

1940.
NEW ZEALAND.

GLEN AFTON COLLIERIES ROYAL COMMISSION

(REPORT OF).

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

Royal Commission to Inquire into and Report upon Colliery Accident at Glen Afton.

GEORGE THE SIXTH by the Grace of God, of Great Britain, Ireland, and the British Dominions beyond the Seas, King, Defender of the Faith, Emperor of India :

To our Trusty and Loving Subjects STANLEY LOGAN PATERSON, Esquire, of Hamilton, Stipendiary Magistrate ; JOHN CONNELL BROWN, M.B.E., of Westport, retired Mine-manager ; JOHN DOWGRAY, Esquire, of Granity, retired Colliery Official ; THOMAS OTTO BISHOP, Esquire, of Wellington, Secretary ; ANGUS McLAGAN, Esquire, of Greymouth, Secretary : GREETINGS.

WHEREAS on the 24th day of September, 1939, at the coal-mine at Glen Afton known as the Glen Afton Mine, the property of Glen Afton Collieries, Limited, there occurred an accident as a result of which eleven persons lost their lives : And whereas it is expedient that a Commission should be issued for the purpose of inquiring into the cause of the said accident and into the working of the existing law in respect to the prevention of such accidents and for the other purposes hereinafter mentioned :

Now, therefore, we, reposing trust and confidence in your knowledge, integrity, and ability do hereby constitute and appoint you the said

Stanley Logan Paterson,
John Connell Brown,
John Dowgray,
Thomas Otto Bishop, and
Angus McLagan

to be a Commission to inquire into and report upon the matters hereinbefore referred to and into the several other matters mentioned in these presents, that is to say,--

1. To inquire into the cause of the underground fire which was found to have occurred in the said mine on the 24th day of September, 1939.

2. To inquire to what extent the provisions of the Coal-mines Act, 1925, and the regulations made thereunder were complied with in the mine and more especially as regards --

- (a) The examination of the mine :
- (b) Ventilation :
- (c) Electric wiring and equipment.

3. To inquire into the nature and character of the working and general management of the mine and whether the mine was well and safely managed.

4. To inquire into the efficiency of the inspection of the mine by all or any persons who are responsible for such inspection.

5. To inquire whether or not the loss of life would have been averted or reduced had the service of a rescue brigade or any additional equipment or any special apparatus been available at the mine.

6. To make suggestions for the prevention as far as possible of similar accidents, and for the safe working of this and other mines in the future.

7. And generally to make inquiry into any matter or thing arising out of or connected with the several subjects or inquiry hereinbefore mentioned or which, in your opinion, may be of assistance in fully ascertaining, explaining, and arriving at a fair and just conclusion in respect to the subjects of inquiry, and into the working of the existing law in respect to the prevention of similar accidents, and to report whether any additional legislation is necessary and the scope of same, and whether any amendment or addition to the regulations included in the existing law is required to provide reasonable and proper safeguards against such accidents.

And I do further appoint you the said

Stanley Logan Paterson

to be Chairman of the said Commission :

And you are hereby authorized to conduct any inquiry under these presents at such time and place as you deem expedient, with power to adjourn from time to time and place as you think fit and to call before you and to examine on oath or otherwise such persons as you think capable of affording you information as to the matters aforesaid, and to call for and examine all such books, papers, writing, documents, and records as you deem likely to afford you the fullest information on any such matters, and also to use the evidence taken in the course of any inquest or other previous inquiry having reference to the said accident and the deaths thereby caused :

And, using all diligence, you are required to report to us under your hands and seals not later than the eighth day of December, one thousand nine hundred and thirty-nine, your opinion on the aforesaid matters :

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

And it is hereby declared and this Commission shall continue in force and virtue although the inquiry be not regularly continued from time to time or from place to place by adjournment :

And, lastly, it is hereby declared that these presents are issued under Letters Patent dated the eleventh day of May, one thousand nine hundred and seventeen, and under the provisions of the Commissions of Inquiry Act, 1908.

In witness whereof we have caused this Commission to be issued and the Seal of the Dominion of New Zealand to be hereunto affixed, at Wellington, in the said Dominion, this twenty-fifth day of October, in the year of our Lord one thousand nine hundred and thirty-nine, and in the third year of our Reign.

GALWAY, Governor-General.

By His Excellency's Command—

P. C. WEBB, Minister of Mines.

Approved in Council—

C. A. JEFFERY,

Clerk of the Executive Council.

*Royal Commission to Inquire into and Report upon Colliery Accident at Glen Afton.—
Extending Period within which Commission shall Report.*

GEORGE THE SIXTH, by the Grace of God, of Great Britain, Ireland, and the British Dominions beyond the Seas, King, Defender of the Faith, Emperor of India :

To our Trusty and Loving Subjects STANLEY LOGAN PATERSON, Esquire, of Hamilton, Stipendiary Magistrate ; JOHN CONNELL BROWN, Esquire, M.B.E., of Westport, retired Mine-manager ; JOHN DOWGRAY, Esquire, of Granity, retired Colliery Official ; THOMAS OTTO BISHOP, Esquire, of Wellington, Secretary ; ANGUS McLAGAN, Esquire, of Greymouth, Secretary : GREETINGS.

WHEREAS by Warrant dated the twenty-fifth day of October, one thousand nine hundred and thirty-nine, issued under Letters Patent dated the eleventh day of May, one thousand nine hundred and seventeen, and under the provisions of the Commissions of Inquiry Act, 1908, you the said

Stanley Logan Paterson,
John Connell Brown,
John Dowgray,
Thomas Otto Bishop, and
Angus McLagan

were appointed to be a Commission to inquire into and report as to the matters therein set forth with regard to a colliery accident at Glen Afton :

And whereas by the said Warrant you were required to report to Us, under your hand and seal, not later than the eighth day of December, one thousand nine hundred and thirty-nine, your opinion on the aforesaid matters :

And whereas it is expedient that the period in which you are required to report to Us should be extended as hereinafter provided :

Now, therefore, We do hereby extend the period within which you are required to report to Us, as by the said Warrant provided, to the twenty-second day of December, one thousand nine hundred and thirty-nine :

And We do hereby confirm the said Commission except as altered by these presents :

In witness whereof We have caused this Warrant to be issued and the Seal of the Dominion of New Zealand to be hereunto affixed, at Wellington, in the said Dominion, this seventh day of December, in the year of our Lord one thousand nine hundred and thirty-nine, and in the third year of our Reign.

[L.S.] Witness Our Right Trusty and well-beloved Counsellor, George Vere Arundell, Viscount Galway, Knight Grand Cross of the Most Distinguished Order of Saint Michael and Saint George, Companion of the Distinguished Service Order, Officer of the Most Excellent Order of the British Empire, Governor-General and Commander-in-Chief in and over our Dominion of New Zealand and its Dependencies.

GALWAY, Governor-General.

By His Excellency's Command—

P. C. WEBB, Minister of Mines.

Approved in Council—

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

Royal Commission to Inquire into and Report upon Colliery Accident at Glen Afton. — Further Extending Period within which Commission shall Report.

GEORGE THE SIXTH, by the Grace of God, of Great Britain, Ireland, and the British Dominions beyond the Seas, King, Defender of the Faith, Emperor of India :

To our Trusty and Loving Subjects STANLEY LOGAN PATERSON, Esquire, of Hamilton, Stipendiary Magistrate ; JOHN CONNELL BROWN, Esquire, M.B.E., of Westport, retired Mine-manager ; JOHN DOWGRAY, Esquire, of Granity, retired Colliery Official ; THOMAS OTTO BISHOP, Esquire, of Wellington, Secretary ; ANGUS McLAGAN, Esquire, of Greymouth, Secretary : GREETINGS.

WHEREAS by Warrant dated the twenty-fifth day of October, one thousand nine hundred and thirty-nine, issued under Letters Patent dated the eleventh day of May, one thousand nine hundred and seventeen, and under the provisions of the Commissions of Inquiry Act, 1908, you the said

Stanley Logan Paterson,
John Connell Brown,
John Dowgray,
Thomas Otto Bishop, and
Angus McLagan

were appointed to be a Commission to inquire into and report as to the matters therein set forth with regard to a colliery accident at Glen Afton :

And whereas by the said Warrant you were required to report to Us, under your hand and seal, not later than the eighth day of December, one thousand nine hundred and thirty-nine, your opinion on the aforesaid matters :

And whereas by Warrant dated the seventh day of December, one thousand nine hundred and thirty-nine, the period within which you were required to report to us as by the said Commission provided was extended to the twenty-second day of December, one thousand nine hundred and thirty-nine.

And whereas it is expedient that the period in which you are required to report to us should be further extended as hereinafter provided :

Now, therefore, we do hereby extend the period within which you are required to report to us, as by the said Commission and by the said Warrant dated the seventh day of December, one thousand nine hundred and thirty-nine, provided, to the sixth day of February, one thousand nine hundred and forty :

And We do hereby confirm the said Commission except as altered by the said Warrant dated the seventh day of December, one thousand nine hundred and thirty-nine, and by these presents :

In witness whereof we have caused this Warrant to be issued and the Seal of the Dominion of New Zealand to be hereunto affixed, at Wellington, in the said Dominion, this twentieth day of December, in the year of our Lord one thousand nine hundred and thirty-nine, and in the fourth year of our Reign.

[L.S.] Witness Our Right Trusty and well-beloved Counsellor, George Vere Arundell, Viscount Galway, Knight Grand Cross of the Most Distinguished Order of Saint Michael and Saint George, Companion of the Distinguished Service Order, Officer of the Most Excellent Order of the British Empire, Governor-General and Commander-in-Chief in and over our Dominion of New Zealand and its Dependencies.

GALWAY, Governor-General.

By His Excellency's Command --

P. C. WEBB, Minister of Mines.

Approved in Council --

C. A. JEFFERY,

Clerk of the Executive Council.

GLEN AFTON COLLIERIES ROYAL COMMISSION.

To His Excellency the Right Honourable George Vere Arundell, Viscount Galway, Knight Grand Cross of the Most Distinguished Order of Saint Michael and Saint George, Companion of the Distinguished Service Order, Officer of the Most Excellent Order of the British Empire, Governor-General and Commander-in-Chief in and over our Dominion of New Zealand and its Dependencies.

