37. *Mr. Dowgray.*] What leads you to believe that they will not work with a spray?—I do not think they will work with a spray because they bore up holes with the popper. They use them in rises.

38. If you used a spray what would be the difficulty?—It would not work if you put water into it.

39. So you think that accounts for them not using a spray?—Yes.

40. In reply to the Chairman you said that in the early days of the mine the mullock was thrown down through holes from the surface: that was when the mine was shallower, was it not?—Yes, it was certainly shallower then.

41. Do you consider that now they have got down to the deeper levels fans should be erected?—Yes, fans should be erected now that the heat warrants it.

42. Do you think that the ladderways leading up into these stopes should be altered?—Yes, a 4-by-4 ladderway would be a lot better than the present size.

43. *Mr. Parry.*] Have you been working in a place where they have taken the temperature?—I cannot say that I have.

44. You have had a good deal of experience in working in hot places?—Yes.

45. What effect does the working in hot places have upon you?—Well, it has a very depressing effect.

46. As regards the idea of having two men on the winding-engine, what is your opinion?—I consider it is unsafe to have only one man at the engine when hauling men.

47. Do you think a standard height should be fixed for stopes?—Yes.

48. What height do you suggest?—Well, I would suggest the height should be such as a man could always reach with a pick. That would be a safe height.

49. What do you consider is the cause of the majority of accidents that occur in these mines?—I think the present contract system is responsible for them.

50. Why?—Well, they do not get a very big price, and have to work at high speed to make a wage.

51. What is your opinion as to change-houses—the room which should be allowed for each man?—There should be 2 ft. for each man.

52. What is your opinion as to the use of bag and paper tamping?—I think it should be done away with.

53. *The Chairman.*] Is it used to any extent by the miners in Waihi?—It is not supposed to be used, but men will use anything they can get, as a rule.

54. By whom is the tamping provided under the contract system?—By the contractors.

55. *Mr. Parry.*] In regard to the firing of holes, did I understand you to say that in your opinion not more than six holes should be fired at once?—Yes.

56. *The Chairman.*] What is your opinion as to the system of plastering: do you think it is safe?—It is fairly safe. Of course, it is a quick method—quicker than boring.

57. But supposing the dynamite does not explode?—We generally examine the place for that sort of thing. We can tell whether the boulder has been smashed or not. If it is not, then we know at once that the shot has missed.

58. But does it not get scattered amongst the debris from the other shots?—No, it is covered over with clay. If it missed it would still be covered by the clay unless it got dislodged with flying rock.

59. *Mr. Reed.*] As a contractor, how many hours do you work in your place, on an average, per shift?—About seven hours, I should say.

60. Have you ever worked in a six-hour place?—Yes, in shafts.

61. In stopes or in a crosscut have you ever worked on a six-hour place?—No.

62. Are there many places in the Waihi Mine being worked in six-hour shifts?—No, I do not think so. I could not say.

63. In what condition, as regards safety, are the ladders kept in the stopes where you have worked?—I think they are fairly good—that is, where I am working.

64. Have you always found them good since you have been working in the mine?—Yes, I have found them reasonably good.

65. Have you ever seen them out of order?—No, I cannot say that I have.

66. Whose duty is it to keep the ladderways clear of the stone or mullock—the company's or the contractor's?—The contractor's.

67. Do contractors frequently throw tools down them?—Yes.

68. Does that not tend to destroy the ladders?—I believe it does.

69. Is it forbidden to do so?—There is nowhere else to drop them down.

70. *The Chairman.*] Have you any other place to put them down?—No, not where I am working. There were at one time empty passes.

71. Is there not a shoot?—Those are quartz shoots.

72. *Mr. Reed.*] Are there provisions made for passing the tools down other ways than the ladderways?—Not in the present system of working while the passes are kept full. It is the only way.

73. Is it not very dangerous, as well as destructive to the ladders?—It certainly knocks the ladders about.

74. And after they are knocked about are they not dangerous?—Well, the workers generally repair them if they get into a dangerous state.

75. Are they now in good repair in your place?—Well, I believe there is a portion not too good, but it is a temporary ladder.

76. So that really you do not look after your ladderways?—I think we keep up to the standard pretty well. We have had no complaints from the manager about them.

77. *Mr. Dowgray.*] You have heard what previous witnesses have said about the safety-bar on the cages in the Waihi Mine: are all the cages fitted with it?—Yes, all the ones I know.

78. In the early days of this mine were the passes always kept open?—Yes, they were always empty.

79. So that you used to pass your steel through them?—Yes. I would like to add that that was another source of ventilation which we had at that time. These passes allowed the air to come in, whereas now they are full.

80. *The Chairman.*] Have you ever had an accident happen in the mine as the result, directly or indirectly, of having only one man at the engine?—No, but it may occur.

81. *Mr. Parry.*] Do you think that it is essential to have a standard temperature fixed for six-hour places?—Yes.

CHARLES OPIE recalled.

82. *Mr. Parry.*] What is your opinion, Mr. Opie, as to whether accidents would be minimized if shots were not allowed to be fired by men depending upon the amount of material gotten, and that all explosives should only be handled by shot-firers?—I believe it would be a good thing if it were put into workable form.

83. *The Chairman.*] Can you suggest a workable form?—Yes, I think it could be done all right if a man were told off to a certain district to have charge of the firing of all shots fired in that district.

84. With a shot-firer who would determine the length of the hole?—The man who bored it.

85. How would it minimize accidents?—Instead of three or four men being engaged in the firing there would only be one.

86. *Mr. Parry.*] You think there would be less accidents occurring if only one man were allowed to handle the explosives instead of perhaps fifty?—Most decidedly.

THOMAS KEARNEY sworn and examined. (No. 18.)

1. *The Chairman.*] What are you, Mr. Kearney?—A miner.

2. How long have you been mining, and where?—Twenty-six years; Victoria, New South Wales, Tasmania, and New Zealand.

3. How long in New Zealand?—Four years this time.

4. Where in New Zealand?—Waihi.

5. In which mine?—Waihi and Grand Junction Mines. I have been working about eighteen months in the Waihi Mine.

6. How long is it since you were there before?—About twelve or eighteen months.

7. What is your total experience of the Waihi Mine?—Close on three years.

8. Have you had any experience of taking temperatures?—No.

9. Upon what matters did you wish to furnish the Commission with information?—As to the heat and ventilation.

10. Have you had any experience of accidents?—Not at Waihi. I wish to speak as to bath-houses and change-houses.

11. Tell us first with regard to temperature?—Well, I was working in the stopes here on the Edward lode on No. 8 level. It is too hot where we are working. I saw the temperature taken last February by the Inspector of Mines, and it was 85° there at that time.

12. Do you know what the surface temperature was then?—I could not say.

13. Was your place visited by the Commission?—Yes.

14. What was the temperature taken?—82½° and 83° at one end, and 81° and 82° at the other end.

15. Who took it?—I do not know. I was not on shift at the time.

16. In what way does it affect you?—Well, after a man has been working hard—say, falling stone—for about ten minutes he feels as though he were in an airship—everything seems to be going round—and his heart beats like the kettle-drum. He has to sit down, or he would fall. At times we get overheated and retch a good deal. It also brings us out in heat boils and abscesses.

17. Have you had medical treatment for any of these things?—No, I have not been examined for them, but I saw a doctor about six weeks ago, and he advised me to get out of the mine.

18. Which doctor?—Dr. Craig.

19. Have you any objection to his giving evidence before the Commission as to his examination of you?—No, not at all.

20. And as to ventilation what have you to say?—Well, the stope in which I am working now is a mullock stope, and the passes are kept filled. We have three ladders, but sometimes these ladderways are covered over with quartz, and perhaps they may be covered that way for a week, and no ventilation comes up. I would suggest that in those hot places where the passes are filled there should be a ladderway to come up alongside every pass.

21. Do you approach your stope from No. 7?—From 8 to 7. It is called Bullock's pass. I have been told that when the Commission went in yesterday they took the ventilation at No. 8 level—that is where we get our ventilation from—and it was 79° and 80°.

22. Have you anything to suggest for the improvement of the ventilation?—Well, the only way I can see to improve matters is to have doors in the main airways in order to carry air up into the stopes. As it is at present it goes where it is not required, and should be distributed better.

23. What is your opinion as to bath-houses? In your experience, are they used when provided?—Yes, they are used a great deal, especially by the men working in those hot places. One perspires very freely even when working in only boots and trousers. A miner gets very dirty, and requires a hot bath, which should be provided. That also applies to men working the machines, for they get covered with dirt and grease.

24. What proportion of baths should be provided—how many men to a bath?—About eight or ten men to a bath.

25. Have you anything to say regarding sanitary arrangements?—Nothing more than what the last witness has said. I agree with that.

26. *Mr. Dowgray.*] In regard to ladderways: you heard previous witnesses give evidence: would you suggest that a ladder be put up each pass?—Yes, in hot places, and where the quartz passes are kept full.

27. Then there would always be one means for ventilation?—Yes.

28. Do you consider, along with Mr. Opie, that the mine ought to be ventilated with fans?—Well, I have not had any experience of fan ventilation, but something requires to be done so as to distribute the air better and draw it from the stopes.

29. Have you had any experience with the trucks in that mine? Do you agree with the previous evidence in regard to them?—Yes.

30. *Mr. Parry.*] Do you consider it essential that a standard temperature should be fixed for a six-hour place?—Yes.

31. What temperature would you suggest?—About 75° should be the standard. Anything over that should be a six-hour place.

32. Have you made any complaints about the stope where you are working?—Yes, to the shift boss. We told him it was too hot.

33. Did you suggest anything should be done to improve the air?—We said that brattice should be put up on the level. They did that, but it did not seem to improve matters, for the stope is still just as bad.

34. Was any other attempt made to make the stope cooler?—I believe there was a door put up in No. 7 level to send the air down to No. 8 and bring it into our stope.

35. Do you know if any men have fainted in your stope?—No, I do not know, but several of us have nearly done so.

36. In regard to the height of stopes, do you think a standard should be fixed?—Yes.

37. Why?—A man should be able to try his stope to know if any danger is to be feared. He ought to be able to touch the back and roof with bar or pick, and sound it to find if the rock is loose or not.

38. What is your opinion *re* firing holes with electric battery or fuse?—I consider that if more than five or six holes are to be fired the battery should be used, because when more than that number are fired a man may miscount them.

39. *The Chairman.*] What time do you think should elapse before a man goes back after a misfire?—No man should go back under one hour.

40. Do you think one hour is sufficient?—Certainly, two hours would be better.

41. *Mr. Parry.*] What is your opinion as to the employment of shot-firers in a mine?—I do not approve of them myself. I think that a man who bores a hole would have a better idea of loading it than a man going round. Of course, there are places where they have shot-firers.

42. Do you think many accidents would be obviated if a shot-firer had a district in a mine and was a qualified man?—Perhaps they would, but I know myself I have come into contact with young fellows in the mine who were very inexperienced and were very careless.

43. *The Chairman.*] Is it not usual to fire shots at crib-time?—No, they fire them whenever they are ready.

44. In a large section of the mine would not delay be caused if only shot-firers were allowed to fire?—Yes, perhaps there would, unless a man had plenty of room to bore. If he were working in a small place it would be very inconvenient for him to have to wait for the shot-firer to come along.

45. *Mr. Parry.*] Do you think it would minimize the risk of accident if no man who depended upon the amount of material gotten was allowed to use dynamite?—I believe it would.

46. In regard to bath-houses, do you think a space for each man should be fixed?—Yes, each man requires about 2 ft. of room.

47. *Mr. Cochrane.*] Have you worked with rock-drills?—No, only hand-drills.

48. Not with poppers or hammer drills?—Yes, hammer drills; but there is no machinery where we are.

49. Have you had any experience of the small hammer drill, called a popper?—No, not here.

JAMES DAVID BLAIR sworn and examined. (No. 19.)

1. *The Chairman.*] What are you, Mr. Blair?—A miner.

2. How long have you been mining?—About six or seven years in Waihi, and about two years in railway-tunnels.

3. What mines have you worked in?—Waihi, Grand Junction, Extended, and Waihi West.

4. Are you working in the Waihi Mine at present?—Yes, on the Royal, No. 9 level.

5. Have you had any experience of taking temperatures?—No.

6. Have you seen temperatures taken?—Yes, when the Inspector of Mines has been round.

7. What do you wish to inform the Commission upon?—Sanitary arrangements, temperatures, change and bath houses. I have also known of a few accidents which occurred in the stopes I have been working in.

8. What is it you wish to say as regards ventilation?—There are places I have worked in on the Royal reef which have been very warm.

9. Was your place visited by the Commissioners?—Well, I did not know if it was visited. I was trucking in another level at that time.

10. Whose stope is it?—Horan and party's.

11. Was that the stope which was closed down on account of the temperature?—No, we had finished our place, and are trucking now. It was not closed down on account of the temperature.

12. What have you to say about sanitary matters? Do you believe that sanitary conveniences should be provided in mines, and that it should be made compulsory for miners to use them?—Yes.

13. Did you hear Mr. Opie's evidence?—Yes, and I agree generally with what he says.

14. Can you give us any information with regard to accidents in places where you have worked?—There have been slight cuts received by the men, and one man was shot while blasting. He got stunned when he had lit the hole by something dropping upon him, and he could only crawl away.

15. Was he killed?—No, he was laid aside for six weeks. That was about three or four months ago.

16. What was his name?—George Faulder.

17. What have you to say as to bath-houses and their use?—I think they are very necessary.

18. What is your experience as to the use the miners make of them?—Well, the greatest trouble is that there are insufficient baths, and the men are kept waiting some time.

19. How many men should go to a bath?—About seven or eight men to a shower.

20. *Mr. Parry.*] You have a good deal of experience of hot places?—Yes, rather too much.

21. What is the highest temperature you have worked in?—It was either 90° or 92°. I am not certain.

22. *The Chairman.*] Was that in Horan's stope?—No, that was in the Extended.

23. What was the highest in Horan's stope?—87° or 88°.

24. *Mr. Parry.*] Do you think it essential that a standard temperature should be fixed for six-hour places?—Yes, I should say 75°.

25. You have heard the other witnesses give evidence to the effect that the size of the trucks is the cause of many accidents?—Yes, and I quite corroborate what has been said by them.

26. What is your opinion as regards one man only being in charge of a winding-engine?—Well, I have often thought of the danger of a man having heart-disease and dropping dead while at the engine.

27. *The Chairman.*] Do they have a windlass on the winding-engines?—Yes, they have them now.

28. Is it a handy, workable system?—Yes, and I think it is a safe one.

29. *Mr. Parry.*] What is your opinion as to the standard height of stopes?—I should say they ought to be about 10 ft. from the solid—that is, 8 ft. stopes.

30. In regard to shot-firing, have you had any experience of the use of electric batteries?—Yes, I have.

31. What is your opinion as to its use?—For myself, I would sooner use the battery than the fuse in rises.

32. *The Chairman.*] For general purposes?—Yes, for general purposes.

33. What percentage of misses do you have with the battery?—You do have misses at times, but I could not say the percentage.

34. Have you used them yourself?—Yes.

35. Do you think that accidents would be minimized if the men depending upon the amount of material gotten were debarred from using explosives, and if all shot-firing were done by qualified shot-firers?—Yes, because where a man is stoping in a hot place and sweating when spitting the hole he is apt not to get a proper ignition.

36. Do you consider that a man who depends upon the quantity of stone he gets is apt to be more reckless than a firer would be?—Yes, a man under the contract system takes a good deal more risk.

37. Do you think that the contract system conduces to accidents?—Yes.

38. Do you think that it would minimize accidents if shot-firers were appointed?—Yes.

39. Do you think it a workable scheme, or would a considerable amount of time be lost?—I do not think so.

40. How are you going to keep in touch with the shot-firer, supposing that a number of men want him?—Of course, a man could not fire for a very large section, and a certain number of firers would have to be told off.

41. How many men do you think it would take to do the firing in the Waihi Mine?—About ten or twelve might be able to do it.

42. *Mr. Parry.*] As regards space in change-rooms, do you think a certain amount of room should be provided for each man?—Yes, about 2 ft. or 2 ft. 6 in.

43. Was there any complaint made in regard to the ventilation in Horan's stope?—Yes, at different times.

44. With what result?—They put up some brattice and doors, but the heat still seemed to be there.

45. How long after the complaint was made were the doors put up?—About a month afterwards, I think.

46. Was the temperature reduced at any time to any great extent?—It would be a few degrees lower some days than on others.

47. *Mr. Cochrane.*] I think you told us that the man at the engine might have heart-disease, and that consequently there would be danger: what do you suggest as a remedy?—He should have an assistant present when they are lowering men.

48. Does nothing else occur to you as a remedy?—I have been told of an automatic brake which comes into action when a driver's weight is taken off the brake.

49. Then, if the driver were examined for heart-disease, would that not be a remedy?—No, because he might get it the day after he was examined.

50. But if these examinations were made periodically?—Perhaps that might fix it.

51. Have you been accustomed to hammer drills or poppers?—Yes.

52. What is your opinion of their effect upon the health of the miners using them?—If they are used dry they are injurious.

53. Have you anything to suggest as a remedy?—They should be done away with, or water should be used with them; but I do not know whether it would work with water. A small spray might be suitable.

54. Do you think that would be sufficient?—I do not know.

55. And as to your suggestion about a temperature standard for a six-hour place, does the temperature vary quickly?—Yes, it may vary a degree or so.

56. Then, so that we may arrive at a fair conclusion, what length of time would you have the place at that temperature before the six-hour shift would come into operation—should it be a day, or a week, or an hour?—After about a day of high temperature.

57. *Mr. Reed.*] You referred to a temperature of 75°: do you mean wet or dry bulb?—I do not know about those things.

58. Are you aware that there is a considerable difference?—I am told there is.

59. Would you consider that a dry-bulb temperature of 75° and a wet bulb of 70° would be too high for an eight-hour place?—I have been told that 75° wet and 80° dry is too high.

60. Then practically you know nothing about temperatures?—No.

61. Do you mean six hours from bank to bank, or actually in the working-place?—Six hours bank to bank.

62. How many hours would that be in a working-place on an average?—About five or five and a half.

63. So that you propose to make a working-day of five or five hours and a half in places which register 75° wet bulb?—Yes.

64. *Mr. Parry.*] Do you think the temperature would vary if mechanical ventilation were installed?—Yes.

65. My question is whether ventilation by fan or other mechanical means would vary as much as the present ventilation?—I could not say exactly.

ALFRED BROWN sworn and examined. (No. 20.)

1. *The Chairman.*] What are you, Mr. Brown?—A miner.

2. How long have you been mining?—About twenty years.

3. Where?—South Australia, Victoria, and New Zealand.

4. How long in New Zealand?—Fourteen years.

5. In which mines?—About twelve years in the Waihi Mine.

6. Have you had any experience of the taking of temperatures?—I have not taken any myself.

7. Have you seen them taken?—Yes, in places where I have been working. That was a while ago.

8. Did the taking of that temperature give you any idea or enable you to compare the actual heat with the registered heat?—Yes, I have a fair understanding of it; it was 81° on the occasion I refer to.

9. How did that temperature affect you: did you consider it an excessive heat?—Yes, I reckon it was too warm to work eight hours in.

10. Do you understand the wet and dry bulbs?—No, I have no practical knowledge of them.

11. And, even with the 81° you quoted, you do not know whether it was by the wet or dry bulb?—I was given to understand it was 81° dry.

12. And that was too warm?—Yes, for eight hours.

13. Are there any matters in particular upon which you wish to inform the Commission?—As far as change-houses go, I would like to say a few words. In alluvial mines they have a different system. Each man has a place and a number. You take your clothes off and put them on the floor, and a man comes round and takes them away, dries them, and brings them back. That is a better system. Of course, the man is not required continually—only for an hour or so when the shifts are changed. Also, as to the bath-houses, they should be boxed off, and there should be hot and cold water. It is impossible to get oil off with cold water—you want a hot shower.

14. Do you mean for the places to be boxed off for privacy?—No; unless they are boxed off a man gets sprayed with the water from the showers. Also, the showers should be boxed off from the basins.

15. How would it suit to have a system of stalls partitioned off with galvanized iron?—It would not matter what they were made of so long as it kept the shower in. Then you want about half as many showers again—about twelve showers for a shift. At the present time, when shifts are changed, there are always a lot of men kept waiting. When men are hot they should not be kept waiting too long. About one shower for every eight men would be sufficient.

16. From your experience can you tell us how many men use the showers?—As far as I know there are very few men who do not use them before going home—in fact, hardly any.

17. Have you any other matters to which you wish to draw the attention of the Commission?—In regard to shot-firing, I am in favour of the use of the battery in rises, winzes, and shafts. It is much safer than the fuse.

18. Have you any limit of shots to be fired by fuse?—Well, I think five holes are quite sufficient to fire by fuse.

19. Have you known of many accidents resulting from firing?—Yes, I have known several in the Waihi Mine.

20. How were they caused?—There was the case of Faulder: he was blown up. In Marshall's case they heard two shots, but they did not warn him that there was more to go. He was fossicking round and struck the charge, which exploded.

21. Can you suggest any remedy for minimizing the risk of such accidents?—No, but I want to say this: that if a miner is firing not more than, say, five holes, and using not less than 4 ft. fuses, he has plenty of time to get away. Of course, at times you get a bad piece of fuse, but that is very seldom. If a man uses ample fuse there should be no accidents when firing five holes.

22. Have you any knowledge of other accidents, caused by falls from roof, and so forth?—I have known of them, but I have no personal knowledge of them. I have been very fortunate in the matter of accidents.

23. Have you any suggestions to make as regards sanitary matters? You heard Mr. Opie's evidence this morning: do you corroborate it?—Yes, I agree with all he said, but I would like to add that the sanitary conveniences should be kept a certain distance away from the travelling-roads.

24. Where do you work in the mine?—On the Royal reef in No. 9 level, in McDonald's stope.

25. How is the ventilation and temperature there?—It is not as hot as it used to be, but still it is hot enough for a man to feel the effects of it.

26. Was the temperature there taken by the Commission?—No.

27. Have you any general suggestions to make in regard to the ventilation?—I believe it would tend to improve matters if the smoke were not allowed to travel all over the workings. Pipes or fans should be used to draw the smoke from the dead-ends and places where the men are trucking. Also, I find that where the shafts are boxed in you get better ventilation. The shaft then acts as a chimney or flue, and you get more good air.

28. Have you anything further to suggest?—I would like to say that, in connection with the inquiries into fatal accidents, the union should have a fair number of representatives.

29. That is already provided for. There has been a suggestion made that some representative of the body of workers should have the right to appear and examine witnesses?—I consider that is quite right, because you want a practical man to inquire into those accidents. I think the suggestion is not unreasonable.

30. Are you working in stopes?—Yes.

31. What is your opinion as to the height of stopes?—It has already been stated by previous witnesses that 8 ft. or 9 ft. is a fair thing. I think they should be no higher—they can be worked safely that way. By having them higher it is impossible for a man to test the back, and they would be far more secure if a man were able to sound them at any time.

32. Have you ever known an accident occur, either directly or indirectly, through having only one man at the engine when hauling or lowering men?—No, I have never heard of such a case.

33. *Mr. Dowgray.*] You heard the evidence as to the necessity for having the ladderways wider than they are at present: it was stated that that would assist the ventilation?—Yes, I would have them wider.

34. How does the ventilation of this mine compare with that of other mines you have worked in?—Well, as I told you before, in alluvial mines they work on a better method. They have air-shafts connecting with the drive every 200 ft. These are connected with the surface. Of course, the mines are not so deep.

35. If this mine had a level driven to connect as a main return, and the stopes connected with that level periodically, that would have the same effect?—I believe if they had two fans, with a downcast boxed in for ventilation, it would make a great improvement.

36. Have you had any accidents when using these trucks?—I consider that the trucks we are using at present are not fit for a man to push. They should have horses.

37. If the timbers were farther away from the roads would that not obviate many of the accidents to men through their hands getting jammed?—Well, it would, perhaps; but there are no accidents where it is not so wide.

38. But still, if there were a stipulated distance between the wall and the truck, it would be an improvement, would it not?—Yes, that might save a good many of the accidents.

39. *Mr. Parry.*] Do you think it is very essential for a standard temperature to be fixed?—Yes; any man who works in 80° for any length of time soon finds that out.

40. What is your opinion as to the appointment of shot-firers to have charge of all shot-firing in the different districts?—I believe it could be worked, as it was in the Junction.

41. Were you working there at the time?—Yes, it worked satisfactorily.

42. Do you know of any accidents taking place under that system?—No.

43. What effect does the dynamite have upon you when handling it when you are hot?—It affects every man more or less; it affects me a good deal.

44. What is your opinion as to there only being one man at the engine when pulling and lowering men?—There is a risk at present, but I think it could be easily overcome. It would require a second man to be there only for half an hour when changing shift. As far as I know there has not been any accident, but one is quite likely to occur.

45. And are you of opinion that there should be a standard height fixed for stopes?—Yes, I would make the standard from 8 ft. to 10 ft.

46. In regard to sanitation and change-houses, you corroborate what the previous witnesses have said?—Yes.

BENJAMIN CAMPBELL sworn and examined. (No. 21.)

1. *The Chairman.*] What are you, Mr. Campbell?—A miner.

2. How long have you been mining?—Thirteen or fourteen years.

3. Where?—In different parts of New Zealand.

4. How long have you been working in Waihi?—A little over four years. I am at present working in the Waihi Mine.

5. How long have you been there?—Pretty nearly four years.

6. Have you had any experience of the taking of temperatures?—Not of taking them.

7. Have you been present when any were taken?—Yes.

8. How does the temperature you are working in compare with that in which it is reasonable to expect a man to do a fair day's work in? How does it affect a man?—Well, I find at times that a man's heart beats a good deal faster than it should. I have known men who have had to go down to the level—they felt sort of seasick.

9. How long ago is it since you saw the temperature taken?—It was taken some months ago; but we were not so high in the stope then as we are now. It is Elsegood's stope that I am working in.

10. That is the one in which there was some heating going on?—Yes.

11. Since the use of rock-drills has the temperature gone up?—We have never used anything else. We did not start with hand labour; we started with the machines.

12. Have you anything to say to the Commission in regard to that temperature?—Well, I think it is too hot for a man to work in for any length of time.

13. What do you mean by that?—The present hours are too long for such a warm place.

14. What do you think would be reasonable?—I think six hours would be sufficient.

15. And if you could get the temperature down to 75° you could work eight hours?—Yes.

16. Have you any suggestion to make as to the method by which it should be reduced?—No, I could not say anything as to that. The lode is naturally hot.

17. From the nature of the lode you think the heat could not be reduced to any great extent?—Yes.

18. Is there any other matter you wish to draw our attention to?—No, I do not think I have anything to say as to accidents. I have never been connected with serious ones. Some of my mates have met with accidents, but not any serious ones.

19. How did they happen?—One man was struck with a windlass-handle over the eye.

20. Was there a pawl on the windlass?—It was what they call a crab-winch, and he was lowering something. It did not happen on my shift. He was found lying down.

21. Do you not use windlasses when you are sinking?—No; on that occasion we were sinking down to connect with a rise, and were putting the dirt down through a pass. I could not say how this man got hurt. He said himself it was not the winch, but that a stone came down the shaft; but, of course, we do not know.

22. Have you anything to say as to shot-firing, and whether the firing should be done by fuse or by electricity?—I believe in the use of electric batteries in shafts, and I think they would be better than fuse in rises also, but I have never used them.

23. In a face where a number of shots are required, which do you think is the better plan?—Four or five is plenty for any man to fire with a fuse, but I would not care about using the battery in a stope.

24. What do you think about having a shot-firer to fire all shots: is it a workable scheme?—It may be workable if the shot-firer has not too large a district, because you could not wait all day for a man to come and fire your shots.

25. What is your opinion as to the size of the trucks and the causes of accidents while trucking?—Well, in the first place, the trucks are too big, and the lines as laid are uphill and downhill and any way at all. I find that trucking is the hardest work I have ever done. I would sooner go into a hot place.

26. About the curves?—The lines would be better if the road were made straighter, or if there was no grade. I have known men to strain themselves when lifting the big trucks when they got off the roads. I have hurt myself that way.

27. What is your opinion as to the necessity of bath-houses and change-houses?—I think they are very necessary, and hot and cold showers should be provided. We have no hot ones here, where we change at No. 4 change-house.

28. What is the present proportion of men to a bath, and how many men use them?—A good many—I could not say how many. They are used mostly in the summer-time, but also a good deal in winter. The basins are too close to the showers, which run along in a row behind you when you are using the basins.

29. *Mr. Dowgray.*] In regard to the temperature of your stope, about which the Chairman questioned you, do you not think if there were a greater volume of air it would be cooler, even though the lode was hot?—It may clear out the smoke, but as soon as you exert yourself you feel the heat coming from the lode.

30. But it would not have as depressing an effect upon you?—It may not.

31. You heard what the other witnesses said as to the necessity for brattice-cloth or doors: would that not be an improvement?—Yes, I believe in swing-doors, but not in the brattice. It is a failure. The swing-door is much the better. There has been one put up near where I have been working, and it is a great improvement. It is the only one I have seen in the mine; but I have not been all over the mine. It sends a big current of air up the main way, but when you get into the stope you cannot feel it, because it is so wide.

32. If the ladderway were wider there would be more air going up?—Yes, I suppose so.

33. *Mr. Parry.*] You think it is very essential to have a standard temperature for six-hour places?—Yes.

34. What temperature would you suggest?—I think about 75° or 76° is quite hot enough for a man to work eight hours.

35. Have you ever had much experience of working in ends and shaft-sinking?—I have worked in a couple of ends in the Waihi Mine. They were pretty hot.

36. *The Chairman.*] Can you say what temperature they were?—No, I do not remember any one taking the temperature. It may have been taken during another shift. That was shortly after I first came.

37. Do you know the difference between the wet and the dry bulb?—No.

38. *Mr. Parry.*] In regard to the appointment of a shot-firer in charge of each district, do you think that would have the effect of minimizing accidents at present caused by the handling of dynamite?—Yes, I believe it would.

39. Does the dynamite have any injurious effect upon you?—Yes, there have been times when I have been so overcome by it that I have had to ask the shift boss to let me up. It affects me in the head.

40. Do you retch at all from the effect of it?—Occasionally.

41. I would like to know your opinion as to the necessity for appointing an assistant to the engine-driver?—I expect it would make matters a good deal safer.

42. Have you known many accidents resulting from firing in any other place but Waihi?—Yes, I had a mate killed in the Talisman. I do not know what happened, whether the first shot ran or whether he was spitting too many holes—he was firing about eight or nine. A hole in the corner was left, and the shot went off and injured him.

43. Do you feel any ill effect from mining?—Yes, I do. I know that I could not do the work now which I used to get through before I started mining.

44. You also think the trucks are too heavy?—Yes.

45. What do you think is responsible for the majority of the accidents which take place at Waihi?—It is the contract system under which we work.

46. Did your party ask for the door to be placed in the level—did you make any complaints?—Yes, complaints were made to the shift bosses pretty often. I was present in the stope when it was mentioned to Mr. Gilmour, and the door was put up shortly afterwards.

47. You corroborate the evidence of previous witnesses in regard to the change-houses and sanitation?—Yes.

48. *Mr. Cochrane.*] You say you desire the standard temperature to be fixed at 75° or 76°: what do you desire if it rose above that?—Shorter hours. Six hours would be a fair thing.

49. And would you allow any time to elapse in which the thermometer stood at that before the six-hour shifts were actually started?—Yes, I would give it a day or two to see if it got any cooler.

50. As to electric firing, do you favour the use of the battery in drives as well as in rises?—No, I do not. I would sooner use the fuse in the face—that is, provided the drive was not wet. Where it is wet the battery is the better.

51. As to swing-doors, do you think they would be efficient in providing really good ventilation?—They would in some of the stopes, but where the lode is naturally hot I do not think the ventilation would be much improved by their use. They might cause a draught and clear the stope of smoke, but it would not be much cooler.

52. I think you said you worked with machine drills?—Yes.

53. Have you the small popper or hammer drill?—I have never worked a popper.

54. *Mr. Reed.*] Have you ever known of a round of holes failing to explode when fired by an electric battery?—Yes; we put it down to a fault in the cables.

55. How many holes do you fire per round?—I have fired as many as sixteen, and only got two or three to go off.

56. What was the reason of that?—At that time we were using the short cap, and we understood afterwards that it is the long cap with a high tension which should have been used.

57. Have you ever experienced or heard of hangfires or misfires when the electric battery has been used?—No. I presume you mean, did it explode after I had worked the machine? No.

