lesmahagow, Kaitangata ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1,511	1,511	..	..	..	..	..	..	..	..	..
Cowpan's, Owaka	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	95	95	..	..	..	..	..	..	..	..	..
Shennan's, Waipahi ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	45	45	..	..	..	..	..	..	..	..	..
Early Bank, Milton ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	320	320	..	..	..	..	..	..	..	..	..
CENTRAL OTAGO.																										
Coal Creek, Coal Creek Flat	Barber, J. ..	33	lignite	1	80′	20′	1 in 6	bord and pillar	..	6′ x 7′	150′	adit	4,317	...	4,317	27,124	31,441	1	6	7	horse	..	..	..	natural	12/9/03
McPherson's, Coal Creek Flat	McPherson, M. ..	33	″	1	80′	30′ to 40′	1 in 6	open	..	..	..	open	3,223	..	3,223	28,430	31,653	5	..	5	″	..	..	..	..	12/9/03
Perseverance, Coal Creek Flat	Craig, J. ..	16	″	1	99′	70′	1 in 4	bord and pillar	..	6′ x 7′	..	adit	4,436	..	4,436	19,330	23,766	2	5	7	Pelton wheel & winch	hyd	rau jet	lic pump	natural	12/9/03
Progress (lately Gully Pit), Roxburgh	Edmeades, T. ..	6	″	1	..	..	..	open	..	..	..	open	27	..	27	489	516	1	..	1	..	..	..	..	..	11/9/03
Alexandra, Alexandra ..	O'Connell, M. ..	23	brown	1	14′	7′	1 in 7	bord and pillar	2	5′ x 2′ 6″ 6′ x 4′	60′	adit	334	..	334	38,330	38,664	1	1	2	steam	..	..	..	natural	16/12/03
Perseverance, Alexandra ..	Hunter, A. ..	5	″	1	14′	7′	1 in 7	ditto	..	..	..	″	4,446	..	4,446	11,313	15,759	1	7	8	″	..	..	..	furnace	16/12/03
McQueenville, Alexandra ..	Howie, J. ..	16	″	1	14′	7′	1 in 7	″	2	4′ 9″ x 3′	62′	shaft & adit	3,811	..	3,811	39,522	43,333	3	8	11	″	..	..	..	natural	16/12/03
Alexandra Coal Company, Alexandra	Pollock, James ..	5	″	1	28′	8′	..	″	1	6′ x 4′	60′	shaft	11,249	..	11,249	27,997	39,246	5	16	21	″	three-ram 12″	thro pump 6″	w p 60′	steam jet	22/9/03
Undaunted, Alexandra ..	Mathias, D. H. ..	5	″	1	7′	6′	1 in 7	″	1	5′ x 2′ 6″	70′	shaft	1,064	..	1,064	1,943	3,007	1	4	5	horse	..	..	..	natural	16/12/03
Cambrian's, Cambrian's ..	Dungey, C. ..	19	lignite	1	9′	all	..	open	..	..	..	open	249	..	249	14,102	14,351	1	..	1	″	..	..	..	..	..
Welshman's Gully, Cambrian's	McGuckin, J. & R.	42	″	1	30′	″	..	″	..	..	..	″	431	..	431	30,475	30,906	2	..	2	″	..	..	..	..	..
Blackstone Hill, Blackstone Hill	Thurlow, R. ..	37	″	1	unknown	16′	..	″	..	..	..	″	755	..	755	3,017	3,772	2	..	2	″	..	..	..	..	..
St. Bathan's, St. Bathan's ..	Enwright, J. ..	6	″	1	17′	all	..	″	..	..	..	″	314	..	314	2,386	2,700	2	..	2	″	..	..	..	..	..
Beck's Idaburn, Idaburn ..	Beck, Wm., Mrs. M. Beck (o)	17	″	1	35′	″	..	″	..	..	..	″	949	..	949	15,369	16,318	3	..	3	″	..	..	..	..	..
McLean's, Idaburn ..	ditto	..	″	1	15′	″	..	″	..	..	..	″	..	..	..	1,127	1,127	..	..	..	″	..	..	..	..	..