MAY IT PLEASE YOUR EXCELLENCY,

We, the undersigned Commissioners appointed by Royal Commission dated 25th day of October, 1939, and issued under Letters Patent dated 11th May, 1917, and under the provisions of the Commissions of Inquiry Act, 1908, to inquire into and report upon the colliery accident which occurred in the Glen Afton Mine on the 24th day of September, 1939, desire humbly to submit to Your Excellency our report.

The Commission formally commenced its sittings at the Town Hall, Huntly, on Monday, 27th November, 1939, after which an inspection of the Glen Afton Mine was made by the Commission, in company with counsel representing the parties, and mine officials. The hearing of the first section of the evidence was commenced on 28th November, 1939, and concluded on 6th December, 1939, and after further inspections of parts of the sealed-off portion of the mine had been made the hearing of evidence was resumed on the 22nd January and concluded on the 24th January, 1940. In all, forty-two witnesses were examined and several were recalled.

The proceedings were open to the public, and reports were published in newspapers.

The parties represented before the Commission were:—

- (1) The Mines Department (represented by Mr. C. H. Taylor, Crown Law Office, Wellington).
- (2) The Glen Afton Collieries, Ltd. (represented by Mr. A. K. North, Barrister, Auckland).
- (3) The Northern Miners' Union (represented by Mr. C. J. O'Regan, Barrister, Wellington, and Mr. T. Hall, Huntly).
- (4) The Superintendent of the Glen Afton Collieries, Mr. P. Hunter (represented by Mr. J. F. Strang, Barrister, Hamilton).
- (5) The Waikato Underground Officials' Union (also represented by Mr. J. F. Strang, Barrister, Hamilton).
- (6) The widow of Mr. James Clark (represented by Mr. A. L. Tompkins, Barrister, Hamilton).
- (7) The Police Department (represented by Sergeant J. R. Corston, Auckland).

With the consent of the parties, Mr. C. H. Taylor conducted the examination-in-chief.

The Glen Afton Collieries, Ltd., operates two adjoining coal-mines in the Waikato Coalfield area—the Glen Afton No. 1 Mine and the Glen Afton No. 2 Mine—situated at Glen Afton, some twelve miles from Huntly, which is the nearest station on the North Island Main Trunk Railway.

The accident which is the subject of the Commission's inquiries took place in the Glen Afton No. 1 Mine. The surface area of this mine is 3,653 acres, part of which is freehold, and the balance leasehold. The area of workings is approximately 438 acres. The Glen Afton No. 1 Mine has been in operation for eighteen years, and the total output to the end of 1939 has been 1,924,728 tons of coal.

The Glen Afton No. 2 Mine, which is known as the MacDonald Mine, is on a Crown lease, and has been operated for eight years. The surface area of this mine is 1,289 acres, and the area of workings is approximately 209 acres. The Glen Afton No. 2 Mine has produced a total output of 1,139,667 tons to the end of 1939.

The number of men engaged in the Glen Afton No. 1 Mine as at 24th September, 1939, was 127 underground, and 25 on the surface, or a total of 152. The number of men employed in the MacDonald or Glen Afton No. 2 Mine as at 24th September, 1939, was 204 underground and 48 on the surface, or a total of 252 men.

Although in the Glen Afton workings there has been considerable faulting and displacement there seems no doubt that the same coal-seam is worked in both mines. The thickness of the coal seam varies from 5 ft. to 15 ft. in the No. 1 Mine and from 6 ft. to 25 ft. in the No. 2 Mine. The coal is classified as brown coal, and is similar to that which occurs throughout the Waikato field.

A typical analysis is:—

	Per Cent.
Water	15.5
Volatile matter	37.5
Fixed carbon	44.0
Ash	3.0

100.0

Sulphur, 0.3 per cent.

Calorific value, 10,800 B.T.U.

The mine workings are mainly dry. From a mining point of view the total quantity of water to be pumped from the lower workings is comparatively trifling.

Throughout the Waikato mines the coal-seams have always been liable to spontaneous combustion, and this factor has to be given due consideration in laying out workings so as to avoid serious loss of coal through heating when pillars are being extracted.

The workings of the Glen Afton No. 1 Mine are on the bord-and-pillar system, arranged in panels, with substantial barriers between them. A plan of the mine workings is attached hereto as Appendix A.

The entry into the workings is by three parallel headings driven in a direction approximately due north from the mine-mouth. The central one of these is the main haulage road and main intake airway, the one to the east is the travelling road for workmen, and the one to the west is the main return. These headings extend in straight lines, the total length being 103.90 chains, and at a point 82.64 chains from the entrance there are two parallel headings driven to the east (see K section on plan). One of these headings connects with the MacDonald Mine workings. These headings

encountered an upthrow fault, the displacement being about 60 ft. The main return airway on the south side of the fault is connected with the continuation on the north side by a shaft shown on the plan, which will be referred to during the description of events in this report. The main haulage road has been graded up to overcome the displacement and this grade is shown on plan, and referred to as "J hill." The travelling road is not driven through the fault, but is continued at the higher level on the north side.

The ventilation of the No. 1 Mine is produced by means of a 72 in. double inlet Sirocco intake fan of 80,000 cubic feet per minute capacity. The MacDonald Mine is also ventilated by a Sirocco fan, and ordinarily with both fans working, the Glen Afton Mine receives a portion of its intake air through the connection to the MacDonald Mine. Apart from this, the two ventilation systems are separate and distinct. The ventilation in the Glen Afton Mine is assisted by two booster fans placed underground. The evidence before us shows that with the fans working the ventilation was adequate and satisfactory.

The power for the pumps, underground haulage-motors, booster fans (and for coal-cutting machines when used) is conveyed into the mine by an electric circuit consisting of 37/083 cables laid in ordinary 3 in. galvanized-iron water-pipes, and there are substantial and roomy inspection boxes with tight-fitting covers every hundred yards. Running parallel with the pipe is an earth cable 19/064, and the pipe itself is also earthed by attachments at the joints. This installation has been in use for sixteen years, and had given no trouble prior to the disaster on the 24th September, 1939. It had been passed by inspectors as being fully up to the standard of the Coal-mines Regulations, and, further, has been approved by electrical experts who gave evidence before the Commission, and who examined it subsequent to the disaster. The haulage system of the mine is an endless-rope system operated by fixed motors. There are, therefore, no exposed power-wires required in the mine. There is a telephone system installed in the main haulage-way, with instruments at points shown on the plan, and this is connected with the deputies' cabin at the mine-mouth, with the mine office, and with the mine-manager's house.

These facts as to the layout, method of working, ventilation, and power-supply of the mine, together with the plan of the workings, are recorded to assist in the presentation of a clear picture of what happened in the mine on Sunday, 24th September, 1939.

It was the custom of the Glen Afton Mine to stop the running of the fan every Saturday, upon the cessation of the work for that day, and for the examining deputies on entering the mine on Sunday mornings to restart the fan immediately prior to their entering the mine, and to stop it again on their return to the surface. There was some conflict of evidence as to the practice at the MacDonald Mine, but we accept the statement of Mr. William Wood, former deputy, and now manager at the MacDonald Mine, that the same custom applied there as at the Glen Afton Mine—namely, that the fan was stopped over the week-end when men were not in the mine.

No inflammable gas has been reported in the Glen Afton Mine since the very early stages, when the development headings were being driven and before they were connected. Inflammable gas has not been reported as having been found at any time in the MacDonald Mine.

In order to ascertain the facts of the unfortunate occurrence it was necessary for us to call and consider an unusually large volume of evidence. This was due to several causes. All the persons who could give direct evidence of the happenings on the fatal Sunday unfortunately lost their lives, and consequently we were forced to sift a large volume of indirect evidence in the hope of finding the essential facts. Then there was a not inconsiderable divergence between the evidence of the two principal witnesses as to the events of the Sunday morning. This was understandable, as both had at the time undergone severe emotional shocks, and, in addition, Thomas, the mine engineer, had been affected by carbon-monoxide poisoning, which is known to impair judgment and affect memory. Unfortunately, this also resulted in our being compelled to consider additional evidence. A further factor which lengthened our task was coincidence of the mine fire and an electrical fault in the mine installation which rendered it necessary for us to consider lengthy technical evidence so that we could be reasonably certain of the exact bearing the one had on the other. After careful consideration we have reconstructed from the evidence the story of the tragedy, which is as follows:—

On Saturday, 23rd September—the day preceding the disaster—the mine work was in charge of William Wilcox, underviewer, who was one of the eleven men who lost their lives the following day. He had men at work in various places. In connection with the events of the day preceding the fatalities, the Commission was concerned, firstly, with the evidence of T. H. Jackson and M. Robinson, who were employed repairing timber in the main intake airway, James Harlock, who was employed at the stopping known as "F wall," in the travelling road, and J. Weir, who was cutting timber in the haulage road. Jackson and Robinson state that at about 10 a.m. on Saturday they detected a smell of fire, and on investigating they found an actual fire burning in the return airway about 6 ft. from the bottom of a 60 ft. shaft, at a point shown on the plan just on the outbye side of the main entrance to the J section workings, which have been entirely sealed for some years. This shaft has a grade of approximately one in one, and forms the return airway at a fault which caused a difference of 60 ft. in level between two portions of the coal seam.

The description of the fire given by these witnesses differed in some small details, but they all agreed that a leg, being one member of a set, was burning, as was also some waste timber stacked between the leg and the rib. They also speak of a patch of dust on the floor which had the appearance of having been burned. This patch of dust extended from the set to the conduit pipe. The witnesses were more intent on getting the fire extinguished immediately than observing the details of the fire and its possible origin. The following is the description given by Jackson of the measures taken to extinguish the fire:—

"Having sent Robinson for a can of water, Jackson doused sufficient stone-dust on the flames to extinguish them. He then got a stick and scraped all the charred embers off the timber. After doing this he himself went for a can of water, which he knew to be handy. On his way he met Harlock and Wilcox, the underviewer. All three of them returned to the scene of the fire, when they doused further stone-dust on to the fire, and gathered the scraped embers in a heap. When Robinson returned with his can of water Jackson doused the burning timber with it and threw water into the crevices of the timber with his hands. The remaining water was used to mix the embers, scraped from the timber, into a dough with the coal and stone-dust."

Wilcox, Jackson, Robinson, and Harlock appear to have been satisfied that the fire was thoroughly extinguished by their efforts, but when leaving, Wilcox instructed Harlock to visit the scene of the fire at intervals up to the time of his leaving the mine, to make sure that the fire did not revive. Harlock states that he made two such subsequent visits, the last being about 12.30 p.m., and was satisfied that the fire was completely out.