58. Have you known of the men in the Waihi Mine interfering with the brattice so as to take the air from another man's place and send it into their own?—No, I have not seen them do it, but I have seen the brattice pulled down.

59. Is it a common practice for the miners to pull it down?—I do not know of its being a common practice, but I have noticed it done under our stope. They do not exactly tear it down, but there are nails on each side, and when we are trucking the cloth is thrown over them.

60. Has the brattice been accidentally torn down?—I could not say.

61. Is it frequently torn down?—No.

62. You stated that the hardest work you have done in the Waihi Mine was trucking?—Yes.

63. Was that hardship owing to the heat?—No, that was owing to the size of the trucks, the quantity of dirt, and the bad lines.

64. So that trucking was more severe upon you than working in a temperature of 81° saturated?—Yes; that is, recently. There was a time when the trucking was easier, when we had good-running trucks, but the trucking under present conditions is harder than working in Elsegood's stope.

65. Would you propose to make the truckers work only six hours also?—You could make it easier for the truckers by using smaller trucks, and so forth.

66. As regards the six-hour places, would you make it six hours from bank to bank or at the actual working-place?—From bank to bank.

67. How many hours would that be in Elsegood's stope?—About five and a half.

68. Would you only take half an hour going to and from your place—would you only lose half an hour out of the six?—We may lose a little more.

69. Do you include crib-time in the five hours and a half? How much would that be?—Not very long—perhaps a quarter of an hour or twenty minutes on a six-hour shift.

70. *The Chairman.*] You say that trucking is worse than working in hot places: is it the heat you complain about or the hard work?—It is not the heat. There is not much heat on the levels, but usually a good current of air. It is on account of the bad lines, and so forth.

71. *Mr. Dowgray.*] Have you ever seen any brattice-cloths, except the one on your own level, in the mine torn down?—Yes, there was one in the stope next to us.

72. It is not customary to put them up, is it? Those are the only two you have seen?—I have not seen very many, I admit.

73. *The Chairman.*] How much of the mine have you been over?—I have been over a good deal of it. I have worked in five or six places.

74. *Mr. Dowgray.*] Those two are the only brattices you have seen?—Yes, I think so, but I would not be sure.

GEORGE NICHOLAS JONES sworn and examined. (No. 22.)

1. *The Chairman.*] What are you, Mr. Jones?—A miner.

2. How long have you been mining?—Between fifteen and twenty years.

3. Where?—In Victoria, Western Australia, Tasmania, and New Zealand.

4. How long have you been in New Zealand?—About four years, all the time in the Waihi Mine.

5. Do you understand anything about taking temperatures?—No.

6. Do you know anything about the wet and the dry bulb?—No.

7. Have you ever been in hot places when they have taken the temperature?—Yes; where I am working at the present time it was taken, and found to be as high as 83½°.

8. Who took that temperature?—The workmen's inspector and the Inspector of Mines. It is Pearson and party's place on the Roval lode in No. 9 level.

9. Is work still being carried on there?—Yes.

10. Did you see the temperatures taken the other day?—Yes; it was down a matter of 5° or 7°.

11. What brought it down, do you know?—I cannot attribute it to any particular influence, unless it is that as the workings are exhausted we get a better current of air with not so much friction.

12. There has been no alteration in the system of ventilation?—No, not that I am aware of.

13. When the temperatures were up at the higher point, how were you affected?—We used to perspire very freely, and working in mineral ore we broke out in boils all over—a sort of blood-poisoning. I had to lose nine or ten days myself through them, and to go to Te Aroha to get rid of them. I was under treatment by the doctor, Dr. Pearse.

14. Of Waihi?—Yes; all my other mates in the same stope were affected.

15. How are you affected when working in the temperature taken by the Commission?—We find it a lot better this last month or two. As the stope goes higher matters improve.

16. Do you find any difficulty in working eight hours in that temperature?—No; it is a bit hot. It would be a great relief if we worked less hours.

17. Do you say that the present temperature has any injurious effect upon you apart from mere personal discomfort?—I find myself to be getting very short-winded, and I blame that for it.

18. Have you had any experience of accidents?—I have been very fortunate in that respect. I have not seen any in my immediate presence, but I have seen several narrow escapes.

19. How?—By falls of ground from the back.

20. What do you attribute these falls to?—They generally happen when working down the ground after firing. Frequently there are loose pieces in the back which may not be noticed, and you have to be very careful not to get under them. On one particular occasion, when my mate and I were working in this place, I heard something crack, and we were just able to get out of the way in time to avoid a big fall.

21. Have you ever known other cases of falls from the roof past the actual influence of the shot?—No.

22. Have you ever known any difficulty in sounding the roof?—Well, we have been able to test it.

23. What is the average height you work to?—6 ft., or 7 ft., or 8 ft. Our job is a shrinkage job. Sometimes we have to leave big places.

24. Have you any opinion to offer as to how many holes a man should fire with a fuse, and when he should use electricity?—I have had no experience whatever with batteries, but I consider that a man should not spit more than four or five holes by hand, and he should have a fair length of fuse so as to allow him plenty of time to escape.

25. Have you had any experience of the trucking-ways?—Yes. I find that trucking is very hard and laborious work; it should be done by horses in the Waihi Mine, owing to the size of the trucks and the bad roads. It is not fit for any man to do. There is something wrong with the trucks we have at present, because in the past we have been able to push them along with ease. Under the present circumstances, after a man delivers a truck, he is fairly exhausted.

26. Do you drill with a rock-drill?—No, by hand.

27. Have you worked the rock-drill or popper?—Yes, the rock-drill.

28. Have you used the water with it?—Yes.

29. How were you affected by the dust?—With the water there is no dust at all.

30. You have had no experience with the popper?—No, and do not want any.

31. Have you known of any accidents being caused through one engine-driver only being at the engine when men were being lowered and hauled?—I have not known of any accidents, but I consider that the driver should have another man alongside, as they have at the Golden Belt, in Western Australia, where I have been, at change of shifts.

32. Do you think that could be done by keeping the man going off an extra half-hour?—Yes.

33. The man who is going on changes the men?—Yes.

34. Do you think the man going off should wait until the men were changed?—Yes, then the men would certainly feel safer. If anything went wrong I do not see what chance the men in the cage would have.

35. Is there any other matter which you wish to bring before the Commission?—There is the matter of ventilation. I am of opinion that the air in the mine could be distributed much better than it is at present by a system of doors, or brattice-cloths, or something like that. The doors are better than the brattices. They are half the time open. If they fall down nobody bothers to put them up again. If there were swinging-doors put in to distribute the air it would be much better. You go down the crosscut of No. 9 level and the air would almost blow your hat off, but that air never reaches the stopes where the men are working. If doors were put up, and the old winzes or passes closed up where stopes are worked out, the air would find its way to the places where the men are working.

36. What is your experience in regard to ladderways, as to their size, and the condition in which they are kept?—The ladderways where I have worked have been kept in good order. The only difficulty is that they are not large enough. In mines where I have been the levels have been every 200 ft.; in the first 100 ft. there should be 4 ft. cribbing.

37. Do you find that throwing steel down the ladderways injures them?—Yes; but they should have proper facilities for sending it down, such as shoots.

38. There are shoots in some of the ways?—Yes, there are; we have them in our place.

39. You think that would keep the ladders in proper condition?—Yes.

40. *Mr. Dowgray.*] Do you not think that 200 ft. between the levels is too great?—Yes, 100 ft. would be sufficient, both from a safety point of view and that of the laborious nature of the work, especially when the men are sinking or rising.

41. Have you had any experience of these rises or winzes?—Yes.

42. What ventilation method have they?—Compressed air.

43. You told the Chairman that there was little or no system of ventilation in the mine?—That is so.

44. How does this mine compare with the mines on the other side?—It is the hottest mine I have ever worked in.

45. With proper ventilation the heat could be reduced?—Yes, I think so.

46. *Mr. Parry.*] What would you suggest for a standard temperature?—About 76°.

47. What is your opinion, in regard to the change-houses, as to the amount of space which should be provided for each man?—I believe that the change-houses are on a bad system here. I could give you an illustration of a system they have on a claim I worked in in Kalgoorlie, the Golden Mile, and which would be beneficial to the men if installed here. They have there three different rooms. You go into the first and remove your clean clothes, hang them on a peg suspended from the roof, and then pull them up and fasten the string with a hook. Then you put your clean boots in a rack. You go into another room where your working-clothes are kept. After coming off shift, if you want a bath, there are stalls with shower-baths and basins with hot and cold water. There are grooves between the basins so that one man's dirty water does not run into his neighbour's basin. You then go into the other room and get your clean clothing. It is an excellent arrangement. The house is hosed out once a week, when every man has to take all his clothes out for the purpose. Then there is a drying-room in the change-house. There are two men in attendance when shifts are changed, and when you remove your wet clothes they take them away, dry them, and hang them on your peg.

48. To what extent are those baths used?—Nearly every man working there will have a bath at least twice a week.

49. How many baths are provided in proportion to the men?—One to every five men, roughly speaking.

50. Did you make any complaint to the company about the condition of your stope?—I am not sure whether they complained to the company, but they did to the workmen's inspector. We said it was hot, and we told the shift boss we wanted more air.

51. Were you given to understand that the matter would be attended to?—No. I myself suggested to Mr. Gilmour that we should have a blast of air sent up there so as we could work with more comfort and under better conditions.

52. What reply did you get?—I did not get any satisfaction at all—only that they would think about it.

53. Do you think a standard height should be fixed for stopes?—Yes. I think that stopes, especially mullock stopes, should not be more than 10 ft. from the solid—about 7 ft. or 8 ft. stopes.

54. Has there been much lost time through sickness in your party since you have been stoping?—I have lost time myself, and so have others; one is in the hospital now.

55. *The Chairman.*] From what causes have you lost time?—Through boils and strains.

56. *Mr. Parry.*] What is that man suffering from now?—Drinking-diabetes, I am told, and nervous breakdown.

57. Do you think the knocker-line should be used by any man other than the chamberman?—No; though I have pulled it myself when there was no chamberman there.

58. Does that often occur?—Very often.

59. Do you think it is dangerous for any other man to use it?—Yes, certainly it is.

60. *The Chairman.*] Are they allowed to use it indiscriminately?—I could not say that. I know we often have to ring the cage away ourselves.

61. How often does that happen?—About six days a week.

62. When men are being pulled up does a different man pull the knocker-line?—No, I have not seen that. Generally the man comes from the top to knock the cage away after the day shift. They may pull one or two cages if he is not down in time.

63. As to the idea of having shot-firers, what is your opinion?—It is a system I would not care about at all. For my own part, I would rather fire my own shots. I do not see that it is going to minimize the danger to any extent. Most men prefer to fire their own holes.

64. Do you regard handling dynamite dangerous or risky?—Yes.

65. Do you not think that shot-firing by a large number of men is more risky than it would be if only one man in a district were allowed to fire shots? Would it not confine the risk to that man?—Yes, perhaps; but I was speaking from results.

66. Just from results, and not as to the danger?—Yes.

67. Would you favour the idea of the shot-firer being a qualified man and undergoing an examination?—Yes, certainly.

68. *Mr. Reed.*] In reply to a Commissioner you said that 200 ft. was too far apart for levels: which levels at Waihi exceed 200 ft.?—There are none.

69. Do you know the maximum distance?—About 150 ft.

70. So that the matter had no application to Waihi?—No.

71. At Kalgoorlie what was the distance—About 100 ft.

72. Are you working in the Waihi Mine?—Yes.

73. What is the maximum quantity of nitro-glycerine explosive you take into your place at any one time?—About two or three packets.

74. How much is three packets, 15 lb.?—I do not know the weight.

75. Do you know that the law only permits 10 lb. of explosive to be taken in at once?—Yes, I think so.

76. How much is the maximum quantity you have used in one shift in one place?—Three or four packets on one shift.

77. You have known cases of 15 lb. being brought down?—Perhaps by two men.

78. The Act says nothing about the number of men; it has only reference to the place?—But if two men are working in the one place.

79. Where do you keep the detonators?—In a tin, with a lid on it.

WALTER ROBINSON sworn and examined. (No. 23.)

1. *The Chairman.*] What are you, Mr. Robinson?—A miner.

2. How long have you been mining?—About twelve years.

3. Where?—In New Zealand, at Thames, Karangahake, and Waihi. I have been at Waihi eighteen months this time, and I was ten months before.

4. How long in between the two periods?—Ten years.

5. Where are you working—in which mine?—The Waihi Mine.

6. Have you had any experience of taking temperatures?—No.

7. You do not know the difference between the dry and wet bulbs?—No; but I know the different effects the hot wet and hot dry temperatures have upon me.

8. Have you ever seen the temperature taken in a dry and hot place?—No, not in a dry hot place. In the stope I am working in it is about 70°.

9. Have you experienced any discomfort from working in that temperature?—No, I do not think so—not at 70°.

10. What level are you working in now?—No. 10, Robinson's stope. I have worked in places that were a good deal hotter. I do not know the temperature of them.

11. Have you any suggestion to offer with regard to the temperature?—Well, the foul air and smoke should be drawn up to the surface rather than be allowed to go up into the stopes. Even if we are not firing at all there is a good deal of smoke about all the time; it seems to be drawn from other stopes. I think that the air in the levels should be utilized, and the foul air should be drawn away from the stopes.

12. Have you had any experience of accidents from blasting or falls from the roof?—Not personally, but I have known of a few blasting accidents and a number of minor ones caused by falls.

13. In what part of the stope?—Falls from the back of the stope and behind.

14. To what do you attribute that?—To bad ground mostly; at other times it is the result of the stopes being taken too high.

15. So as to prevent the falls, could you not have a system of periodical examinations of the height of the stope?—I consider that the stopes should not be taken higher than a man could feel the roof. I should say not more than 7 ft. or 8 ft.

16. That is at the highest part?—Of course, it may go higher, but it should not be broken any higher. Another suggestion is that a person should examine these stopes, and not leave the responsibility to the men working there.

17. Some one connected with the management?—Yes, I think that is a recommendation which the Commission might consider. The present practice is for the boss who comes round to ask the men how the stope is, but the men have to test it themselves. The management should take the responsibility.

18. Do you know of accidents caused in any other way—by machinery, for instance?—Only minor accidents, caused through falls of ground. There was one accident when a man was blown up in firing. In that case I happend to be on the jury, and it appeared that the man had stayed too long. I think that not more than five holes should be fired out by one man at a time.

19. Have you had any experience of firing by electricity?—Yes, the use of the battery is fairly satisfactory. I would recommend the battery for firing in driving shafts and rises over 40 ft., but in stopes it is too severe for safety.

20. And what about drives?—Yes, a battery is satisfactory for drives, but more especially so in shafts and rises.

21. Have you had many hangfires when using the battery?—Yes, but not many.

22. What is the longest hangfire you have known?—About a second, just an appreciable length of time.

23. What length of time do you think a man should remain out of a place after a misfire?—It is questionable. I have known a hole not to go off for four hours. I certainly recommend two hours.

24. Have you ever known an accident happen through only one man being at the engine?—No.

25. Have you anything to suggest in regard to the matter?—I certainly think it would be better for the man to remain until the men were hauled, and so have two men by the engine; but I have never known of an accident happening.

26. Have you had any experience of trucking?—Yes. I consider that trucking in the Waihi Mine is not fit for a human being at all, with the size of the trucks and the state of the lines. I have had a good deal of experience in the union with strains caused when trucking. In this mine you have to push 22 cwt. uphill, and a man after he has done that is gasping for breath. The grades are certainly not steep, but they are not level—perhaps a rise of 4 in. or 5 in. in 300 ft. or 40 ft. The rails are too light for the size of the trucks. I certainly recommend the use of horses for trucking if the present trucks are to continue in use.

27. *Mr. Dowgray.*] We have heard a considerable amount of evidence about the height of stopes, but none regarding the width. What do you consider a reasonable width?—About 20 ft. to 25 ft. in good ground. Of course, it depends upon the ground. In some places it is not safe except with timber.

28. Are we to understand that nobody examines the places at all?—The shift boss comes round and asks the men, but nobody examines the places.

29. Judging from the evidence we have had in regard to this mine it would appear there is no system of ventilation?—No.

30. *Mr. Parry.*] Have you ever done any timbering?—Yes.

31. What is the system of getting the timber off the plats in the mine?—Well, we have 8 ft. or 9 ft. lengths. They are thrown down into the water, and the men have to lift them on to the trolly. We asked the superintendent to put up a staging, so as the men would be able to slide the timber on to the trollies. It is a system of pure bullocking at present, and consequently men injure themselves.

32. Cannot you have it delivered in a certain way under your contract?—Well, they say they will deliver it down to the bottom of the shaft.

33. But you have a written contract: could you not have a condition for certain appliances to be supplied for dealing with the timber?—Yes, I suppose that could be done.

34. Can you suggest to the Commission anything to get over the present state of things?—I would suggest that appliances be provided to lift the timber on to the trucks or up on to a platform.

35. Are you in a position to suggest a temperature for a standard?—I should say not more than 75° or 76° for an eight-hour place. Over that and up to 80° it should be six hours.

36. Are you in favour of a standard height for stopes?—Yes; for safety the management should not allow them to go higher than a man can feel them all the time.

37. *The Chairman.*] Do you think that if the management were made responsible for the safety of the places that that would have a tendency to keep them down?—I certainly think the management should have the responsibility as to the stope. The men should be told to take it to the height at which it is safe, and be compelled to do so.

38. *Mr. Parry.*] And, in the event of its not being possible to keep the stope that height, what standard would you suggest?—Timber should be used after it gets too bad, because with low stopes filled in quickly you would be able to work the ground.

39. You have heard the evidence with regard to change-houses and sanitation: do you corroborate that evidence?—I certainly think the change-house which we use is far too small.

40. In connection with the appointment of shot-firers, what is your opinion?—I have worked in a mine where they had a similar system, and there were no accidents; but, personally, I like to fire my holes myself. Probably it would be safer to have shot-firers. They should be qualified men.

41. What is your opinion of an assistant engine-driver being appointed for the safety of the men?—I certainly think it would be safer, though I have not known of an accident to occur.

42. Have you known of many miners in Waihi suffering from scalds to the feet?—Yes, I have suffered myself from that. It is due to walking in the water and standing in your wet boots all day.

43. *Mr. Reed.*] You said you considered a standard temperature should be fixed for a six-hour place, and that it should be 75°. How did you arrive at that?—I have worked in a place 70°, and think 75° or 76° would be a fair thing for an eight-hour place.

44. Do you carry a thermometer in the mine?—No.

45. You have heard other witnesses quote the same temperature?—Yes, I heard one this afternoon.

46. Have you arranged amongst yourselves to say that?—No, I have not spoken to them about it.

47. It is a peculiar coincidence?—It is not arranged. The stope I am working in is about 69°, and, considering that to be 69°, I reckon 75° or 76° would be a fair temperature for an eight-hour place.

SAMUEL EDWARD WILLIAMS sworn and examined. (No. 24.)

1. *The Chairman.*] What are you, Mr. Williams?—A miner.
2. How long have you been mining?—About eleven years.
3. Where?—About nine years in Waihi and two years in Komata.
4. You are working in the Waihi Mine now?—Yes, in No. 8 level, Williams's stope.
5. Have you had any experience in taking temperatures?—No, but I have seen them taken.
6. Recently?—Yes, by the workmen's inspector. He took the temperature in part of our stope.
7. Do you know the difference between the wet and the dry bulb?—No.
8. What have the temperatures registered that you have seen taken?—80° was the temperature when the workmen's inspector took it about four months ago.
9. How has the temperature kept since then?—It generally keeps about that point—it might be a little less and it might be a little more. On the occasion I refer to the workmen's inspector took it at a different place to that at which it was taken on the occasion of the Commission's visit. The place where the Commissioner took it was the best-ventilated place in the stope—in the centre, right under the winze, with an open ladderway on each side.
10. How does that temperature compare with the average temperature in your stope?—It will be lower than the average.
11. How does the average heat which you have been subject to affect you when you are working?—Well, when I am working in the hot stope it has a decided effect upon me physically. I generally feel ill, and do not care about my food after the day's work is done. I have worked in hotter places than either of those, but I think a temperature of 80° is too high for a man to work eight hours in.
12. What is the highest temperature you have worked in?—I do not know what it registered, but the candle bent over with the heat. That was in the Welcome lode.
13. Did you find it any serious inconvenience in that temperature?—Yes, I did.
14. How long were you working there?—Till the end of the job.
15. How long ago was that?—About eight years ago.
16. Well, have you any suggestions to offer in regard to the temperature question?—The only thing I wish to say is that I am in favour of a maximum being fixed for an eight-hours work. I really do not think a man should work eight hours in a temperature higher than 77° or 78°.
17. You do not know whether that is with the wet or dry bulb?—Yes, dry.
18. Have you had experience of hot wet places and hot dry places?—Yes; I do not know that it has been very dry, but I have worked in the dry crosscut.
19. And you were affected more? Could you appreciate the difference between a wet place and a dry place?—I do not know that I noticed it very much; it is a good many years since I worked in a dry place. Still, it had a very injurious effect upon me physically; afterwards I had to have a holiday. I was considerably emaciated.
20. How long had you worked in that hot place?—About two or four months.
21. And then you had to have a holiday: how long?—It really is not what a man should have, but what a man can afford to have. I could only afford to take a week or a fortnight, and it did not set me up by any means.
22. Have you anything to say on the subject of the ventilation of your stope?—Well, I would suggest that fans should be used to draw away the smoke and fumes from the bottom levels. Our stope is nearly all day filled with smoke which comes from No. 9, and every time they fire a shot it comes straight up and through one end of our stope, so that all day long we have to inhale the smoke either from our own shots or theirs.
23. Have you had any experience of blasting accidents or accidents caused by falls of roof?—I had a narrow escape myself from blasting one time, when they were firing too many holes. I did not get away in time, and was struck with small fragments of rocks. That was the result of firing too many holes.
24. That was done at your own risk?—Well, there were three or four of us.
25. Have you had any experience of electric firing?—Yes, I have used the batteries.
26. With what results?—I prefer the battery to the fuse in rises and machine drives and shafts.
27. And how many holes could a man fire by fuse with safety under ordinary circumstances?—I think there are some men who could fire from eight to ten shots, but for the majority, so far as my experience goes, the maximum should be fixed at five. I have seen men run unnecessary risk when firing. Some men become very excited after the first fuse is lighted.
28. What is your opinion as to the appointment of shot-firers for districts in the mine?—I think myself it would be beneficial to the miner. It would minimize the risk.
29. In what direction?—In this way: a shot-firer would have no regard to the quantity he breaks, and he would not take any unnecessary risk himself; whereas a miner who has to depend upon the amount he can break tries to get through his work as quickly as possible, and is apt to take risks.
30. Do you mean that by overcharging the holes he tries to bring down more stuff?—Yes, they do overcharge the holes.
31. I suppose, on sanitary matters, you agree with the evidence given by previous witnesses?—Yes.
32. What is your opinion as to the extent to which the baths are used by the miners where provided?—Fully 90 per cent. of the miners wash at the change-houses here now, and I cannot say how many would use the hot shower if it were provided—we have never had that privilege; but in the summer-time a very large majority of the men use the cold shower. I am compelled to use the cold shower once or twice a week even in this cold weather.

33. You agree that bathing-accommodation is necessary and reasonable?—Yes.

34. *Mr. Dowgray.*] Have you had to consult a doctor lately about your health?—Yes, I did so last Friday. I felt I should have consulted him months ago, but I have been putting it off from time to time.

35. Would you mind telling the Commission the result?—The doctor made a careful examination of me, as I told him I wanted a thorough overhaul, and at the conclusion he asked me what I was doing. I told him I was mining, and he said that my lungs were not in a fit condition to continue mining, and that I should leave the mine at once. I might say that I was examined by two doctors about eight years ago, and they both told me that my lungs were exceptionally good, and that my heart was also very strong. I suffer now a good deal from palpitation of the heart. The doctor told me that was the result of mining-work, and he also said that my lungs were so affected that I should not work any longer.

36. *The Chairman.*] Does the doctor attribute it to anything?—No, he simply said that I was not to work underground any longer. I have had a little over a year's work on the surface during the last eight years. I only left the mine then because I was not feeling well.

37. *Mr. Dowgray.*] In connection with the question of the appointment of shot-firers, you heard the statement made by Mr. Robinson to the effect that some responsible person should examine the stopes: do you think the shot-firer could combine the two offices and fire his shots as well as make these examinations?—Yes.

38. You have also heard evidence regarding the necessity for a second engine-driver: do you know of any instance of an engine-driver dropping down dead or becoming suddenly sick?—No, I do not.

39. *Mr. Parry.*] When you suggested 77° or 78° as a standard temperature for a six-hour place, you were thinking of the temperature which had been told you in the place where you had been working?—Yes.

40. Who do you think should be the best judge as to the effect of high temperatures—a theoretical man or a practical workman?—I think the workman should be, most decidedly.

41. Have you worked on the 12 o'clock shift during your experience underground?—I have not done so lately, but I did a few years of it.

42. Did you feel any ill effects from working on that shift?—Yes; a man never feels so well when working night shift. I did not, and I do not know any man who did. He does not feel fit for his work, nor can he do justice to his meals.

43. Do you think it is possible to have a standard height fixed for stopes?—Yes; I think that if a stope is over 20 ft. wide in ordinary ground it should not be over 9 ft. high. When less than that width it might go from 10 ft. to 11 ft.

44. In the event of its not being possible to keep the stope at that height what would you suggest?—Timber is the only means.

45. Have you had any experience of a chamberman not being on the plat, and the men using the knocker-line?—Frequently. I have seen accidents narrowly averted at times, when men were ringing from one side or the other, before the men on the opposite side were in the cage properly. Any one can ring the knocker-line when the chamberman is not there.

46. Do you think that the ventilation in that mine is efficient?—No, I do not. I consider the place where I am working should be better ventilated. The smoke from the stopes underneath us in No. 9 passes through our stopes, and when they fire we get the smoke from them all day. It should be drawn out with a fan.

47. Do you think specified space should be given to men in change-houses?—Yes.

48. Have you seen many men suffering from burnt or chafed feet?—I have not noticed it lately, but I used to work in No. 7, and suffered then a good deal from that sort of thing.

49. Would you sooner truck on footboards than on the bare mud and water?—If I were trucking at all I would sooner truck on footboards, but I would not truck at any price in this mine just now.

WILLIAM MCLENNAN sworn and examined. (No. 25.)

1. *The Chairman.*] What are you, Mr. McLennan?—I am a miner, and just now I am workmen's inspector.

2. Does your inspectorship occupy all your time?—Yes.

3. How long is it since you ceased mining?—About three weeks.

4. Before that where were you working?—In the Junction Mine.

5. What experience have you had in the Waihi Mine?—I worked there about six years ago.

6. Have you ever had any experience in inspecting that mine since you were appointed?—No.

7. Have you ever had any experience of taking temperatures?—No, but I have seen them taken.

8. In the Waihi Mine?—Only those which I saw the Commission take.

9. Do you understand the wet and dry bulb?—Yes.

10. Upon what matters do you wish to inform the Commission?—As to ventilation, temperature, accidents, and change-houses.

11. As to ventilation?—I do not think the Waihi Mine is ventilated to the best advantage.

12. In what way is it defective?—The smoke from the bottom levels could be taken direct to the shaft by means of an exhaust fan placed there. I think it would be a great improvement to the men working above. Also, the air in the other levels is not sufficiently distributed in the faces. I think that if there were brattices placed here and there it would improve matters. The air would be utilized and forced up into the stope at different points.

13. And upon the matter of temperature have you anything to say?—I certainly think there are many places in the mine too hot for any man to work eight hours in, and the temperature should be reduced.

14. How?—Well, if the mine were properly ventilated it would reduce the temperature.

15. And what have you to say about the fixing of a standard temperature?—The only temperature I have heard of previous to this Commission is the dry-bulb temperature. That is what our Inspector has always taken, and if it registered 78° or 79° it was quite hot enough for an eight-hour shift.

16. So that any temperatures that you have seen taken before were dry-bulb temperatures?—Yes.

17. What is the highest temperature known to yourself that you have worked in?—I have not had the temperature taken in the hottest places where I have worked, but the thermometer registered 72° in the hottest where I have known it to be taken. I am not quite positive upon that point.

18. What experience have you had regarding accidents?—Well, I have seen a few accidents from falls in stopes.

19. How are they caused?—By places not being properly dressed down after shots had been fired.

20. And have you any suggestion to make in regard to that matter?—The only suggestion I would offer is that the height of the stopes should be kept down. The ground may be solid when you pass through it, but if it is left there for two weeks or so the air gets into it, and by simply looking at it you cannot tell whether it is loose or not.

21. You have heard the suggestion that the management should take the responsibility of testing the roofs: are you in favour of that?—Yes; I certainly think that where the manager or shift boss comes through he should take a bar and try the stuff to see for himself whether it is safe or not.

22. Have you anything to say as to machinery accidents?—No.

23. You say you have been workmen's inspector for three weeks?—Well, I have only been properly appointed for a few days.

24. Have you any records?—Yes, I have the reports of the previous inspector.

25. Who was the previous inspector?—Mr. W. E. Parry. [Inspection reports (two) put in—Exhibit No. 6.]

26. Is there any other matter which you wish to speak of?—In regard to firing, I certainly agree with most of the other witnesses that not more than five or six holes ought to be fired with fuse at one time.

27. Have you had any experience of electric firing?—As far as I have used them, electric firing by batteries has been satisfactory. You certainly have a misfire now and again, but you know that a misfire by a battery is not going to go off, whereas with a fuse it is different. In regard to the proposal to have shot-firers I think it is a very good idea, especially in regard to electric firing, which requires a little experience, and if you had a properly qualified man for the work I think it would be a first-rate thing.

28. In what way do you consider it would minimize risk?—To this extent: there have been several accidents in the district due to men firing too many holes and not getting away in time.

29. Supposing a shot-firer is firing with a fuse, is he not carrying all the risk—the risk is there, but only one man is carrying it?—Yes, but he is an experienced man, and is consequently not running so much risk. Then, again, when the man who is firing is depending upon the quantity of stuff he breaks he bores a hole 5 ft. or 6 ft., and by bullying it he can get two or three packets of explosive in the one hole. Then, possibly that hole may fail to explode and it simply burns away, whereas if you have a shot-firer he would take all sorts of care of that. If a man were drilling a hole which a shot-firer could not charge sufficiently to bring down the burden it would be to his disadvantage, because he would be paying for his gelignite.

30. Have you ever known or heard of accidents with cages through having only one engine-driver?—No.

31. Do you think that the man at the engine changing shifts should remain so that the men are both present?—I am not altogether in favour of the proposal. I think there ought to be a separate man to go on. It is not right to keep the first engine-driver an extra time. There should be another man for the purpose.

32. Not even with extra pay?—No, the strain is bad enough at the winding-engine without extending the time.

33. But the strain is passed on to the new man?—But the other man would have to stand by.

34. *Mr. Parry.*] Have you ever known the knocker-line to be interfered with by men other than the chamberman?—No.

35. Do you think it is wise for it to be used by other than the chamberman?—No, there is certainly a great risk attached to such a practice.

WAIHI COURTHOUSE.—23RD AUGUST, 1911.

JAMES LONG GILMOUR sworn and examined. (No. 26.)

1. *The Chairman.*] You are mine-manager of the Waihi Mine, Mr. Gilmour?—Yes
2. What certificate do you hold?—First-class certificate under the Mining Act.
3. When did you obtain your position?—In January, 1903.
4. What total experience have you had of mining?—Twenty years.
5. Where?—A few months at the Thames, and the remainder at the Waihi Mine.

6. You are aware, Mr. Gilmour, of the scope of our inquiry: have you any information to volunteer to us on any of the questions which the Commission is called upon to investigate? First of all, as to ventilation?—Yes, I am aware of the different points to be dealt with by the Commission, and I have some information here which I can give. As regards the ventilation of the Waihi Mine, we have downcast and upcast shafts in which there are over 75,000 cubic feet of fresh air going into the mine.

7. How many men per shift have you working in the mine?—About three hundred (maximum).

8. Have you worked out what it amounts to per man?—There are about twelve horses, which are allowed 600 ft. each, and that leaves about 230 cubic feet per man.

9. How many of these downcast shafts are there, and how many upcasts?—There are seven downcast and six upcasts. I have taken out the quantity of air which goes down the shafts. We have two or three other places, but these are the regular ones.

10. Do these downcasts all go on to the same levels or on to different levels?—To different levels. They do not all go to the bottom level. Two of the main ones go down to it.