Idaburn, Idaburn ..	White, J. ..	33	″	1	20′	″	..	″	..	..	..	″	1,027	..	1,027	33,564	34,591	2	..	2	″	..	..	..	..	..
Border, Rough Ridge ..	Turnbull, G. ..	33	″	1	12′	″	..	″	..	..	..	″	121	..	121	7,013	7,134	1	..	1	″	..	..	..	..	..
Gimmerburn, Gimmerburn ..	Docherty, C. ..	38	″	1	12′	″	..	″	..	..	..	″	48	..	48	2,653	2,701	1	..	1	hand	..	..	..	..	..
Commercial, Kyeburn Diggings	Archer, C. ..	24	brown	1	10′	8′	vertical	stoping	..	..	..	incline	519	..	519	14,472	14,991	1	2	3	water wheel	..	..	..	natural	..
Vincent, Clyde	Turner, G. F., Clyde Collieries Company (owners), L. G. Reeves, secretary	..	″	1	40′	14′	1 in 2	levels	..	..	..	dip incline	2,636	..	2,636	16,203	18,839	1	5	6	steam	..	..	..	″	24/9/03
Dairy Creek, Clyde		31	″	1	40′	14′	1 in 2	″	..	..	..	ditto	2,049	..	2,049	10,582	12,631	2	5	7	″	..	..	..	″	15/5/03
Holt's, Shepherd's Flat, Clyde	Holt, W. J. ..	1	″	1	6′	all	..	″	..	..	..	incline tunnel	6	..	6	..	6	..	..	..	horse	..	..	..	″	15/12/03
Cardrona, Cardrona ..	McDougall, R. ..	19	″	1	30′	″	vertical	open	..	..	..	open	2,130	..	2,130	12,823	14,953	9	..	9	″	..	..	..	″	22/5/03
Gibbston, Gibbston ..	Hodson, J. ..	17	″	1	30′	″	1 in 2	bord and pillar	..	..	..	adit	1,632	142	1,774	8,344	10,118	2	5	7	steam	..	..	..	″	6/10/03

STATISTICS of WORKINGS in COAL-MINES, 1903—*continued.*

Name of Mine and Locality.	Name of Manager.	Number of Years worked.	Quality of Coal.	No. of Seams worked.	Thickness of Seams.	Thickness worked.	Dip of Seam.	System of Underground Working.	Number of Shafts.	Dimensions of Shafts. Size of Shaft or Adit.	Dimensions of Shafts. Depth of Shaft or Length of Adit.	Output delivered by	Output for 1903. Coal.	Output for 1903. Slack.	Output for 1903. Total.	Approximate Total Output to 31st December, 1902.	Approximate Total Output to 31st December, 1903.	Number of Men ordinarily employed. Above.	Below.	Total.	Power used for drawing Mineral.	Pumps. Stroke.	Pumps. Size of Barrel.	Pumps. Height of Column.	Means of Ventilation.	Date of Inspector's Last Visit
MIDDLE ISLAND—*continued.*																										
CENTRAL OTAGO—*continued.*													Tons.	Tons.	Tons.	Tons.	Tons.									
Doolan's Creek, Gibbston	Murray, A. C., sec.	2	brown	1	10′	6′	..	levels	..	6′ x 4′	60′	adit	5	1	6	25	31	..	1	1	..	..	..	..	natural	..