Before leaving the mine, Harlock cut out a transformer situated near the top of the shaft—further in the mine than the seat of the fire—thereby stopping a subsidiary fan. All the men were out of the mine by about 1.30 p.m. (Saturday), at which time the main fan was stopped. On leaving the mine Wilcox, the interviewer, made two written reports upon the work of the day, one as a deputy, and the other as interviewer. Copies of these reports are attached (Appendix B (1) and (2).) In these reports there is no mention of the fire, and there is nothing to show whether or not Wilcox reported orally to the manager of the mine that a fire had occurred. Both Jackson and Robinson state that while they were at the seat of the fire in the morning Wilcox remarked to them "this looks like a short." There is, however, no evidence that he took any steps at that time to discover a short-circuit.

The mine draws its power-supply from the Huntly substation of the Central Waikato Electric-power Board. At about 2.10 o'clock on the Saturday afternoon the attendant at the Huntly substation noticed that the ammeters had registered and were continuing to register an unbalanced load, indicating a serious fault somewhere on the circuit. The following is a record of the readings from the tapes of the printometer at the Huntly substation on the 16th and 23rd September, as supplied by the Central Waikato Electric-power Board (the record for the 16th September is included for purposes of comparison):

Printometer Readings, Huntly Substation.

	16th September, 1939.		23rd September, 1939.	
	K.W.	R.K.W.	K.W.	R.K.W.
12 midnight	14	00	9	00
	15	00	10	00
11 p.m.	15	00	10	00
	15	00	9	00
10 p.m.	15	00	11	00
	15	00	10	00
9 p.m.	15	00	11	00
	15	00	11	00
8 p.m.	17	00	11	00
	17	00	10	00
7 p.m.	15	00	11	00
	14	00	10	00
6 p.m.	15	00	10	00
	14	00	17	01
5 p.m.	15	00	83	09
	15	00	80	16
4 p.m.	15	00	97	30
	16	00	99	33
3 p.m.	16	00	94	36
	25	00	81	32
2 p.m.	37	03	27	00
	44	13	36	00
1 p.m.	45	12	38	00
	43	08	43	06
12 noon	42	03	41	02
	41	03	41	04
11 a.m.	41	03	39	05
	43	06	43	07
10 a.m.	41	03	42	06
	42	00	42	07
9 a.m.	42	07	44	09
	39	01	39	01
8 a.m.	36	00	39	00
	37	00	37	00
7 a.m.	37	00	36	00
	36	00	34	00
6 a.m.	36	00	35	00
	36	00	35	00
5 a.m.	35	00	34	00
	36	00	35	00
4 a.m.	36	00	35	00
	36	00	35	00
3 a.m.	36	00	35	00
	36	00	35	00
2 a.m.	36	00	35	00
	36	00	35	00
1 a.m.	36	00	34	00
	37	00	35	00
	*	†	*	†

* Active † Reactive.

Metering constant, 2.4.

"Fault in Glen Afton Mine, Saturday, 23/9/1939, from 2 p.m. to 5.30 p.m. Note.— Power cut off from 4.10 p.m. to 4.45 p.m. Tapes one half-hour behind as from above time to 1.30 a.m., 25/9/1939."

Troublemakers were set to work to trace this fault to its source. By a process of elimination they traced the trouble to the line supplying current to the Glen Afton Mine. One of the Power Board officers went to the mine and informed William Wilcox, the underviewer, David William Thomas, the engineer, and Christopher Blackburn, the mine-manager, that there was trouble in connection with the power-supply. Thomas states that Wilcox informed him that probably the trouble was in the mine circuit within a few yards of the entrance, because he had noticed there a displacement of the conduit pipe. In passing, it is notable that at this stage Wilcox did not make any reference to a probability of a short having occurred at the site of the fire which he had seen that morning. After a second Power Board officer arrived it was decided to experiment by cutting out the mine circuit altogether, and to telephone the substation to see what the effect might be upon the trouble formerly indicated. It was found that by cutting out the mine circuit the trouble was eliminated entirely. The circuit was examined at the point suggested by Wilcox as being likely to cause trouble, but, although there was displacement of the pipe there, the cables were found to be in perfect order, indicating that the trouble was further in the mine.

The mine circuit was then switched in again, but disconnected beyond A section, thus leaving the wires alive up to that point, but rendering them dead from that point farther into the mine. By again communicating with the Huntly substation it was ascertained that this still indicated an absence of any trouble on the main circuit. It was proved, therefore, that the trouble which had been observed in the Huntly substation had been caused by some defect in the mine circuit at a point farther in the mine than A section. This conclusion was reached at about 5.30 p.m. C. Blackburn, manager, D. W. Thomas, the engineer, W. Wilcox, underviewer, and R. V. Turley, electrician, then went into the mine to examine the conduit and inspection boxes with a view to locating the trouble. Later they were joined by Bell, and Blackburn was replaced by Rogers. They worked until about 7.30 p.m. without success, and then ceased work for the day under instructions from Mr. Blackburn, mine-manager, to turn out at 8 a.m. on the following morning (Sunday) to continue their examination.

The electrical circuit is laid in the travelling road for the first 874 ft., and from there it continues in the return airway. The fan, which had been stopped at about 1.30 p.m., was not restarted while the examination of the electrical circuit was being made between 5.30 and 7.30 p.m. There was no one in the mine from 7.30 p.m. on Saturday, 23rd September, until 8 a.m. on Sunday, 24th September, and the fan was stopped throughout that period.

On the morning of Sunday, 24th September, two deputies, Richard Ireland and Walter George Cole, and two mine electricians, Raymond Vivian Turley and William Rae Bell, entered the mine at approximately 8 o'clock. The deputies went in to make their usual Sunday examination of the workings and the electricians to continue their search for the electrical fault which had occurred on the previous afternoon. In addition to these four men, it appears from the evidence of D. W. Thomas, the engineer, that John Marshall, a shiftman, was engaged on repairs to timber just within the mine-entrance.

We are satisfied from the evidence that the fan was not started by these men before entering the mine. They may have thought that as the electricians had to work in the return airway, the strong air-current with the fan working would make their work inconvenient and unpleasant, and it would be more convenient for the fan not to be running.

The evidence of Mrs. Blackburn, widow of the mine-manager, shows that at about 9 a.m. Christopher Blackburn informed her that he was going over to the mine to have a look round, and he left his home for that purpose, saying that he would not be away long. There is no direct evidence of the movements of any of the first four men who entered the mine, or of Mr. Blackburn himself, but Mrs. Blackburn's evidence shows that some time after her husband left his home he telephoned to her from the mine, "For God's sake tell Thomas to get the fan going, as there are men trapped in the mine." As Blackburn's body was later found close to the telephone at the entrance to K section we think it safe to assume that the message was sent from that point. It is probable that the time of the message was about 10 o'clock. Thomas, the mine engineer, said he received a message from Mrs. Blackburn at 10 o'clock, and thereupon went over and started the fan. He was not told at that time that there were men trapped in the mine. It is probable that the time of starting the fan was not later than fifteen minutes after Blackburn had telephoned. Shortly after delivering the message to Thomas, Mrs. Blackburn received a second one, this time from the deputy, W. G. Cole, who appeared to her to be seriously distressed because there was a distinct pause between his words. Mrs. Blackburn immediately left her house and ran towards the mine, which is situated on the opposite side of the gully, approximately a quarter of a mile away. When she was about half-way to the mine she saw Thomas coming from the fan and called to him that she had a message from Mr. Cole to say there was carbon-monoxide gas in the mine and that he had to start the fan. Thomas replied that he had started the fan, but in his evidence he affirmed that he did not hear Mrs. Blackburn make any reference to carbon monoxide. Mrs. Blackburn then returned home and waited by her telephone, and in a few minutes her husband again spoke to her, saying that he had found Cole, one of the deputies, and that he was going back for the others. He stated that the condition of the mine was "awful."

After receiving the message from Mrs. Blackburn, Thomas went to the deputies' cabin at the mouth of the mine, where there is a telephone communicating with the underground telephones and surface stations. There he found John Marshall, who said that when working just inside the mine he had heard the telephone ring and had come out to answer it. He said Blackburn was speaking and was asking for men to be procured and sent into the mine. Thomas states that he took the telephone receiver from Marshall, and Blackburn instructed him from inside the mine to get certain men into the mine as quickly as possible. Blackburn, who had given the names of the men he required to Marshall, repeated the names of four men to Thomas (Rodgers, Clark, Hunter, and

Peden). Thomas appears to have received no instructions from Blackburn as to why the men were required, where they were to go to in the mine, or what they were to do, but Marshall appears to have received some further instructions from Blackburn because, when getting the men together, he also sent messages to Wilcox and Brown, the underviewers, to say that they were required in the mine, that they were to go to K diamond and to take safety-lamps. Thomas and Marshall went different ways to collect all the men required as soon as possible, and they were collected probably in about half an hour. Thomas prepared safety-lamps for the men, and Peden, Marshall, Hunter, and Clark all went into the mine together—Marshall taking the place of Rodgers, who was not at home. Wilcox arrived later, and on hearing from Thomas what had happened at once followed into the mine. A few minutes after Wilcox, William Brown, the other underviewer, arrived, and also went into the mine. In his evidence Thomas states that at some time not fixed he had seen smoke issuing from the fan drift and had drawn the attention of these men to it before they went in.

Before entering the mine Brown arranged with Thomas that he would telephone from each telephone station on the main intake as he progressed, but Thomas states that although he waited by the telephone no message was received. Thomas took no further action, and states in his evidence that he felt no alarm, although he had rung each of the mine telephone-stations when he did not hear from Brown as he expected and had received no reply. After waiting until close on one o'clock Thomas, accompanied by an experienced miner, David Johnston, entered the mine, taking tea for the men underground and leaving Devereaux, mine clerk, in charge of the telephone. Thomas and Johnston found nothing to alarm them until they got to E section (see plan). On crossing the haulage road at this point they detected a smell of smoke, and a little farther in smoke was visible. Thomas telephoned to the surface, reporting his position from the section telephones as he progressed. Beyond E section the air was becoming foul, and was causing the men some distress. They proceeded, however, as far as F wall (shown on plan), and at this point Thomas saw a light ahead. On reaching the light he found the body of Brown, whom he considered dead. At this time Thomas was affected by the fumes. He stated in his evidence that his legs were just about giving way under him, and that his head and breathing were affected. The position of Brown's body in the travelling-road is shown on the plan.