11. At which levels do you split the air from these downcasts?—A certain quantity of the air goes into each of Nos. 8, 9, and 10 levels.

12. Now, as to the system of distribution?—We have doors put across the levels which send up the air through the stopes where it is required.

13. And does the upcast deliver the air direct to the surface, or does it pass through the other levels?—In the south section the air passes through one stope into another.

14. Does the air from one level mix with the air from the other levels?—Yes, in certain cases. For instance, on the Royal the smoke from the bottom level would go up to No. 9 and through one of the shrinkage-blocks, and then travel to the next level, No. 8. It might then go through the stopes on the Edward lode and up to some of the stopes on No. 7 level. There are some cases where it goes through four different levels and the stopes on them.

15. What mechanical ventilation do you use?—On the Reptile south-east crosscut we have a Roots blower driven by a motor: that delivers enough air for the men working there. Tests have been made at different times, which have shown that for the four men working there 500 cubic feet of air is provided.

16. Does that supply of sufficient air come through one of the seven downcasts?—Yes; it gets its air from No. 4 shaft downcast.

17. Have you any exhaust fans?—No, nothing but the Roots blowers I have referred to.

18. Do you reverse them?—We have done so, but the men like the fresh air going in rather than that the blowers should be reversed.

19. What have you to say as regards sanitary matters?—In connection with that I would say that we have the borough service at the mine. The cart comes to the mine twice a week, and brings new pans and removes the full ones. A man is constantly in charge of this work. Disinfectants are used, and each place is bratticed off so as to prevent the air in the mine from mixing with the odour from the places.

20. Do you find that the men use the pans, or do they use the places in the mine?—The men use the pans regularly. I have known one or two cases where the men have not used the pans, but an example was soon made of them.

21. You consider it is a necessary system, and ought to be satisfactory?—Yes.

22. You have heard a suggestion by a previous witness that some improvement might be made in the pan system?—Yes, I heard a witness say that we should have soil there. It might be an improvement, but I think everything goes into the pan, and the soil is hardly necessary.

23. Are the pans watertight?—Yes, and there should be no nuisance caused by leakage. We have specially constructed the affairs so as to make the system satisfactory. We have given the matter a good deal of consideration.

24. In regard to change and bath houses what have you to say?—The change-houses are large, and the one at No. 2 has 240 ft. of forms. A hundred and fifty men in all use it.

25. What is the greatest number that will use them at once?—Roughly speaking, there are forty-six to fifty on the night shift, about three hundred on the day shift, and a hundred and twenty on the afternoon shift. There are three change-houses.

26. Are they convenient for the men when they reach the surface?—Yes. We have change-houses at No. 4 and No. 2 shafts. When No. 2 shaft is not working they come up No. 4, and some come up No. 5, but now the shaft is in good order about two-thirds are pulled up No. 2 and one-third up No. 4.

27. And what use is made of the baths which you have provided?—At No. 2 bath-house we have nine basins and five showers, and about eighty men use them at changing-time.

28. What proportion of the eighty use the showers?—They do not all use them. The cold shower is not in great request at the present time.

29. Would fifty out of the eighty use them?—I do not think so many as that use them.

30. What do you think the proportion of men to each shower should be?—About one shower to every twelve men, if they all used them.

31. You heard the evidence given yesterday as to accidents, and suggestions in regard to them?—Yes, we keep records of all the accidents and all details in connection with them.

32. What have you found to be the most frequent cause of accidents?—The most common form of accident is cuts on the hand.

33. What are they caused by?—By sharp pieces of quartz running down the bars when the men are working with them.

34. Do these cuts set up suppuration?—Some of them fester, but it all depends on the condition of the man's blood.

35. Have you had many blasting accidents?—We have had a few, but not many.

36. How were they caused—by misfires or firing too many holes?—We have had no accidents through firing too many holes, so far as my knowledge goes—not serious ones, at any rate. We had one man blinded when he was using a moil working in the bottom of a winze through striking something. We had two or three of those accidents in the mine, and I am at a loss to account for them. The point of the moil must strike some gelignite.

37. That would point to a misfire?—It points to some of the gelignite having been left in the bottom of the hole by incomplete explosion. We have had three such accidents in the last ten years.

38. What is your opinion on electric firing?—We have had a good deal of experience of it in shaft work. We thought that, theoretically, if one shot went off they would all go, but that was not proved in practice, and now, as a rule, the men do not fire more than six or eight holes.

39. Did you attribute that to a faulty current?—We have been trying to find out the cause. We bought the best material, and I have seen Nobel's agents two or three times about the matter. We have had guttapercha cords which are specially made for submarine work, but found those worse than the others: there were more misholes. We use the cotton-covered wires, and put grease on them.

40. What percentage of misses did you have with the electric firing?—They vary a great deal. The complaints from the men were numerous, and so now they only fire six or eight holes at a time.

41. What is your opinion as to the necessity for appointing shot-firers?—Well, they are not wanted at all, because the men we have working in the mine are intelligent miners, and they all know how to use explosives.

42. Do you think the appointment of shot-firers would tend to minimize the risk?—I do not see how it would do so. I think it would cause confusion and be found unworkable in our mine. It would mean an undue loss of time, and with the number of men we have working underground it is an impracticable idea.

43. What is your opinion about falls from the roof and sides, and the height of stopes?—As regards falls from the roof, there has been only one fatal accident from that cause in the whole history of the mine—that is, about twenty years.

44. You have heard a suggestion made as to fixing the height of stopes?—We are trying to insist upon stopes being carried up 8 ft. high, with filling within a reasonable height of back, say 2 ft. or 3 ft. But there are times where there is a loose piece which is ordered to be worked down, which makes the stope higher, and which the men do for their own safety. But as a general rule we like to keep 8 ft. of quartz in the stopes, and 2 ft. or 3 ft. off the filling—about 11 ft. from the sollar.

45. Would a statutory standard make any difference to the mine?—It ought to take into consideration that these places are fairly safe. As a natural contingency the difference of the ground should be taken into account.

46. You have heard the suggestion as to the necessity for a second engine-driver for raising and lowering the men?—My experience goes to show that there is no necessity for more than one man in the engine-room at one time, as if there were two they would be sure to get talking, and that might tend to cause an accident rather than the fact of there being two of them tending to avert one.

47. Have you ever known of anything happening in the engine-room to a driver which might have resulted in an accident, but which could not have occurred had there been two drivers present?—No, I have never known of such a thing.

48. Is there any other matter which you wish to refer to in a general way?—I heard complaints made by some witnesses yesterday as to the trucking-roads. One witness stated that our tracks were uphill. In that particular section I gave special attention to that track, and it is downhill with a loaded truck.

49. And uphill when the truck is empty?—Yes. As regards the straightness, we have to construct our roads according to the course of the reef, and that accounts for the tracks winding. As to the tracks not being clean, we have shift bosses and a man in charge of each section whose duty it is to visit the roads and working-places every eight hours and see that they are in good order. There are three managers, and one of them constantly looks after the stopes.

50. What have you to say in regard to the management taking the responsibility of the safety of the stopes by testing the roofs and sides?—The present system under which the person working in the stopes tests them is the better one. It is the duty of the men to trim the roof after blasting, and work the stope generally in a safe way. Sometimes the shift boss orders them to test the roof with the bar in his presence, and sometimes he uses the bar himself. That is the system at the present time.

51. *Mr. Molineaux.*] Do you consider that the periodical medical examination of winding-engine drivers would tend to reduce the risk of accident?—Yes; but there is provision already for that in the Act. They have to be examined once a year.

52. If it is not there you consider it should be?—Yes.

53. Are your winding-engines fitted with any appliances to prevent accidents?—No. 6 engine has a steam brake, and the other engines have foot brakes. No. 2 has an emergency brake.

54. Will the emergency brake stop the cage in case of an overwind—is it automatic?—We have no automatic brakes.

55. How often are the safety appliances on the cages tested?—Once a week.

56. Have you ever known the appliances to fail?—Sometimes when testing I have known something to go wrong—perhaps they did not catch—but not often. The weekly inspections find out these weaknesses, and they are remedied at once.

57. What is the method of testing the grips on the cages?—We lift a cage off the clips and put beams underneath, 12 by 12. Then we have a hook with a lever and rope, and the hook is so fixed that it takes the weight and leaves the chains loose. The small rope is attached to the end of the lever, and the drop, as a rule, never exceeds 4 in.

58. Do you test with a loaded cage or an empty cage?—Sometimes it is loaded, and sometimes it is empty.

59. Which is the more effective test?—Well, the loaded test makes the grip all the tighter.

60. How often are the safety-hooks tested?—Once every three months on all our shafts where men are working.

61. And you have not found them to fail on any occasion?—Some eight years ago our hooks did fail; but we have King's hooks now, and they never fail. The Omeroid hook got worn at the top hole, and it was there that the defect lay.

62. So that in that case you were depending upon the safety-catches to hold your cage up?—I thought they would have caught. There was one in No. 2 shaft which did not catch. I drew the Inspector's attention to the matter, and since then we have always tested them every three months.

63. In the case of an overwind, is any provision made for the safety of the men in the cage at the bottom of the shaft?—No, we cannot make any provision for that.

64. When the cage is lying on the cups at the bottom of the shaft?—Yes, I do not see how you could get over that.

65. What steps are taken to ascertain the condition of the winding-ropes?—Every day the braceman takes a piece of waste in his hand and lets the rope run slowly through his hand in order to detect any broken wires. He reports to the engineer in charge.

66. *The Chairman.*] Is the rope tested running both up and down?—As a rule, when the cage is going up.

67. *Mr. Molineaux.*] Have you found the water in the mine exercises a deteriorating effect on the ropes?—I have noticed sometimes that the mineral water eats the knocker-line away, but we have thicker wire now, and we find it is not eaten away so quickly. We have never had any accidents. We change our ropes every two years.

68. How often do you reshoe?—Every three months where men are being hauled.

69. What length do you take off when you reshoe?—2 ft. or 3 ft.

70. *The Chairman.*] What is the test for the rope?—The factor of safety is something like 8, and is tested with weights twice the working-load.

71. *Mr. Molineaux.*] Is there a chamberman stationed at every working-level?—At No. 2 shaft there are ten levels, and we have two chambermen who go up to the different levels.

72. What are the duties of the chambermen at the time of changing shift?—One man goes to the bottom level and the other to the level above. As he finishes one level he goes up above to the next.

73. But is it done in practice?—There are odd times when the men in the cage have to ring themselves down.

74. Do you consider it a safe practice for men other than the chamberman to give the signal?—Yes, I think it is quite safe, because all the men are required to know the signals. The Mining Act requires that.

75. *The Chairman.*] Have you ever known of accidents through wrong signals being given?—Not in cases of that kind.

76. What is the capacity, by weight, of the trucks used in your mine?—The large trucks hold about 17½ cwt.

77. Have you heard any cases of men injuring themselves with those trucks?—In the earlier days there were cases of truckers hurting themselves when we were using wooden trucks and fast wheels. They strained themselves by twisting the trucks on the flat sheets. We altered the wheels to loose ones, and it is an easy matter to turn the trucks now. I have heard of men straining their backs when lifting the trucks on without using a lever.

78. Are the levers always available?—Yes, there are generally slabs about.

79. Could you not provide handy levers?—Well, slabs are in frequent use in the mine, and you do not have far to go to get one.

80. *Mr. Molineaux.*] Under what conditions would you prefer to use electricity for firing?—In wet shafts.

81. Only in wet shafts?—Yes.

82. Under other conditions you consider the ordinary fuse is the safer?—Yes.

83. How many shots do you consider it safe for a man to fire at one time?—About six.

84. You think that is the limit of safety?—Yes, about six.

85. What is the greatest length of time you have known a shot to hang fire?—I have not had much experience of hangfires. One hung fire for about fifteen minutes, I remember, but I have not known any to do so for a longer time.

86. After how long do you consider it safe to go into a place where they had been firing?—About an hour would be quite long enough.

87. What is the most frequent cause of misfires with the ordinary fuse?—Sometimes a little sawdust in the cap, or the fuse gets damp. It is unsatisfactory to use the fuse in a wet place.

88. What tamping is generally used in your mine?—Clay filling

89. But in a drive or winze where there is no filling?—Some make up little pieces of paper and fill with that.

90. Do you disapprove of the use of bag or paper tamping?—It is not wise.

91. *Mr. Cochrane.*] As to the height of stopes, Mr. Gilmour, you have told us that you endeavour to maintain a standard of 8 ft.?—8 ft. of quartz.

92. Then, in the event of the filling sinking, how do you provide for the safety of the men?—If the filling were to sink a foot that would make the stope a foot higher.

93. Would the men be able to sound it then?—Yes.

94. In case they were not able to sound it, how would you provide for their safety?—The stopes should be filled in.

95. You have heard the opinion expressed that it would be desirable to have the shift boss to sound the backs: what is your opinion on that?—Under present conditions our shift bosses look after the safety of the men in that respect. The men working in the stopes are the best judges as to what the ground is like.

96. Always?—The miner knows best where he has fired and what is likely to be loose. The shift boss uses his judgment also when he sees the place on his round.

97. Do you think his judgment is sufficient if he only looks at it?—The shift boss, on looking round, frequently tells a man to test a place with his bars before he is satisfied, and I consider you could not get a better judgment than his on the matter.

98. *The Chairman.*] Do they do that regularly, Mr. Gilmour? Do they have tests made in their presence when they go round?—Yes, if they have cause to think that the place is bad.

99. *Mr. Cochrane.*] Do you approve of the shift bosses sounding the places?—No; it is sufficient if it is done under their instructions.

100. Not even in cases of special danger?—The men take it upon themselves and do the sounding.

101. You approve of that?—Yes.

102. We have heard about the chamberman being absent at times, and the men doing the ringing up: are not the signals posted at each level?—Yes, every chamber has a list of signals.

103. Then, as to the ladders, what is your opinion as to their condition when tools are thrown down and the rungs bent?—If they get out of order the contractor using that particular block has to maintain them. There are passes also for putting the steel down.

104. Is that not contracting yourself out of your liability under the Act?—No, I insist upon them doing it.

105. Coming to the matter of electric firing, you mention cases of unexploded gelignite: did they cause accidents?—I have never known of them. We have not had any fatal or serious accidents through that cause.

106. Would not electric firing tend to prevent that?—Electric firing sometimes also leaves them unexploded.

107. Would firing by fuse not equally leave them?—There have been cases where some shots have cut off another hole, and the explosives have been left unexploded.

108. Which do you consider the safer for a round of twelve holes—if you had to fire twelve holes together?—I say six is enough to fire with a fuse.

109. In that case electric firing would be safer?—It would be safer, but there might be some misses. Neither system is absolutely safe for twelve holes.

110. As to the grading of the roads: do you have subsidences to contend with?—Yes, in a few places we have to raise the rails and roads.

111. Under your contract system does the manager or the contractor have to keep the ladderways in order?—The contractor has to keep in repair that part of the block in which he is working, which includes the ladders. Sometimes the contractor is paid extra for that, or the company's workmen are put on.

112. *The Chairman.*] In regard to timber, you might give us an idea of the conditions under which it is provided: where is it delivered?—Well, different blocks have different conditions. For a stoping block underground our specifications say that the timber shall be cut and dressed at the sollar of the shaft. The contractor comes in the morning, perhaps, and says, "I want you to send down such-and-such timber to-day." The orders are written out, and copies are given to the braceman and chamberman, and they know what orders are coming down for that day. The timber is put into a cage, and sent down and thrown off in the chamber. The contractor comes with his trolly and takes it away.

113. You simply deliver it to the chamber, and they load it themselves and take it to their stopes. You have to keep the general roadway in repair, and they look after the way into the stope?—Yes.

114. *Mr. Cochrane.*] Now, as to the ventilation, you say there are 75,000 cubic feet of air circulated?—Yes.

115. Did you get this 75,000 in one registering of the anemometer?—I took it at the inlets.

116. Answer my question: in one registering of the anemometer?—No.

117. Necessarily it must be in several different main currents?—Yes.

118. Can you tell us how many you measured?—Seven downcasts and five upcasts. The measurements are as follows: No. 6 shaft, 26,161 cubic feet; Rickards filling pass, 642 cubic feet; No. 1 filling pass, 1,385 cubic feet; Wheel filling pass, 1,554 cubic feet; Bulson's filling pass, 10,200 cubic feet; No. 1 shaft, 5,358 cubic feet; No. 4 shaft, 30,536 cubic feet. Those are the downcasts.

119. Can you give us the number of men that have to be supplied from each of these separate currents?—The gross total is three hundred men and twelve horses. I have not the figures for each current, but they could be supplied.

120. Then, dealing with the question generally, does portion of that air go direct from the downcast to the upcast in places?—No, we have no short-circuiting; we have doors to prevent that.

121. Do you find an efficient current at all places?—In all the stopes where the men are working, whenever questioned, I have taken the anemometer readings. There was over 100 cubic feet per man.

122. In all cases?—In all cases in the stopes.

123. What was your reading for Elsegood's stope?—I did not take that one.

124. What is your opinion of the conditions in Elsegood's stope?—The amount of air going up the ladderway was never questioned, and, though I have not put the anemometer upon it, I should say there is more than the Act requires going through it.

125. How many men are in it?—Four men, as a rule, but sometimes six.

126. Are the conditions exceptional?—There is a good deal of iron-pyrites in that stope, and there is some heating going on. Iron-pyrites gets oxidized and sets up heat.

127. You lead me to believe that you are doing your best with it?—I am having another winze put through in the east end of the block to give a double current.

128. You say you have no fans for mechanical ventilation?—No.

129. Do you not think the time has arrived to put up fans?—The quantity of air that is passing through the mine is sufficient. I do not see any necessity to put up fans to draw out the air. The quantity of air passing through is 232 ft. per man and 600 ft. per horse. The Act says 100 ft. per man, so that I consider that while we have two and one-third times the statutory requirement the fan is not required.

130. Will you tell us your opinion of the distribution of the air through the stopes?—Every stope has a winze down, and some have three or four. Each stope has two ladderways, which are 3 by 3 in ordinary stopes, and in shrinkage stopes they are larger. The distribution is always arranged for whenever work is laid out. Provision is made for a current of air to go round to the working-face.

131. Do you think it could be improved on?—That system has proved satisfactory, and there is plenty of air travelling through these places.

132. But that is not an answer to my question: do you think it could be made perfect?—Possibly; you could supply twice the amount of air if you put on eight times the power.

133. Have you any suggestion to make as to that?—The general ventilation in the mine is satisfactory, and I have no suggestion to make.

134. Have you exceptional difficulty in ventilating a mine like this?—We have had no difficulty. There is natural ventilation. Our upcasts are all on the hill, 90 ft. and 100 ft. above the downcasts. The average temperature of the air coming out is close on 80°, and the average temperature on the surface is 56°. The water going up the columns is about 80°. If you take a barometer reading at the bottom of the shafts also you will get the difference in the temperatures, and if you work it out you will find that the ventilation is equivalent to a good many horse-powers.

135. Then, even the heating in the pyrites is an assistance to ventilation?—Yes.

136. But, still, it would have a bad effect upon the men?—Yes, if the temperature were kept too high.

137. Then you made reference to the surface temperature: when the temperature is higher in the summer-time how does that affect the ventilation?—The ventilation of the mine now is a little better than what it is in, say, February, when the temperature is over 60°.

138. And how is the ventilation when the surface temperature is perhaps 85°?—The air on its way down is cool on Nos. 4 and 6, and does not go into the mine at 85°. The ventilation in the summer-time is certainly at its worst, but even then there is sufficient quantity passing through the mine.

139. Have you any special working difficulties in ventilating this mine through the number of parallel lodes?—Our downcast and upcast shafts are spread over such a large area that the different lodes have their different inlets and outlets.

140. What is your opinion of the necessity of fixing a temperature for six-hour places?—My experience has shown me that there is no need for it, because if you have a difference of a few degrees between the readings of the bulbs, and the temperature is not too high, the place is good enough to work in.

141. But take a case with the two bulbs the same (saturated), would you be in favour of a standard temperature being fixed for that place?—Well, then, with the air saturated and temperature high, it is not fit to work in at all.

142. Can you assist this Commission by suggesting a feasible workable scheme as regards the fixing of a temperature?—I would say that the temperature should not be fixed.

143. *The Chairman.*] At what heat, then, is the saturated temperature unfit to work in?—We had a condition where both bulbs were at 86°, and when I saw that state of things I brought the work to an end a little quicker and put a stop to the work.

144. Is that what you would call an unsuitable temperature to work in?—When it is in that condition the ventilation should be improved to reduce the temperature of the wet bulb.

145. Up to 86° is it workable?—When I saw it in that condition I thought it was not good enough to let the men work there any length of time.

146. Supposing it had been 85°?—I have never seen one 85°. Theoretically you should not have that condition of air. You should put in fresh air so as to reduce the difference between the readings of the two bulbs.

147. *Mr. Cochrane.*] In the event of a difference of opinion as to whether it should be a six-hour place, how do you settle it at the present time?—The Inspector of Mines settles as to whether it should be a six-hour place.

148. Do you think that if a workable standard were fixed which would act automatically it would save a lot of argument and dispute?—I think they should not fix a standard temperature.

149. Why?—Because if you had, say, 90° dry bulb and 86° wet bulb the men working under those conditions would feel no great inconvenience.

150. Would you, then, be in favour of fixing a standard for saturated temperatures only?—If the temperatures are both the same I say that that place should not be worked in; the conditions should be altered.

151. You say you have three shift bosses?—More than three. On day shift there are four, and three managers.

152. What do you mean by three managers?—Myself, the assistant manager, and the second assistant.

153. The other two are sub-managers?—Yes.

154. And you are the responsible mine-manager with full charge?—Yes.

155. The question has arisen before the Commission as to the interference by superior officers with mine-managers?—In my position, as regards the safety of the men, I have never been interfered with.

156. Generally, do you wish to express an opinion as to that matter?—No, except to say that I have never been interfered with while I have been manager of the mine.

157. *Mr. Dowgray.*] Mr. Gilmour, in regard to the ventilation of your mine, have you ever seen gas in the mine?—Yes.

158. What method of ventilation do you adopt?—We have a Roots blower.

159. Can you show us the ventilation plan of your mine?—[Plan produced and examined by Commissioners].

160. Have your workmen been compelled to leave the working-place on account of gas?—Yes, in the Reptile crosscut, even when the fan was running.

161. Do you consider the men are able to do a fair amount of work in the present conditions of the mine?—Yes.

162. *The Chairman.*] In all places?—Yes, in all places where the men are working.

163. *Mr. Dowgray.*] Do you consider that in a mine which shows 79° of heat in places the conditions are good enough for a man to do a fair day's work?—Yes.

164. In reply to one of the Commissioners you said you tested the amount of air travelling through the workings?—Yes, at different times, when we had any doubts on the matter.

165. Could you give us the reading for Bullock's stope? Did the anemometer register at all?—Yes, the air was rushing through it at a frightful rate.

166. Have you ever had the air analysed to see whether it was pure or not in Bullock's or Elsegood's stopes?—No.

167. When you are testing do you take your readings for quantity in the intake or the return?—In Horan's stope in the outlet.

168. You mentioned that in some places you had the air travelling through four levels. Could that not be regulated? Should it not be brought up a separate shaft?—In some cases it goes right up No. 5 without going anywhere else.

169. But could the levels be ventilated by regulators?—Whenever occasion arises we always look into the matter.

170. Is it not possible to ventilate each level separately?—That is done as much as possible, according to the places the men are working in.

171. It is not done according to the plan you showed us?—No. 1 shaft delivers the air only down to No. 7 level.

172. Do you allow the foul air and fumes to travel from the lower levels right through the others up to the upper level?—The return from Bullock's stope takes the smoke from right round there. There are four places.

173. When do you consider a mine adequately ventilated in regard to the condition of the air?—If there is 100 ft. that is adequate according to the Act.

174. And if this 100 ft. of air is not circulated in the stopes in the working-places?—That is what we try to do.

175. It does not follow, though, that because you show 75,000 cubic feet of air travelling in the mine, and that averages 230 ft. per man, that that amount of air is circulating in the places?—You can try any of the stopes you wish—everything is in working order—and you will find there is more air than the requirement.

176. *The Chairman.*] The Act says that the Inspector may prescribe the amount of air to be considered adequate under certain conditions?—Well, whenever the Inspector has asked for more air we have always attended to it.

177. Has the Inspector made any complaints in regard to your ventilation?—He has spoken about Horan's stope, but there was enough air for twenty-six men there.

178. Was he satisfied?—Yes, as to the quantity.

179. Does the Inspector furnish you with a copy of his readings?—No. If there is anything he considers requires attention he sends me a letter.

180. Would it be any advantage if he furnished you with a copy of his readings?—The matter could be all the better attended to. The more information I get the better.

181. Of course, we are open to receive any suggestions on any points either one way or the other: it is for anybody to make a suggestion, and the Commission will consider it?—The workmen's inspector makes an inspection once a month and furnishes a report. I think it is a great advantage to me, because he points out anything which he considers wrong, and shows me that the mine is being inspected in addition to the work carried out by our own men.

182. Would it be any advantage to you to have the Inspector's report similarly?—Yes.

183. *Mr. Dowgray.*] When the check inspector calls your attention to matters do you remedy them?—I read his report carefully, and do my best to remedy any matters complained of, and which I consider require attention.

184. In connection with the ventilation, the 100 cubic feet is needed for each man for consumption?—No, a man only wants about 1 cubic foot of air to breathe.

185. But in places where there is a lot of gelignite?—They make up the 100 ft. with decaying timber, gelignite-fumes, probable gases given off from the rocks, candle-burning: that makes up 25 cubic feet, and they multiply it by four. It is considered that that 100 ft. represents four times what is absolutely necessary.

186. How would you account for the difference in the prescribed quantities for a coal and a gold mine?—I suppose it is because of the inflammable gas met with in coal-mines.

187. What amount of air would it require to dilute 1 lb. of gelignite to make the air fit for human use?—As I have already said, allowing for the gelignite and gases included, it only wants 25 ft. to free it.

188. You think 100 cubic feet is quite sufficient?—Yes, it is four times as much as is actually necessary.

189. Is that a standard?—It is laid down in standard works.

190. Though, according to your calculation, there is 230 ft. of air available for every man, it does not follow that every man in every place has a sufficiency of air?—I do not say that every man has 230 ft. Some have more, and some may have less; in some places they get a little too much.

191. So that the 230 ft. cannot be taken as the quantity which each man gets?—No, that is only got by dividing the total current by the number of men.

192. Would you be surprised to hear that in one place measuring 7 by 4½ we could not get the anemometer to move at all?—You would very often not get the anemometer to register. Where was that?

193. In No. 4?—I am surprised. I was not with you, and do not remember the place.

194. In reply to a question by Mr. Molineaux you said that the ropes were tested and the conditions reported: have you that report with you?—No, it is in the engine-driver's room; I did not bring it.

195. Were you working in the Waihi Mine prior to the introduction of the contract system?—Yes.

196. Is it a fact that Mr. Coutts, late Inspector of Mines, said that during the six months after the introduction of that system more accidents occurred than during the previous six years?—That may be so, but the mine is very progressive. I say that the accidents should be taken per man, and not over any number of years. That is no way to take out an average for accidents.

197. But under the contract system it usually follows that the number of accidents increase?—There have been more men employed.

198. It is a fact that such a report was made?—I have never had my attention drawn to it.

199. *Mr. Parry.*] You say, Mr. Gilmour, that you distribute the air by brattice and doors?—Yes.

200. How many brattice-cloths and doors have you in the mine at the present time?—There are ten main ones, besides small pieces of brattice-cloth.

201. How many doors are there?—That includes doors made of wood and doors made of brattice.

202. How long is it since the major portion of these were put in?—They were put in when I started to study the ventilation of the mine more seriously, when Mr. Bennie was Inspector of Mines here—about six years ago.

203. On the 1st November, 1909, was there a brattice in the mine at all?—Yes, these doors were put in long before that.

204. In what places were they put in on that date?—Speaking from memory, I know there was one at No. 8 level, so as to stop the air from going up into No. 5 shaft from No. 4 shaft, and also at No. 7 level there were two. I went into the question very seriously when Mr. Bennie drew my attention to the fact that our air was not being distributed. I went into the question then, and had the doors put in.

205. Has there been any suggestion about the doors made by the workmen's inspector?—Yes, but not of late. He asked that brattice be put in to send the air round several of the stopes.

206. Of late how many reports have you had as to brattice and doors?—One or two.

207. And do you contend, Mr. Gilmour, that there is a sufficient current of air in all those stopes?—I contend that there is over 100 ft. in the main roads. You may get a time when it does not go right round the face, but through the outlets you will get sufficient current.

208. Do you think there was 100 ft. in Pearson's and Waddell's places?—I am quite sure there was in Pearson's—in fact, about four times that quantity.

209. In the event of a stope being that shape [sketch handed to witness], with three rises and two travelling-ways, how would you distribute the air into the ends?—Well, we do not go more than half that distance; we have no condition of affairs similar to that.

210. What is the distance between the ends in Bullock's stope?—Now their winze is within 40 ft. of the end.

211. And they have 40 ft. to break where there is no circulation at all, and under your system it is impossible to give ventilation?—Is there not a ladderway in that stope? [Sketch referred to.]

212. Will you explain to the Commission how you would ventilate that?—Well, the air goes up that ladderway and causes a draught, which sucks the air out of the end, and if there was smoke there they could empty the quartz pass.

213. Do you think that plan of ventilation is adequate for the stopes?—The winze in the stopes would be adequate to ventilate it.

214. You said that the majority of the accidents have been caused by sharp pieces of stone: are there not a great many cases of jammed hands?—There have been several jammed hands.

215. What is the cause of that?—Some of the men had their hands jammed by the trucks. They did not use the bars, and their hands have been jammed against the side of the level.

216. Do you think the accidents in the Waihi Mine are excessive?—No, I do not, considering the number of men employed. The serious accidents are not excessive, although there are a lot of minor accidents. The percentage of fatal accidents is very low compared with mines in other parts of the world.

217. What mine in the world has a higher average?—They have higher averages in South Africa.

218. Have you compared the number of accidents here with those in the Thames mines?—No, I do not know how many men are working there.

219. Do you think Waihi would compare favourably?—It would not be a fair comparison.

220. What is the difference between mining here and at the Thames?—They have no big stopes and no wide reefs. There are more accidents from falls of ground at the Thames, according to my experience. A man is never safe in those mines even after sounding the backs. The Thames miners, when they come here, will seldom go into a place without sounding all the time. There has been no sliding here, the result of volcanic action, as there has been at the Thames. I have not compared the figures, but when the Thames field was in full swing years ago there were far more accidents than we have now.

221. You have a different system of mining: the stopes here are bigger and the reefs wider, consequently there is more danger?—No, I did not say so.

222. You said that the stopes were bigger, and that was the cause of the accidents?—I did not say that was the cause of the accidents; if so, I misunderstood your question.

223. With regard to the proposal that the company should take the responsibility for the safety of the stopes, and the shift bosses to do the sounding, what is your opinion?—At present I go through the stopes myself, as well as the shift bosses, and I take the responsibility through the shift bosses.

224. Then, if you say that you are taking the responsibility now, and it is not necessary for any other provision to be made, who had the responsibility at the time Mr. Samson was killed?—No blame was attachable to any one. That was the jury's verdict.

225. *The Chairman.*] Do you consider it should be made compulsory?—I consider that the present method covers the ground.

226. The question is whether it should be made more specific, in view of the fact that in the absence of any statutory provision the responsibility is at present left to the contractor or to the men working in the stope?—It says in the Act that every man must satisfy himself as to the safety of his place.

227. *Mr. Parry.*] Will you tell the Commission what responsibility rests on your shoulders?—Well, the Mining Act says that the responsibility is mine.

228. What would be the result if the engine-driver was to faint when the men were being raised or lowered?—It all depends where the cage was when he fainted.

229. Suppose he fainted when the cage was 100 ft. from the surface?—By that time he would have cut off the steam, and the cage would go on up to the detaching-hook. It all depends upon the speed at which it went up. I consider that the men would be safe.

230. *The Chairman.*] If anything were to happen at any time, what would be the result as far as the cage is concerned?—The down-going cage would go down at the velocity at which it was running, and the up-cage would be hung up at the top of the poppet-legs.

231. It would depend upon which cage the men were travelling in?—If they were going down they would get a bump at the bottom, which would depend upon the velocity they were travelling at; but if they were in the up-cage there would be a reasonable chance of safety.

232. *Mr. Parry.*] But your statement that the men would be safe is only supposition?—Well, I have never known of an accident nor read of one. If a man did not feel fit while at the engine he would say so.