Cairnmuir, Bannockburn	Gibson, J.	..	"	..	..	..	..	"	..	..	..	shaft	24	..	24	1,451	1,475	..	1	1	horse	..	..	..	"	5/10/03
Kawarau, Bannockburn	Cromwell and Bannockburn Collieries Co., A. S. Gillanders, Mine Man.	26	"	1	10′	6′	1 in 4	bord and pillar	1	6′ x 6′	34′	incline	5,296	..	5,296	31,759	37,055	6	19	25	steam	..	..	..	"	5/10/03
Excelsior, Bannockburn		11	"	1	6′	5′	1 in 4	ditto	1	6′ x 5½′	..	"	1,134	..	1,134	15,392	16,526	4	9	13	"	..	..	..	"	16/11/03
Bannockburn, Bannockburn	T. K. Harty, sec.	14	"	1	6′	5′	1 in 4	"	1	6′ x 4′	20′	adit	2,331	..	2,331	11,306	13,637	5	13	18	"	..	..	..	"	5/10/03
Nevis, Nevis	Scott, C.	10	"	1	20′	all	vertical	open	..	..	..	open	563	..	563	3,704	4,267	1	1	2	hand	..	..	..	..	11/12/03
Ryder's (including Clough and Allen's), Nevis	Scott, C.	3	"	1	45′	"	"	"	..	..	..	"	426	..	426	2,340	2,766	2	..	2	"	..	..	..	..	13/12/03
Ritchie's, Nevis	Ritchie, Jas.	1	"	1	..	..	..	"	..	..	..	"	20	..	20	..	20	1	..	1	..	..	..	..	..	..
Ritchie's, Nevis	Ritchie, R.	1	"	1	..	..	..	"	..	..	..	"	20	..	20	118	138	1	..	1	..	..	..	..	..	13/12/03
Private Pits.																										
Kyeburn, Upper Kyeburn	McCready and Coombs	20	"	1	..	..	vertical	levels	..	..	..	adit	12	20	32	15,367	15,399	..	..	..	hand	..	..	..	natural	..
Price's, Blackstone Hill	Price, G.	6	lignite	1	12′	all	..	open	..	..	..	open	26	..	26	86	112	..	..	..	"	..	..	..	..	..
Angel's, Bannockburn	Angel, C. F.	1	brown	1	..	"	..	"	..	..	..	"	2	..	2	2	4	..	..	..	..	..	..	..	..	..
Pits not at work.																										
Black Diamond, Roxburgh	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	232	232	..	..	..	..	..	..	..	..	..
Simpson Theyers, Alexandra	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1,636	1,636	..	..	..	..	..	..	..	..	..
Cromwell, Cromwell	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3,019	3,019	..	..	..	..	..	..	..	..	..
Cooper's, Cromwell	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	385	385	..	..	..	..	..	..	..	..	..
Upper Nevis, Nevis	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	65	65	..	..	..	..	..	..	..	..	..
Williamson's, Nevis	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	95	95	..	..	..	..	..	..	..	..	..
Padgett's, Blackstone Hill	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	46	46	..	..	..	..	..	..	..	..	..
Waikerikeri, Clyde	Dunstan Coal Co. (Smart, J., sec.)	..	..	..	..	..	..	..	..	..	..	..	..	..	..	20,322	20,322	..	..	..	..	..	..	..	..	..
Drummey's, Alexandra	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	179	179	..	..	..	..	..	..	..	..	..
Enterprise, Alexandra	(Rivers)	..	..	..	..	..	..	..	..	..	..	..	..	..	..	703	703	..	..	..	..	..	..	..	..	..
Fennessy's, Idaburn	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	70	70	..	..	..	..	..	..	..	..	..
Cooper & Gibson's, Bannock'rn	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	5,395	5,395	..	..	..	..	..	..	..	..	..
Gibbston, Gibbston	(Cowan's)	..	..	..	..	..	..	..	..	..	..	..	..	..	..	19,464	19,464	..	..	..	..	..	..	..	..	..
Harrex and Owen's, Cambrian's	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	60	60	..	..	..	..	..	..	..	..	..
Blackman's Gully, Clyde	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	144	144	..	..	..	..	..	..	..	..	..
Nulli Secundus, Bannockburn	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	632	632	..	..	..	..	..	..	..	..	..
Blackman's, Alexandra	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	89	89	..	..	..	..	..	..	..	..	..
Gibson's, Bannockburn	Gibson, J.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	220	220	..	..	..	..	..	..	..	..	..
Watherston's, Nevis	Watherston, A.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	5	5	..	..	..	..	..	..	..	..	..
SOUTHLAND.																										