Thomas and Johnston then retreated towards the mine-mouth, but at the telephone-station at A section Thomas telephoned the mine clerk who had been left in charge of the deputies' cabin instructing him to allow no one else to enter the mine, and to inform the Inspector of Mines at Huntly, and other mine-managers in the district that there was trouble in the Glen Afton Mine, and men had been lost. These instructions were expeditiously carried out, and the evidence shows that Mr. R. H. Schoen, Mines Inspector, Mr. John Watson, Mr. Joseph Smith, and other mine-managers arrived at the mine-mouth at approximately 1.45 p.m. Prior to the arrival of these officials medical aid had been summoned, and an attempt at rescue had been made by a party which had been able to enter the mine far enough to reach the body of Brown, which they were able to carry back to a point in the mine where the air was not affected by gases, and there artificial respiration had been applied under medical supervision for a period of about half an hour without success. The first rescue party was led by James Mitchell, a deputy then employed in the MacDonald Mine, and Harry Walter Rodgers, a deputy at Glen Afton Mine.

The evidence of Mr. Schoen, Inspector of Mines, John Watson, Thomas Geddes, and others shows that their party which entered the mine at approximately 1.45 p.m. was equipped with a carbon-monoxide detector, and also carried birds to indicate the presence of noxious gases. The air was all right as far as E section haulage-road. The Inspector states that at that point he found 0.1 per cent. of carbon monoxide in the air. The intake into E section was then stopped off by bratticing so as to drive the air farther along the main haulage-road. Proceeding along the haulage-road beyond E section the party opened a door between the intake and the main return and found the air in the return to be heavily charged with smoke and gas. There was a tarry deposit on the inside of the door and a high percentage of carbon monoxide present. The party propped open that door and proceeded a farther distance of approximately 10 chains, when another door into the return was opened, and the same condition was noted in the return. Beyond this door the party was able to proceed to near the top of J hill, where the air was found to be dangerous. The party then retreated towards the mine-mouth as far as the point marked on the plan as F wall.

Prior to this retreat of the main party, Mr. John Watson had gone out of the Glen Afton Mine and had proceeded to the MacDonald Mine, as advice had been received that an attempt at rescue was being made from that end, and it was thought advisable to have a qualified mine-manager in charge of the operations there. After waiting for some considerable time, not quite definitely determinable, the main party led by the Inspector made a further attempt to explore the mine airways, and this time these men were able to get as far as the bottom of J hill. At this point they found a miner's cap and portion of a safety-lamp, and they then proceeded farther. At about 5.30 p.m. they met a party from the MacDonald Mine, led by Mr. John Watson, who had found Marshall, Peden, and Wilcox at the points shown on the plan. These men were all dead when found.

The bodies of Clark, Blackburn, Cole, and Hunter had previously been discovered by a party which had entered the MacDonald Mine between 1.45 p.m. and 2 p.m. under the leadership of David Bryson Thomson, underviewer. This party, proceeding from the MacDonald Mine and following the connecting road to the Glen Afton workings, was able to continue without meeting unusual conditions to a point somewhere between K3 and K4 (see plan). Thomson states that at that point a slight smell of fire was noticed. He was able to proceed farther, and he and his party found the bodies of Clark, Cole, Blackburn, and Hunter at the positions shown on the plan. Describing the finding of these men Thomson stated that Clark appeared to have been dead for some time. From the position of the body he concluded that Clark had been endeavouring to escape to the MacDonald

Mine. Blackburn was found nearer the junction of the K section intake, and he also appeared to Thomson to have been heading towards the MacDonald Mine when overcome. We obtained no evidence as to which direction the deputy Cole had been travelling. In the case of Hunter it was concluded, from the fact that he was in a crouched position near the door between the intake and the return, that he had been hoping to get air underneath the door.

After discovering these bodies, and as the air was still breathable and was showing no ill effects on the bird carried by the party, Thomson and Wood continued along the Glen Afton haulage road as far as J hill. At that point they found the air was becoming dangerous, and they retreated again towards the MacDonald Mine.

When retreating they found the body of Marshall in a cross-cut between the haulage road and the travelling road, Glen Afton Mine. They came to the conclusion that he also had been heading towards the MacDonald Mine. After telephoning to the Glen Afton Mine mouth to give information as to the discovery of bodies, they made an effort to recover the bodies, but found the air becoming worse, and the bird they were carrying began to show ill effects. They therefore went in the direction of the MacDonald Mine as far as K rope road, and they did take out through the MacDonald Mine the bodies of Clark, Blackburn, Cole, and Hunter.

After Mr. Watson had arrived at the MacDonald Mine and had taken charge of the operations there it was decided to put a temporary stopping in the Glen Afton Mine intake at a point between F and H sections, and so, by opening doors into the return airway inside the stopping, to cause the MacDonald Mine to act as an intake and the intake airway in the Glen Afton Mine beyond the temporary stopping to act as a return. When this had been done K section was ventilated and cleared of noxious gases.

With the ventilation so arranged the party was able to locate the seat of the fire within approximately narrow limits, and steps were taken to seal off this area from the rest of the mine workings by the erection of stoppings, which are shown on the plan as fire stoppings Nos. 1 to 5. These, however, were erected in the reverse order of their numeration - that is, No. 5 was erected first and No. 1 was erected last. During the course of this work it was proven that there was a blockage in the Glen Afton main return airway probably about the seat of the fire. The return airway between No. 1 fire stopping (shown on the plan) and the mouth of the mine was explored on Tuesday morning (26th September), when the body of Ireland was discovered, and further on the bodies of Turley and Bell were found at the positions shown on the plan. From the position of the bodies and marks on the dusty floor it is clear that Turley had dragged Bell for a considerable distance towards E doors. But for this valiant effort to rescue his mate it appears that he might have saved his own life.

Subsequently the L section of the mine workings was ventilated and explored, and in this section it was noticed that there was a considerable deposit of soot and distilled tar showing that a large volume of smoke had passed through that section.

From the sequence of events above-described, and the evidence of witnesses as to the condition of the air found at different points in the Glen Afton airway as far as the connection with the MacDonald Mine, it is possible to arrive at a reasonable conclusion as to what happened to the unfortunate men who lost their lives. The fire which was the cause of the trouble on the Sunday has been proved to have occurred at or about the position of the fire which was discovered by Jackson and his mate on the Saturday morning. The most probable happening is that although Jackson and his mate and also Wilcox and Harlock were of the opinion that they had extinguished this fire they had in fact not completely extinguished it, and after Harlock's last inspection at about 12.30 on Saturday the fire had revived and continued to burn. The indications of a breakdown of the electrical circuit observed in the Huntly substation at about 2.10 on that afternoon lead to the conclusion that the fire had reached such intensity by that time as to cause damage to the electrical cables through heating of the conduit pipe sufficient to lead to a short circuit. The short circuit so created resulted in a secondary short circuit occurring farther out which caused a melting of the conduit pipe discovered later on Tuesday, the 23rd November, by Mr. A Burt and the mine electrician. It was suggested to us in the course of our inquiry that the fire had been caused by an electrical short, but all the evidence before us supports the conclusion that the reverse was the case, and the electrical short was the result of the fire.

The fault subsequently discovered by Mr. Burt, and of which photographs are attached to this report (Appendix C), consisted of a short circuit which had resulted in an arcing of the current and had completely severed two of the cables and damaged the third, while at the same time it had melted a hole in the conduit pipe. An examination disclosed that one of the cables had been seriously damaged at this point, probably when the circuit was being installed, and had been repaired by binding with insulating-tape, this being decidedly bad practice. However, the repair had remained for sixteen years without causing any trouble. This points to there having been an overload thrown upon the cable from some other cause, and this overload found a weak spot in the repaired cable. The trip switch at the mine switchboard did not act and cut out the circuit at the time of this happening.

Leaving out the cause of the fire for the time being, it is clear that there was a fire in the mine at or about the foot of the shaft connecting the upper and lower levels of the return airway. As the Glen Afton Mine fan was stopped from about 1.30 p.m. on Saturday, this fire, when it assumed considerable proportions, would cause the air to flow down the Glen Afton main return from the fan-drift to the seat of the fire, and therefore, although the fire must have been burning throughout the whole of Saturday afternoon and evening, it was not noticed by the workmen who, until 7.30 o'clock that evening, were engaged in the return airway searching for an electrical fault. Had the fan been working the fire must have been discovered.

The fact that the air-current was moving towards the fire also explains how it came about that Ireland, Turley, and Bell were able to enter the return airway on Sunday morning without discovering the fire. In all probability Cole and Ireland, accompanied by Turley and Bell, travelled the main road as far as the E doors. After inspecting a portion of the return from that point they admitted Turley and Bell to the return so that they could commence their examination of the electrical-supply cables. Ireland then proceeded to examine the remainder of the return airway and Cole to inspect the other workings as part of the Sunday morning routine examination. Probably somewhere about the entrance to the L section Cole encountered smoke and noxious gases from the fire. He would not at once retreat, but would make some effort to locate the seat of the fire.

At about the same time that Cole met this experience Blackburn arrived at K section junction referred to in the evidence of witnesses as "K diamond." He had probably looked in upon Turley and Bell on the main return airway in passing, since he knew they were to be employed in that position that morning. On arrival at K diamond he detected signs of fire, and probably opened a door into the return airway somewhere near that point. Discovering the condition of the air therein, he appears to have come to the conclusion that the men in the return airway were trapped, and he telephoned to his wife in the manner already described. Expecting the air current to commence to follow its normal direction on the starting of the fan, he probably then endeavoured to make his way back towards the Glen Afton entrance. At this time Cole retreated from the dangerous conditions he had found, and, on reaching the telephone, he too called up Mrs. Blackburn as already described. At this moment Cole and Blackburn had not met, otherwise Cole would have known that Blackburn had already telephoned a request for the starting of the fan, and would not himself have delayed to send a similar message.

If Blackburn after his first telephone message had been endeavouring to get out by the Glen Afton haulage road, he must quickly have realized there was something wrong with the ventilation system, as there was not sufficient fresh air coming to meet him with the starting of the fan, and he then apparently decided to go back to the telephone, where the atmosphere had at least been breathable. In doing so he met Cole, and he again telephoned to his wife, and also telephoned to the deputies' cabin at the mine-mouth requesting that men be sent into the mine.