233. Is it not a fact that a man does not know when he feels a little "off colour"?—I do not think a man like that would remain at his engine.

234. With regard to the trucks, do you not think it is beyond the strength of one man to replace a truck on the line if it becomes derailed?—As a rule, a man generally goes back for his mate.

235. In the event of a man being in a level by himself?—In that case he can replace it on the rails by using the lever. If it is right off the rails he must get assistance. If only the front wheels are off he can replace it by himself.

236. With regard to the delivery of the timber, you say that there are different conditions for different places. Is it not a fact that in all cases the timber is only delivered to the plats?—Yes.

237. Is it not also a fact that the men have to take it out of the cages themselves?—At No. 6 shaft there are men told off to do it. The shift boss instructs them.

238. With regard to the temperature in Horan's stope: in answer to a question by Mr. Cochrane you said that when your attention was first drawn to the heat there it was 86° moist. Who drew your attention to that heat?—I did not say that. I said that at the finish I said it was 86° dry and 86° wet. I stopped the work sooner than was intended, because I considered it was not a fit place. Before that it had not reached that temperature. The Inspector of Mines visited the place, and I got a reduction of a few degrees in the temperature. The men went on working, and as they got in further the heat increased until it registered 86° dry and 86° wet. Then I took them out and sealed up the stope.

239. Is it not a fact that the job was completed at the time it was stopped?—No, it was not completed when I gave orders not to work there any longer.

240. And you consider that an excessive temperature?—Yes, when both bulbs read alike. I would stop it every time.

241. If in the course of driving one of your levels you got that heat, and you required to drive it to open up, what would you do?—I would put in a fan or something to alter the temperature, so that it would be fit for men to work in.

242. Do you think a dry temperature is not injurious?—No, not within certain limits.

243. Not even 100°?—No. Take, for instance, a stokehole. I believe they go up to 150°. A dry heat does not affect your work so much.

244. Would you rather work in a place with 100°, or 70° temperature with a wet bulb, 30° lower in each case?—I would take the 70° place.

245. As a matter of fact, then, you would sooner work in a cool place?—You have to work according to the conditions. You cannot make your own choice.

246. Why do you think it is wrong to fix a standard temperature? You say it is unworkable?—Because, supposing it was 90° dry, and the wet bulb showed a good deal lower, it would not affect a man's vitality to work in it.

247. If an honest, hard-working man were working in a temperature like that, and he told you that it had a bad effect upon him, what would you do?—I would test the temperature with the wet bulb, and find out what was affecting him.

248. Leave the moisture out of the question?—You cannot.

249. Then we will say it was 90° dry and 80° wet?—That would be a good place.

250. In the event of that being an honest man, and telling you that the air was affecting him?—It would not be the air which was affecting him in those conditions.

251. What would it be?—I do not know.

252. Would it be the heat?—No.

253. Who do you think is the best man to judge of the effects of a hot place, the theoretical or the practical man who works there?—Each man is the best judge of the effect it has upon himself.

254. Do you say that the working-man is the best judge as to the effect of a hot place?—I would not say the working-man; it is a matter of common-sense. You cannot say that a working-man would know better than a theoretical man.

255. *The Chairman.*] A man may be ill, but it may not be the heat which is affecting him?—That is so.

256. At what temperature saturated, less than 86°, would you stop a man from working?—It would have to be saturated fully. I would introduce something which would lower the wet-bulb temperature.

257. Would you stop a man at any temperature less than 86° if you could not reduce it?—No, I would not stop below 86°. I have not had any experience of the two bulbs being the same below 86°.

258. *Mr. Parry.*] If they were reading 85° saturated would you stop?—I would want to know what the other conditions were.

259. Have you been in such a place yourself?—Yes, I have been sampling.

260. Have you done eight hours' work there?—No.

261. So that you are not in a position to give an answer as to the effect on your constitution?—I do not know. I have never worked for eight hours in such a place.

262. You said workers were the best judges of their places: it is only reasonable, then, to extend to them the same privilege as to a judge?—A man is the best judge if he is a competent miner.

263. As regards the appointment of shot-firers, you said the idea was impracticable, but you did not tell the Commission why?—If you had one shot-firer for half a dozen parties, and if one of them wanted him down a long winze, perhaps another party would require his services in a stope. He would be required in several places at once, and the men would become dissatisfied very quickly with such an arrangement. It would end in confusion, particularly in a mine like ours, where there are so many men employed.

264. Are you aware that that system was in operation at the Junction at one time?—I do not know.

265. Do you think that electricity would be safer for firing in ordinary work—say, in stopes?—It is safer in shafts—we had experience with it in No. 2—but I do not know about its use in stopes.

266. What accident did you refer to?—Gray and Boxhall.

267. Do you think that Faulder, Strong, and Cochrane would have been blown up if electricity had been used?—I do not know what happened to Faulder. He himself did not know what happened.

268. In what way did Nicholls get killed?—My recollection of that case was that he did not go up after the hole was fired, but his mate did. They thought his pick struck into the gelignite in a hole which had not gone off, or else into gelignite which had been left in a hole. No one could tell the details, because the evidence was destroyed.

269. What is the chief reason for stopes being taken high?—I have known a workman sometimes to drill a hole above 8 ft. of stone.

270. *The Chairman.*] Do you think the contract system conduces to higher stopes?—No, I do not think so.

271. *Mr. Parry.*] Do you think there is any necessity for mechanical ventilation in the Waihi Mine?—In these long crosscuts you must necessarily have it.

272. I mean for taking away the smoke from the stopes?—The present quantity of ventilation in the stopes is ample.

273. And you consider the temperature of the mine is good?—Yes, except at different places, where it was 86° wet and 86° dry. That was considered bad.

274. *The Chairman.*] When the Inspector of Mines goes round and finds CO or CO_2, does he give you notice?—I heard the Inspector say the other day that he had not seen CO_2 in our mine.

275. *Mr. Parry.*] Have there been any complaints about the fuse burning too quickly?—Yes, a few years ago. We found that the fuse was bursting, but we had no misfires with it. We timed samples of it, and found it burned at the rate of 2 ft. to the minute, if my memory serves me right.

276. Have you not ordered stages to be removed from ladderways?—Yes, I ordered the 9-by-2 stage to be taken away. The Inspector asked that platforms be put in the ladderways, but the men put in two wooden boards together. I ordered these to be taken out and two iron rails to be substituted, so as not to block the airway. It complied with the Act, which requires platforms every 30 ft.

277. Is No. 1 shaft a downcast?—Yes.

278. With regard to the air which goes from No. 1 shaft, is it not a fact that it does not circulate in the stopes, but goes to No. 2?—You can feel a nice cool current near No. 1 shaft. It is the downcast air which is going through the stopes immediately alongside Truscott's.

279. Do you not think that the stables should be as near as possible to the upcast shaft?—Yes, or on a return current.

280. Where does the drainage from the stables go to?—We have a man to clean up the stables, and the refuse is sent up the shaft. The drainage is led into a hole, and is taken up in a barrel.

281. *Mr. Cochrane.*] Do you say there are more misfires with a battery than with a fuse?—Yes, I know that from practical experience.

282. If you were told that statistics proved that there are many more misfires with a fuse than with a battery what would you say?—Our experience in the Waihi Mine shows the opposite.

283. If general statistics differ from your experience, does it not point to something being wrong with your batteries?—Theoretically I know there is something wrong, but I do not know what it is. We have tried to get the agents to send the best material and the strongest exploders. The Inspector brought down the Government Inspector of Explosives, but he could not see anything wrong.

284. *Mr. Dowgray.*] In connection with the temperature, you said it was quite healthy to work in 100° dry. Would the dust then not come in as an element of danger?—There would be dust if the water were not used in the drills. If there were no difference as regards the dust there would be no ill effects.

285. But the temperature does not go up to 90°?—We have had it 100° in the mine.

286. You say that a man could work with 100° dry in temperature in comfort: what I want to know is if dust does not play an important part generally in the matter of health?—If the air were as dry as that everything, of course, would be as dry as a bone.

287. So that even the dry temperature is an important element and injurious to the miners?—Yes.

NUTCOMBE JEANES EVERED sworn and examined. (No. 27.)

1. *The Chairman.*] What are you, Mr. Evered?—A mine-manager, holding a first-class certificate.

2. How long have you held your certificate?—Ten years.

3. What experience have you had apart from the time covered by your certificate?—Seventeen years' experience.

4. What mines have you managed?—Only the Waihi. I am assistant manager there.

5. How long have you been in Waihi?—Fifteen years; ten years as assistant manager.

6. Have you anything to tell the Commission regarding the ventilation of the mine?—I cannot say that I have anything to add to Mr. Gilmour's statement. I quite agree with what he has said.

7. Do you agree with his remarks in respect to sanitary arrangements?—Certainly; also as to accidents.

8. Then you corroborate his evidence in all particulars as far as it was conducted by me?—Yes.

9. *Mr. Molineaux.*] Do you think, Mr. Evered, it is to the benefit of the miners to have bath-houses and change-houses?—Yes.

10. And also adequate sanitary appliances?—Yes.

11. With regard to winding, do you consider any provision should be made to prevent accidents with cages down the shaft in the event of an overwind?—I do not see how you could make any provision for controlling if the cage had got up its velocity. The only thing you could control would be the engines. I have nothing to suggest to avoid an accident to a descending cage in case of a runaway.

12. How is subsection (27) of section 254 complied with in regard to descending cages and the examination of appliances?—The appliances referred to in that subsection are the grippers on the cage, and these are what we test every week.

13. Do you consider that periodical medical examinations of engine-drivers would minimize the liability to accident?—I should think it would be inclined to do so. Though I have never heard of an accident, it is possible one might happen.

14. Do you consider the idea of having two men in charge or in close proximity to the engine when men are in the cage would have the effect of minimizing the risk of accident?—No, I do not think so. I think the second man would be inclined to attract the other man's attention, and the danger would be increased rather than otherwise.

15. In your experience of explosives, by which system have you found the most misfires to occur?—By electric firing.

16. Under what conditions would you use electricity in preference to a fuse?—I think only in wet places. Of course, if a place was very un-get-at-able, it might be advisable to use electricity also.

17. How many holes do you think it safe to fire with ordinary fuse?—About six.

18. Do you consider that number should be fixed by regulation?—Yes, I see no objection to it.

19. Have you received any complaint from the miners with regard to the heavy running of the trucks underground?—Yes, I have heard complaints at various times.

20. Have many miners been injured through attempting to put the trucks on the line?—Yes, I have heard of them injuring themselves while attempting to lift a truck without a lever.

21. Is there any difficulty at any time in obtaining a suitable lever?—They may have to go 100 ft. for one, but not very far.

22. With regard to ladders in the passes leading to the stopes, have you frequently to make complaints as to their condition?—No.

23. Have they to be kept in order by the contractor?—Yes.

24. *Mr. Dowgray.*] Do you think that if the side of the level was kept further from the truck many accidents would be avoided?—No, I think that the trouble is that the men take hold of the trucks by the corners instead of by the handles.

25. Does the air become heated the further it goes down the mine?—It may get slightly heated, but not much.

26. By the temperature of the rocks?—Yes, a little.

27. Then you do not agree that the air gets cooler at the bottom in the summer-time than it was at the top?—It might. The mean temperature in the summer is not very high down below. It depends on the initial temperature.

28. Supposing it registers 60° on the surface, will the temperature of the air be reduced or increased when it gets to the bottom?—It depends upon the local conditions—upon the temperature of the rocks.

29. Has velocity anything to do with it?—It may.

30. Then it is practically impossible for the air to be cooler at the bottom than it is at the surface?—Certainly not; the variations in temperature on the surface are very large.

31. Does good ventilation mean a good temperature from surface back to surface again?—Well, if you have noxious gases it cannot be as pure when it comes back as when it went down.

32. *Mr. Parry.*] You corroborate Mr. Gilmour's evidence as to ventilation?—Yes.

33. The air is well conducted in the mine?—Yes.

34. Do you know that the members of the Commission were in the mine on three different occasions for half a day each time, and only one door was seen during their inspection—under Elsegood's stope?—They were unfortunate, then.

35. *The Chairman.*] How many are there marked in the plan of the mine?—Eleven.

36. *Mr. Parry.*] Do you not think, as a practical as well as a theoretical man, that the time has arrived for having a systematic plan of ventilation for the mine?—We have a plan now.

37. But can you produce a systematic plan of ventilation?—You have had it.

38. Have you a plan now for the next level?—Our next level will not be needed until two years hence.

39. You have no sufficient plan of ventilation laid down for that level?—We have enough for present requirements.

40. *The Chairman.*] Is it customary to prepare a plan of ventilation before opening new workings?—Well, if you are opening up new workings you do not know where the reefs are or where they will be found to exist. You have to be guided by circumstances.

41. *Mr. Parry.*] But, as a matter of fact, you know that you will have to drive to certain points?—No, I do not know. We have to be guided by the ground. There may be upheavals or slides, and we cannot tell before we get there what that development will be.

42. But you know that there are certain points for which you must drive where the reef exists?—We do not know where it exists. We cannot go on a proposed line of reef.

43. I want to know whether it is feasible, in opening up another level, to have a systematic plan?—No, it is not usual; it is unworkable, and I do not think it is necessary.

44. I wish to know if winzes are sunk for ventilation purposes only?—It is not usual. We generally utilize our winzes for other purposes as well; we combine their utility. We may sink them at the time because the ventilation is bad, and ultimately use them for filling.

45. Have you ever sunk a winze in the country for ventilation purposes alone?—No, I cannot recall such a place as that.

46. Your reason against the appointment of a second engine-driver was that they may talk to such an extent as to increase the risk of accident?—Yes; but I have never heard of an accident occurring through only one man being at the engine.

47. And that is the only reason that you see for not having two men at the engines at once?—Yes; we have a rule that no man shall speak to the engine-driver, but if there were two men there the risk of the rule being broken would be great.

48. Could you not have a similar rule to prevent them from talking to one another?—It would be a very difficult matter.

49. As regards the appointment of shot-firers, you corroborate Mr. Gilmour's evidence that it is impracticable?—Yes.

50. Why is it impracticable?—For one thing, there would be the difficulty of communicating with the shot-firer. If, for instance, he were 100 ft. up a rise, how are you going to let him know?

51. Could not there be certain times arranged for firing?—We have often tried that, but it has not been satisfactory.

52. Do you not think it is in the interests of the health of the men, and also to assist the ventilation, for the men to fire at regular times?—It is a very difficult matter to arrange.

53. Do you think it would be better for their health and ventilation?—No, I think it would be more satisfactory as it is.

54. *The Chairman.*] Would the fumes be likely to carry away better?—No, I think there would be too much noxious gas passing away at the one time. It is better for a little smoke to be passing all through the eight hours.

55. *Mr. Parry.*] You say that you think it would make no difference if they were all asked or made to fire at a certain time?—I say that the present system is preferable.

56. Why did you try to regulate it?—We tried to do so in one particular stope, but the men said it would not suit them, and they wished to fire when they had finished.

57. In the event of the appointment of shot-firers you say that the man, when required, might be 100 ft. up in a stope or rise. But if there were sufficient shot-firers the system would be quite practicable, would it not—if there were enough shot-firers to attend to all the firing?—You might fill the mine with shot-firers. I do not think it would be practicable.

58. Do you think the expense would be too great? Is that your reason?—Of course, the expense would be an item against it.

59. As regards the ventilation, have you taken any temperatures of rocks in the Waihi Mine?—No, but I have been present when they have been taken.

60. What is the highest temperature registered by the rocks?—I could not tell you without referring to records.

61. Would it be 92°?—I have not seen that. It varies very much.

62. Supposing the rocks in the stope registered 84°, and there is, we will say, 5,000 cubic feet of air, would it necessarily follow that the air would have the same temperature as the rock?—If it were a large stope you would find that the air would vary a good deal. It would be cool at the centre, and hotter at the sides where it came into contact with the rock. Then, with that large amount the velocity would be great, and that would make it cooler in the centre, too.

63. The greater the current of air the cooler the place would be?—Yes. You see, if it were travelling fast it would not reach the heat of the rock, but if it remained stationary it would.

64. It would depend upon the circulation of the air and the speed?—Yes.

65. What would be the best means to reduce the temperature in such a place?—You could put ice in there.

66. If the circulation of the air was increased would that not bring the temperature down?—It might affect it in some parts of the stope.

67. Would an exhaust fan have the effect of reducing the temperature if it were shut up so as to operate upon that particular hot place?—It would probably reduce it a little.

68. What do you think is the cause of the present high stopes?—Where it has been baulked ground they have had to take it down, and that tends to increase the height.

69. Do you think a standard height should be fixed for stopes?—I do not think you can fix a standard. If a man is not allowed to take down a piece of ground which threatens to fall on him, what is he to do? He has to take it down for his own safety. You cannot say that his stope everywhere shall not exceed a certain height.

70. But in the case of a stope that will run up by the firing of a hole?—Well, you fill it in if it gets very high.

71. But you cannot fill a stope in until the face gets far away?—You can fill in a stope at any time.

72. Yes, if you want to stop the work?—Yes.

73. But it might not be desirable to stop the stope, as that would be detrimental to the company's interests?—Certainly, it would; but if the work were unsafe you would have to do it.

74. *Mr. Dowgray.*] But in the event of a stope getting unsafe do you not use timber?—Yes, but you cannot start timbering in the middle of a stope that would be dangerous.

75. Do I understand you to say that it is not practicable to commence timbering when a stope has been partly filled in—you do not do that sort of thing?—We have tried it, and found it unsatisfactory.

76. I would like to ask you if Brooks's stope was not partly filled in first?—There may have been one stope.

77. Was Owen's?—Yes, and we had to abandon it.

78. And Davies's stope in No. 7 level?—I think Davies's was started from the level.

79. Are you sure?—No, I am not quite sure, but it was started at the level or near it.

80. How do you extract your arches up above—on timber?—We give the mullock probably a couple of years to consolidate. It sinks for a year, at any rate; the sole plates sink just as much as the mullock.

81. *Mr. Parry.*] Is it not a fact that these stopes were up some distance when the timber was put in?—In only two or three cases.

82. *Mr. Reed.*] Do you not think it advisable that the use of penthouses in shafts should be made compulsory by law?—Yes.

83. Are you aware of any provision in the present statute in connection with them?—I do not think there is any reference to them. We make it a practice.

84. And you would recommend that they should be provided for in the regulations?—Yes, I would; that is, in working-shafts, of course.

85. In regard to sanitary matters, do you not think that the pans should be provided with lids?—Yes.

86. Would you recommend the use of an automatic earth-feeder to regulate the supply of earth?—It might be feasible, but I have had no experience on the subject.

87. Would the earth act as a deodorizer?—Yes.

88. Would you recommend that small spaces round the pans be concreted?—I do not see quite where the moisture is to come from. The pan is supposed to receive it all.

89. Do you not think it is necessary to prevent spilling?—No, it should not be.

90. As regards a six-hour place, could you inform the Commission what would be the hours actually worked?—Well, under the conditions, I should say not more than five hours. The men always have crib; then it takes a good deal of time going to and from their work.

91. In an eight-hour place what would be the average worked?—About seven hours.

92. Does that seven hours include crib-time?—Yes.

93. As regards spliced winding-ropes, some countries have a regulation prohibiting the use of them?—It may be necessary.

94. How often do you anneal your cage-chains?—Every six months.

95. Is that compulsory by law?—No, we have our own rule for it.

96. Have you studied the question of the most modern type of change-houses?—I have read various descriptions of them.

97. Have you read the specifications of those in use in Westphalia?—I have heard of them.

98. When a man removes his clothes he hangs them on a line, pulls them up to the roof by rope and pulley, and padlocks the rope to the back of a seat?—Yes, I have heard of it.

99. Would that not give greater space?—In our change-houses here the clothing is hung on pegs. If we had to adopt that system the change-house would have to be made higher.

100. If you had to redesign your change-houses what scheme would you follow?—It might be an improvement to adopt the method you refer to, but I have not seen it working myself.

101. As regards the use of brattice in your mine, what is your experience?—It is unsatisfactory. The men trucking on the levels leave it open.

102. Is that done intentionally?—You cannot say whether it is intentional or not.

103. During your experience here has there been a rider added to a Coroner's jury's verdict which was averse to the company?—No.

104. Has the company ever been cast in damages in regard to injuries as the result of litigation?—No, not as far as I can remember.

105. As regards the ventilation, would increasing the air to a considerable extent reduce the temperature?—Of course, if the temperature of the air were low it would.

106. But would not a large volume of air tend to lower the temperature?—Yes, it naturally would.

107. You have 70,000 cubic feet of air?—Yes, over that—76,000.

108. Are you aware that in New South Wales in some mines they have 300,000 ft .of air per minute?—Yes.

109. Apart from the expense, do you not think it would be advisable to put in a fan to increase the quantity of air and reduce the temperature?—But the ventilation of the mine is good.

110. But why not have it better?—Well, that is an economic question.

111. But if a colliery can afford to install a plant capable of providing 300,000 cubic feet is it not reasonable to ask the Waihi Company to install one?—Yes, possibly.

112. In connection with the damage done to ladder-passes, has the company no remedy for preventing the throwing of tools down them?—It is against orders to do it in any case.

113. Have you ever taken action against the contractors for that?—No, but we have cautioned them about it. The men are supposed to lower the picks and tools with ropes.

114. In connection with sprays, would you recommend their use to be made compulsory with drills?—Well, it is compulsory now according to the Act.

115. Under the present statute it is compulsory for the company to provide them, but it is not compulsory for the men to use them?—It is a rather difficult question. You can take a horse to water, but you cannot make him drink.

116. Are the men liable to a penalty for not using the spray?—I do not think so.

117. Would you recommend that their use by the men should be made compulsory?—Yes.

JOHN HOLLIS sworn and examined. (No. 28.)

1. *The Chairman.*] What are you?—I am one of the shift bosses in the Waihi Mine.

2. How long have you been mining?—Twenty-five or twenty-six years.

3. Where?—At Waihi and Waitekauri.

4. Have you heard the evidence given by Mr. Gilmour and Mr. Evered?—Yes.

5. So far as it relates to the working of the Waihi Mine can you corroborate it?—Yes.

6. *Mr. Reed.*] Do you examine the stopes?—I do.

7. In what condition do you find them?—In my section of the mine they are good.

8. What height do you generally keep them?—I try to keep them 8 ft.—that is, 10 ft. or 11 ft. from the sollars.

9. Are you always able to keep them at that?—No, not always, because the loose quartz is brought down sometimes and makes the roof of stope higher.

10. What section are you in?—No. 2, Edward and Royal lodes, and No. 4.

11. How long have you been there?—I have been looking after it for about eight years.

12. Have you had any fatal accidents there?—No.

13. How many men on an average work in your section?—About eighty to a hundred.

14. Have you had many complaints as to the excessive height of the backs?—Sometimes the Inspector of Mines has advised me that the stopes were too high.

15. And what steps did you take?—We cautioned the men, and gave instructions that no hole was to be bored above 8 ft.

16. Do the men make complaints to you as to the height?—No, it is fairly good.

17. Do they complain to you about the ventilation?—Only in one stope, Horan's. They complained as to the heat there.

18. What was the temperature when it was last recorded?—I forget now.

19. Is that a six-hour place?—No, eight hours.

20. Have you any six-hour places in your section?—No.

21. How do you determine a six-hour place in the stopes?—There are no six-hour places in the stopes.

22. Have you had any trouble in keeping the brattice-cloth up in your mine?—Yes. I do not know whether it is the result of carelessness or accident, but trucking has pulled them down.

23. Do the men use the sprays in connection with the drills?—Only with the rock-drills.

24. Do they ever neglect to use the sprays?—They are very seldom used in the rises.

25. And in the levels and crosscuts?—They always use the jet there.

26. Do they complain of the water splashing over them?—No.

27. What is your opinion as to the appointment of electric shot-firers?—I do not believe in it at all. If a man is capable of boring a hole he is capable of firing it. The men should not be treated like blacks in Africa.

28. How do you think the men would stand having shot-firers put over them to fire their shots?—Speaking for myself, I would not have it.

29. Have you had any experience of mines in other countries?—No.

30. Have you met miners from other countries?—I have met one or two from Africa.

31. In Waihi do you meet miners from Australia?—Yes.

32. Have any of them informed you whether shot-firers are employed in Australian mines?—No.

33. Have you ever heard of the employment of shot-firers in mines where white quartz-miners are working?—Only in the Grand Junction Mine.

34. How long have they been employed in the Junction?—I could not say.

35. Could you suggest anything for keeping those closets in the mine a little cleaner, and freer from offensive odours?—There is a man employed to go round and keep them in order. The pans are taken up twice a week and changed.

36. Have you tried the use of earth at all?—No.

37. Where do the men get their drinking-water from?—It comes down No. 4 shaft from a spring in No. 4 level. Down to No. 2 level the men use race-water.

38. *Mr. Cochrane.*] I think you said you found brattice-cloth unsatisfactory?—It does not seem to last any time. The trucking pulls it down.

39. What would you suggest in its place?—A door is the only thing.

40. It might need double doors?—No, I do not think so.

41. Would you recommend doors in place of brattice?—Yes, where they are required.

42. *Mr. Dowgray.*] When the roof of a stope gets bad do you put timber in?—No, we take it down.

43. Then it will run up out of your reach: you can only take it down a certain distance?—It is an awkward matter to timber with filling.

44. When is it considered necessary to timber a stope?—If there were anything rotten there they would start off with timber.

45. If they got up a certain distance, and then found it necessary to timber?—I have never found that happen in my section.

46. *Mr. Parry.*] Have you taken many temperatures in the mine?—No, none.

47. Is it the usual thing for the shift boss to take temperatures?—No.

48. Have you seen any temperatures taken in that mine apart from those taken by the Inspector of Mines?—Yes, by Mr. Gilmour and Mr. Evered.

49. In regard to brattice-cloths being torn down, would the concussion have any effect upon them?—No, we cut them into strips.

50. Are they all cut into strips?—No, only sometimes.

51. Was the brattice in Horan's stope cut into strips, or was it in three pieces, or singly?—I forget now. There were several pieces put up in Horan's stope.

52. You say you have not had much trouble in your section with high stopes?—No; now and then we have had, but very seldom.

53. Have you any opinion to offer as regards the fixing of a standard temperature?—No.

54. You have worked in hot places as a practical man?—I have not worked in many hot places—only in the Waihi Mine for ten years.

55. You are not in a position to suggest anything in regard to hot places?—No.

56. *Mr. Reed.*] Do you ever sound the backs of stopes, or do you cause them to be sounded?—Yes, I have sounded them myself, and also drawn the attention of the men to them. Sometimes I have pulled them down.

JOHN COOMBE sworn and examined. (No. 29.)

1. *The Chairman.*] What are you, Mr. Coombe?—Assistant manager of the Waihi Mine.

2. What certificate do you hold?—I have a metalliferous and a coal-mine manager's certificate.

3. What experience have you had?—About forty years, in different parts of the world.

4. How long have you been at the Waihi Mine?—Nearly ten years.

5. In what capacity?—Assistant mine-manager.

6. You have heard Mr. Gilmour's evidence in detail: do you corroborate it, or have you anything to add to it?—I do not think I can take from or add to it.

7. Have you any suggestions to offer in regard to any of the matters before the Commission?—No, I do not think so.

8. *Mr. Molineaux.*] You are accustomed to taking temperatures?—Well, no, I have not been taking temperatures for some time. Mr. Gilmour and Mr. Evered do that.

9. Do you understand the difference between the dry and wet bulb?—I do.

10. Do you consider it practicable to fix a standard temperature for all gold-mines?—I should say not.

11. Why not?—Because I do not think there is so much in the temperature altogether as long as you have the assurance that you have the quantity and quality of air necessary for the men that are employed about the place. I do not think the temperature has much to do with it. I have worked in Western Australia, where we could not have had it less than 110° in the summer-time at any time.

12. What hours did you work there?—Eight hours.

13. Was that 110° dry?—Yes, with very little humidity in the air, as a rule.

14. If it were absolutely necessary for a standard to be fixed, what would you consider it should be, taking into account the quality, quantity, and temperature?—Both quality and quantity are the only things worthy of consideration. We know miners are not salamanders, and cannot stand boiling-heat. I should say that from 80° to 90° is high enough to work in.

15. With regard to shot-firing by fuse and electricity, which have you found the more reliable?—My experience in Waihi has shown me that there have been more hangfires with electricity than with the ordinary fuse.

16. More hangfires or misfires?—More misfires with the electrical appliances.

17. Then under ordinary circumstances you prefer to use the fuse?—I certainly do.

18. Under what conditions would you prefer to use the electricity?—If I were sinking in a wet shaft I should certainly prefer to use the battery, but under no other conditions.

19. You mentioned the term "misfire": what length of time have you known a shot to miss fire when fired by electricity?—Well, I believe on one occasion three shots missed, and the men did not go back for two or three days, and then one shot was known to explode.

20. With the ordinary fuse what is the greatest length of time you have known a shot to hang fire?—Well, as a rule, I have been too quick to see that it did not hang too long. I have gone back, but it is not a good rule. The longest would be about an hour.

21. Do you think an hour would be a fair time?—I think so. I cannot see the use of wasting time for two hours. Perhaps the tamping may be damp, or something of that kind. There may be a bit of sawdust in the cap, and the fire does not get into the fulminate of mercury.

22. *Mr. Fletcher.*] With reference to conducting the air in your mine, do you think you have sufficient doors for the purpose?—Well, they are only necessary where the current has not a great velocity. We are only using them now and again for the trucks. Where the roads are used for traffic we put up brattice-cloth.

23. Where you do not put up a door do you put up more than one brattice?—Not more than one.

24. If one door is not sufficient could you not have another door, to be closed while the other one was open?—I do not think it is as necessary in these metalliferous mines as it might be in a coal-mine where a lot of gas is generating.

25. But there are hundreds of collieries without any gas, and it is repeatedly done in them. You do not think two doors are necessary?—No, I do not think so.

26. *Mr. Reed.*] If two doors were erected would they obstruct the trucking to a considerable extent?—Yes, if the trucks were going through that way. We do not put a door where they are trucking.

27. You can give us some important information as regards the hours of labour?—Well, I suppose by the time the men have gone up and down, had their crib, and talked a little politics and so forth, pretty well an hour and a half would be spent.

28. What would you say was the average working-day?—About six hours and a half.

29. Supposing there were six-hour places, would the average working-day be six hours less one hour and a half?—Yes; but I would not like to say that every man did that.

30. Say four hours and a half to five hours: would that cover it?—I think it would.

31. What part of Western Australia were you referring to?—Kalgoorlie and Peak Hill.

32. How many hours do they work in Kalgoorlie?—Eight hours.

33. Are there any six-hour places?—No.

34. Do you know the temperature in the shade in Western Australia?—From 100° to 115°.

35. Do the men complain about working outside in those temperatures?—Not very much, if they are covered with light clothing. I do not mean to say it is very comfortable, but, still, they do not suffer very much.

36. Would 110° in the shade possibly represent 140° in the sun?—I could not tell you. It would mean a considerable difference—I do not know how much.

37. *Mr. Dowgray.*] Do I understand you to say that you hold a coal-mine manager's certificate?—Yes.

38. How does the system of ventilation in gold-mines compare with that in coal-mines?—That depends. If you refer to the Waihi Mine, we have ventilation there which is quite sufficient and more than sufficient for all the men and animals that are employed. In a coal-mine you would get mechanical appliances to produce it. We do not need that.

39. But do you not think that you may have it in the levels and not in the faces?—As the manager told you, he has a blower which supplies the faces. We must have mechanical appliances to supply the air in the far-away places.

40. But do you not need regulators in the shape of brattice-cloth to send the air up these rises? Do you not think that would be better than your system?—I do not see it. We have ample ventilation, you see. We know in a moment when we want a brattice-cloth.

41. Are you in the habit of travelling up those ladderways?—Yes, as much as any man present.

42. Do you think the stopes are adequately ventilated?—Yes.

43. Do you consider there could be any improvement?—There is no stope perfect.

44. Could you suggest anything?—If I suggested anything it would be suggesting a superfluity. We have all we want.

45. Can you ever get a superfluity of air?—Well, if we went in for any mechanical appliances they would be superfluous.

46. Would it injure any workman to have a superfluity of air?—No.

47. Do you not think a workman would be the better off with a superfluity?—I do not think you can give him too much, but I think he has already got sufficient air. There may be a little heat in places, but still the quality and quantity of air are there.

48. But if they installed a large Sirocco fan, and put in a superfluity of air, would that not reduce the heat?—I question very much whether an increase in volume would reduce the heat. You want a refrigerator to do that.