Pukerau, Pukerau	O'Hagan, C.	23	lignite	1	16′	8′ to 10′	1 in 10	bord and pillar	1	8′ x 8′	11 ch.	adit	1,001	..	1,001	29,600	30,601	1	3	4	horse	..	..	..	natural	1/12/03
Nelson's, Pukerau	Nelson, J. H.	14	"	1	16′	10′	..	ditto	..	..	..	"	120	..	120	2,845	2,965	..	1	1	hand	..	..	..	"	1/12/03
Whiterigg, Gore	Paterson, W. H.	21	"	1	18′	12′	1 in 20		1	3′ 6″ x 2′ 6″	2 ch.	"	4,566	..	4,566	10,871	15,437	2	3	5	horse	..	..	..	"	5/11/03

Heffernan's, Gore	Hoffman, T.	25	lignite	1	11′	8′	..	levels & headings	..	..	..	adit	700	..	700	6,847	7,547	1	2	3	hand	..	..	..	natural	5/11/03
Rosedale (Sarginson's), Gore	Reinke, A.	17	"	1	7′	all	..	open	..	..	..	open	26	..	26	2,567	2,593	1	..	1	"	..	..	..	..	5/11/03
Green's, Gore	Smyth, J. and J.	15	"	1	22′	17′	1 in 20	bord and pillar	..	..	5 ch.	adit	6,636	..	6,636	30,641	37,277	..	8	8	horse	..	..	..	natural	2/12/03
River View, Gore	Nicol, L. D.	12	"	..	..	..	..	open	..	..	..	open	122	..	122	879	1,001	1	1	2	hand	..	..	..	..	..
McDonald's, East Gore	McDonald, G. H., G. Perry (lessee)	2	"	1	7′	all	..	"	..	..	..	"	267	..	267	56	323	1	..	1	"	..	..	..	..	..
Knapdale, Chatton	Irvine, R.	18	"	1	26′	15′	semi-vertical	wide headings	..	..	..	adit	120	..	120	6,360	6,480	..	1	1	horse	..	..	..	natural	..
Hoffman's, East Chatton	Hoffman, J.	1	"	1	16′	12′	..	levels & headings	..	20′ x 12′	100′	"	..	..	..	..	..	..	..	..	"	..	..	..	"	3/11/03
Perkin's, East Chatton	Perkins, A.	4	"	1	30′	20′	1 in 5	open	..	..	..	open	483	..	483	850	1,333	1	..	1	hand	..	..	..	..	3/11/03
Pacey's, East Chatton	Pacey, W. R.	27	"	1	30′	14′	1 in 6	"	..	..	..	"	1,125	..	1,125	12,680	13,805	3	..	3	"	7″	..	..	..	3/11/03
Johnstone's, Springfield, Waikaka Valley	Johnstone, W.	10	"	1	71′	all	..	"	..	..	..	"	1,685	..	1,685	4,658	6,343	2	..	2	"	..	..	..	..	5/11/03
Glenlee, Waikaka	McGill, J.	10	"	1	14′	8′	..	levels & headings	..	10′ x 8′	1 ch.	adit	1,237	..	1,237	3,213	4,450	2	2	4	"	..	..	..	natural	4/11/03
Thorndale, Waikaka Valley	Orchard, E. C.	4	"	1	10′	all	..	open	..	..	..	open	1,803	..	1,803	1,365	3,168	5	..	5	..	..	..	..	..	5/11/03
Willow Bank, Waikaka Valley	Reid, R. (owner), W. Mitchell, Manager	7	"	1	15′	"	..	"	..	..	..	"	4,434	..	4,434	4,569	9,003	6	..	6	hand	..	..	..	..	5/11/03
McDonald's, Wendon	Nicol, D.	4	"	1	16′	12′	..	levels & headings	..	12′ x 12′	..	adit	2,260	80	2,340	2,589	4,929	..	5	5	"	..	..	..	natural	4/11/03
Wendon, Wendon	Edge, A. A.	25	"	1	16′	all	..	ditto	..	..	..	"	804	..	804	5,432	6,236	4	..	4	"	..	..	..	..	4/11/03
Radford's, Wendon	Scott, and Sons	13	"	1	20′	"	vertical	open	..	..	..	open	47	..	47	4,221	4,268	2	..	2	"	..	..	..	..	..