It is probable that at this time both Blackburn and Cole were partially overcome by carbon-monoxide poisoning, and were therefore not capable of arriving at perfectly sound conclusions. They both appear to have been obsessed with the necessity for starting the fan, and yet it seems to us to be clear in the circumstances that had they not requested the fan to be started but had proceeded, at the first sign of vitiation of the air, to travel back along the Glen Afton haulage-road they would in all probability have been able to escape from the mine, and it is even probable that on the way they could have notified Ireland, Turley, and Bell of the danger, and that these men also could have escaped.

We are forced to this conclusion because of the fact that until the fan was started the fire itself was causing a reversal of the normal direction of the air-current. The fresh air was travelling along all three headings of the Glen Afton Mine towards the fire. Dangerous atmospheric conditions existed only on the inbye side of the fire until after the fan was started. The distance Blackburn and Cole would have had to retreat from the point where they discovered the fire-gasses to a point where they would have been in comparatively pure air did not exceed 10 chains. Because of the blockage in the return airway the starting of the fan at once had the effect of drawing the accumulation of poisonous gases from L and K sections down through the Glen Afton main haulage-road, where it would seek an entry into the return through every door and stopping.

The condition of Blackburn and Cole, arising through their being partly overcome by the effects of carbon monoxide, also explains why Blackburn, when he asked Thomas to send additional men into the mine, did not give any instructions as to what the men were to do, what direction they were to take, where they were to make for, or what conditions they might expect. Although Thomas received no such instructions, the evidence of Edwards, storekeeper, who at Marshall's request went for Wilcox, and the evidence of the boy Rodgers, who took a note to Brown, shows that Marshall had been told that the men were to proceed to K diamond.

This reconstruction of what happened on the Sunday morning, which must be very approximately correct, although there is no evidence other than circumstantial evidence, leads inevitably to the conclusion that the loss of these eleven men arose from entirely preventable causes. Had the fan been started before the men entered the mine on the Sunday morning, the presence of fire must have been discovered at least as soon as the deputies attempted to enter the return airway, if not before they actually left the surface, through smoke appearing at the fan-drift.

Later on Blackburn and Cole might have escaped from the mine, and perhaps have secured also the escape of the other three men from the return had they not reached a conclusion, subsequently proved to be mistaken, that the starting of the fan would give them assistance. Further, the lives of the other six men who entered the mine in response to Blackburn's request would not have been sacrificed had they been warned as to the mine-conditions they were likely to encounter so that they could have taken the necessary steps to protect themselves, steps such as were taken later in the day by those who entered the mine when the conditions had become even worse.

In view of the well-recognized fact that throughout the Waikato mining field mine fires are the principal source of danger to be constantly guarded against, it is difficult to understand why it was apparently taken so much for granted that the fire discovered on the Saturday morning was completely extinguished. It would have been only ordinary good practice for the underviewer, or the mine-manager if his attention had been called to the fact that a fire had occurred, to have arranged that the place should be watched for some time after the ordinary time for ceasing work on the Saturday. There

was a serious dereliction of duty by the interviewer in that neither of the two reports that he signed on that day made any mention of the fire having occurred.

Again, in connection with the electrical fault which was discovered on the Saturday afternoon, it is difficult to understand why, in the face of the mine officials' knowledge that there had been a serious breakdown somewhere in the circuit, an examination of the whole length of the circuit was not made on the Saturday evening by these mine officials with the object of making sure that no fire had been caused by the short circuit which they knew had occurred. In our opinion good mining practice would have required the examination of the whole length of the electrical system to ascertain any consequences that might have resulted from the short circuit.

A feature of the whole of this case which has impressed itself upon us is that happenings which in themselves might not have been of supreme importance, but which none the less were potential sources of danger, were not taken seriously enough, and more thoroughly investigated.

We now proceed to deal seriatim with the specific questions arising under our order of reference :

1. The cause of the underground fire which was found to have occurred in the said mine on the 24th day of September, 1939.

There was no direct evidence as to the origin of the fire which was found in the mine on Sunday, 24th September, 1939. There is, however, the direct evidence of eye-witnesses as to the occurrence of a fire at about 10 o'clock in the morning on Saturday, 23rd September, 1939. Two witnesses stated that at the time of this fire Wilcox the interviewer said, "This looks like a short," indicating his opinion that the origin of the fire had been an electrical short circuit. We are of the opinion, however, that there was no justification for that assumption. In the first place there was no damage to the conduit pipe discovered. In the second place there was no interruption of the power-supply beyond the seat of the fire. The fan in the K section continued running until the power was switched off at the transformer several chains beyond the seat of the fire when work ceased for the day, and in the third place there was no indication of any fault in the electrical circuit either at the mine or at the Huntly substation until ten minutes past two in the afternoon.

We therefore reach the conclusion that the fire on Saturday morning was caused by a dropped cigarette or a naked light coming into contact with inflammable material. The subsequent examinations of the mine by several persons and by ourselves have proved that the site of the fire on Sunday morning was the same as that of the fire on Saturday. In our opinion the only safe conclusion is that the Saturday morning fire was not properly extinguished, but revived and burned vigorously after work ceased in the mine for the day. We reject the theory advanced to us that after the Saturday morning fire had been completely extinguished a second fire was caused by the electrical fault subsequently recorded. In our opinion this is a possibility too remote to be accepted. The reasonable conclusion based upon all the facts is that the revival of the fire on Saturday afternoon caused the electrical fault that was then observed.

2. To what extent the provisions of the Coal-mines Act, 1925, and the regulations made thereunder were complied with in the mine and more especially as regards—

(a) *The Examination of the Mine.*—The examination of the mine by underground officials appears to have been carried out on the whole in accordance with the Coal-mines Act and Regulations. There was, however, an exception on certain Saturdays, since no reports covering the period from 6 a.m. to 8 a.m. on those days were found in the deputies' report-books. As a general practice the back-shift deputies did not make reports specially covering the period between 10 p.m. and midnight. Although this is not proof that examinations were not made within that period preparatory to the commencement of the night shift we are of the opinion such reports should always be made.

A custom seems to have grown up among all those who were responsible for reporting upon their mine examinations of following a stereotyped form, and failing to record observations of many frequent occurrences which, in every mine, should be regarded as abnormalities. A case in point is that although Wilcox, the interviewer, signed the report for Saturday, 23rd September, he made no mention therein of the abnormal happening which occurred on that day—namely, an active fire of considerable proportions in the return airway. Another instance as showing the general tendency is that although the barograph in the fan-house, which should at all times record variations of pressure between the intake and return airways, was not working satisfactorily, neither the Government Inspector nor the officials of the mine recorded their observations of this fact. We also find the reports upon the electrical equipment which are required under Regulation 254 and described as the Electricians' Daily Log-book were not satisfactory in that they were with very few exceptions identical from day to day and contained no detailed reports of work done or examinations made. We think that these reports should be initialled by the manager in all cases and should be filed in such a way as to be always accessible to the Inspector of Mines, who should also initial them on his periodical visits.

(b) *Ventilation.*—The ventilation of the mine was adequate and satisfactory. However, there appeared to be some uncertainty as to the true meaning and interpretation of the regulations with regard to the running of the fan. We shall refer more fully to this later.

(c) *Electric Wiring and Equipment.*—The evidence of electrical experts who appeared at the inquiry was that the electrical system of the Glen Afton mine complied in all essentials with the requirements of the Coal-mines Regulations, but in our opinion the regulations should now be carefully examined to see that they are adequate in the light of present-day knowledge.

3. The nature and character of the working and general management of the mine, and whether the mine was well and safely managed.

The methods of working and the layout of the mine have been fully described earlier in this report.

Except in respect of the matters already commented upon in this report the evidence submitted to us indicates that up to the 23rd September the management of the mine was satisfactory and up to the generally accepted standard of New Zealand mines. Moreover, for sixteen years the most serious injury to any workman was a broken leg.

It is clear that the tragic happening of the 24th September was due to the cumulative effect of a number of happenings already discussed in this report, none of which may at the time have appeared to be of great importance, but all of which taken together led to consequences quite disproportionately tragic. There was on Saturday, 23rd, and Sunday, 24th September, a striking failure of the human element in several instances.

4. The efficiency of the inspection of the mine by all or any persons who are responsible for such inspection.

The Government Inspectors of Mines and the Workmen's Inspectors appear to have carried out their inspections at sufficiently frequent intervals, and to have called attention to anything which they thought required a remedy, but we do not think they paid sufficient attention to the daily reports of examinations of the mine.

It goes without saying that attached to coal-mining there are certain inherent dangers. Because this fact is recognized in all countries where coal-mining is performed there have been framed legislative enactments with a view to providing a maximum degree of safety. New Zealand has in its Coal-mines Act and Regulations followed the lead of other countries, and has based its legislation largely upon that of Great Britain. The regulations set up a safety organization in respect of each mine consisting of a mine-manager, underviewers, deputies, shot-firers, workmen's inspectors, and, lastly, the miners themselves. Upon each of these classes of mine-workers the regulations impose certain duties and responsibilities. Superimposed upon this organization at the mines there is an inspection branch of the Mines Department consisting of a Chief Inspector and Mines Inspectors who are charged under the law with the duty of seeing that all those responsible for safety in coal-mines faithfully discharge their duties. It is clear that if an individual member of this safety organization, or any section of members, do not perform their duties at all times with the utmost efficiency there may be a breakdown of the whole safety organization.

We desire to emphasize the need for strict discipline, and the greatest possible measure of co-operation between the Government Inspectors, the managerial staffs, and the workmen at every mine. The most certain contribution which mine-workers can make towards their own safety is to accept strict discipline in the administration of all legislative provisions and the observance of safety methods, and it cannot be too strongly pointed out to mine officials that their duties as to mine-inspection and the recording of their observations are of supreme importance and must at all times be so regarded. Lastly, strict enforcement of all provisions of the law is a duty imposed upon the Government Inspectors. Even trivial acts of neglect or omission on the part of mine officials should not, in our opinion, be overlooked or condoned by Government Inspectors. It is only by the strictest possible compliance with all the requirements of the law that the maximum degree of safety can be attained. In mining eternal vigilance is the price of safety.

5. Whether or not the loss of life would have been averted or reduced had the service of a rescue brigade or any additional equipment or any special apparatus been available at the mine.