49. Did you not hear Mr. Gilmour say that he had put up an extra rise: was that not a superfluity?—It was to take away the foul air. Three vents going up out of a stope would take it away quicker than two.

50. Does it not sometimes occur that there is only one inlet into a stope?—Perhaps in the shrinkage stopes.

51. Sometimes one of the ladderways is stopped up?—They have to suffer the inconvenience of that for a day.

52. It is only practicable to put ladderways at each end. Could you not put a ladderway up alongside the pass?—There is no pass in the shrinkage stopes.

53. *Mr. Parry.*] You said, Mr. Coombe, that the men in Western Australia work hard: during your experience have you ever known any men work harder than the men in the Waihi Mine?—I suppose they work hard enough in the Waihi Mine, but I do not know that they work any harder than the men anywhere else. They may work under more favourable conditions in the Waihi Mine than in most other mines.

54. What hours do the men actually work on an eight-hour shift?—I do not know exactly how much. They have their crib, and then it depends upon what they are talking about; it may be politics and it may be socialism.

55. Is it not a fact that if the men were working a six-hour shift they would be able to work more constantly?—I do not know. I always had to work eight hours. I was one of those unfortunates.

56. Did you ever feel that six hours was sufficient to work in a hot place?—Well, there are places that six hours was quite enough to work in—cold, wet places.

57. As regards Elsegood's stope, do you think the temperature there was too hot for a man to work in over six hours?—I saw Elsegood's stope yesterday, but I do not know that it was very uncomfortable. Of course, the men have two machines going there all the time.

58. How long did you stop there?—I suppose I was there more than half an hour.

59. You say that the brattices are put up in different places where they are required. Do you not think they are required in several parts of the mine to send more ventilation up into the stopes?—We may overlook a place sometimes, but the management and shift bosses are always looking round to see where they can make any improvement. They may overlook a thing, and it may not be done quite so quickly as it ought to be, but generally they attend to matters as quickly as possible.

60. Is there anybody employed in the mine to see that those doors are put in and kept shut?—I do not think so. The shift bosses delegate men to put up the doors.

61. So that a door might be down or a brattice torn down for some time?—No; the shift boss goes round his section every day, and sometimes twice a day.

62. During your experience in the Waihi Mine have you found that the circulation of the air has been somewhat altered by the mullock in the stope?—It might, possibly, if one pass gets choked, but that would not cause any detriment to the stope except for a few minutes.

63. Have you noticed that some stopes in particular contain the smoke all day?—I certainly have seen places where the smoke seems to hang round somewhat long.

64. What is the cause of it?—There may be a block in the level up above, or an atmospheric change may account for it.

65. The air-currents are not always the same?—No.

66. Then mechanical ventilation would be an advantage?—Well, whilst there are alterations in the current they only reverse the course of the current; the current itself is not altered, though it may be reversed.

67. Would not the air-current be more uniform if there were mechanical ventilation?—Yes, perhaps, but it would be of no advantage.

68. You do not think any system is necessary in the Waihi Mine to take away the smoke from the bottom levels, and the vitiated air?—No, I do not think it is necessary just now, because I have not found very much smoke. For a few minutes after the men have fired a good number of holes perhaps you might get some smoke.

69. Do you think working in those stopes has a bad effect upon a man?—Well, I do not know. I suppose it has a tendency to affect him. The miner is not supposed to have the most pleasant and longest life, but at the same time I think the conditions under which the men are working in the Waihi Mine would compare more than favourably with any place I have seen yet.

70. *Mr. Reed.*] What is your opinion about the appointment of shot-firers?—I think that would be an insult to the contractors. I would not care to be the man who attempted it. Besides, I do not think there would be any advantage.

71. What is your opinion as to the necessity for having two men at the winding-engines?—If you did that you would want to duplicate every office in the mine. It does not matter what position a man holds, there is always something about it that may be unsafe.

72. Supposing two men were necessary, do you think it would be possible to prevent them from conversing?—Knowing men as I do, I do not think so.

73. In all engine-rooms that you know of is there not a notice prohibiting men from speaking to the driver?—Yes, it is posted up on the door. To have two men there would be a source of danger, and would tend to increase the liability of negligence.

74. Are you aware of a recent accident in the Energetic Mine, where with two men in the engine-room they killed a man between them. The accident occurred during the last twelve months?—No, I do not know of it.

75. *Mr. Parry.*] As regards shot-firers, you said it would be an insult to the men. Have you ever had any complaints from the men as to the effects of using dynamite when they were hot?—They get rubbing their heads or faces before washing their hands. I have felt the same effect myself.

76. That is to say, a man who was cool would not be so likely to be affected as a man who was working laboriously?—He would be pretty hot by the time he had used much dynamite.

77. *Mr. Dowgray.*] It does not follow that the place where he is preparing a hole is very warm?—You know that a man who is working by any hole certainly gets fairly warm.

WAIHI COURTHOUSE.—29TH AUGUST, 1911.

LINTON MOORE sworn and examined. (No. 30.)

1. *The Chairman.*] What are you?—A miner.
2. How long have you been mining?—About thirteen years.
3. Where?—In New South Wales and New Zealand.
4. How long have you been mining in New Zealand?—About six years.
5. Where have you worked?—In the Waihi and Grand Junction Mines.
6. Where are you working now?—In the Grand Junction Mine.
7. How long have you been working there?—About three years.
8. Do you hold any certificates?—I hold a mine-manager's certificate.
9. How long have you held it?—Since last March.
10. Do you hold any office at the mine?—No, I am simply a miner.
11. On what subjects do you wish to inform the Commission?—I would like to make a few suggestions in regard to ventilation. I think every mine ought to have a proper system of ventilation. I think the dust is responsible for more deaths than explosions or falls of earth. A standard of quality of the air is much more important than a standard of heat, and no man should be allowed to work in a place which did not come up to the quality standard as regards the air; he should not be allowed to work there at all. I think that if such a standard were fixed the management of the different mines would find out some way for providing efficient ventilation. At present there are many places in the mines which are not fit for men to work in.
12. Can you suggest a workable rule by which such a standard could be ascertained?—There is one workable rule which might be insisted on, but possibly there are not many companies which would be prepared to go to the necessary expense. There should be some upcast shaft away from the working-places by which the air could be conducted straight from each level without going through any of the other workings. It would then perhaps be possible to conduct the foul air away and leave the air in the workings fresh. I do not suppose every company would go in for such a system on account of the expense.
13. You think there should be a separate shaft for ventilation purposes, which should be an upcast, and serve for all levels?—Yes, instead of allowing the air from one level to circulate through all the other levels.
14. How would you propose to ascertain the conditions which you consider sufficient to close a place—how are you going to measure it?—If you measured the quantity of dust, and found more than, say, four times as much as the average quantity of dust on the surface, it should be considered unfit to work in. I think some such scheme should be devised.
15. What elements would you take into consideration in deciding when a place was unsuitable to work in?—I would take into account the dust first, and the noxious gases, and the quantity of air, though that is already provided for. At present the air is measured with the dust and fumes as well: that ought to be done away with.
16. Who that is available would be competent to decide when those conditions exist on a place to an injurious extent?—I think the Inspector of Mines and the workmen's inspector conjointly ought to be able to decide that. If the workmen's inspector was not in a position to analyse the air, it could be done by a local chemist. There is no doubt about the importance of the dust in connection with the matter, because any man who works in a mine for twenty years will be either dead or so much crippled as to be unfit for anything else.
17. Have you had any experience of working rock-drills or poppers?—I have had experience with rock-drills, and think they are all right, but as far as the popper is concerned I would advocate its abolition. I have never worked one, and do not intend to do so. I have, however, seen men who have worked them, and they have come out of the place looking as though they had been working in a flour-mill.
18. Have you ever seen them trying to work a popper with a water spray?—I have seen them at it, and have seen them with the drill stuck in the hole. If they do not use the spray the drill comes out easier, and consequently there is a tendency for the miner to work without the water. Most miners do not understand the injury they are doing to their system by breathing the dust, and they are not overparticular in using the water even with the rock-drill, with the result that the dust is frequently seen flying through the air.
19. Would you suggest that where rock-drills are in use it should be made compulsory for the miners to use the water?—Yes, I certainly would. I have also another suggestion to make in regard to spraying places after firing. Some simple and inexpensive spraying arrangement should be used in winzes, drives, and passes leading out of stopes after firing, with a view to laying the dust and fumes to enable the men to get their air a little purer.
20. You mean by using a hose or a pipe?—You would not need a hose. If you had some pipes arranged in the winze so that the water could be turned on it would get over the difficulty. It would not have to be too far up the winze or it would interfere with the ventilation. In crosscuts the fumes are not so noticeable when you use water. A spraying arrangement here and there through the mine would be very beneficial.
21. Have you had any experience in artificial ventilation by means of a blower or a fan?—I have had experience with a water-blast.
22. Have you any suggestion to offer as to the use of mechanical appliances?—Yes; I consider that it is very important that the air circulated into the mine by means of a fan should be fresh air. A fan is sometimes set up where there is only foul air, and that is driven into the face for the men to breathe.
23. That is to say, it should be set up in an intake, and not in a return airway?—Yes.
24. Have you any remarks to offer in regard to ventilation?—I wish to say a few words as to hot and wet places, and to the fixing of a standard temperature.

25. Have you had any experience of the wet and dry bulbs and the taking of temperatures?—I have not taken any temperatures in the mine, but only experimentally. I understand what it means, however.

26. Have you any suggestion to make with regard to a standard temperature for hot and humid places?—I think the standard should be set at about 80° dry bulb, and in anything over that the men should work six hours.

27. That is, assuming that the air is otherwise quite clear, and that there is nothing more than the temperature to be taken into account?—I think that is a good-enough temperature to set. In my experience there are very few places where the air is as pure in the mine as on the surface. It would be quite fair to both sides to set the standard at 80°. Sometimes the miner would consider it a good thing at 80°; in most cases, however, it would be bad enough. If you have no standard set for quality, then you might set the temperature standard at 80°; but if you have a quality standard fixed you might make the temperature standard a little higher.

28. Have you any opinion to offer as to the height of stopes?—I think the height of stopes should not exceed 8 ft. or 9 ft. from the mullock.

29. Have you had any experience as to accidents either in the mine or in connection with machinery?—I was in the Grand Junction Mine when Anderson was killed. At Cobar I have known men blown up through misholes. I have not had much experience of accidents in Waihi; they have seldom happened on my shift.

30. What is your opinion about the firing of holes either by hand or by electricity?—I think that all holes in shafts, rises, and winzes should be fired by electricity, and good caps should be used. I think that is a matter which should be placed in the hands of the Government, because we cannot depend upon getting first-class material from the makers. If a good cap were obtainable we would have some reasonable amount of certainty of the holes going off. A great deal of trouble is caused by defective caps or detonators.

31. For firing in stopes and faces do you recommend the use of hand-fuse or electricity?—I do not think there would be any advantage in using electricity in stopes. I look upon electricity as something which gives a man a chance to get away; but in the stopes you get better results with the fuse, and it is safer. Electricity is probably the more satisfactory in wet places.

32. In regard to safety, how many holes should a man be allowed to fire at one time with a fuse?—There is this to be taken into consideration in connection with that matter: that if you fire only two or three holes you have the disadvantage of going back and breathing the dust and smoke twice. If two men were spitting the holes it would be reasonable to allow them to fire four each. They could fire eight holes in one place safely.

33. Have you any opinion to offer as to the appointment of shot-firers?—Do you think the proposal, if given effect to, would be an advantage in a mine as against men firing their own holes?—I am looking at it from the point of view of the number of accidents. In my own experience I have known of accidents which would never have occurred if shot-firers had been employed. There was one such case in Cobar, where a man was blown to pieces; and in the case of Mr. Franklin, who was injured in the Waihi Mine, his accident would not have happened under a system of shot-firers.

34. Was it the result of incompetency?—No, it is the result of the contract system. We are all eager to make as much money as possible. Franklin went back earlier than he should have. The Cobar accident I referred to occurred in the Occidental Mine; they fired a hole, and went back and started to load it up with powder before it was cooled down. The other accident was due to the same cause—the hole was fired with gelignite, and it did not come out. They went and loaded it up again, and in about twenty minutes it went off, and they were both killed.

35. Do you suggest that the shot-firer should also determine when the men should go back?—There is a provision in the Mining Act about misholes, but it does not seem to be enforced. It is very difficult, I know, for the management to deal with these cases, because they cannot see the men always.

36. How would the shot-firer get over that difficulty? He would simply fire the hole, and would not wait unless there was a mishole?—No, he would not wait. I am only mentioning a few cases. I do not altogether agree with this proposal to appoint shot-firers.

37. How long do you say should be fixed as the time which must elapse before a man goes back after a mishole?—It is set at three hours.

38. But you say that is not observed. What do you think is a reasonable time?—I think an hour would be reasonable. Three hours would make it too long, though I have known a hole to hang fire for twelve hours.

39. What implements do you use when you have a mishole to deal with?—Whenever I fire a hole I do not go in for tamping; I always use clay. I never have any difficulty in getting the clay from the hole in order to put a new fuse in. It is easy to get the clay from the collar; you can pull it off.

40. Are there copper prickers provided in the mines?—I have never seen them in Waihi.

41. Supposing a man does tamp his hole, what is the general method adopted for getting to his shot?—He has to use a scraper, and I have known some to drill their shots out; several men do that even now. They use all sorts of dangerous methods. Provision ought to be made to prevent men from tamping holes right from the bottom to the top.

42. Under the contract system who provides the tools?—The company.

43. Are you provided with copper prickers?—No, I have never known any one to be provided with them in the mine. I do not know whether there are any there.

44. *Mr. Dowgray.*] In connection with shot-firers, do you not think it should be part of the shot-firer's duty to fence a hole off in case of a misfire, with a view to minimizing accidents: do you not think, if only from that point of view, they ought to be appointed?—Yes, from that point of view.

45. Do you not think that, in the event of their being appointed, the fencing of holes should be portion of their duties?—Yes; but I think the miner should undertake that. I myself have always made arrangements in such a case to prevent any one going into the place.

46. You may have adopted that course yourself, but others do not do so. The shot-firer could attend to it?—Yes; though in the case of a big mine it would be a difficult matter. He could not be in every place at once.

47. But a shot-firer could be appointed to look after a certain portion of the mine?—Yes, in that case he would be able to watch them.

48. So you think that from that point of view the appointment of shot-firers would minimize the risk of accidents?—Yes, it might be the means of preventing some.

49. In connection with the ventilation, with your experience, both practical and theoretical, you do not see any difficulty in the way of ventilating a mine so as to prevent the fumes from passing from one level to another?—No. Of course, it would be more difficult in metalliferous mines than in collieries, but I do not think it is impossible if brains were brought to bear on the subject. Whether a man gets miners' disease or not is not of very much concern to the company.

50. You do not think as much attention has been paid to the matter as possible?—No; brains are only brought to bear on the subject in coal-mines in order to avert explosions which might destroy the property of the owners.

51. Do you think that no provision is made in gold-mines because there is not so much risk of destroying property?—There is not so much reason to fear gas-explosions, and the matter is therefore not of so much importance.

52. I suppose you are aware that for the purpose of inquiring into accidents the Mining Act provides that the inquiry shall be held before a Court, consisting of the Warden sitting with two assessors (appointed by the Warden), who shall be the holders of first-class certificates as mine-managers: do you think that is a fair tribunal?—No, not at all.

53. Are you aware that there is such a thing in this district as a mine-managers' union, with its head office at the Thames?—I have heard of it.

54. It is to protect one another?—Yes.

55. Do you think one mine-manager would go against another?—[Question ruled out by Chairman].

56. Could you suggest an alteration in the constitution of that tribunal?—Yes; I would suggest one mine-manager, the Warden, and the president of the miners' union.

57. Do you think that would be a more unbiassed tribunal?—Yes; you would have both sides represented then.

58. *The Chairman.*] What do you think of the Warden alone being the tribunal?—I think it would be better as I have suggested it, because the Warden would have the assistance of the manager and the president, who would be practical men. The Warden would not understand the case himself.

59. By saying that the Warden would not understand you mean that he would not have had any experience in mining detail?—Yes, he would not have any practical experience.

60. *Mr. Parry.*] You say it is very important to have a quality standard fixed for air?—Yes.

61. In the event of the working-face complying with the quality standard, but the temperature being high, say, over 80°, what would you suggest?—If the air was proven to be as pure as it was on the surface I think a man could work his eight hours even at 84° or 86°, but when it gets higher than that it should be a six-hour place. If there is no quality standard set the temperature standard should be 80°.

62. 84° or 86° wet or dry bulb?—Dry bulb.

63. What would you think the wet bulb should read?—There should be a difference of 3° or 4°. With the temperature too dry the mine is liable to be dusty.

64. Have you had any experience in working in hot places?—I have worked in the Waihi and Grand Junction Mines, and most of my places in the Junction have been hot places.

65. What effect has it had upon you?—I have suffered a good deal from boils, and I am also very liable to blood-poisoning from the slightest scratch. It is due to the system being run down as the result of working in these hot places. A man feels very languid and fit for nothing but lying down when he has done his day's work.

66. Do you think the temperature underground is more injurious to a man than the same temperature on the surface?—Yes, because I think the sun plays an important part in health-giving. A man underground is not able to enjoy the sunlight at all.

67. Therefore you contend that it is more injurious to work underground even if the temperature is the same as on the surface?—Yes.

68. Do you think there is a necessity for fixing a standard?—Yes.

69. You said that you knew of a case where a shot hung fire for twelve hours and then exploded?—Yes.

70. Was that in Waihi?—No, in New South Wales. There were only two of us working in the tunnel, and we fired when we went off work at 4 o'clock. My camp was near the tunnel, and early in the morning I was wakened with the report. I struck a match, looked at my watch, and found it was 4 o'clock.

71. How do you account for that?—It would be a faulty fuse which might smoulder away for a long time, and when it reached the powder it would spit again and the shot would go off.

72. Have you worked in very many wet places?—I have worked in wet shafts in New South Wales and also in the Junction.

73. Have you had to use oilers in those places?—Yes.

74. Are they comfortable or healthy?—No, they are not very comfortable, but I cannot say for a fact whether they are unhealthy. I find I am going a bit bald through wearing an oil-hat.

75. Do you know of any effect that the oiler may have upon a man's health?—I cannot say that I know of any ill effects, but we are all aware that anything which prevents the air from getting to the pores of a man's body is bad.

76. When a man is compelled to wear an oiler by reason of the wetness of the place what would you suggest should be done?—I think it ought to be a six-hour place.

77. What is your opinion of the risk run by miners when being raised or lowered with only one man at the engine?—The only risk I know of would occur if the driver were seized with a sudden fit: the men in the cage descending the shaft would very likely be bumped on to the clips at the bottom and killed.

78. Did it ever appeal to you that the miners were running a risk with only one man at the engine?—I had never given it much thought except when reading about accidents which have occurred through overwinding. I have never thought about having another man there, but considered that brains should be brought to bear to devise some other arrangement.

79. Some automatic brake which would stop the engine if a man took his foot off?—Yes.

80. So that you think something is required?—Yes. Any one is liable to take fits. I have fainted myself, and I am considered fairly strong; it might happen to any man.

81. Do you think mining a healthy occupation?—No, I do not.

82. What is your opinion of the system of bulling holes—what effect has that upon a miner's health?—The fumes generated by gelignite as well as the dust have an ill effect upon a man. I know they go straight back when they bull a hole, and in that way, too, I think they run a danger. If they did not go back for, say, twenty minutes I do not think there would be danger.

83. What is the reason for bulling holes?—They do so to bring down a lot of burden.

84. You agree that the appointment of shot-firers would tend to minimize accidents?—Yes. Of course, to be satisfactory you would require to have a good many shot-firers, and if they were to watch the men to see that they carried out their instructions there would be a considerable cost to the mine.

85. Do you think that where life is at stake the cost that would be involved by the appointment of shot-firers should be taken into consideration?—No; in my opinion a man's life comes first.

86. What is your opinion as to sanitary appliances?—For one thing I think that a freer use should be made of disinfectants, and that the pans should be placed a little further away from the travelling-ways than is the case at present in some places.

87. Have you known any men suffering ill effects from poisoned hands or chafed feet as the result of working in the levels?—I have had my own feet blistered and sore, and in the change-houses I have seen other men worse.

88. What remedy would you suggest to overcome that difficulty?—The only way would be to keep the roadways dry, and have footboards to walk on.

89. What is your opinion as to the necessity for having liniment and first-aid boxes at different central places?—I think it would be a good idea to have them always handy on each level, and also for shift bosses to have some knowledge of first aid. It would also be a good thing for some of the men and other officials of the mine to know a little about it, in order to be able to render assistance in case of accident and make things more comfortable for the injured party.

90. You think that all the necessary appliances should be close at hand at each level?—Well, they should be kept in a place where they could be procured in two or three minutes—first appliances, lint, and bandages.

91. *The Chairman.*] You mean also stretchers and tackle for rescuing a man out of a shaft or winze?—Yes, all necessary things for the relief of the sufferer.

92. *Mr. Parry.*] Have you any recommendation to make as to accidents in shaft-sinking?—A good penthouse over the top of the shaft is wanted, and a good strong stage-board. As far as my experience goes, I think every practical precaution is taken that is possible. In some places there should be a stronger stage-board.

93. Is it just a plain stage-board?—Yes. It is any amount strong enough for the weight of one man, but for carrying more it should be a 3 in. board. Probably we could get it if we asked for it, but it ought to be the rule.

94. What is to prevent stage-boards slipping either way?—If a miner used his head a little he could easily prevent it from slipping. You cannot nail it down, because you require to move it about. I do not know of any practical precautions that can be taken, but a careful man does not need any.

95. In the event of a man not using his brains, is there any provision in the boards themselves?—No, I do not see any necessity for one. A man would be mad if he did not fix the board.

96. Have you ever worked on stage-boards with cleats at each end?—No.

97. Do you think they would prevent the board from slipping?—You would have to have the cleat in the wall-plate.

98. But, supposing the cleat was in the inside, would the bar be so likely to slip lengthwise?—I cannot see that it would be any great advantage. If it was a 12 ft. shaft, and the board was the right size, I cannot see any possible danger of it slipping even without a cleat.

99. Do you feel any ill effects from working underground?—I do not feel as fit as I did before coming to Waihi. I notice a difference in my general health since I came here. I have never been medically examined, but I feel I have a load of dust on my lungs.

100. How long have you been working in hot places in Waihi?—About three years.

101. *Mr. Cochrane.*] As to a standard quality of air, do you think it is necessary?—Yes.

102. Will you amplify your answer by telling us what standard you would have?—I would take the ordinary pure air on the surface as a basis. Now, the dust in a mine is far more dangerous than the dust on the surface. I am offering the suggestion that when mine-air has, say, four or five times as much dust as the average surface air no man should be allowed to work in it until it is made pure, and it should be also free from noxious gases.

103. Would you also indicate the percentages of the different gases to be fixed as a standard?—With CO_2, if you had more than, say, 2 or 3 per cent. in the air, it would be bad to work in.

104. Have you heard the proportion of carbonic-acid gas which Dr. Haldane says is injurious?—I would set it at the quantity that would put a miner's lamp out; I think it is 4 or 5 per cent.

105. If other witnesses said 1·25 per cent. would you go against that?—No.

106. *The Chairman.*] Do you know Dr. Haldane's standard?—No. I only offer the suggestion that a standard should be fixed by medical men who thoroughly understand what amount of gas would be injurious to a man. I think you could get a medical man to set a standard unbiassed.

107. *Mr. Cochrane.*] You do not offer any suggestion yourself other than that a quality standard should be fixed: you would accept, say, English high authorities?—Yes.

108. Then you said there must be sufficient air: do I understand you to mean that you would maintain a quantity standard as well?—Yes; the quantity at present prescribed is enough, but a quality standard ought to be set too.

109. Both?—Yes.

110. Then, coming to the dust question, how would you arrive at the proportion of dust in the air?—Well, I am not an expert on that question, but I know that could be ascertained.

111. A dust-counting machine? Are you aware that there is such a thing?—There was a contrivance which was used by a medical man on the Commission which inquired into the matter at Bendigo and Ballarat. They could arrive exactly at the quantity of dust in the air by holding up a piece of paper in the airway, and the dust would adhere to one side of it.

112. Are you aware that saturated air is much worse than air of the same temperature but less saturated?—Yes, I am.

113. Would you set a standard temperature for the wet bulb?—No; I would set it at, say, about 80° for the dry bulb, and 77° or 78° for the wet bulb. I think it is necessary to set it for both. If you go in for quality, of course, you must have a standard for both.

114. Then you told us that you thought it would be a good thing to have a difference between the two bulbs of 3° or 4°?—Yes.

115. Then there is a practical difficulty in the way: if you found the two bulbs reading only perhaps 2° different, to insist upon the standard would have a tendency to close the mine?—I do not think it would be necessary to form a hard-and-fast rule. To prevent any difficulty it would be well to set a standard for one bulb.

116. The wet bulb?—No, the dry bulb.

117. You say that most miners do not understand the injury they do to their system by inhaling dust: can you put on record why that is so?—Because they do not read or they do not think what harm they are doing to themselves. They have any amount of examples of the effect of the dust, and yet I have noticed men working rock-drills dry when they could have used the water.

118. Is the injury not very slow?—Yes, it is slow, but it varies. In Bendigo and Africa men have been killed in two years. It might take twenty years; it is according to a man's constitution, and to the quantity of the dust he inhales.

119. When miners are afflicted with tubercle as well as miners' complaint, would you be in favour, in the interests of the other miners, of excluding them from working in the mines?—Yes, for the sake of the other miners; and provision ought to be made for those men to be maintained.

120. *The Chairman.*] By whom?—By a tax on the company; or, perhaps, the Government which allowed the system to be in existence might pay something towards it also.

121. *Mr. Cochrane.*] You put your finger on a weak spot in connection with electric firing when you mention that the detonators were at fault. How would you remedy that?—I think the only reliable way is to make the manufacturer of the detonator come under Government supervision.

122. How would you put a check upon them by the Government?—They would not have the same incentive to make a cheap article.

123. *The Chairman.*] I understood you to mean that the Government should undertake the manufacture of them?—Yes.

124. *Mr. Cochrane.*] Then how would you deal with the leakage of the current in wet places? You say it is more liable not to go off?—The use of properly insulated conductors is the only way to deal with it.

125. In regard to the appointment of shot-firers, can you give us any idea of what proportion of men should go to one shot-firer?—One shot-firer might be able to look after one lode in one level. It might be half a mile between two lodes, and one man could not be running from one to the other. I want you to understand that I am not an advocate of this system, and I only say this because I think the appointment of the shot-firers might minimize the risk of accident.

126. As to the general system of ventilation, have you anything to recommend as to keeping winzes and rises well ahead of the workings?—If a reef were a few hundred feet away from the shaft it is a good idea to have the winze down, so that ventilation would be provided.

127. Have you any special recommendation to make in regard to that?—Only what I have already said: that I think it would be a good plan to have a special upcast to take the air from each level, or some way of purifying the air before it goes into another level.

128. Then, as to strong charges, where the explosive is a nitro-glycerine compound, are you aware that that is forbidden under the Act?—Yes.

129. Would you recommend that that provision should be repealed?—Well, any one with any practical experience will understand that that is rather a foolish clause in the Mining Act. If you leave two or three holes in the face you would have to bore another hole. As regards boring within a certain distance of the bottom of the discharged hole, that is impossible altogether: you must continue the face on. I would recommend that tamping should be done only up to within a foot or so of the collar of the hole.

130. *Mr. Reed.*] How long have you been a certificated manager?—Since March last.

131. Have you ever acted in an official capacity in connection with any mine?—Yes, in New South Wales. My father was manager of a small mine, and when he has been absent I have been in charge.

132. How many men were employed?—About twelve.

133. Has your knowledge of ventilation been obtained through connection with practical installation-works or from text-books?—Practical.

134. Where did you gain it?—In connection with the water-blast in the Waihi Mine. We have nothing to do with the installation of the fans in the Junction Mine. We see them installed, and, of course, we have to breathe the air they deliver to the faces.

135. You recommend separate returns and upcasts to carry the air up from the stopes?—Yes.

136. Will you describe how that could be done without traversing the levels?—You would have to have a separate system of ventilation for each level. It would be a more practicable idea to make some attempt to purify the air as it is circulated.

137. But you recommended at first that there should be separate return air-courses: why did you make that recommendation?—Because I think it would be a good idea, and not an impossible one. It would take some planning to do it, because you would have to provide a different system for each level.

138. When the air becomes vitiated in the stope how would you deal with it?—As I said before, I think it could be purified with water. It would have to pass through a spray in the winze.

139. What quantity per man would you think it necessary to purify?—You would want to purify the whole air in the mine.

140. As to the removal of the gases?—That is for a better brain than mine to deal with.

141. So you are only discussing the dust, and not the gases?—That is so. I am not a high authority on gases, but I believe they are a very injurious element in metal-mines.

142. You stated that in the Junction the dust is driven into the working-faces from the return airways?—Yes, in some places.

143. Where?—On the Mary lode. I consider that place is hardly fit for a man to work in.

144. Can you tell us from which airway the dust is driven and into which working-place?—It comes from somewhere in No. 5 level—I cannot say exactly where.

145. You mentioned a standard of 84° or 86° wet bulb?—Yes, that is for a place where the air is proven to be as pure as it is on the surface; but if that standard of purity is not reached 80° is high enough.

146. Do you mean with a small proportion of dust or noxious gas present?—I think the dust is the more important. Of course, the noxious gas must be taken into consideration also.

147. You mentioned 4 or 5 per cent. of carbon-dioxide: have you any idea of the maximum in the Waihi mines?—No, I do not know.

148. Would you be surprised if the Inspector of Mines said that 1 per cent. has never to his knowledge been exceeded?—I do not know, and I do not think it plays an important part at all.

149. Can you tell us which noxious gas plays an important part?—I do not know of any noxious gas.

150. Are you aware that there is any carbon-monoxide in the Waihi Mine?—No.

151. So that really the amount of noxious gas is not of importance?—It is not altogether negligible, because in some few isolated cases there has been too much carbon-dioxide to work in; but it has no lasting ill effect upon a man. The dust is of much more importance.

152. The mines here are not seriously troubled with gas?—No.

153. You have no complaints to make about the gas?—No, only the fumes created by explosions.

154. In regard to the fumes created by explosions, can you tell us what you would regard as a dangerous proportion of carbon-monoxide in those fumes?—A very, very small proportion is fatal.

155. What would you regard as fatal?—It should not be in the air at all.

156. Would you be surprised to know that the maximum quantity of carbon-monoxide found in the Waihi Mine is 0·0025 per cent.?—No, I would not be surprised.

157. Would you think that a very infinitesimal proportion of carbon-monoxide?—It is worth looking into, because any quantity is very dangerous.

158. Are you aware that Dr. Haldane reported that the least quantity which affects a man is 0·02 per cent., or ten times as much as has been discovered here?—No, I do not know. I agree that the gases are not very troublesome in the Waihi mines.

159. You stated that accidents have seldom happened on your shift?—Yes, very few.

160. Which shift have you worked on?—I have worked on every shift.

161. Consequently you have never had any accidents on the night shift?—From my own experience I know that I am not awake properly when I get into the face. We prevented one man from actually walking down a shaft when he was asleep. He deliberately lifted the guide-bar, and was about to walk down.

162. Suppose a man contracted fibrosis in another country and came to New Zealand, would you have him excluded from the mines?—He should be examined before starting work in a mine.

163. Suppose he came from Australia, should he be sent back?—We cannot take that into consideration.

164. You said that you did not recommend electrical firing for stopes and drives, but only for shaft-sinking?—Yes, and in winzes and rises.

165. Are copper prickers in use at all with high explosives?—No, I have never seen them used.

166. Are they meant for use with high explosives or blasting-powder?—They could be used with both. They might be some use in removing the tamping.

167. Have the miners ever asked for copper prickers about here?—No, I have never known them to do so.

168. Would you like a shot-firer to fire your round of holes?—I would not object if I were working on wages.

169. And if you were working on contract?—No. When we are working on contract we like to get the best results, and men prefer to fire the holes themselves.

170. So that you get the better result from firing your own shots?—No, but you would not have to wait for the shot-firer.

171. If you were on wages what would you do while waiting for a shot-firer?—It would be in the interests of the company for a shot-firer to be up to his business and to be always handy.

172. As regards the use of poppers, if the spray were played across the drill-hole would it be blocked?—Yes, in a good many cases.