Bushbridge's, Wendon Valley	Bushbridge, P.	3	"	1	..	"	..	"	..	..	..	"	40	..	40	67	107	1	..	1	"	..	..	..	..	4/11/03
Vial & Gillespie's, Waikaia	Vial, G. S., jun.	1	"	1	6′	"	..	"	..	..	..	"	186	..	186	631	817	2	..	2	"	..	..	..	..	9/7/03
Argyle, Landslip, Waikaia	Baxter, J. and T.	12	"	1	10′	"	..	"	..	..	..	"	196	..	196	2,128	2,324	1	..	1	"	..	..	..	..	..
Waikaia (Monaghan's), Landslip, Waikaia	McKay, W. G.	4	"	1	20′	10′	vertical	levels & headings	..	6′ x 8′	60′	incline tunnel	831	..	831	411	1,242	2	4	6	steam	..	..	..	natural	11/11/03
McIvor's, Landslip, Waikaia	McIvor, R.	12	"	1	15′	all	..	open	..	..	..	open	390	..	390	2,500	2,890	2	..	2	hand	..	..	..	..	8/7/03
Goldie's, Landslip, Waikaia	McIvor, R.	7	"	1	7′	"	..	"	..	..	..	"	86	..	86	388	474	1	..	1	"	..	..	..	..	8/7/03
Number One, Landslip, Waikaia	McKinnon, A.	4	"	1	12′	7′	..	bord and pillar	..	6′ x 5′	..	adit	814	..	814	479	1,293	..	3	3	"	..	..	..	natural	8/7/03
Muddy Terrace, Landslip, Waikaia	Goldie, T. F.	1	lignite & shale	1	10′ 4′	all	..	open	..	..	..	open	356	..	356	..	356	1	..	1	"	..	..	..	..	8/7/03
Waimea, Longridge Village, Waimea	Larsen, P.	13	lignite	1	3′	"	..	"	..	..	..	"	643	..	643	7,602	8,245	2	..	2	"	..	..	..	..	12/11/03
Beer's, Mossburn	Beer, Mrs. T.	1	..	1	..	..	..	..	..	..	..	..	17	..	17	..	17	1	..	1	"	..	..	..	..	..
Pyramids, Mandeville	Junker, F. A.	11	brown	1	18′	9½	1 in 2	bord and pillar	..	6′ x 5′	..	adit	22	..	22	1,634	1,656	..	3	3	"	..	..	..	natural	12/11/03
Waimumu, Mataura	Sleeman, C. P.	7	lignite	1	17′	all	..	open	..	..	..	open	10,345	..	10,345	56,797	67,142	9	..	9	"	..	..	..	..	27/10/03
Mutch and Hurst's, Mataura	Mutch and Hurst	7	"	1	16′	"	..	"	..	..	..	"	211	..	211	2,880	3,091	2	..	2	..	..	..	..	..	27/10/03
Mataura Lig., Mataura	Coster, W.	27	"	1	16′	"	..	"	..	..	..	"	5,660	..	5,660	33,778	39,438	4	..	4	hand	..	..	..	..	27/10/03
Waimumu, Waimumu	Williams, W. J.	4	"	3	6′ 10′ 6″ 5′	"	..	"	..	..	..	"	4,181	..	4,181	3,285	7,466	8	..	8	"	..	..	..	..	6/11/03
Ota Creek, Wyndham	Shields, W.	23	"	1	6′	"	..	"	..	..	..	"	848	..	848	10,896	11,744	2	..	2	"	..	..	..	..	..
Lambert's, Edendale	Lambert, R. H.	1	"	1	12′	"	..	"	..	..	..	"	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Robin Hood, Pine Bush	Trotter, R. A.	22	"	1	15′	"	..	"	..	..	..	"	264	..	264	1,594	1,858	1	..	1	..	..	..	..	..	..