It is difficult to answer this question as it is set out. We think that a central station such as the one which is now functioning on the West Coast coalfields is not properly described as a rescue-station. The word "rescue" implies that some one has to be safely brought out of a dangerous position in which he may have been placed, but it is seldom, if ever, that men who have been caught in an atmosphere containing a dangerous percentage of carbon-monoxide gas have been rescued by men from central stations. No cases of such rescues having been effected were reported to us.

We are of opinion that the most important function of a central station is to train men in the use of safety breathing apparatus and in the use of restorative appliances and methods, so that at each mine within the district served by the station there will be a squad or squads of men so trained who will be able in cases of emergency to enter otherwise unbreathable atmospheres without danger to themselves. If there had been a central station situated in the Waikato coalfield exercising this function, there would have been at the Glen Afton and other mines in the district squads of men trained not only in the use of safety-breathing apparatus, but also trained in safe methods of entering a mine under abnormal conditions, and having a knowledge of precautions to be taken. It is probable that when Thomas received the message from Blackburn to send men into the mine, instead of those men being selected more or less at random, one or more squads of specially trained men would have been procured, and would have entered the mine in safety or at least without unduly exposing themselves to danger, as was actually done by the parties under the control of the mines inspector and the managers from other mines. To this extent it is certainly possible that the lives of the last six men who entered the mine during the morning would not have been lost, but we do not think that the lives of any of the first five men could have been saved after the fan had been started on that Sunday morning.

We have seen in the press a statement made by the Minister of Mines that it is his intention to establish a central station in the Waikato District, otherwise we would have recommended such establishment.

6. Recommendations -

1. *Ventilation.* It is obvious from the evidence before this Commission, as indeed it has been obvious from the evidence given before other Commissions set up to inquire into mine disasters, that it is essential for the safety of every mine that the ventilation system should operate efficiently. Provisions designed to ensure the efficient operation of the ventilating appliances are contained in Regulations 177 to 181 of the Coal-mines Regulations 1939. During the hearing there seemed to be some doubt in the minds of witnesses holding responsible mining appointments as to the true interpretation of these regulations. Our attention was drawn in the first place to the circumstance that Regulation 179 (1) requires a mechanical ventilation appliance to operate not only while there are any "persons" in the mine, but also during the preceding eight hours, whereas subsection (2) of the same regulation requires a ventilating-appliance to operate while there are "persons" in the mine and for two hours before "workmen" enter the mine. A suggestion was made to us, and of some weight, that the distinction drawn between "persons" and "workmen" was so drawn designedly with the intention that in naked-light mines it should not be necessary for examining deputies and other officials to wait for two hours after the starting of the fan before entering the mine. Inasmuch as the loss of life in the present case was attributable to the fan not being started before the examining deputies entered the mine on the Sunday morning, and although we think that this constituted a breach of Regulation 179 (2), it would make the obligation to start the fan clearer and more definite if the word "persons" were substituted for the word "workmen" in that subsection. This should not, however, be made to apply in the case of naked-light mines on days upon which no work of any kind was to be carried out except the examination of the workings by officials. In such cases the running of the fan for half an hour prior to the mine being entered should be sufficient. Another suggestion was made to us that the term "ventilation machinery driven by mechanical power" as used in Regulations 180 and 181 did not include a ventilating-fan driven by electricity. In our opinion, there was no substance in the suggestion, because it is obvious that an electric motor driving a fan is a mechanical appliance, the electricity merely providing the motivating power as steam provides the motivating power for steam-driven machinery. Again, it was argued that while Regulations 181 to 184 make provision for the duties of persons in charge of ventilating-machines there was no obligation under the regulation for the mineowner to appoint such a person, and if in fact no such person had been appointed, then those regulations had no application to that particular case. We have no doubt as to the true intent of the framers of these regulations, but the omission from the regulations of the obligation to make such appointment leaves a loophole for their evasion. Many mineowners, we are given to understand, do appoint fan-attendants. In this case no fan-attendant had been appointed, and it appeared to be nobody's specific duty to tend the fan or the automatic indicator registering the water-gauge. We are of opinion that a regulation should be framed making the appointment of a fan-attendant obligatory. His duties need not necessarily be confined to attendance at the fan alone, but he could carry out other duties not inconsistent with the duties imposed on fan-attendants by the regulations. It would probably make for efficiency if fan-attendants were appointed in writing and their duties were set out clearly in their appointments.

Again, it was suggested that the regulations made no provision for emergencies which might arise by reason of which it might be essential that persons should enter the mine while ventilating-appliances were not running. We think that a proviso could well be made in the regulations to meet such a circumstance, and that every case where men are required by the mine-manager to enter the mine in the case of emergency without the fan running should be recorded and notified to the Inspector of Mines. It was also pointed out that the regulation made no provision for temporary stoppages of the fan. This is another matter which we think could be provided against by a further amendment to these regulations. It is undesirable that regulations should be such as to lead to any laxity in the interpretation thereof as seems to have been the case in the matter before us.

We therefore recommend as follows: -

(1) That Regulation 179 be amended as under—

In paragraph 2 after "workmen" to "persons", and add—

" Provided that on Sundays or other days on which there is no work being done in the mine other than an examination by the officials it shall be sufficient compliance with this regulation if the said officials see that the ventilating-appliances are running continuously for thirty minutes before they enter the mine."

Add proviso to paragraphs 1 and 2—

" Provided, further, that in any case which the mine-manager regards as a case of extreme emergency it shall not be an offence under these regulations for persons to enter the mine while the ventilating-appliances are not running, but in any such case the limit of time that men may remain in the mine while the fan is stopped shall not exceed the minimum required to overcome the emergency, and, further, the circumstances of each such case shall be forthwith reported by the mine-manager in a report-book to be kept for that purpose, and a copy of each such report, stating the reasons which in the opinion of the manager constituted a state of emergency, shall be forwarded to the Inspector of Mines."

(2) That new Regulation 179 (a) be adopted—

" In the event of a stoppage of the ventilating-appliances while workmen are in a mine the underground officials shall withdraw the workmen from the working-places and order them to proceed without delay to the nearest underground station appointed as provided in section 127 of the principal Act.

“ If the ventilating-appliances shall not have recommenced running at the expiration of thirty minutes from the commencement of the stoppage in the case of a mine in which safety-lamps are required to be used, and sixty minutes in the case of other mines, then it shall be the duty of the underground officials to see that all workmen shall forthwith leave the mine.

“ If the ventilating-appliances shall have recommenced to operate within the periods named, then the workmen shall return to work, but not until the fireman deputies have examined the working-places with a locked safety-lamp and reported all clear.

“ In the event of a temporary stoppage of the ventilating-appliances during the time that they are required to be run prior to men entering the mine, provided that such stoppage does not exceed thirty minutes in the case of a safety-lamp mine or sixty minutes in the case of a naked-light mine, the workmen may be permitted to enter the mine when the ventilating-appliances resume running, but only after the workings have been examined by the fireman deputies and found clear of all inflammable or noxious gas, but if the stoppage exceeds these times the provisions of Regulation 179 (1) and (2) shall apply, as the case may be.”

(3) That Regulation 181 be prefaced by the following words:—

“ The manager of every mine in which mechanical ventilation appliances are used shall appoint some person or persons to be in charge of the ventilating machinery.”

(4) *Noxious Gases*.—That Regulation 266 (12) (b) (ii) be amended to provide:—

“ That small birds be kept at all mines and, further, that in all mines employing fifty men or more there shall be kept at the mine an approved carbon-monoxide detector.”

2. *Underground Fires*.—The principal causes of mine fires are:—

- (a) Spontaneous combustion:
- (b) Naked lights:
- (c) Electrical faults.

We recommend that regulations be adopted to provide:—

(a) That, with a view to minimizing the risk of spontaneous-combustion, panels in mine workings be not more than three and a half acres in area, except in cases where the nature of the seam makes such an area unsuitable. In such cases the area may be extended, with the consent of the Inspector of Mines, to not exceeding seven acres.

(b) That no inflammable materials which are not required for use in the mine and which are not part of the equipment of the mine shall be allowed to accumulate in any of the workings or airways underground, that all waste materials of an inflammable nature shall be removed, and that if in the opinion of the Inspector of Mines there are dangerous accumulations of inflammable material in any mine it shall be his duty to enforce their removal or, alternatively, to require the cessation in that mine of the use of all naked lights while such accumulations remain.

(c) *Electricity in Mines*.—The short circuit discovered in the mine on 21st November, which is illustrated in Appendix C, did not cause a fire because the electric arc did not come into contact with any inflammable material, but such an occurrence could be expected to cause fire in most cases. While we are of the opinion that armoured cable is to be preferred to cable protected by conduit pipes, we feel that the matter is one requiring expert electrical knowledge, and, in view of the extensive and increasing use of electricity in mines and the fact that the progress of electrical science calls for highly specialized knowledge, we recommend that there be appointed forthwith a fully qualified and experienced electrical engineer to be an inspector of electrical equipment and installations in mines, and that one of the first duties of this officer after his appointment shall be to examine the regulations governing the use of electricity in mines with a view to making such further provisions for safety as may be found necessary.

3. *Central Safety Brigade Stations*.—In view of the public pronouncement of the Minister of Mines that it is the Government's intention to establish one of such stations in each mining district, and in view of the fact that these stations may be a danger rather than an additional means of safety unless they are properly equipped and staffed only by suitable men, highly trained under expert leadership, we recommend that there be appointed an officer who shall have the direct control and supervision of all the stations, and that such officer be the holder of a first-class mine-manager's certificate of English, Australian, or New Zealand origin, in addition to a thorough training and extensive experience of safety-station work, and that the instructor at each station in the use of safety-apparatus be under the control of this officer. Further, since we have received information that in some mining countries apparatus other than the Proto apparatus now in use in New Zealand is preferred for mine-work, we recommend that one of the first duties of this officer when appointed shall be to investigate the properties of different makes of safety-breathing apparatus with a view to seeing that the new stations are equipped with the best appliances available.

Conclusion.—The Commission is indebted to Sergeant Corston for the able way in which he carried out the preliminary inquiry and obtained statements from witnesses, as this was of valuable assistance in our investigations.

We should also like to express our appreciation of the efficient work of our secretarial staff.

We return herewith Your Excellency's Commission, together with the various extensions thereof. Also we forward herewith a verbatim report of the evidence given together with the relevant appendices.