173. If it were played across the mouth of the hole instead of into the hole?—I have had no experience with poppers. If you do not put it into the hole the hole will clog, and if you attempt to spray round the collar it will clog them also.

174. As to Franklin's accident, did it not occur on Saturday evening between 6 and 7 o'clock?—Yes, I believe so.

175. Was his object to get up the shaft earlier than usual?—No.

176. What was the height of the stope where Anderson was killed?—On one side it was about 7 ft., but the debris was uneven in the shrinkage stope. On the other side it might have been 12 ft.

177. What was the height above him when he was killed?—Somewhere about 7 ft. or 8 ft.

178. You would consider that an unsafe height?—No, I do not think that is excessive, and if they had not been rushing things it would not have fallen on him.

179. What temperature did you work in in Cobar?—I have not worked in uncomfortable temperatures except in Waihi, though there are hot places in Cobar.

180. Which mine, according to your experience, is the hottest, the Waihi or the Grand Junction?—I think it is a toss-up. I have never measured the temperatures.

181. You are working in the Junction now, I believe?—Yes.

182. Is the Junction as hot as the place in the Waihi where you worked?—There are more cool places in the Waihi Mine than in the Junction.

183. And yet they have a ventilating fan in the Junction?—Yes; but you understand as well as I do that the natural ventilation in the Waihi Mine helps them. They need not study the matter of ventilation so much.

184. Then you think the Waihi Mine is better ventilated than the Junction?—In a lot of places it is.

185. You stated that the Waihi Mine is cooler than the Junction. How do you account for that when they have a fan in the Junction?—One reason, perhaps, is that the rocks in the Waihi are not so hot as those in the Junction Mine.

186. So that the fan in the Junction Mine does not materially cool the rocks?—I do not suppose they go in for cooling the rocks so much as for cooling the air-currents.

187. Where does the air get heated in the mine—it enters fairly cool?—I suppose it gets heated from the rocks.

188. So that the fan does not cool the air heated from the rocks?—The fan gives a sufficient quantity of air, so that the heat of the rocks does not have much time to affect the air as it passes.

189. The fan in the Junction is drawing 44,000 cubic feet of air per minute: do you not think that quantity should reduce the temperature of the mine?—Yes, it has a very beneficial effect. They have tried to ventilate the Junction, and have done more in that direction than has been done in the Waihi Mine.

190. And yet you state that the Waihi Mine is cooler than the Junction?—Yes; they have the advantage of a big upcast shaft at No. 2.

191. You said that by sending a large quantity of air in the mine you remove the moisture?—If you followed what I said you would know that I advocate the use of sprays.

192. Did you say that the heat dried the atmosphere in the mine?—The heat tends to make the air more moist.

193. Would that settle the dust?—No, not where you are boring with poppers or drills.

194. *Mr. Parry.*] As regards the ventilation of the Junction compared with that of the Waihi Mine, I understood you to say, in answer to Mr. Reed, that there were more cool places in the Waihi than in the Junction: is that in the ratio to the number of places?—Yes. There is another thing I would like to suggest, and that is that the men who are working in hot and wet places should have the preference when going up the shaft at the end of the shift. They come out into the chamber, and it is very uncomfortable standing there waiting.

195. *Mr. Dowgray.*] Do you think that if there were a system of ventilation by doors and brattice at the bottom of the stopes to send the air up the ladderways from the levels it would improve the stopes considerably?—Yes.

196. In regard to your proposed system of ventilation, it would require one intake and one return for each level?—Yes, and you would require to have a different system for every level. The expense would be very great.

197. Then it would only mean splitting the air in the shaft?—If there were four levels in the mine you would have to have four times the amount of air in circulation. It would be a better plan, I think, to try and purify the air.

198. *The Chairman.*] In view of the quantity of carbon-dioxide which you said would have an ill effect, and of Dr. Haldane's standard, do you wish to alter your evidence in that connection?—Yes, I made a mistake there. I would like to put in Professor Haldane's estimate of 1·25 per cent.

199. You said that miners suffering from miners' disease or tubercular disease should be provided for?—Yes, miners' complaint.

200. But there is a distinction between that and consumption, which is transmissible?—I only meant miners' disease contracted in mines and consumption in the ordinary sense.

201. Your suggestion is that consumptives proper should not be allowed down mines?—They certainly should not, both for their own and the miners' good.

202. And you think that a man who has been incapacitated with miners' disease should be provided for?—Yes.

203. You would exclude when the disease is infectious?—Yes.

204. Would you exclude when the disease is non-infectious?—I would exclude him for his own sake. He should be looked after by the State, and provided with a pension paid for by the companies.

JOHN GAYNOR sworn and examined. (No. 31.)

1. *The Chairman.*] What are you?—A miner.

2. How long have you been mining?—About fourteen years.

3. Where have you gained your experience?—In Tasmania and New Zealand.

4. How long have you been mining in New Zealand?—About eight years.

5. Where?—In the Waihi, Grand Junction, and Extended Mines. I am working in the Junction at present.

6. How long have you been working there?—About eighteen months.

7. Upon what do you wish to inform the Commission?—Generally as to sanitation, ventilation, and accidents.

8. What have you to say in regard to ventilation?—I wish to corroborate what has been already said by previous witnesses as to the necessity for a better system of ventilation in the mines here, so as to make it more comfortable for working.

9. Have you had any experience in the taking of temperatures?—No, but I have been in places where temperatures have been taken, and I know the effects of them.

10. By whom were they taken?—By the workmen's inspector, and the Mining Inspector sometimes.

11. Can you quote any particular instances of temperatures being taken?—Yes, I know of temperatures being taken in the Junction and Waihi: they were 85° and 86° by the dry bulb.

12. Are you aware how that temperature affected you?—I thought it was too hot for any man to work in for eight hours. After his day's work is done under such conditions a man does not care to do anything but lie down, and he feels very languid.

13. What have you to say as to sanitation?—I consider that disinfectants should be used, and concrete flooring should be put down.

14. Are you a contractor?—I am practically, because I have a share in a contract.

15. What do you think of the proposed system of shot-firing?—I think it is a good suggestion. I have seen it in vogue on the "other side," and I think it would minimize accidents if introduced here.

16. You think it is a workable scheme? How many places could one shot-firer attend to?—It is hard to say, but it would soon regulate itself. I could not say how many places a man could attend to.

17. Have you had any experience of firing shots with electricity?—I have been with men using electricity, but I have never used a battery myself. I consider the battery is the better method in winzes, rises, and shafts.

18. Do you work a rock-drill or popper?—I have worked them both. I have not worked a hammer drill a great deal. We worked one with a patent for running the water through the drill, but the men got impatient and threw the water appliances aside, preferring to bore dry.

19. Are they boring dry?—Yes, in many places.

20. But water is provided for them?—It did not act.

21. Is not a jet provided apart from that going through the drill which you mention?—I do not know. I have not seen them in the Junction.

22. Where are you working in the Junction now?—In the shaft. They use rock-drills there.

23. Have you seen attempts made to use water with a popper?—Yes, they use a new style of popper, which does not seem to be a success. They tried spraying round the collar, but it seemed to get clogged.

24. Have you come into contact with many accidents?—No, I have not been connected with any serious ones, but I should certainly say that the trucking-roads and the trucks could be in a better condition than they are at present. There are a lot of accidents caused through strains when working with a heavy truck, and the system of trucking in both mines is responsible for a great many injuries. Each man has to truck his own dirt.

25. How are you going to prevent those injuries?—Well, the trucks are stiff, the lines bad, and matters generally could be much improved.

26. What weight should a truck be for a man to be able to handle it with reasonable ease?—They would require to be a good deal lighter than they are at present. If the roads were made so that the trucks would not come off it would not be so bad.

27. Is there any other matter you wish to refer to?—The change-houses could be a good deal more up-to-date than they are. They seem to have a better system for drying clothes in the Broken Hill Mine and in other parts of the world. Here the drying facilities are poor, and there is not enough space.

28. *Mr. Parry.*] You say that you have seen temperatures taken in different places where you have been working, and that they have registered 84° and 86°: you have had a good deal of experience in hot places?—Yes.

29. Do you think it is necessary to fix a standard temperature?—Yes, very much so.

30. From the experience you have had in places where temperatures have been taken, what would you suggest as a standard?—It should not exceed 78° dry bulb.

31. Have you done much work in wet places where it has been necessary to wear oilers?—Yes, but not for some time.

32. Is it uncomfortable or inconvenient working with oilers?—Yes, and also injurious; it affects a person's kidneys.

33. Where it is necessary for a man to wear oilers what would you suggest?—It should be a six-hour place. A man gets damp, and the oilers drive it through him.

34. What is your opinion in regard to the question of an assistant engine-driver?—I think it would be a good idea. It would help to minimize the risk of accident.

35. Have you ever suffered with blood-poisoning or chafed feet?—Yes. I have also noticed that with the slightest scratch a man gets poisoned. It is simply the result of a man's system getting run down.

36. Do you think the practice of bulling holes has a tendency to vitiate the air?—Yes; it should be done away with.

37. What effect does it generally have upon a man's system?—It makes him very shaky and nervous.

38. Have you worked with men who could not fire or load a hole that was bulled?—Yes, they were too nervous to attempt anything like that. There are some men in such a condition that they go all to pieces when they touch dynamite.

39. Where does it affect them?—They can hardly hold anything in their hands, they tremble so, and get nervous. They also suffer from headaches caused by going into smoke and fumes and handling explosives.

40. Is there much difference in the ventilation of the Junction Mine as compared with five or six months ago?—Yes; I think it is very much improved, and that is the general belief of the men. There were some very hot places a while ago.

41. Do you think the mine has cooled down considerably?—Yes.

42. What is your opinion as to the necessity for doors and brattice to take the air into the stopes?—I think it would be an improvement in many cases.

43. Have you suffered any ill effects from following mining, and have the doctors ordered you to take a spell from the mines at any time?—No, but I have felt it has a bad effect on me. I do not think I am as well as I was some time ago.

44. What do you think is responsible for the majority of accidents which happen in Waihi?—The contract system, under which the men have an incentive to rush matters, and which causes a great number of accidents.

45. Do you think a standard height should be fixed for stopes?—Yes; they should not be more than 8 ft.

46. Have you had much experience of working in stopes?—Yes, and some very high ones, in which I did not feel very safe.

47. What is the greatest cause for the stopes being high?—I think it is purely a matter of cost. They know that by getting higher stopes they get more stone broken.

48. And so it is a financial gain to the worker to take the stopes high?—Yes.

49. *The Chairman.*] Do you blame the contract system or the contract price? Supposing a higher price were paid, would the same result follow?—Probably if the price were higher the risk might be minimized, but under present conditions the men have to go the pace in order to make a living. I believe the contract system should be done away with altogether, as practically 75 per cent. of the accidents are the result of it.

50. *Mr. Cochrane.*] With regard to the weight of the trucks being the cause of strains, have you any suggestion to make?—The only suggestion I can offer is that the lines should be properly graded and the rails fishplated.

51. In regard to miners suffering from infectious lung-disease, would you have such men excluded from the mines in the interests of the other workers?—I do not know. Some men are forced to go into those places when, if they had an opportunity to get a living elsewhere, they would not follow mining. It is not altogether a matter of choice, though it would be better for themselves if they kept away from mines.

52. If provided for, would you have them excluded?—Yes, because then there would be no hardship to them.

53. Do you think the miners would submit to be examined for the purpose?—I could not say as to that. I do not know that they would. I have no opinion to offer on that point.

54. *Mr. Reed.*] You recommend that the standard temperature should be fixed at not more than 78° dry bulb?—Yes.

55. How do you fix that standard?—I have been working in places where the temperature has reached that point and considered it was too hot. I have seen the temperature taken by the Inspector of Mines when it registered 80°, and I know that was too hot for me.

56. You said that oilskins should only be used in six-hour places. Who should decide when it is time to put them on?—I do not know—perhaps the Inspector; but a man would naturally put them on when he was getting wet through.

57. So you would establish a standard of wetness on oilskin-coat standard?—When it was necessary to wear oilskins it should be a six-hour place.

58. Who would decide that—the miner?—Yes, I should say that the men would decide. They would not wear oilers if the conditions were good enough to work in without them, because they are an encumbrance.

59. In regard to the assistant engine-driver, where would you recommend that he should stand?—Somewhere close to the engine, so as to be able to take a hand if anything went wrong.

60. Close to the other man?—Fairly close.

61. Would you allow them to converse?—I do not think they would be likely to converse too much when the men were being raised or lowered. The driver in charge of the engine would have his attention on the work, and would not have time to talk.

62. You heard previous witnesses state that the Waihi Mine is cooler than the Junction?—Yes.

63. Do you agree with that?—Well, I know that in some places it is.

64. Have mining accidents increased at Waihi recently?—Yes, a great number of men have been suffering with poisoned hands, and so forth.

65. Do you think they have increased as compared with last year?—Well, they were very heavy last year. At the same time, I know there are a large number of men at the present time suffering from bad hands.

JAMES RICHARD SPEERING sworn and examined. (No. 32.)

1. *The Chairman.*] What are you?—A miner.

2. Have you any office at the mine or other qualification?—I hold a mine-manager's certificate.

3. How long have you held it?—About two years.

4. Are you working as a miner?—Yes.

5. How long have you been mining?—About eleven years.

6. Where?—In New South Wales and Waihi.

7. How long have you been working in Waihi?—Nine or ten years.

8. Which mine are you working in now?—The Junction.

9. How long have you been there?—Nine months.

10. Prior to that where were you working?—In the Waihi Mine.

11. On what points do you wish to inform the Commission?—I have evidence to give as to sanitation, temperatures, and ventilation.

12. What have you to say in regard to sanitation?—I think disinfectants should be provided to lessen the smell.

13. Have you anything else to suggest?—The ventilation could be better and more adequate.

14. What do you consider adequate ventilation?—Well, I have worked in places here where a candle would not burn, and we have had to retire.

15. In which mine?—Both in the Waihi Mine and in the Junction.

16. How long ago is it since you had that experience in the Junction?—A few months ago.

17. Have you any suggestion to offer in regard to the improvement of the ventilation?—I think fans should be provided. Good air should be made to travel round as many working-places as possible. That is all I have to say as to ventilation.

18. Have you had any experience of accidents?—No, I have not had any experience of them, nor have I been in the vicinity where any have occurred.

19. Have you any opinion to offer as to the necessity for appointing shot-firers?—Speaking for myself, if I bored a hole I would like to fire it myself. I am not in favour of the appointment of shot-firers. I do not see the necessity for them.

20. Have you had any experience with firing by electricity?—Yes.

21. What is your opinion as to that?—Electricity is very good in certain cases, but I do not think it is as efficient as fuse.

22. *Mr. Dowgray.*] In connection with the ventilation of mines, do you consider that a mine in a district such as this is better ventilated by a fan than by natural means?—I think the natural ventilation is the better if you can get it.

23. Is it possible to give a man an adequate amount of ventilation to reduce the temperature in mines such as you have here, with working-places 1,000 ft. below the surface, by that means?—No, not with natural ventilation.

24. Then you think, when they get down that distance, a fan is necessary to cause a greater velocity?—Yes; when you get down 1,000 ft. it all depends upon the downcasts.

25. Did you work in the Junction prior to the installation of the fan?—Yes.

26. Do you think the fan has reduced the temperature of that mine?—I could not say, but I do think it has in any hot places. I cannot remember what the temperature was like then.

27. Do you think it is possible to have a companion level with two crosscuts so as to conduct the fumes from one level without allowing them to mix with other places? Would they have any difficulty in driving two instead of one level, with, say, 20 ft. between them?—Of course, they could do it.

28. Would that improve the ventilation?—I dare say it would.

29. The fumes then would pass from the stope into the return air-course: they could have two winzes put from this back crosscut into the stope to take the air and fumes instead of their going into the level above?—Yes, that could be done, I expect.

30. Could you improve the ventilation with brattice or doors down at the bottom of your ladderways?—Yes, possibly.

31. That would facilitate matters if it were done in these shrinkage blocks where you have a ladder at each end, would it not?—Yes.

32. Do you think it would be any improvement to increase the size of the ladderways, which are at present 3 ft. by 3 ft., for ventilation purposes?—If you make the space bigger, of course, more air would carry up into the stope.

33. *Mr. Parry.*] Have you worked in hot ends?—Yes.

34. What effect does working in those places have upon you?—It makes you low-spirited and depressed. I know for a considerable period every month I seem to have lost energy. And I had no less than ten boils upon me.

35. Have you taken any temperatures at all?—No, I have not taken temperatures, but you yourself took one where I was and said it was 87°. That is the only time I have seen a temperature taken.

36. Do you think it essential to fix a standard temperature?—With regard to that I cannot say what difference it would make, but I certainly thought 87° was too high.

37. How much lower do you think the temperature should be for you to work comfortably in?—I could not say. I could not fix upon a temperature as the right thing—a fair temperature.

38. That temperature was 87° dry: you say that is far too high?—Yes.

39. And you think a standard temperature should be fixed?—Yes, certainly, in the interests of the health of the miners; but what that standard should be I would not undertake to say.

40. As regards the assistant engine-driver, has it ever appeared to you that a great risk is being run by workers with only one man manipulating the handle at the engine?—Of course, there is always a certain amount of risk with only one man in charge of an engine, and with, say, six or twelve men in the cage simply relying on the one man.

41. Do you think it reasonable to suggest that an assistant should always be present when men are being lowered and hauled?—Of course, it is a case where there have been so very few accidents resulting from only one man being in charge. I do not know of any myself through the engine-driver losing control, but certainly it would be safer to have two men. Probably the second man could arrest the engine before any damage was done.

42. What is your opinion as to the necessity for making a recommendation on the subject?—Of course, if a man is apt to lose control of the engine the men's lives would be in danger, but if there were another man there he could probably stop it. It would certainly be a guard against the danger.

43. Have you ever worked in any wet places?—Yes.

44. Is it inconvenient to work with oilers on?—Yes; but you get accustomed to them to a certain extent.

45. When the conditions necessitate a man wearing oilers what would you suggest?—Well, the usual thing is that he should work six hours only in that place.

46. Do you think that six hours is long enough to work in them?—It is a recognized fact that six hours is sufficient.

47. Do you think that the practice of bulling holes is detrimental to men's health?—Possibly it is, but I have never gone into the matter. Generally, if you bull a hole the result is added fumes, which cause headaches and one thing and another.

48. Have you suffered from headaches from that cause? In your experience have you noticed many men who cannot handle dynamite?—I have had one experience with a man who asked me to load a hole because he got headaches when loading.

49. Do you think the temperature in the Junction Mine has decreased or the ventilation improved during the last five or six months?—I do not know. Where I have been working I do not think there has been much difference in the ventilation.

50. You have never had a general run through the mine?—No.

51. On account of your not having travelled through the mine you could not give an idea on that point?—No.

52. What do you think is the cause of the majority of the accidents which take place in Waihi?—That is a question I cannot answer.

53. *Mr. Cochrane.*] How many years have you worked in the Waihi Mine?—Something like seven years.

54. Do you consider the ventilation in the stopes satisfactory in the Waihi Mine?—The ventilation in the Waihi Mine may be good in one particular part and not in another.

55. Do you think it is bad in some places?—Yes.

56. What would you recommend for its improvement?—It all depends on the winzes or drives.

57. Do I understand you to mean that you would have better connections between the levels by winzes and passes?—They generally do put winzes and passes through.

58. Do you think they are sufficient?—Not in all cases.

59. You suggest that 87° dry is far too high for a standard temperature?—Yes.

60. Which mine was that in?—The Junction.

61. Can you say if the wet temperature was also high?—I cannot say.

62. It might have been?—It might have been.

63. Do you see any practical difficulty in the way of treating the wearing of oilers as a criterion for a six-hour shift?—Of course, it is possible that a man might want to wear an oiler where it might only be dripping, and still there would be no necessity for a six-hour place. The conditions might be good enough.

64. And he might have rheumatism?—Yes.

65. Would you have a six-hour place fixed on the basis of the wearing of the oiler, or as it is at present?—It is a difficult problem.

66. Can you give any opinion?—No, not at present.

67. Have you anything to say as to the use of penthouses in shafts?—It is a recognized necessity.

68. You have them?—I think the pump shaft is exempted from that.

69. Have you any remarks to address to the Commission on that point?—No.

70. *Mr. Reed.*] You stated that you do not believe in shot-firers?—No. For my own part, I would sooner fire my own hole.

71. And are you speaking as a contractor?—Yes.

72. And if you were a wages-man would you prefer to have a shot-firer?—I do not know, but a man who bores and loads generally has his own ideas on the matter.

73. If a wages-man had shot-firers in the mine he would have a little time for a rest while the shot-firer was being found—it would be a spell for him?—That is quite possible. It has been adopted here once.

74. Was it a failure?—I do not know.

75. Was it discontinued?—Yes.

76. You do not know why?—No, I do not know.

77. In regard to ventilation: as the Waihi Mine has natural ventilation is it not superior to the Junction Mine in that respect?—I cannot say that it is, though I prefer natural ventilation.

78. In which mine have you experienced the most heat?—I have worked in the Waihi Mine, but it is so long ago that I could not say.

79. Have you worked in American mines recently? How did you find they compare with New Zealand mines as regards safety precautions and accidents?—I worked in the mines in Butte City for two months and a half, and every day there were reports of accidents in the newspaper.

80. In the mines there are the safety provisions as good as they are here?—New Zealand compares very favourably with them.

81. Is it superior?—Yes, I think so.

82. Is Waihi superior?—Yes, I think Waihi is.

83. Were those mines in Butte City very hot?—No. The ventilation was very bad—worse than I have ever known in New Zealand.

84. You said that, so far as your experience goes, you have not noticed any difference in the ventilation of the Junction Mine recently?—No.

85. Did you work in the Junction Mine before the installation of the fan?—Yes.

86. So that the fan has not improved the working-places?—No, I do not think it has.

87. How do you account for that?—I cannot say.

88. Do you think the temperature of the rocks is so great that it heats the air as it goes into the working-places?—It certainly would have that tendency.

89. You stated that one man might decide to wear an oilskin where another man would not: consequently you think that the oiler test is unsatisfactory for a six-hour place?—In my opinion it is.

BENJAMIN BURGESS sworn and examined. (No. 33.)

1. *The Chairman.*] What are you?—An engine-driver.

2. What certificates do you hold?—A winding certificate and also a first-class stationary certificate.

3. How long have you held them?—The winding certificate since the 11th May, 1896, and the first-class certificate since about four or five years later.

4. Where are you working?—At the Grand Junction Mine.

5. How long have you been there?—About two years and a half.

6. Where were you before that?—At Pelawmain, in Australia.

7. How many years' experience have you had altogether in engine-driving?—Fifteen years since I got the ticket, and six years previous to that.

8. On what matters do you wish to inform the Commission?—I would like to place before the Commission a matter regarding the signals. There is one signal which I consider very unnecessary. When quartz is being sent up they ring three, whereas I consider one is sufficient.

9. Does that lead to any confusion?—In the coal-mines one ring is sufficient, but in gold-mines they ring three. It is apt to confuse the driver, and also hampers the work of the chamberman. If, say, two hundred trucks are being sent up, he has to ring four hundred times more than is necessary—that is, four hundred times more than would be rung in coal-mines.

10. You consider that the gold-mine signals should be uniform with the coal-mine signals?—Yes, in regard to that one signal. I have had seven years in coal-mines using the one-ring signal, and could never see anything wrong with it.

11. Is there anything else you wish to place before the Commission?—Yes; I consider there should be a telephone connecting the driver with the chamberman, in order to keep them in direct communication with one another, in case of a cage hanging up in the shaft. A cage may be in the shaft for an hour, but if there were a telephone you could communicate with the chamberman and let him know about it, or *vice versa*. Those are the main points I wish to bring forward.

12. Have you ever experienced any difficulty or threatened danger when winding with only one man at the engine?—I have heard of cases, but I have not experienced any myself. I read of a case some time ago, and heard of another just lately.

13. From your experience, is there any likelihood of danger?—Well, there is always a chance.

14. What chances are there of an engine-driver losing control, and where would the danger lie?—In the event of a man being suddenly taken ill, if there were men in the bottom cage they would probably get hurt, and the other one would go up to the cut-off.

15. Do you think the risk is sufficient to warrant any steps being taken in the matter, and, if so, what would you suggest?—Of course, where life is in danger it is always worth while doing something.

16. What would you suggest?—I do not think it would be a bad idea to have an extra man at the engine when changing shifts.

17. How could that be accomplished without having a spare man all the time?—Of course, it would be no use having a man there who had no certificate.

18. He would not be allowed there in that case?—No; the man who is going off could stand by till the men went down.

19. There is a provision in the Act which prevents a man being employed more than eight hours?—Of course, he would not be working the engine; he would be simply standing by.

20. *Mr. Dowgray.*] In connection with the matter of signals, have you no communication between the engine-house and the braceman at all?—Yes, we have a speaking-tube from the brace to the driver, but not to the chamber.

21. When men are going to use the shaft how does the chamberman know you are going to haul?—He does not know.

22. They may be doing something at the brace?—Yes, sometimes it might be ten minutes before we can haul.

23. Are you prepared to recommend the alteration of that signal?—Yes; I think the coal-mines signal is what we want. You must signal back before men get on the cage, otherwise they do not know when they are going up. There is a return knocker in coal-mines from the engine-driver himself.

24. And you think there is the same necessity in gold-mines?—Yes, I do not see that there is any difference.

25. You would recommend a uniform code of signals in gold and coal mines?—Yes. In coal-mines there is generally only one level; in some cases we have as many as five, but we have different signals for different wards in gold-mines. It would be a good idea to have uniform signals.

26. *Mr. Cochrane.*] Would you insist upon these telephones being installed in all mines whether large or small?—I only suggest it. I would not insist upon it.

27. Do you suggest it for the small mines?—No, only where they are in, say, 40 ft. or 50 ft.

28. But, apart from the depth, if there were only a few men working?—It would be a good thing in one case as well as another.

29. *Mr. Reed.*] To your knowledge, has the present system of knocker-lines resulted in an accident at any time?—Only as far as the upsetting of trucks and the capsizing of them down the shaft goes.

30. Would the telephone not require that some one should be always at the levels to attend to it?—Of course, there is no use sending a message if there is no one there to take it.

31. It would necessitate a man being always there?—There is always some one there.

32. It could not be depended upon if a man was not constantly there?—I only suggested it merely as a standby.

33. Would you recommend the examination of winding-engine drivers as regards their eyesight and liability to fits?—Yes.

34. How frequently?—About every four or five years.

35. In view of your experience as a winding-engine driver, do you approve of learners being permitted to wind men before they obtain their certificates?—No.

36. Are you aware that at the Energetic Mine at Reefton a man was killed through that cause?—I believe I read about it.

37. Are you aware that the New Zealand Inspection of Machinery Act permits learners to wind men?—A learner should not be allowed to wind men until he has his ticket.

38. You have known of learners winding men in New Zealand?—I cannot call to mind a case just now.

39. How would you recommend that a learner should qualify?—By winding material while the shaft is safe, and the certificated man is standing by.

40. As to the examination of winding-engine drivers in New Zealand, do you think it is strict enough?—No, I do not.

41. What additional test would you suggest?—I consider that a winding-engine driver should not get his ticket until he has been in charge of boilers.

42. Have you any other reasons why these men should be better examined than they are at present? Would you like to see a candidate submitted to a practical test of winding mineral?—Yes, and I consider there should be a winding-engine driver on the Board of Examiners.

43. Will you tell us how the examinations are conducted?—I was examined verbally for about two or three hours, and I had to answer twenty or thirty questions.

44. Were you submitted to a practical test?—Yes, and the manager came down and saw me winding.

45. Were you tested by a medical man as to eyesight?—No.

46. Your certificate was granted without your being subjected to examination as to liability to fits or anything of that kind?—Yes.

47. Have you ever known of an instance of an accident happening through sudden illness of the driver?—Yes, I heard of one this morning.

48. As an engine-driver, would you yourself like to have another man standing at your heel all day long?—No.

49. Do you think he would attract your attention?—No.

50. Supposing he conversed with you, would that not be inclined to harass you?—Yes, possibly it would do so to some men, but not to an old winder.

51. The most dangerous point is when the cage is approaching the top: supposing you were to take a fit with the cage in that position, do you think a man standing by would have time to get out of your way and seize the levers and arrest that cage before it went over the top?—If he had had experience of the same engines he could, but perhaps he would not be able to do so always. On the engine I am working at present he could do so.

52. Are you not working one of the most superior engines in the country?—Yes, I believe it is.

53. Do you think, with an ordinary engine, a man would have time to arrest the cage under such conditions?—It all depends. A good deal depends on the man.

54. Do you not think that his instinct would be to catch the driver in preference to grabbing the levers?—The experienced man would jump to the engines regardless of everything else.

55. You think the second man would not invariably be of assistance?—It depends who he is. Of course, it is a matter of opinion. I consider that an experienced man would be of great assistance.

56. Do you prefer a telephone to a speaking-tube for communicating with the chamberman?—I could not say; anything at all would do.

57. But you spoke about the necessity for a telephone: do you agree with me that a speaking-tube is equally good?—Yes, if a speaking-tube would carry the distance. It is doubtful whether you could speak through a tube 2,000 ft. down a shaft.

58. Do you approve of winding-ropes being spliced?—Well, I am a wire-rope splicer myself, and I consider I can splice a rope so that it would be as safe as it was when new.

59. Do you consider it safe to use spliced ropes?—Not where men are travelling; there is always a doubt.

60. Do you think the tests with light cages on top of the shaft are adequate?—There is a doubt about that.

61. What is your opinion about men giving signals promiscuously? Do you think that any man should be allowed to come along and give the signals at the levels?—It is not the correct thing, but sometimes you cannot avoid it.

62. *The Chairman.*] Would the telephone obviate the necessity for that?—Of course, you could then communicate.

63. *Mr. Reed.*] Have you an automatic brake on your engine?—We have an air-brake.

64. Have you seen a visor arrangement so that when the cage reaches the top steam is cut off and the cage arrested? Do you approve of that appliance?—Yes, it is much better to cut them off there than it is to let them be drawn right up to the top.

JAMES LONG GILMOUR recalled. (No. 34.)

1. *The Chairman.*] You are recalled in connection with the currents of air in the Waihi Mine taken by you: can you supply the Commission with data as to when you took those measurements, and how and where?—Yes, I have a record of what I took. On the 8th August, 1911, in No. 4 shaft, I went down to No. 4 level and took a reading in all the compartments. The east compartment was 6 ft. by 3 ft. 7 in. I took the size of the guides out of that, and it gave 21·16 cubic feet. I placed the anemometer in the shaft and took it round the different parts of the compartment, and found it registered 530 revolutions per minute, and with 30, to be added for friction of the anemometer, it gave 560 altogether. That, multiplied by the area of the compartment, gives 11,849 ft.; and then I took the other compartments just the same. The centre compartment gives 12,526 ft. The pump compartment gives 6,160 ft. I took the other readings which I have given you in the same way.

2. Before you leave that matter I would like to know where were the cages in the shaft?—When we went to No. 4 level I had the cage rung two levels below us, and the readings were taken with the cages stationary.

3. What effect do you think the shaft being in use would have upon your readings, with the cages going up and down?—I put the cages in such a place that we would obtain the air which would go through the mine if the cages were working. I sent the cages away for that purpose.

4. Is there any way of measuring with the cages working?—Not with the cages working; you have to hold the anemometer over the compartment.

5. *Mr. Cochrane.*] When you were in the witness-box before you gave me the volume of air circulating in a number of different currents. I then asked you if you could give us the number of men which each of those currents supplied, and you said that you had not that information with you, but it could be supplied: can you do so now?—I have not the information. It would be a month's work for two men to prepare it.

6. Can you tell us even approximately?—I gave the number of men in the mine.

7. You gave us that there were 26,000 ft. of air in one current: can you tell us how many men that current supplies?—No. To get that you would have to take all the working-places and the quantities, and, as I say, it would take two men a month to get the information.

8. *Mr. Reed.*] As regards measuring the air in the shafts, how do you hold the anemometer?—It is held horizontally.

9. It will register just as accurately that way?—That is the orthodox method of holding it. I have read of its being done in the Comstock mines in America, where the matter was gone into by the management very thoroughly.

10. Have you ever known of an anemometer being held any other way in a shaft?—No.

11. As regards the air-measurements you have given us, what did you allow for the air from the rock-drills?—That is an extra; I have not given that.

12. Your drills are working at a pressure of 80 lb.: have you any idea of the air one would account for?—100 cubic feet per minute.