Graham's, Fairfax	Graham, P. S.	25	"	1	5′ 6″	"	1 in 20	bord and pillar	..	..	6 ch.	adit	420	..	420	13,906	14,326	..	2	2	hand	..	..	..	natural	23/10/03
Isla Bank, Fairfax	Slattery, M.	23	"	1	14′	"	..	open	..	..	..	open	382	..	382	5,891	6,273	1	..	1	"	..	..	..	..	23/10/03
George's, Fairfax	George, James	1	"	1	..	..	..	"	..	..	..	"	..	..	..	..	..	..	..	..	"	..	..	..	..	23/10/03
Naylon's, Fairfax	Naylon, J.	1	..	1	..	..	..	"	..	..	..	"	..	..	..	..	..	..	..	..	hand	..	..	..	..	23/10/03
Nightcaps, Nightcaps	Lloyd, J.	22	brown	3	36′ in aggregate	24′ in aggregate	variable to 1 in 7	bord and pillar	3	4′ x 4′ 4′ x 4′ 6″ 5′ x 5′	32 ch.	adit	42,348	..	42,348	338,497	380,845	25	53	78	steam and horse	..	..	..	fan	4/12/03
Hit or Miss, Nightcaps	Tinker, W.	3	"	1	..	..	..	..	..	..	..	..	266	..	266	575	841	1	1	2	hand	..	..	..	natural	22/10/03
H.B. (Lamont's), Nightcaps	Kelly, J. W.	5	"	1	6′ 6″	all	..	bord and pillar	..	..	..	..	982	..	982	2,990	3,972	3	..	3	"	..	..	..	"	22/10/03

Statistics of Workings in Coal-mines, 1903—*continued.*

Name of Mine and Locality.	Name of Manager.	Number of Years worked.	Quality of Coal.	No. of Seams worked.	Thickness of Seams.	Thickness worked.	Dip of Seam.	System of Underground Working.	Number of Shafts.	Dimensions of Shafts. Size of Shaft or Adit.	Dimensions of Shafts. Depth of Shaft or Length of Adit.	Output delivered by	Output for 1903. Coal.	Output for 1903. Slack.	Output for 1903. Total.	Approximate Total Output to 31st December, 1902.	Approximate Total Output to 31st December, 1903.	Number of Men ordinarily employed. Above.	Below.	Total.	Power used for drawing Mineral.	Pumps. Stroke.	Pumps. Size of Barrel.	Pumps. Height of Column.	Means of Ventilation.	Date of Inspector's Last Visit.
													Tons.	Tons.	Tons.	Tons.	Tons.									
MIDDLE ISLAND—*continued.*																										
SOUTHLAND—*continued.*																										
The Willows, Nightcaps ..	Brighton, G. ..	4	brown	1	14′	all	..	open	..	..	..	open	249	..	249	356	605	2	..	2	hand	..	..	..	..	22/10/03
Kent, Nightcaps	Quested, J. ..	5	"	1	4′	"	..	"	..	..	..	"	72	..	72	577	649	1	..	1	"	..	..	..	..	22/10/03
McBride's, Nightcaps ..	McBride, A. ..	3	"	1	10′	"	..	"	..	..	..	"	64	..	64	3,994	4,058	1	..	1	"	..	..	..	..	22/10/03
Bush Siding, Seaward Bush	Robson, R. W. ..	1	..	1	..	..	..	"	..	..	..	"	50	10	60	..	60	1	..	1	"	..	..	..	..	..
Gillies, A., & Rayward, Clifton	Gillies, A. ..	2	..	..	..	..	..	"	..	..	..	"	..	..	..	82	82	..	..	..	"	..	..	..	..	15/6/03
Orepuki, Orepuki	..	20	brown	..	12′ to 22	6′	..	sectional	..	10′ x 6′ 6″	..	adit	601	..	601	23,870	24,471	2	2	4	steam	..	..	..	fan	3/12/03
		2	oil-shale		4′	4′							36	..	36	14,386	14,422									
Pits worked for Private Use.																										