All the foregoing matters and considerations we humbly submit for Your Excellency's gracious consideration.

Dated at Wellington this 2nd day of February, 1940.

S. L. PATERSON, S.M., Chairman.
J. C. BROWN.
JOHN DOWGRAY.
T. O. BISHOP.
A. McLAGAN.

The foregoing report is signed by Messrs. Bishop and McLagan subject to the addenda following :—

ADDENDUM BY MR. T. O. BISHOP.

Item No. 3 in our order of reference is "to inquire into the nature and character of the working and general management of the mine, and whether the mine was well and safely managed."

I read that as an instruction to consider the management of the mine as a whole and to give due weight to all matters which reasonably come within the definition "general management."

If that is a correct reading, I think it requires an addition to the foregoing report. It is easy to be wise after the event, but in estimating the quality of the management of this mine it is necessary to consider the whole period from the commencement of the mine to the present time, and to give proper and proportionate weight to the history of the mine prior to the accident of the 24th September, 1939.

The mine is well laid out and well equipped, and from the commencement of work until the 24th September last, a period of sixteen years, it had a remarkable history of immunity from serious accidents. That history points to good and safe management and I desire to record my opinion to that effect.

T. O. BISHOP.

ADDENDUM BY MR. McLAGAN.

I desire to add that in my opinion the Commission's reply to question No. 3 should specify the happenings referred to in that reply, "none of which (according to the Commission's report) may at the time have appeared to be of great importance, but all of which taken together led to consequences quite disproportionately tragic."

These happenings, in my opinion, were as follows :—

On at least three Saturdays immediately prior to the disaster no examination of the mine was made within the two hours immediately before the commencement of work on the day shift. No reports of such examinations were made, and it is evident, from the other reports that were made, that no examining deputy was in the mine during the time prescribed for the making of these examinations.

No reports of special examinations made solely within the two hours prior to the commencement of the night shift were made for a considerable period prior to the disaster. These examinations may have been made without the making of a special report concerning them having been considered necessary. It should be pointed out, however, that similar special examinations were made on the other shifts, and special reports of such examinations were always furnished.

It was stated in evidence that the management met nearly every day and discussed the reports of the daily examinations. The management did not take the necessary steps to ensure that these daily reports were made.

No written report was made of the fire that occurred in the return airway on the morning of Saturday, 23rd September.

The ventilating-fan was not started before the workmen entered the mine on the evening of Saturday, 23rd September, nor was the fan started and continued in operation whilst these workmen were in the mine.

The ventilating-fan was not started on Sunday, 24th September (the day of the disaster), before the workmen entered the mine.

No examination of the mine within the two hours immediately preceding the commencement of work in the mine on the 24th September appears to have been made.

A. McLAGAN.

APPENDICES.

Appendix A.—Plan of Glen Afton Mine.

Appendix B.—(1) Copy of Underviewer's Daily Report. W. Wilcox, Glen Afton Mine, 23rd September, 1939.

(2) Copy of Fireman-Deputy's Report, W. Wilcox, Glen Afton Mine, 23rd September, 1939.

Appendix C.—Photographs (two) of Conduit and Cables taken from Glen Afton Mine, showing effect of a Short Circuit.

Appendix D.—(1) Horizontal Section Plan of Sealed Portion of Glen Afton Mine showing Stoppings removed and Effects of Fire.

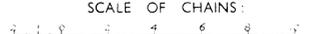
(2) Vertical Section Plan of Fire Area, Glen Afton Mine, showing Extent of Fall.



DENOTATIONS.

-  Denotes aircrossing.
-  Red colouring shows return airway.
-  Blue " " intake " "
-  Denotes brick or concrete stopping.
-  " " board and brattice " "
-  " " brattice " "
-  " " Door in stopping.
-  Blue arrows show stopping of air currents.
-  Green line shows electric power line.
-  Denotes fault in coal seam.
-  Black arrow shows direction coal measures are thrown down by fault.
-  Denotes a fault causing a vertical displacement of 61.5 ft.
-  Tel. denotes Telephone.
-  " " Coal pillars extracted.
- X No. 1 denotes where W. Brown's body was found.
- X No. 2 " " J. Clark's " "
- X No. 3 " " C. Blackburn's " "
- X No. 4 " " W. Cole's " "
- X No. 5 " " G. Hunter's " "
- X No. 6 " " J. Marshall's " "
- X No. 7 " " W. Wilcox's " "
- X No. 8 " " W. Peden's " "
- X No. 9 " " R. Ireland's " "
- X No. 10 " " W. Bell's " "
- X No. 11 " " R. Turley's " "
-  Denotes temporary stoppings put up to isolate the fire after the disaster.
-  Denotes concrete stoppings put in to isolate the fire after the disaster.
-  Denotes air regulator.

APPENDIX A.
PLAN OF
THE GLEN AFTON MINE.

SCALE OF CHAINS:


APPENDIX B1.

GLEN AFTON MINE.

COPY OF UNDERVIEWER'S DAILY REPORT.

DISTRICT inspected and state of working places--A, E1, E2, E3, K1, L, H, F, and main return airway.

State of ventilation--Good.

Have you had occasion to withdraw men from any working place? If so, why?--Mine idle.

Have you observed or had your attention drawn to anything of a dangerous nature in or about the mine?--No.

If so, what has been done to remedy the above?--[No answer].

Have the men received sufficient trucks? If not, state reason--Mine idle.

Is there sufficient timber available in the working-places to meet requirements?--Yes.

Have any accidents occurred during the day? If so, state to whom, and the nature of same.--No.

Is there any matter you desire to draw under the notice of the Manager?--No.

Has there been any breach of the Mining Regulations by employees? If so, state what nature.--No.

Number of men on shift--Eighteen.

Are all man-holes kept clear?--Yes.

Have you had any difficulties with regard to output?--Mine idle.

Are all your day-wage men satisfactory workers?--Yes.

Do you require additional truckers or rope hands? If so, at what point--Mine idle.

General Remarks--Everything all right.

(Signed) Underviewer: W. WILCOX.

Date: 23/9/39.

APPENDIX B2.

GLEN AFTON COLLIERIES, LTD.

FIREMAN-DEPUTY'S REPORT.

No. 1 Mine. Ther.: 59° F.

23/9/1939.

I HAVE this day between the hours of 8 a.m. and 2 p.m. examined with a locked safety-lamp all the working-places and roadways leading thereto in _____ Section: A, E1, E2, E3, K1, L, H, F, and main and return airway.

Roof and sides: Safe.

Ventilation: Good.

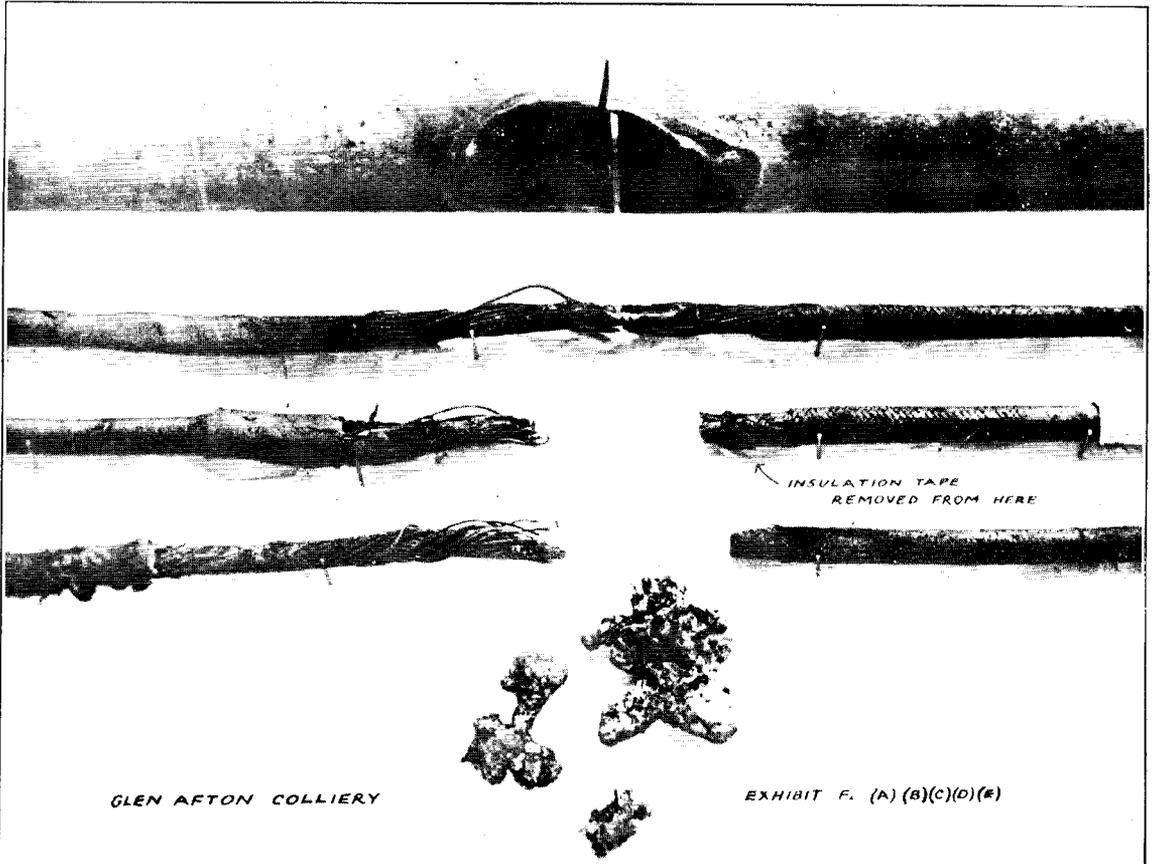
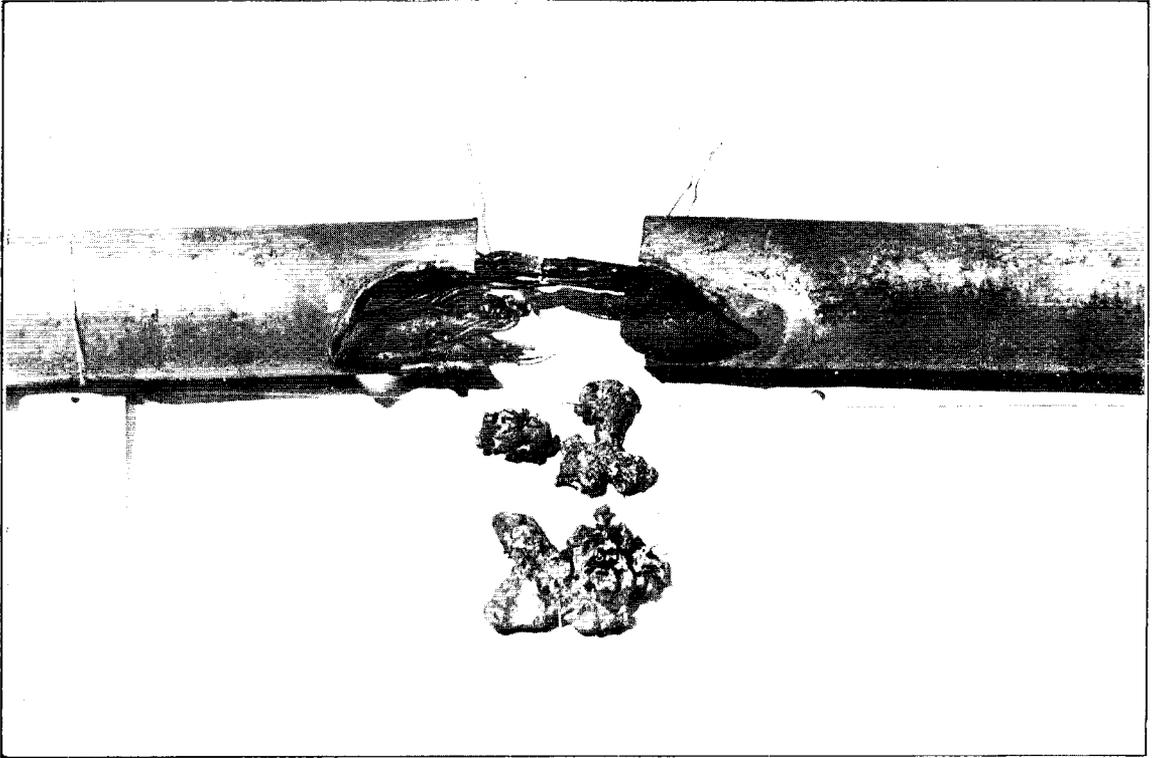
Presence of gas: None.