13. What is the diameter of the largest drill you have?—3¼ in. That would give off 100 cubic feet.

14. How many drills have you?—About sixteen or eighteen of the large machines, and about six of the small poppers.

15. So that they would provide a few thousand feet?—Yes, I had not taken that into my calculations as regards the quantity of air going into the mine.

16. Those drills would provide air in the working-faces?—Yes.

17. As regards the obstruction in the winding-shaft by cages, is not all ventilation, whether mechanical or otherwise, subject to the same intermittent obstruction?—Yes, that is the working-conditions.

18. *Mr. Dowgray.*] In connection with the air-currents you gave us the other day you said that Bullson's pass did not connect direct with the surface?—I explained that the surface level goes in 30 ft., and then Bullson's pass connects with it.

19. Where does that air go to?—It does not go to the bottom of the mine. We have these filling passes arranged so as to feed different levels with mullock. We have large openings excavated at the levels. It goes down a pass within 30 ft. of the level, and the dirt accumulates there. At one side there is a ladderway, alongside of which there is a pass, which lets some of the mullock down to the next level, so that the air gets round to that level. Sometimes it happens that the current does not flow freely for the last level, but it does so intermittently.

20. In connection with the taking of the reading of the air-current you said that you held the anemometer over the shaft when the cage was below you, and the other cage was in the other compartment?—Yes.

21. That means that the shaft was clear to the surface?—Yes.

22. Then you said you measured the pumping-space in the same shaft?—Yes.

23. Do you think that is a correct way?—Our pumping-shaft has no connection with the winding-shaft; it is lined off.

24. What instrument did you use to take the reading?—One of Davis's make. It is a standard make.

25. Is it correct?—You have to allow 30.

26. Have you ever had it corrected—they get out of order occasionally?—I have not had it adjusted since it was bought.

27. So that you could not say whether it is correct or not?—There is nothing wrong with it as far as I know.

28. Is there any place in New Zealand for testing these instruments?—Not that I know of.

29. *Mr. Parry.*] Why do you prefer taking the air underground in the shaft?—In the case of No. 4 shaft I took it in the shaft opposite No. 4 level plat.

30. Is it possible to take it at the intake of the different levels?—At No. 4 level in No. 4 shaft there is no connection, as the level is blocked.

31. But at the different places where the air is distributed is it not possible to get the air by measuring at each of the levels?—Yes.

32. Would there be any difference in the readings taken when the cages are stopped and when they are going?—I do not know—I have never tried; but theoretically I do not think there would be any difference. Of course, if it were taken with the cages rushing past, they would have an effect upon the anemometer and spoil the reading.

33. How do you account for some of the Commissioners not being able to get a reading at No. 4 shaft?—I do not know. I was not there.

34. Then, if the anemometer does not register, the current cannot be regular?—You must take an average of several readings, say, over an hour: that is a fair way to take it. It is like taking a sample of stone from the mine: if you take all the rich stuff you spoil the mine.

35. Why is it impossible to give the Commission the number of men supplied by each current of air?—As I said before, it could be supplied, but it would take two men a month to investigate the matter. One would have to be a surveyor, and the other would require a knowledge of the reading of anemometers and barometers to be able to find out what air was going from each split.

36. *Mr. Cochrane.*] My object in asking was so that we would be able to divide, say, the 26,000 ft. between the number of men and see how many feet per minute each got. It was not temperatures I was inquiring for, but only to find out what quantity of air each man in the different stopes would get?—Well, as I said before, it would take two men a month's work to prepare that information. Our downcasts are spread out and serve the same level by perhaps six places. They do not feed it to the men in one stope only, but all round that area—pretty well over three-quarters the area of the mine.

37. *Mr. Parry.*] You said in your evidence that the mine was adequately ventilated, and that each man was getting the amount of air prescribed by the Act. How did you find that out?—I have a certain amount of practical knowledge, and in going round I notice the amount of air circulated, and so find that the air is adequate according to the regulations under the Mining Act. The Inspector of Mines has never told me that the requirements of the Act are not being complied with. He has made reference to certain stopes, and I have taken the readings and found that there was a sufficient air-current there. In places I have had six times the required quantity.

38. Is it owing to your system of distribution that you cannot supply these figures asked for?—Yes.

39. Is it not a fact also that if these figures were got to-morrow, and readings taken at the same places the next day, the results would be different?—Yes. For instance, we are going to hole at No. 2 shaft along the Martha to make a connection with No. 6 shaft. As soon as we do that a large quantity will be taken away from the Empire lode. When we make these different connections the air-currents are changed. If we find that there are no movements in the air in places we have to put in doors and get a draught to go through. What suits for one drive will not suit for the next.

40. When did you take the air reading in Pearson's stope?—I have not the record here, but I know there was adequate ventilation.

41. How many months ago was that, can you say?—It was when we put the winze through. I went along to find out if there was enough air to start the stopes, and found that the current of air was established before the stopes were started.

42. You did not take the current of air afterwards at all, then?—The rise was there, and I had no occasion to put the anemometer on it. You could take the candle-deflection. The travelling of the smoke is a far better guide than the anemometer.

43. But in stopes where the smoke stays?—I do not know any place where that happens unless there is a block in the winze. You are referring to an exception. It is easy enough to quote exceptions.

44. You said in your evidence that you have eleven brattices and doors: could you tell the Commission how many you have put up in the drives for conducting the air into the stopes?—The whole of those eleven are for sending the air into the stopes.

45. And how many doors are put in the levels for taking the air into the stopes for ventilation purposes?—All these eleven indirectly, and some directly.

46. In regard to those that do it indirectly, does it necessarily follow that the air goes into the stopes?—Yes. If you go to the winze in the level above in any of the shrinkage blocks you will find a current of air coming out against which you cannot hold a light. Elsegood's stope is a place where there is a door to send the air up the travelling-way, and to get more air into the stope, because there is a little mineral oxidizing and heating there.

47. And you have not taken the readings in every stope with the anemometer, but only by your own observations?—I have taken several readings in the stopes.

48. But in some of the stopes you have only taken practical observations, and you thought——?—Not "thought" at all, but made sure. I did not want an anemometer at all to tell me. I could tell by the smoke travelling.

49. A man cannot tell the number of cubic feet travelling without an anemometer?—Of course he can.

50. Give us an idea of how you measure it by the smoke?—Simply by timing the smoke travelling, taking the area, and working it out at so-much per minute.

51. *Mr. Dowgray.*] You say you test by the deflection of the candle?—Yes, that is a very good test.

52. At what rate would the air be travelling per second to give you a deflection of the candle?—I have read the annals of the Australian Commissions, and one of the Commissioners was here, and he said that if the flame was deflected there was sufficient air for a man to work in.

53. But should not the air travel at a certain velocity?—It is the volume of air which is prescribed as well as the velocity.

54. *Mr. Reed.*] Are you aware of the minimum velocity that can be recorded on an anemometer?—No, I do not know.

55. Are you aware that the smoke test is more accurate than an anemometer when the velocity is slow?—Yes.

56. Therefore, in a large area, you could have the air passing at a slow pace, and it might be recorded by the smoke but not by the anemometer. You are aware that the smoke is a recognized test?—Yes.

57. But does not the smoke go along with the fastest current? Is the velocity equal over the whole section of the air?—No, it is greater in the middle.

58. And the smoke will find the place where the velocity is greatest?—Yes, the temperature of the air has something to do with that.

59. Consequently the smoke travels faster than the average air in the current?—I suppose it would have a tendency to do that.

60. Do you make any allowance for that accelerated velocity when measuring the smoke?—No, I just make a rough calculation.

CHARLES COGHLAN sworn and examined. (No. 35.)

1. *The Chairman.*] What are you?—A carpenter, but I am working in the mine.

2. How long have you been mining?—About twelve years.

3. Which mine have you been in last?—I have been in the Grand Junction Mine practically the whole of the last four years.

4. What matters do you wish to speak on?—Sanitation, ventilation, and temperatures.

5. As to sanitation what have you to say?—I think they should provide up-to-date w.c.'s, with concrete floors and built away from the chambers, and arrangements should be made to carry away the drainage. Also, plenty of disinfectants should be used.

6. And upon ventilation?—Of course, I am not an expert upon ventilation. Most of my work has been done in rises. The only thing I wish to say is that they should put in fans in order to keep the places cool.

7. What description of work are you employed on when you are below?—Mostly winzes and drives.

8. In regard to temperatures, have you had any experience in the taking of temperatures?—No, only what the workmen's inspector has told me.

9. Have you seen temperatures taken?—No.

10. What have you to say as to temperatures?—The workmen's inspector informed me that one place where I was working was 81° and 84° on two occasions, and I consider those temperatures were too high to work eight hours in. I do not understand about standard temperatures, but it ought to be under 80°.

11. Have you always done your own firing?—Yes.

12. As to the proposed scheme of having shot-firers, do you think that would work?—Personally speaking, I like to fire my own holes, but I think that probably if they had shot-firers it would minimize the risk of accident.

13. Have you any opinion to offer as to firing by electricity?—I think it would be the safest in rises, winzes, and shafts.

14. *Mr. Parry.*] You say that you have been four years in the Grand Junction Mine?—Yes.

15. Have you been working in hot places?—Yes, pretty well all the time.

16. Have you felt any ill effects from working in those places?—Yes, I have been pretty bad; in fact, I have been ordered out of the mine by Dr. Frazer-Hurst.

17. What did he say you were suffering from?—He said I showed symptoms of miners' complaint.

18. You have heard the evidence given by Mr. Moore and Mr. Gaynor: do you corroborate it?—Yes.

19. *Mr. Reed.*] Do you corroborate the statement made by a previous witness that the Waihi Mine is cooler than the Junction?—Well, I have only worked in the Waihi Mine for about a month, but I know that as regards the ventilation it would blow your hat off.

20. Would it blow your hat off in the Junction?—No.

21. Which stope are you in?—I am on the surface.

THOMAS FRANKLIN sworn and examined. (No. 36.)

1. *The Chairman.*] What are you?—A miner.

2. How many years have you been mining?—About twenty.

3. Are you mining still?—No, not now, since I met with my accident.

4. How long is it since you have been mining?—Since the 15th April last.

5. What are you doing now?—Nothing.

6. You met with an accident in the mine?—Yes.

7. Where?—In the Grand Junction Mine.

8. How long had you worked in the Grand Junction Mine before your accident?—About three years.

9. What is it you wish to bring before the Commission?—I would like to make a few remarks in regard to sanitation, ventilation, and accidents.

10. What have you to say as to sanitation?—There should be more pans supplied below, and more suitable appliances. Where a crowd of men sit down to have their crib there should be a proper system arranged to look after the spare crib.

11. Are there not boxes provided?—In some places there are.

12. As to ventilation what have you to say?—In the Grand Junction Mine there are many hot places, and though they use fans the temperature does not seem to be reduced a great deal. The heat seems to be there all the same. I think, if the Waihi and Junction Mines were connected, it would have a tendency to give better air and better ventilation too. At one point where they connected the Junction and the Extended it was improved.

13. Have you anything to say in regard to accidents?—The height of the stopes should be regulated and kept about 8 ft. It would be better if that were done, and where that is not possible the timber should be used.

14. How did you meet with your accident?—I was shot.

15. Was it a mishole?—No. I had fired one hole and that went off, and I had several other holes charged. As is the custom, we put the fuse in and then coiled it in the sollar of the hole while we fired the others. Possibly a piece of bag tamping landed on the sollar of this hole and ignited it. When I came back I heard the fuse burning. I turned to run away, but I did not get far before the shot went off.

16. Have you had any experience of firing by electricity?—Yes. I certainly would choose the battery for firing in shafts. The fuse is better for drives or stopes. In a rise I certainly think it would be better to use electricity.

17. *Mr. Dowgray.*] In regard to ventilation, you are of opinion that it would improve the mines considerably if the mines were compelled to connect?—Yes, I think so.

18. You would recommend that provision be made in the Mining Act compelling the companies to connect up?—Yes, that is my suggestion.

19. How has it affected the Extended?—I do not know whether it has improved it or not.

20. In firing with the battery, if you wanted one hole to go off before the other, could you fire that hole first?—Yes.

21. So that it does not prevent you from firing any hole you want off first?—No; my reason for saying so was that it would take up more time.

22. *Mr. Parry.*] Have you had any experience in working in hot places?—Yes.

23. Have you seen any temperatures taken, or have you taken any?—I have been present when they were taken, but I do not understand it myself.

24. What is the highest temperature taken where you have worked?—84°.

25. Do you consider that was a hot place?—It was too hot to work eight hours in.

26. Do you think a standard temperature should be fixed to avoid confusion?—I certainly think so.

27. Have you suffered from any illness which the doctor has told you was the result of working underground?—No.

28. As regards the height of stopes, do you say there should be a standard fixed?—Yes; about 8 ft. is quite high enough.

29. As regards the appointment of shot-firers what is your opinion?—I would like to fire a hole myself if I bored it. I know it worked in the Junction Mine.

30. Do you think it would minimize the risk of accident?—I certainly think it would.

31. Did it ever occur to you that a great risk is run by men being hauled or lowered when only one engine-driver was at the engine?—I think, for safety's sake, it would be far better if an extra man were at the engine while lowering and hauling men.

32. What is your opinion of the practice of bulling holes before charging them?—It is detrimental to the average miner.

33. Have you suffered any ill effects from doing that?—Not from that, but from the effects of dynamite; it has given me headaches.

34. Are headaches common amongst miners?—Yes.

35. Do you think your accident would have happened if the battery had been used?—No, certainly not.

36. When you met with your accident that night were you firing in order to get up on top first?—No, we had plenty of time. After the hole went off we stayed down for ten or twelve minutes.

37. How did you think that accident occurred?—I could not form any idea, unless a spark lit the fuse.

38. You are satisfied that the fuse was not lit by you?—No, not by any of us.

39. Do you think it was possible for a piece of tamping to be blown on to the fuse from the other shot?—Yes.

40. Have you worked in many wet places?—Yes.

41. Is it any inconvenience to work with an oiler?—Yes, very inconvenient, so much so that we used to throw them off.

42. So that a man would not work with an oiler unless he were forced to?—No, certainly not.

43. What would you suggest when it was necessary for a man to wear an oiler?—I certainly think it should be a six-hour place.

44. *Mr. Cochrane.*] What was the effect of making a connection between the Junction and Extended Mines?—I do not know with regard to the Extended, but it improved part of the Junction.

45. In view of that you would recommend that all adjacent mines should be connected?—In Victoria and Western Australia they are compelled by the Act to connect.

46. Is it not left to the discretion of the Inspector whether they must connect or not?—Well, it is in the Act.

47. Can the Inspector order the mines to be connected?—Yes.

48. You would be agreeable to that provision being inserted in the New Zealand Act?—Yes.

49. And you would recommend the connecting-up of the Waihi Mine with the Junction?—Yes.

50. Supposing all the smoke and vitiated air from the Waihi Mine were to come into the Junction. Do you see that disadvantage?—Certainly, it would cause a bigger volume of air.

51. Yes, but you might have more smoke in the Junction than at present?—I do not know. Of course, that may be; I cannot say.

52. You think it would be a wise provision to leave the matter to the discretion of the Inspector of Mines or the Inspecting Engineer?—I do not know.

53. *Mr. Reed.*] By connecting one mine with another might you not foul the good air in the one mine by the vitiated air of the other?—I do not think it would be that bad.

54. And what about one mine flooding the other one with water: would that be reasonable?—The water does not seem to make any difference here.

55. You only recommend the use of electricity for firing in shafts?—And also in rises and winzes.

56. Would you recommend its use in stopes?—No; I think it would be wise to use it only in the places I have mentioned.

57. You stated that fans did not much reduce the temperature in mines: why is that so?—It does not reduce the temperature a great deal. At the Junction they now draw out the air, but it does not reduce the temperature. They keep the gases down.

58. Do you think a fan would reduce the temperature in the Waihi Mine?—I have never worked there.

59. Do you think it would?—I was always under the impression that they would.

60. *Mr. Dowgray.*] The fan that you talk about in the Grand Junction is a blower?—Yes.

61. Was that prior to the introduction of the exhaust fan that they have now?—Yes.

62. So, of course, it was only like putting hot air in the face?—Yes, that is the trouble; it was not getting fresh air from the surface.

WILLIAM MCCONACHIE sworn and examined. (No. 37.)

1. *The Chairman.*] You are a mine-manager?—Yes, at the Grand Junction Mine.

2. How many years' experience have you had?—Twenty-one years.

3. How long have you held a mine-manager's certificate?—About eleven years.

4. And where have you gained your experience?—On the Waihi goldfields.

5. How long have you been in your present position?—Two years and a half.

6. And prior to that where were you employed?—For seventeen years in the Waihi Mine.

7. On what subjects do you wish to inform the Commission?—I am prepared to answer any questions.

8. Have you anything to say with regard to ventilation?—Nothing further than that we are doing the best we can to ventilate the Junction Mine at the present time.

9. Have you anything to say on the subject of connecting up adjoining mines? What would the probable effect be?—I think it would be a good thing for both mines; it would set up really good ventilation. It is the secret of good ventilation to make connections between two shafts. It would give more inlets and outlets for the air.

10. And do you think it should be compulsory or discretionary?—Well, on fields like this, where water does not come into the question, connections help the ventilation a great deal. If there were any danger of an inrush of water it would be a difficult matter to decide.

11. Have you any remarks to offer in regard to temperature?—My experience of temperature is that it does not matter as long as the air is clear if it is not too high. I have seen temperatures of 90° with clear air which were not as bad as some I have known which have only registered 80°.

12. But were either of them comfortable to work in?—Well, I do not suppose any hot place is comfortable.

13. Would you say that any reduction should be made in the hours for places where those temperatures were registered?—If the air is impure I think steps should be taken to put a greater volume of air through the place. If the air is impure it should be remedied.

14. Do you think a standard temperature should be fixed?—No, unless you put it pretty high. At 90° in some places it is not worse than in other places at 80°.

15. Will you give us your own opinion as to the objections that could be reasonably taken to the fixing of a standard temperature?—The temperature varies. Taking our own mine, what would be a six-hour shift at 80° to-day would not be one to-morrow. It depends also upon the air-currents. In many cases the men cannot tell. They will say it feels all right to-day, and you will find that the temperature is actually higher than in other places which they say are bad.

16. As a mine-manager, how do you think the appointment of shot-firers would suit?—We have had shot-firers in our mine, and we have abolished the system.

17. Were they under the contract system?—They were firing for contractors, and also on a small scale for wages-men, but not generally for wages-men.

18. What was the objection to it?—We abolished them when we abolished the system of boring. My experience with them was that we had as many misholes as we have at the present time.

19. What do you consider the proper length of time that miners should remain out of a face after a misfire?—I think the rule should be an hour. Personally, I have gone back within half an hour when using fuse. My experience is that the hole ought to go in five minutes or not at all.

20. You have heard Mr. Gilmour's evidence as to his method of measuring the air with the cages in the positions he described: do you think, under those circumstances, he would get the average quantity of air travelling with the cages working?—As I understood Mr. Gilmour, he was standing in the airway with the cages down below. Had he placed the cages up above he would have got a greater volume of air. Any velocity that he got by the anemometer must have been caused by the air going down the shaft.

21. What we want to know is whether the test made would give the average current of air under working-conditions?—Well, after listening carefully to Mr. Gilmour, I think his test would be on the low side—that is, if I understood him aright as to the positions of the cages.

22. Have you any opinion to offer as to fixing a standard height for stopes?—We try to keep the stopes at 10 ft. from the solid, and succeed fairly well. I do not see much objection to their being a little higher if the ground is good. At times it is better to pull it down and not leave it higher than a man. If a man standing on a block of wood can reach it, then I think it is all right. That is pretty well our standard.

23. In regard to the weight of trucks, it has been suggested that an undue amount of exertion is necessary when trucking: have you anything to say in regard to that matter?—I think if you provide good clean tracks it is all right. They may be on the big side, but that cannot be avoided if you are to get the material up in the twenty-four hours.

24. What is your opinion as to the necessity for an extra engine-driver while shifts are being changed?—In my experience of twenty years I have never seen an accident such as it is sought to avoid by this proposal. I have never seen a man at the engine get suddenly taken ill, and I do not think the extra man would be able to stop an overwind. I do not think there has been a case of that sort on the field.

25. *Mr. Molineaux.*] Have you any appliances for use in such an emergency?—We have three appliances—the catches on the side of the cage, the cut-off, and the detaching-hook. There is also the magnetic brake on the engine.

26. Have you an automatic cut-off and brake on the engine?—Yes.

27. Do you consider that periodical examinations of winding-engine drivers are advisable?—Yes.

28. How frequently do you consider they should take place?—Possibly once or twice a year.

29. Have you at any time known the safety-catches on a cage refuse to act?—Not when men were travelling. I have known them to fail when winding material.

30. When?—About ten years ago.

31. But not recently?—No. On the occasion I refer to I cannot say what caused them to refuse to act. I do not remember the details.

32. How often are the safety appliances on your cages tested?—The side-catches are tested every Monday morning.

33. And the detaching-hook?—Once in every three months. We overwind the cage in the presence of the Inspector of Mines.

34. What precautions do you take to see that the ropes are in good order?—They are examined every Monday morning.

35. How do you examine them?—One of the officials makes an examination as they pass down.

36. And how do you judge when a rope is no longer safe?—When I see anything wrong with it, such as a broken strand, we take it out.

37. How long do your ropes remain in use?—The last pair of ropes we had for about three years. I cannot give you the actual dates. I think that two years is long enough for a rope winding, say, 8,000 or 10,000 tons per month.

38. What steps do you take to equalize the wear on the rope: do you reverse it, or cut the ends?—I do not think I have reversed the rope at any time.

39. You have never used a spliced rope for winding men?—No.

40. Do you consider it would be unsafe?—I could not say. You would want expert advice on that point.

41. Is there a chamberman stationed at every level?—No.

42. Do you consider there is any danger in allowing men other than the chamberman to knock the cage away?—I think it preferable for the chamberman to ring the men away, one level at a time. That is our procedure.

43. In your opinion would it lessen the probability of accidents to have two engine-drivers?—If there is a possibility of such an accident occurring as the result of a driver fainting the presence of a second man might avoid the accident. As a rule, however, such accidents are the result of overwinds, and I do not think the second man would have time to get hold of the appliances quick enough to prevent an accident. I have never known anything like that to occur.

44. As a matter of fact, it is possible that the second man being there would tend to increase the liability of an accident by attracting the other man's attention?—Yes, they might enter into a discussion, which would make the risk much greater. I think one man is quite enough in an engine-room when they are winding men.

45. Do you consider it practicable to fix by regulation a standard height for stopes?—No. I think it is a question which should be left to the Inspector of Mines to decide whether stopes are too high. The Inspector of Mines should have the power to say whether they are too high, and to require them to be timbered.

46. Then you do not think any improvement could be made in the present regulations?—It would be a very drastic matter to compel stopes to be timbered above a height to be fixed by regulation.

47. In your opinion is it the practice of the mine officials to test the roof, or is it left to the men in the stope?—The men are supposed to test the roof themselves, and the officials test any places of which they have doubts. They point out to the men such places as they consider unsafe.

48. With regard to shot-firing, you heard the evidence given yesterday as to the appointment of shot-firers: what is your opinion on the subject?—We had shot-firers in our mine, but abolished them when we did away with the system of boring. I do not think that the presence of shot-firers in the mine lessens the danger, because for the twelve months prior to their abolition I had as many notices of accidents on my table as we have in any year now. I do not think you could get shot-firers any more capable than the men themselves.

49. You consider a miner to be as capable of charging and firing a hole as a shot-firer would be?—Yes.

50. What has been your experience with regard to firing charges by electricity?—It has been that you have a great many misses, probably more than with fuse, though I believe in electric firing in sinking shafts where the men cannot escape if anything goes wrong; but in dry winzes or rises, where they have ladders to escape by, I prefer the fuse, because I think there is less risk of misfires. Many times I have seen seven or eight holes connected up, and probably two or three missed. I have seen the dynamite come up amongst the debris.

51. What is the general cause of those misfires?—In some cases it may have been the caps, but I really could not say. I have been told it was the result of a short circuit.

52. As a general rule, you do not consider electricity surer than the ordinary fuse?—No, I would sooner work with fuse, except at the bottom of a shaft where there may be no chance to get up a ladder. Where a man can get up a winze or climb down a rise, or in stopes where he has good opportunity to get away, the fuse is better.

53. What is the usual cause of misfires when fuse is used?—In all cases which I have investigated, with the exception of one, carelessness has been the cause. The exception I refer to was a shipment of defective fuse. In most cases the men are absolutely sure that they have cleaned the cap out, or they might get a drop of water on it. There is also carelessness in loading. I have seen many cases of that when investigating misholes by drawing the charges to examine them. About ten or twelve years ago we found misholes being caused by defective fuse, but since then we have not been troubled in that way.

54. With regard to misfires, what is the usual procedure?—The first thing to do is to pull the fuse out. The hole should be tamped with clay. If you get the cap out there is very little danger. The clay is pulled or washed out until you get down to the dynamite, and then you fire it again. Providing you get the cap out there is very little danger if you do not hit it a blow.

55. And for drawing the tamping what tool do you use?—I have drawn any amount with a stick, or with the scoop on the scraper.

56. Do you think it is a safe practice to charge a number of holes when it is intended to fire only a few of them?—No.

57. In your mine do you find that bag and paper is used for tamping?—It has been used, and we have attempted to stop the practice on several occasions. I do not think it is used to any extent now.

58. What is your objection to using tamping or material of that kind?—It causes a great deal of dust, and if it does not it will probably fly about in the air. If it burns it causes a great deal of fumes.

59. With the popper is there any method of stopping the dust from becoming a nuisance?—We have had the popper in use for about twelve months. At first there was great difficulty with the dust, because the poppers were only intended for boring upwards, or for holes at an angle of 40° or 45°. We find that spraying is very effective, and if a man uses the spray across the mouth of the hole there is no trouble. It is better for a man to get wet than to suffer from the dust.

60. Do you find the sprays are generally used with the ordinary rock-drill?—In a great many cases miners do not use the sprays as much as they should, and we sometimes have to speak to them.

61. Do you think the water-jets are effective in allaying the dust from rock-drills?—Yes, I should say they are.

62. Can you suggest any method of laying the dust which is raised when firing in dry places?—Only the spray.

63. Are the sprays used for this purpose in the mine you are managing?—I think the majority of miners do use the sprays, but there are some careless men who do not, even though they have the appliances at hand.

64. *Mr. Cochrane.*] You say that some of the miners do not use the sprays?—That is so. Once or twice a week I have to ask them why they are not using the sprays.

65. Would you be in favour of making the use of the sprays compulsory?—Certainly.

66. Then you told us of one occasion when the safety-catches did not act?—Yes.

67. Was it in a case of actual winding, or when the catches were being tried with a small drop?—It was in winding rock at a fair rate of speed. The cage went down the shaft.

68. Do you consider the present short drop a sufficient test?—If they drop more than a short distance they are no good. When you drop a cage it is only a few inches. Our test is up to about 1⅜ in. If they drop further than that we take the catch off and see what is wrong with the appliance.

69. Do you consider the present test an efficient one?—Yes, I think it is a satisfactory one.

70. What is your opinion generally as to the connecting of adjoining mines?—I think it would greatly improve the ventilation.

71. Then, in a case where a vast amount of smoke might come into a smaller mine and deluge it with vitiated air?—I think you would get such an increased supply of air that the amount of smoke would not do any harm. I would be quite prepared to take any additional smoke that might come into our mine from an adjoining one.

72. I think you said that the fixing of a standard temperature would be a difficult matter on account of the variation in the weather?—Yes.

73. Is the difficulty not chiefly owing to humidity?—I could not say.

74. I want your opinion as to keeping winzes and rises well ahead of the development-work, so that the stopes shall be well ventilated as they come forward?—That is a point we always try to adopt. The more air we get in, from a financial point of view, the better for everybody. We try to keep the winzes and rises as far ahead as possible.

75. Do you think a provision should be enacted in regard to that?—Well, I do not think so.

76. You would not recommend it?—I think it would be far better to provide a sufficient quantity of air. Sometimes it might be possible to give the men a sufficient quantity of air, and they would not want the winze or rise.

77. Then what is the use of a large current of air if it does not go to the place where it is wanted—if it is short-circuited?—We consider that it does go to the place.

78. By means of the winze?—By mechanical ventilation if it suits us the best.

79. Do you not get better results by having your winzes and rises than by a small fan?—Yes, certainly.

80. *Mr. Reed.*] As regards the heating of air in the stopes, how is that caused?—It is the heat of the rocks which heats the air.

81. Is that sometimes greater in some varieties of ore or rock than in others?—Yes.

82. What class of ore creates the greatest heat?—Ore full of mineral. That is my experience.

83. Can the heat in the stopes be reduced?—As you open them up the heat is reduced.

84. When you begin to open up these sulphide bodies is the heat greater?—Yes.

85. And at that time does the best of ventilation that is available make the places cool?—It does not bring it down to the standard that it will finally come to, but it certainly reduces it. We have driven levels that have been 85°.

86. Are you aware that the quantities of air passing through each intake were measured by the Commissioners?—Yes.

87. Will you give them? First, No. 5 level, south crosscut: how much air circulates per man per minute?—325 ft.

88. In the north crosscut?—1,208 ft.

89. No. 4 level, north crosscut?—263 ft.

90. No. 3 level, north crosscut?—1,166 ft.

91. What was the total intake as registered?—47,565 ft.

92. For how many men?—Eighty-eight.

93. How much does that work out at per man per minute?—540 ft.

94. Does that quantity enable you to cool your stopes?—It brings them down considerably as compared with what they would have been without it.

95. Would you explain to us the phenomena that, notwithstanding that fair volume of air, the temperature taken by us in Keen's and Adams's stopes registered 83°, wet bulb; will you also state whether you consider that such high temperature was caused by the rocks, inadequate ventilation, or sulphides?—In Keen's stope, where the Commission took the temperature, it was hardly a fair thing, because those men should not have been allowed to work at that point. They started there without my knowledge. Within 50 ft. they had a clean open rise to work in. And the point where that temperature was taken was not fit for a man to work in.

96. At the other end of the stope the temperature was 70°: how do you account for the difference in temperature between one end of the stope and the other?—At the cool end the air is coming direct from the main shaft, and there is more air going in there.

97. Where did you wish the men to work?—They should have started from the rise.

98. How long had the men worked there unknown to you?—I had not been in the stope for several days.

99. Why were they working there?—They stated it was on account of the acid water injuring their pipes.

100. Was there sulphide ore in Adams's stope to cause the temperature to be so high—it was 80° and 84°—or was it simply bad ventilation?—The cause of the heat there is that the intake is higher than the outlet.

101. Have mining accidents increased during the last year?—No, I do not think so; not to my knowledge.

102. How is a six-hour place determined?—By the Inspector of Mines.

103. Have you known the heat alone in hot places to injure a man—I do not mean the dust, but the heat alone?—No, I cannot say that I have known of it.

104. How high are your stopes generally?—Well, our rule is to keep them between 8 ft. and 10 ft.; those are my instructions. At times, however, some of them are higher, perhaps on account of bad ground, or where the ground is good and there is no risk.

105. With your good mechanical ventilation how do you account for the statement of some of the witnesses that the Waihi Mine, with natural ventilation, is cooler than your mine?—Well, Mr. Speering was not in a position to tell whether it is better or not; he has not worked much about the place.

106. As regards misfires, what is your opinion as to the man who charges a mishole being responsible to report it to the incoming shift?—I think the man who fired it should be the man to report it.

107. What is your opinion of the employment of special men to fire shots, and why was that system discontinued in your mine?—It does not minimize accidents. We discontinued it when we abolished the system of boring.

108. Does the workmen's inspector visit your mine regularly?—Yes, except during the last couple of months.

109. Have you a book containing the reports by the workmen's inspector?—Not here.

110. Do they draw your attention to their requirements?—They point out matters which they consider unsafe, and what other changes they consider ought to be made.

111. Have any recent notes been made as to the temperature in stopes?—The Inspector's reports have referred to the temperatures. The last report I had was three months ago.

112. Have they made requests for cooler stopes?—Yes, some time ago.

113. Does the Inspector of Mines visit the mine frequently?—Yes, he visits us at least once a quarter, and at intervals when he is called, or when it is necessary for him to make an inspection. Sometimes the workmen's inspector calls him, sometimes I call him, and he also comes when there is an accident.

114. Does he thoroughly inspect the mine and all the arrangements?—He personally supervises the testing of the cages and the ropes, and he usually has the workmen's inspector with him.