Waverley Park, Pukerau ..	Milne, Jas. ..	2	lignite	1	7′	all	..	open	..	..	..	open	9	..	9	15	24	..	..	..	..	..	..	..	..	1/12/03
Waikoikoi, Pukerau ..	Kirk, W. ..	16	"	1	6′	"	..	"	..	..	..	"	20	..	20	310	330	..	..	..	..	..	..	..	..	..
Mason's, Pukerau	Mason, A. M. W.	2	"	1	7′	"	..	"	..	..	..	"	24	..	24	10	34	..	..	..	..	..	..	..	..	..
R. Smith's, Pukerau ..	Smith, R. ..	2	"	1	14′	"	..	"	..	..	..	"	12	..	12	20	32	..	..	..	..	..	..	..	..	..
Smith's, East Gore ..	Smith, H. ..	2	"	1	7′	"	..	"	..	..	..	"	15	..	15	20	35	..	..	..	..	..	..	..	..	..
Leitze's, Gore	Leitze, M. ..	24	"	1	4 to 7′	"	..	"	..	..	..	"	20	..	20	1,452	1,472	..	..	..	..	..	..	..	..	..
Cross's, Otama	Cross Bros. ..	5	"	1	4′	"	..	"	..	..	..	"	20	..	20	116	136	..	..	..	..	..	..	..	..	12/11/03
Ford's, Chatton	Ford, P. ..	23	"	1	..	"	..	"	..	..	..	"	21	..	21	449	470	..	..	..	..	..	..	..	..	..
Perkins's, Wendon Valley ..	Perkins, G. A. ..	2	"	1	7′	"	..	"	..	..	..	"	4	..	4	23	27	..	..	..	..	..	..	..	..	..
McGilvray's, Mataura ..	McGilvray, J. ..	13	"	1	4′	"	..	"	..	..	..	"	20	..	20	333	353	..	..	..	..	..	..	..	..	..
Wyndham, Wyndham ..	Walker, Wm. ..	8	"	1	..	"	..	"	..	..	..	"	12	..	12	287	299	..	..	..	..	..	..	..	..	..
Marshall's, Edendale ..	Marshall, H. ..	12	"	1	5′	"	..	"	..	..	..	"	50	..	50	575	625	..	..	..	..	..	..	..	..	..
Pits not at work.																										
Glover's, Pukerau	Glover, A. ..	7	..	..	..	..	..	..	..	..	..	..	..	..	..	84	84	..	..	..	..	..	..	..	..	..
Waikoikoi, Pukerau ..	Scott & Ferguson	2	..	..	..	..	..	..	..	..	..	..	..	..	..	110	110	..	..	..	..	..	..	..	..	..
McBride's, No. 11, Nightcaps	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	72	72	..	..	..	..	..	..	..	..	..
Nichol's, Gore	Nichol, W. ..	2	..	..	..	..	..	..	..	..	..	..	..	..	..	10	10	..	..	..	..	..	..	..	..	..
Smyth's, Gore	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	7,107	7,107	..	..	..	..	..	..	..	..	..
Boyd & McNee (late Black's), Greenvale	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	478	478	..	..	..	..	..	..	..	..	..
Glendhu, Mataura ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	347	347	..	..	..	..	..	..	..	..	..
Southbrook, Waikaka ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	117	117	..	..	..	..	..	..	..	..	..
Smith's, Mataura	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	55	55	..	..	..	..	..	..	..	..	..
Edendale, Wyndham ..	McDonald, A. ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1,997	1,997	..	..	..	..	..	..	..	..	..
Neill's, Edendale	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	79	79	..	..	..	..	..	..	..	..	..
Valley Road, Pukerau ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3,062	3,062	..	..	..	..	..	..	..	..	..
Moffet & Longshaw's, Waikaia	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	72	72	..	..	..	..	..	..	..	..	..
Town's, Mataura	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	8,002	8,002	..	..	..	..	..	..	..	..	..
Carr's, Mataura	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	518	518	..	..	..	..	..	..	..	..	..