General remarks: 18 men in; 18 men out.

Time of making report: 2 p.m.

W. WILCOX, Deputy.

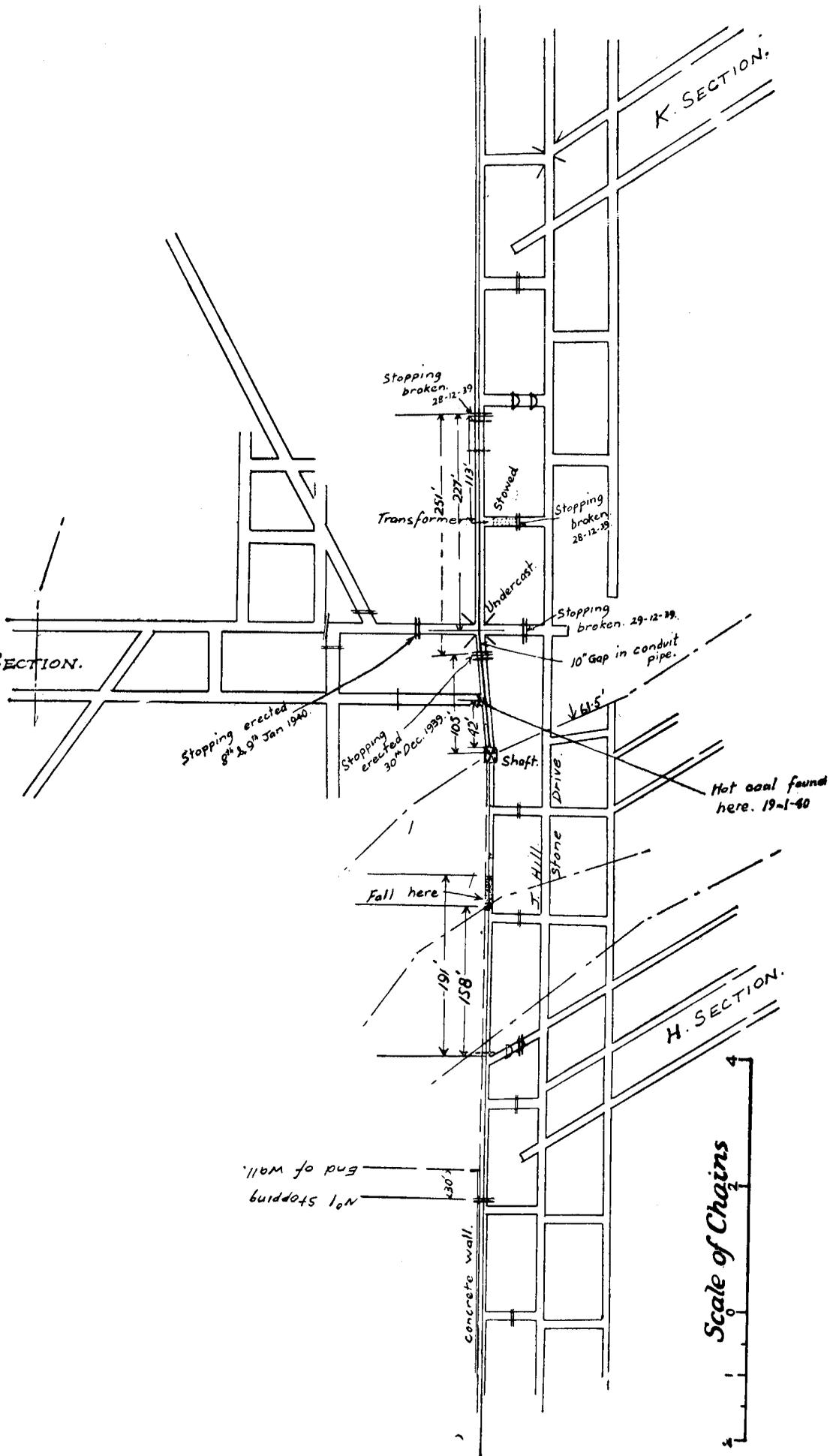
APPENDIX C.



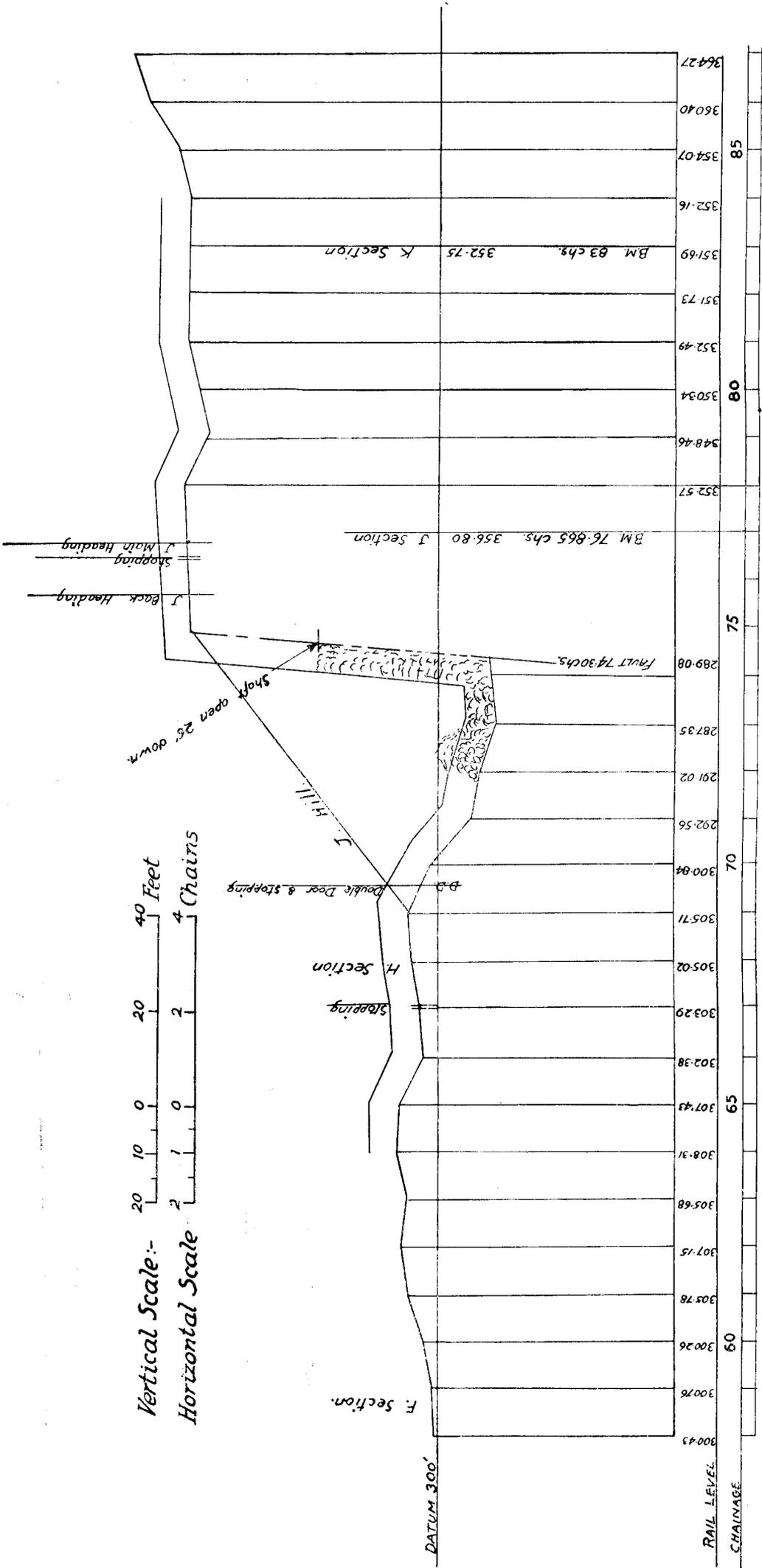
GLEN AFTON COLLIERY

EXHIBIT F. (A) (B) (C) (D) (E)

APPENDIX D1.



APPENDIX D 2.



Approximate Cost of Paper.—Preparation, not given; printing (615 copies, including maps, graphs, and illustrations, etc.), £85.

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