Porter's, Pukerau	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	22	22	..	..	..	..	..	..	..	..	..
Dickson and Walker, Croydon	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	37	37	..	..	..	..	..	..	..	..	..
Hokonui, Hokonui ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	52,084	52,084	..	..	..	..	..	..	..	..	..
Slaughter-yards, Mataura ..	(Freezing-works use)	..	..	..	..	..	..	..	..	..	..	..	..	..	..	83	83	..	..	..	..	..	..	..	..	..
Perseverance, Pukerau ..	..	..	..	..	..	..	..	open	..	..	..	open	..	..	..	2,052	2,052	..	..	..	..	..	..	..	..	..
Frank's, Pukerau	..	..	..	..	..	..	..	"	..	..	..	"	..	..	..	45	45	..	..	..	..	..	..	..	..	..
Rejefsky's, Gore	..	..	..	..	..	..	..	"	..	..	..	"	..	..	..	57	57	..	..	..	..	..	..	..	..	..

Clukoski's, Gore									open				open				28	28										
Kirk and Sheddon, Gore									"				"				140	140										
Fryer's Excelsior, Gore									"				"				807	807										
Gutzchlag's, Gore									"				"				3,294	3,294										
Coal Creek, Wendonside									"				"				40	40										
Dryden's, Gore									"				"				438	438										
Kingdon's, Gore									"				"				27	27										
Westbrook, Greenvale									"				"				175	175										
Middlemiss, Greenvale									"				"				15	15										
Marshall's, Otama																	48	48										
Maslin's, Wendon																	854	854										
Cambrian (McIvor), Waikaia																	191	191										
Northcote's, Waikaia																	685	685										
McGowan's, Mataura																	125	125										
Genge's, Wyndham																	2,819	2,819										
Monaghan's, Pine Bush																	11	11										
Morley Village (Brazer's)																	2,096	2,096										
Cluny, Orepuki																	156	156										
Waikaka, Gore																	604	604										
Croydon, Gore																	25	25										
Hunter's, Otama																	1,944	1,944										
North Chatton, Waikaka																	672	672										
Edge's No. 14, Wendon Valley																	1,286	1,286										
Munro's, Wyndham																	11,151	11,151										
Wallace, Nightcaps																	20,147	20,147										
Alley's Reliable, Nightcaps																	704	704										
Black Diamond, Nightcaps																	220	220										
Morley Village, Nightcaps																	301	301										
Jones, Edendale																	280	280										
Monaghan's Landslip, Waikaia																	630	630										
Spey Bank, Fairfax																	540	540										
Blythe, Nightcaps																	1,009	1,009										
Healy's, East Gore																	12	12										
Otama, Otama																	295	295										
Mount Linton, Nightcaps																	634	634										
Marlow, Nightcaps																	10	10										
Harvey's, Chatton																	13,586	13,586										
Townsend's, Mataura																	739	739										
Totals, Middle Island														992,026	218,408	1210434	13687511	14897945	640	1830	2470							
Totals, North Island														199,267	10,528	209795	3130720	3340515	77	305	382							
Grand Totals														1191293	228,936	1420229	16818231	18238460	717	2135	2852							

Add output of following twelve mines, included in previous statement but now abandoned: Motupipi, 360 tons; Westport-Wallsend, 3,441 tons; Waimangaroa, 17,307 tons; Wellington, 2,299 tons; Inkerman, 2,665 tons; Inglewood, 314 tons; Devil's Creek, 343 tons; Inangahua, 71 tons; Murray's Creek No. 2, 450 tons; Burke's Creek, 300 tons; Reefton, 36 tons: total	27,586
Add output of Waikaka, Adam's Flat, and Waimea Mines, inserted twice in statement for 1891	6,518
Output of mines included in statement for 1890, but whose operations were suspended prior to 1890, less three, which are again included in body of statement—namely, Hill's Creek, 779 tons; Lovell's Flat, 323 tons; and Wyndham, 1,988 tons: total, 3,090 tons	132,732
Output of mines included in former statements, but whose operations were suspended prior to 1889	172,529
	18,577,825

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