115. Does he examine the stopes and ladderways?—At least once a quarter he is through most of the stopes.

116. What is his practice when he observes anything which requires attention—safety precautions, for instance?—If they are not in order he notifies me, and orders me to put them in a proper state of repair.

117. Does he take air-measurements and temperatures periodically?—Yes, he has taken them many times.

118. Is there much gas in your mine?—No.

119. Is it reasonable to suppose that the reason for your not detecting gas in any serious proportion is because you have adequate ventilation?—Yes.

120. Do you consider the ventilation in the Junction Mine adequate?—Yes, it is not bad. We will probably improve upon it as we go along.

121. *Mr. Dowgray.*] In reply to Mr. Cochrane you said that you were in favour of adjoining mines being connected?—Yes.

122. Even although your mine is equipped with an exhaust fan, would you be in favour of the Waihi Mine being connected with your mine?—It would mean a big improvement in our mine.

123. How would it affect the Waihi?—I think they would get a lot of cool air, provided it went from our place into theirs.

124. Would not your exhaust fan materially assist them?—The effect of our exhaust fan would be to draw a great deal of noxious gas from the upper levels and assist them in that way.

125. Would you be in favour of a clause being inserted in the Mining Act compelling adjoining mines to effect connections, or would you leave it to the discretion of the Inspector of Mines?—I am in favour of mines connecting unless there are hard bars of country blocking water so as to prevent it swamping the mines.

126. Would you be in favour of a clause being inserted in the Act compelling connections to be made?—Yes.

127. You said that when you had the system of shot-firers you frequently had notices left on your table in regard to misshots?—Yes.

128. Would that not be one of the reasons that you think there were more then?—There were just as many misholes under the system of shot-firing as there are at the present time, and probably more. There was more dynamite used in those holes than was necessary.

129. But if there were a shot-firer appointed would it not do away with the danger of going back before the statutory time?—My experience is that you cannot stop men from going back; you would want the police to keep them back.

130. The shot-firer would be the police?—But the shot-firer would go back.

131. In connection with the spray being used on the popper, does the spray not have a tendency to choke up the dust at the collar of the hole?—No, especially in upper holes.

132. Do you consider your mine better ventilated with the installation of the exhaust fan than with natural ventilation?—The exhaust fan brought the temperature down in two or three weeks by 5°.

133. Would you be in favour of a clause being inserted in the Act compelling companies to introduce mechanical ventilation where the temperature is high?—Yes, or to supply the air by some means.

134. The temperature of the rocks is reduced by the air?—Yes.

135. Would you consider that a mine which had an average in eighty-seven places of 79° to be adequately ventilated?—Yes, provided that the air was clear; of course, it would be pretty warm.

136. If you had that average in your mine would you consider it satisfactory?—Yes, if the air was clear. I might say in regard to holing that since we holed into the Extended the temperature in some of our crosscuts has been reduced at least 5° or 6°.

137. And you attribute that to the connection being made?—Yes.

138. *Mr. Parry.*] Sometimes when the catches were being tested by the Inspector have they refused to act?—Yes.

139. In regard to firing with the electric battery you said there was just as much risk: did you mean in regard to hangfires?—I have had no experience of hangfires with the electric battery, because if a shot does not explode the man disconnects his machine and makes an examination to see what has happened.

140. Have they exploded afterwards?—Only when the man has reconnected up—there is no risk provided they disconnect the battery; but, personally, I have had no experience of hangfires.

141. Do you think the misfires are mostly caused by the unequal resistance of the detonators or faulty manufacture?—Well, I cannot say, but I think the faulty connections are the cause of most of the trouble.

142. Will you tell the Commission how much driving and sinking you have done for ventilation purposes alone?—Last year we spent about £5,000 on drives and winzes for ventilation alone, and £700 for power for fans, and about £300 for attendance on those fans—that is, with three men employed all the time. For ventilation alone we drove about 2,000 ft., and winzing and rising accounted for 600 ft

143. How much money would have been saved by the Junction Company if you had been allowed to connect?—Well, thousands of pounds perhaps—at any rate, a very large sum. We worked under bad conditions until we got our ventilation system going.

144. Have you gained a good experience this last six months in connection with the decreasing of temperatures of rock by a large circulation of air?—Yes.

145. And it has been a demonstration of the cooling off of rock with a big circulation of air?—Yes.

146. In regard to Keen's stope, in answer to Mr. Reed as to the temperature being much lower at one end of the stope than at the other, is that not accounted for by the air travelling up a rise before it comes to where those men are working?—No; those men were actually starting a new rise, and the excessive heat is due to the fact that there is no chance of the air getting in or out.

147. There is a rise up another way, and the biggest proportion of the air goes up that rise without going through the other end?—Yes, that is so. I think that temperature is pretty low in that stope. At the west end it was 70° and 75°. Had they worked the stope in the proper way I do not think it would have been up more than 2° or 3°.

148. And you do not think it was fit for them to work in?—No, certainly not, up in that place.

149. You say that you do not think it would be advisable to fix a standard temperature owing to the temperatures varying: is that the only impediment in the way of fixing a standard temperature?—Really, I do not see any reason for doing so if the air is clear. It might be no more injurious at 88° in one place than in another place at, say, 72°.

150. Do you think that a high temperature underground is not exhausting and fatiguing for a man to work in?—Yes, if the air is not clear

151. But even in the event of there being a good current of air, and the temperature being 86° or 90°, would it not be more fatiguing than with a temperature of 70° with the same sort of air?—Probably it is more fatiguing.

152. In the course of your experience at the Grand Junction Mine, when the temperature was very high, have you not heard complaints in general conversation from the men as to how they felt when working in those hot places?—Yes, I have heard men say "It is fearfully hot," and so on.

153. Do you think it would save confusion between the workers and the companies if there were a standard temperature fixed?—No, I do not. If you had a standard temperature in our mine you would probably cut out about 75 per cent. of the mine unless you fixed it high, because at times it is high and at times low. Personally, I am in favour of the question as to whether it is too hot for an eight-hour shift being referred to a Government official.

154. Do you think a decrease of hours is necessary in high temperatures?—I think if the air is bad the shorter hours the better—if it is poisonous or not pure.

155. As regards sanitation, do you think there should be proper sanitary appliances?—I think the sanitary appliances that we have installed in our mine are adequate and well attended to.

156. Do you consider mining a healthy occupation?—It is not as healthy as working on the surface, I know.

157. In regard to high stopes, would you be in favour of some provision being made in the Mining Act whereby a man would not be allowed to bore a hole too high in a stope? You say it is not advisable to fix a standard height for stopes. In keeping your stope 9 ft. or 10 ft. high, would not a hole bored 9 ft. from the bords have a tendency to loosen the back so that it would require working down? Would you be in favour of a certain height being fixed for the hole to be bored?—That is a matter which depends on the miner's judgment. I would be quite prepared to have the place timbered if in the opinion of the Inspector the hole was too high. There are many cases where the hole must be bored 9 ft. high, and if a man has a good knowledge he will bring that off without any difficulty.

158. But in wide stopes have you not found in your experience that it is not advisable to bore holes 9 ft.?—In ordinary average ground it is not advisable to put holes that height.

159. Do you think that it is necessary to have the ambulance-box, liniment, and stretchers on the different levels handy?—I believe that the best place for them is the surface, because it generally happens that the first man that rushes to them has his hands very dirty, and by the time they get to the patient they are not fit to handle.

160. But if they were kept in a properly arranged box?—It would require to be properly secured.

161. Do you know the practice in other countries?—I do not know.

162. *The Chairman.*] What would be the difference in time taken to get them from the foot of the shaft and from the surface?—It would mean only about five minutes. There are, of course, times when it might mean much longer, owing to the inability to get a cage.

163. Would ten minutes cover the difference in time—that is, assuming that they were kept in some place handy on the surface?—Yes, I think ten minutes would cover it. At times it might be more, but generally from five to ten minutes would be about the difference.

164. *Mr. Parry.*] You said that the man having the mishole should be the man to fire it: supposing the man who fired it were going off shift, would he fence the place off till he came on shift again?—No; I would be quite prepared to shut the place down. Under ordinary circumstances a man should fire his own hole.

165. *The Chairman.*] Supposing under present circumstances your mine were connected with the Waihi Mine, would that make any revolutionary changes in the system of ventilation in the Waihi?—I could not tell you; it is three years since I was in the Waihi Mine.

166. You say you have an exhaust fan: what would be the general effect to both mines?—The advantage to us would be that we would save all this driving. The large current of air would tend to drag the bad air out, and the effect upon us would be that we would have a greater circulation. The effect on the Waihi Mine would be that they would get clear air at about 75°.

167. Would that connection not make a number of your shafts upcasts for the Waihi?—It is possible, but we are prepared to take it the other way, too. I do not see how all the fumes in the Waihi, or the proportion that would come to us, would do us any great injury.

168. What is your opinion as to the general effect of connection on the intakes and outlets?—The effect would be a greater quantity of air going down our shaft, and a lot of it would go direct through into the Waihi Mine; it would also have a cooling effect owing to the greater quantity.

169. How many connections would you make—one, two, or more?—One on each level.

170. Only one on each level, not two?—Well, if necessary, you could have two. My opinion is that the more connections you have the better.

171. *Mr. Dowgray.*] The more shafts you have to the surface the better?—Certainly.

172. You heard the reference to the necessity for the engine-driver giving return signals to the braceman: would that be an improvement?—I have not seen such a system working, but I think it would be a good idea as a workable scheme.

173. The men go on to the cage without having a return signal?—Yes.

174. But if it were a workable scheme you think the return signal would be a good thing?—No, I have not gone into the question.

FARQUHAR STEWART sworn and examined. (No. 38.)

1. *The Chairman.*] You are a mine-manager?—Yes.

2. With how many years' experience?—I have been a manager a little over five years.

3. And before that what mining experience had you had?—Something over twenty years. Before going to the Extended Mine I was for six years a shift boss in the Waihi.

4. How long have you been in your present mine?—Just over five years, as manager all the time.

5. Have you any opinion to offer to the Commission on the question of ventilation, either generally or particularly?—I do not know that I have anything to say in particular on that matter, but I am prepared to answer any question as far as I can.

6. As to sanitation, have you any suggestion to offer as to the improvement of existing conditions?—I do not know that I can suggest any improvement. All reasonable care is at present taken to keep the places clean.

7. What is your opinion in regard to a system of shot-firers: how would it work?—I have had experience with shot-firers, more especially in open cuts and quarries, and there are as many accidents with shot-firers as without them.

8. Have you had any experience of the results of firing by electricity as opposed to fuse?—Yes, I have had a fair experience in the use of both. The electric battery has, of course, certain advantages, but I do not think it would be advisable to lay down a hard-and-fast rule and make it compulsory to fire all shots by electricity.

9. Have you any opinion as to a standard height for stopes, and, if so, how would you fix it?—Well, as far as the mines in Waihi are concerned, I do not know that a hard-and-fast rule in regard to that matter would be workable. In my experience I have found that at times, although a stope may exceed 8 ft. or even 10 ft. in height, it is better to take it up until you have clean ground. It is better at times to take down baulked ground rather than timber it, though, of course, there are times when it would be safer to timber.

10. Have you any opinion to offer as to fixing a standard temperature for six-hour places?—Well, I do not know that it would be workable if a clause were inserted in the Mining Act fixing a standard. I think our system, which has been in operation here for some time, works fairly well—that is, in the event of the companies and the men not agreeing between themselves, the matter is referred to the Inspector of Mines, and he determines whether it should be a six-hour place.

11. Would you give him statutory authority to determine it?—Yes, I do not see any objection to that.

12. Have you had any experience in regard to accidents?—Yes, in a general way.

13. What do you find is the commonest cause of accidents?—Well, that is a difficult question to answer, because each accident and its cause must be taken separately.

14. Have you any opinion to offer as to the necessity for an extra man in the engine-room when shifts are being changed?—I do not think it would really be any advantage. In the course of my experience I have found that on some fields, at any rate, the system is to exclude every one but the engine-driver from the engine-room, to prevent his attention being attracted while he is raising or lowering the men. So far as the extra man is concerned I think, in the event of an accident occurring—in my experience I have never known of one—that in all probability the damage would be done before the second man could gain control of the engine.

15. Do you think it would be an advantage to have a system of telephones for communicating between the surface and the different levels?—Yes; that is, provided the telephone system is reliable.

16. Would there be anything to prevent it working satisfactorily in a mine, as far as you know?—No, I do not think so.

17. Have you known of such a system being in vogue in wet mines, or under any other conditions which might affect the working of a telephone?—Apart from effective insulation of wire, I do not know that there is any objection to the system.

18. Do you know of the existence of a system at all?—The only place in this district that I know where they have the telephone is at the Crown Mines, where I believe they have had considerable trouble with it at times. I do not know why. I did hear that it was affected by the electric currents in the air. In Waihi we rely on the speaking-tube, which has been found fairly effective on the whole.

19. *Mr. Reed.*] Will you please tell us of the holing between the Extended and the Grand Junction Mines as regards ventilation?—The holing has resulted in a decided improvement.

20. To which mine?—To the Extended, I know; and I am also satisfied it has improved the Junction.

21. Have you any idea of the amount of air passing through that holing on the 28th of this month, when the measurements were taken in the Grand Junction by the Commissioners and the Inspector of Mines?—I believe there was something like 11,550 ft.

22. Does your mine get the benefit of that holing?—Yes.

23. Is the air pure?—Comparatively good, pure air.

24. Fit to breathe and work in?—Yes.

25. What would be the result of holing between the Waihi and the Grand Junction Mines?—I think it would be beneficial to both mines.

26. Do you think that a powerful fan running constantly at the Grand Junction would have the effect of drawing the air from the Waihi Mine?—It might draw a small proportion. I do not know that it would have an appreciable effect.

27. If it did not draw an appreciable amount what benefit would that be to the Junction?—The connection would allow a greater amount of ventilation.

28. Yes, but the fan is the power at the Junction. If there were no appreciable drag at that connection what would be the benefit to the Junction?—There is no doubt that the fan would draw a proportion of the air, but, not knowing its capacity, I cannot say how much.

29. Would the tendency be for the air to follow the greatest drag, either artificial or natural ventilation?—Yes.

30. Would it only go into the Waihi Mine when the drag on the air was greater in the Waihi Mine than at the Junction?—Yes, of course, it would follow the greater drag.

31. Is it possible that upon certain good days for natural ventilation the air would travel from the Junction to the Waihi, and upon bad days the drag of the air would reverse it, so that it might be a matter of see-saw between the two mines?—I do not think the atmospheric conditions would be sufficient to reverse the current of air.

32. Which way do you think the air would travel?—I am not sufficiently acquainted with the circulation in either mine to say.

33. So that really it might be a doubtful benefit?—I do not think so, because so long as the air circulates one way or the other it does not matter—the direction is not of importance—the benefits would still accrue.

34. But if the air in the Waihi were vitiated, would not that vitiation affect the pure air in the Junction?—If the air were comparatively small in volume, of course, it would; but with the large volumes circulating in the two mines I do not think it would injure either mine.

35. How many hours do the men work in your mine?—Six.

36. It is somewhat wet: do the men complain?—No, only at various times they have said it was hot.

37. Do they work fairly hard in saturated air?—Yes.

38. What sort of health do they have?—Good health, as far as I know.

39. How long have they been working in high temperatures?—Probably about six weeks. Of course, some of them have been working in other portions of the mine from four to six months.

40. Notwithstanding that they are working under wet and hot conditions their health is good, and they do good work for their employers?—Yes.

41. Would you say that heat alone does not injure a man's health?—I do not think that heat in itself really affects a man's health to any great extent. Of course, we know that a cooler atmosphere is more pleasant.

42. In hot places do the men take rests and work according to the conditions?—Yes.

43. Would those rests counterbalance to a certain degree any inconvenience or injury that might result from the heat?—Yes, it would have that tendency.

44. *Mr. Dowgray.*] Seeing that you have gained some benefit from the connection of the two mines, would you be in favour of a provision being inserted in the Act to compel companies to connect adjoining mines?—Yes, I think so, but with certain conditions. It should be left to the Mines Department, the Inspecting Engineer, or the Inspector of Mines to decide whether such connection was likely to be beneficial or otherwise.

45. What proviso would you suggest?—I have not gone into the matter. The requirements would vary with the local conditions. But if a clause were put in the Act giving the Mines Department authority to insist upon connections being made where they were found necessary or advisable it would be a good thing.

46. *The Chairman.*] Supposing it was likely to be injurious to one of the mines?—Well, the company would have the power to object to the connection.

47. But you could not tell till the connection was made?—You could form an opinion by taking the local conditions into consideration. You can tell what the effect would be of a proposed connection between any two mines.

48. With any degree of certainty?—It might not be theoretically correct, but it would be sufficiently correct for practical purposes.

49. *Mr. Dowgray.*] Would you be in favour of some proviso permitting the companies to refrain from connecting in case, say, of a threatened inrush of water?—That would have to be taken into consideration.

50. I understood you to say, in reply to Mr. Reed, that if the number of openings in a mine were increased the volume of air would be increased, so that necessarily both mines would benefit?—By increasing the number of openings you increase the capacity of the inlets.

51. So that, if there were no danger from an inflow of water, it would be beneficial to both mines?—Yes, I think so, almost invariably.

52. Have you had any difficulty in getting men to work in your mine on account of the heat?—I may have had difficulty at times to get suitable men for special work, but not otherwise.

53. *Mr. Cochrane.*] In regard to connections between mines, would you have that done compulsorily? In the event of it being found that a connection had an injurious effect, would you be in favour of the Inspector or the Inspecting Engineer having the power to close the connection?—Certainly.

54. *The Chairman.*] Would compensation meet the case?—Either the power to close the connection or to give adequate compensation. I think if the Mines Department had that power it would be a good thing in many cases.

55. *Mr. Parry.*] Is it not a fact that most of the work done in your mine at No. 5 level has been done on six-hour shifts?—No, I do not know that we have done more than 50 per cent. on six-hour shifts.

56. How much sinking have you done on six-hour shifts?—Less than half of the present lift. I think that down to 80 ft. or thereabouts we had it practically dry.

57. But on account of the heat: there are other things besides water which prevented you from working eight-hour shifts?—Of course. On the south-east crosscut and on the two reefs the bulk of the work was done on six-hour shifts.

58. Could you tell us how many changes of men you have had working on this last sinking?—I think we have had three. The present is the third party. That has not been due to the heat or the water. When the water became too heavy we had to stop till we obtained the pump.

59. And you have had practically three changes in the last lift?—Yes, chiefly due to stoppages in the sinking.

60. How many changes have you had in the individual members of the party?—Comparatively few.

61. But you have had changes?—I do not know. In the first party that went on I do not think there were any changes—in fact, I do not know that there were any actual changes in any of the parties.

62. Do you think that working in hot places has an ill effect upon a man's constitution?—It would depend upon the degree of heat and surrounding conditions. I do not know that the actual heat in a place has any great effect.

63. Has it any effect at all?—Of course, we all know that heat has an effect.

64. Do you think the temperature on the surface is more healthy than a corresponding temperature below?—Usually it is.

65. It is more healthy to work on the surface?—Yes, there is a greater quantity of air travelling.

66. You said that you get good work done in the six-hour places in your mine: do you think you would get any more if you were working three shifts of eight hours than four shifts of six hours?—I do not know that it would make any appreciable difference as long as the same number of men were employed.

67. As a rule, does a man stick to his face more solidly when working a six-hour shift than if he were working an eight-hour shift?—I have not found any great difference.

68. You said that the men were in good health: do you know if the men have been sounded by a doctor who has stated that they are not in good health?—No, I do not know.

69. And you do not think it is necessary to fix a standard for a six-hour place?—No, I do not think it would be workable if you fixed a hard-and-fast temperature. The surrounding conditions must be taken into consideration. For instance, the conditions in one place with a temperature of 85° may be better than those in another place with a temperature of 80°. It depends upon the amount of air circulating and the quality.

70. What temperature do you consider injurious to a man?—That is a question I could hardly answer.

71. Do you think a temperature of 88° saturated in that shaft is too high to work eight hours?—Yes.

72. As regards the height of stopes, you think it would not be wise to fix a standard?—I do not think it would be altogether workable. As I said before, at times it is better to work down baulked ground and get a sound reef than it would be to work under that baulked ground with the stope 7 ft. high.

73. What is the baulked ground due to?—To the firing of charges too high, or sometimes the nature of the ground.

74. Have you ever had any trouble with the workers in connection with hot places?—I do not think so; I cannot recall an instance.

75. Have the men asked you for a six-hour shift, or have you voluntarily settled which were six-hour places?—When we went on with the south-east crosscut we arranged between ourselves that it should be a six-hour place.

76. Have you had any practical experience of working in hot places?—I have had some experience; as a matter of fact, I put in a good deal of my time in the shaft in the Extended. I do not know that I have been working in any exceptionally hot places recently. Before coming to New Zealand I worked in hot places.

77. As a miner?—Yes.

78. What were the temperatures?—I could not recall them now; it is a good many years ago.

79. Did it ever have an effect on you?—Not as far as I know.

80. Did you feel as strong and fit after finishing your work in a hot place as in a cool place?—I felt tired, I suppose.

81. When you decided on making them six-hour places was it after taking a sample of the air and analysing it?—No, we simply judged the general conditions from my knowledge of the place.

82. *Mr. Reed.*] In reply to Mr. Parry you said that 88° was too high a temperature for an eight-hour place: do you mean that to apply to a shaft or to a dry stope?—Under present conditions, to the sinking of the shaft.

83. At what depth is that?—1,100 ft. from the surface.

84. Do the men wear oilskins?—No, there is no overhead water.

85. Would you call it a wet shaft?—Yes.

86. So you would not apply that 88° wet bulb to a dry stope?—No, not necessarily.

87. You only referred to the conditions in that particular shaft?—Yes.

88. *Mr. Dowgray.*] When deciding on a wet place do you consider whether it is wet overhead or underfoot?—Well, it may be both.

89. Would it become a wet place if it were only wet underfoot?—It depends on the depth of the water.

90. What depth of water would be required to make it a wet place? Two or three inches—would that be a wet place?—If a man were simply getting his feet wet that would not be a wet place.

91. What depth would the water have to be?—I could not fix any depth.

92. How would you decide a wet place if it were only wet underfoot?—I would leave it to the Inspector. In the agreement under which we have been working with the miners' union for some years past there is a clause to the effect that, in the event of the company and the men not agreeing as to what constitutes a wet place, then the Inspector shall decide, but there is no statutory obligation on the Inspector to deal with the matter.

93. In this particular shaft the water is not dripping down on the men from overhead?—There are only a few drops falling.

94. If it were in a drive would you consider it a wet place?—Not with the same amount of water.

95. So, then, the heat is taken into consideration too?—Of course, with the amount of water, apart from the heat, it would be a six-hour place. With the quantity of water coming from close to the bottom of the shaft at times the men may be working in 3 ft. of water.

96. And they work in 3 ft. of water?—Yes, on certain work, such as getting down to connect the fuses, as you do with the electric battery. They usually connect up and stop the pump to allow a certain amount of water to accumulate before firing.

97. You can fire with fuse?—No, we fire with electric battery.

98. In the event of the Inspector deciding that the men should use oilers, would you consider it a wet place?—If the Inspector said so, yes; but it does not necessarily follow that because the men wear oilers it is a six-hour place.

99. If the Inspector of Mines said it was necessary?—I should not bring the question of oilers into the matter at all. It would be decided irrespective of whether the men were wearing oilers or not. A man could wear an oiler or not as he liked.

100. *Mr. Parry.*] In connection with your shaft in operation now, if it were practically dry—say, only damp—and the temperature was 88°, would you think it a six-hour place?—Yes. I would give that as a six-hour place without the water—that is, if the air contained a large percentage of moisture, as it probably would do.

101. In the event of another place having the same temperature—88° saturated—and not wet, what would you think then?—In all probability I would give them a six-hour place.

WAIHI COURTHOUSE.—30TH AUGUST, 1911.

MATTHEW PAUL sworn and examined. (No. 39.)

1. *The Chairman.*] What is your name?—Matthew Paul.
2. You are the Inspector of Mines for the district?—Yes, for the Hauraki Mining District.
3. How long have you been in your present position?—Three years and a half.
4. What certificates do you hold?—A first-class mine-manager's certificate, by examination.
5. And what experience have you had of mining generally?—About thirty-two years.
6. And how long as a mine-manager?—About fourteen years.
7. Where?—In the Hauraki Mining District, at Thames and Waitekauri.
8. Have you any general observations to make as to matters that have come under your notice in regard to your duties or into which the Commission is inquiring—as to ventilation, for instance?—I do not know that I have anything particular to say except under examination.
9. Have you anything to mention in regard to sanitation in the mines under your supervision, or generally as to what you consider the most satisfactory method of carrying out sanitary arrangements?—I think there could be some little improvement in the sanitary arrangements.
10. In what direction?—Well, for one thing, I think the pans should be emptied oftener; and, for another, they ought to be kept away from the air-currents and partitioned off so that the smell cannot get into the air-currents. I think everything else is provided for.
11. You become acquainted with the conditions surrounding every accident in your district: have you any suggestions or recommendations to make to the Commission for the purpose of minimizing or preventing accidents?—Well, accidents resulting from blasting are the most frequent, and in some cases they are caused by charging the holes and only firing the cut. I think that is a dangerous practice. I do not think any holes should be charged other than those it is intended to fire.
12. Would you suggest that that should be made compulsory?—I would.
13. As to the height of stopes, what is your opinion as to the necessity for restricting or limiting them?—I consider 8 ft. is high enough to work in a stope.
14. How would you bring about a uniform height of 8 ft.: would you limit the shooting upwards?—Yes, and I would add "unless the ground was dangerous and had to be pulled down." I think the stopes should not exceed 8 ft. unless there is some good reason.
15. Would that in any way hamper the working of the lodes?—No.
16. Now, have you had any experience of electrical firing as against fuse firing?—Yes, I have had a good deal of experience of electrical firing, and it has not been altogether satisfactory.
17. And have you known hangfires when electricity was used—a charge to hang for a time and then explode?—No, I have known them to miss, but not to hang.
18. Have you any suggestions to offer with regard to the dust question?—Yes. I think that in drilling the men should be compelled to use water.
19. And would you go the length of providing that if there were machines with which water could not be used their use should be prohibited?—Yes.
20. What is your opinion as to the likelihood of an accident happening through only having one man in the engine-room?—I have never known of an accident occurring through an engine-driver taking ill. A man on a winding-engine does not like to be interfered with, and if there were a second man there, and he were offering his opinion as to how things should be done, his presence would probably lead to accidents rather than prevent them.
21. In regard to the custom which exists in the district of leaving it to the Inspector to decide a hot or six-hour place, have you any opinion to offer as to whether that should be made compulsory, or any recommendation to make in regard to devising a scheme by which a six-hour place could be determined under certain conditions?—There are so many conditions which must be taken into consideration when fixing a six-hour place that it would be a hard matter to lay down a standard. A man really requires to know all the conditions in each case.
22. Do you decide, or have you been called upon to decide, a six-hour place?—Yes.
23. Do you know of any objection to giving you the right by statute to determine a six-hour place, and to make your decision enforceable?—No.
24. Do you think that a standard of temperature alone would be more satisfactory than leaving it to the Inspector, with statutory powers to determine and enforce a six-hour place?—I do not think a standard could be made to apply generally. There are many other conditions besides heat which it would be necessary to take into consideration when deciding six-hour places.
25. So that you consider a statutory authority given to the Inspector would be more satisfactory?—Yes, than if there were a standard.
26. *Mr. Reed.*] Will you kindly explain the method of your inspection: do you notify the management that you propose to inspect their property?—No.
27. Do you keep the matter quite private?—I have a considerable amount of other work to do, and sometimes I do not know myself till the morning that I will be able to inspect that day.
28. Do you examine the books?—Occasionally I examine the mine-manager's book, and generally the engine-driver's.
29. And the workmen's inspector's report-book?—No, I have never seen a book containing workmen's inspector's reports. I have their reports, but they are filed.
30. Do you inspect the mine and surface arrangements?—Yes.
31. Thoroughly?—Yes.
32. For what purpose?—To see that everything is safe, and that the Act is complied with.
33. If you observe defects what do you do?—I at once inform the manager.
34. And if he does not comply with your requirements what do you do then?—It depends upon the nature of the defect. If, for instance, I inform the manager that I consider a certain stope is dangerous it does not follow that he need stop it. He can appeal to the Warden against my decision, and in the meantime I have no authority over that stope.

35. Do you think the tribunal composed of the Warden and two assessors is satisfactory?—Personally, I would just as soon the matter came before the Warden alone.

36. Do you find the ventilation of the mines in the Waihi district adequate or inadequate?—I have found it adequate, with a few exceptions, and those exceptions were in the Waihi Mine before they introduced the blower—in the Reptile crosscut, No. 10 level, and the Scorpion crosscut, No. 9 level.

37. Since you became Inspector has the ventilation improved?—Yes.

38. By what means has it been improved?—By the introduction of mechanical ventilation and more connections with winzes and rises.

39. In connection with your reply to the Chairman's question as to the height of stopes, will you make it clear if you mean 8 ft. high above the sollar-boards?—I meant 8 ft. from the bottom of the stopes or solid ground.

40. Do you consider it safe to charge all the holes in a face when only a portion are to be fired at one time?—No.

41. Why?—Because we have had men injured through that being done. On the 17th April a man named Franklin had his arm blown off as the result of that practice.

42. You have submitted to the Commission tables showing temperatures and results of analyses of mine-air, also quantities of mine-air: are these correct to the best of your knowledge and belief?—They are.

43. Are the air samples and temperatures taken generally in doubtful places?—Yes, I have always taken them in doubtful places.

44. What do you do with the mine-air when you have taken samples?—Send them to the Dominion Analyst at Wellington to be tested.

45. Can you inform the Commission of the shade temperature at the Waihi Mine when we visited it in your company on the 21st August?—Wet bulb, 45°; dry bulb, 54°.

46. And on the 25th what did the wet and dry bulbs register outside in the shade?—49° and 50°.

47. What were the differences on those days?—9° on the 21st, and 1° on the 25th.

48. Under the temperature conditions on the 25th was the outside air saturated to within 1°?—Yes.

49. Do you consider the extreme fluctuation to be an important argument against the introduction of a standard temperature in mines?—Yes, I think it would, because the air would not dry in going into the mine; it would be delivered saturated.

50. So that there were 8° difference in saturation on those days?—Yes.

51. When in doubt as to the quality of mine-air what is your practice?—I take a sample and have it tested by the Dominion Analyst in Wellington.

52. How do you account for the fact that the Commission observed drier temperatures in the stopes in the Grand Junction Mine than in the Waihi Mine, notwithstanding that the former mine has mechanical ventilation, while the Waihi has natural ventilation?—It is the result of the natural heat of the country and the mineral in the reef.

53. So that the temperature of a stope would be affected by the quantity of mineral in it?—Yes.

54. Might that make one end of a stope hot and the other end cool?—I have never tried it that way.

55. Have minor accidents at Waihi increased lately?—I should say they had.

56. Do you think they have increased since the Gold-miners' Relief Fund came into operation?—Certainly; I had no data regarding the minor accidents prior to then, but it seems to me that they have increased.

57. Do you think they have increased?—I think so. I have never noticed so many men previously going about with their hands tied up, for instance.

58. To what do you attribute that?—I really could not say.

59. What is the highest percentage by volume of carbon-monoxide which has been found in the Waihi Mine, even under the most unfavourable conditions?—0·0025.

60. Is that the most you have ever ascertained under the most unfavourable conditions in the Waihi Mine?—Yes.

61. What is the maximum percentage of carbon-monoxide which is injurious to a man?—0·01 to 0·02.

62. Whose authority have you for that proportion?—Dr. Haldane's.

63. What does he say on the point?—He says that the symptoms are never noticeable with less than 0·02 per cent.

64. As regards carbon-dioxide, what is the maximum that you have found in the Waihi Mine under the most unfavourable conditions?—No. 1 sample from the face of No. 11 level, which gave 0·37 per cent.

65. Now, what is the standard fixed by the British Royal Commission as the maximum percentage of that gas?—Not to exceed 1·25 per cent.

66. What is the lowest percentage of oxygen found by analysis in any of these mines?—20·3 per cent.

67. What is the standard fixed by the British Royal Commission for oxygen in mine-air?—19 per cent.

68. Now, in connection with these gases, have the worst samples procurable been taken by you and found well within the British standard?—Yes.

69. Did you hear the witnesses say yesterday that there was little or no gas to be found in the mines here?—I did.

70. Now, how is gas produced in a mine—say CO_2, black-damp?—From the country rock, from the mineral, from lights, and from the breathing of men and horses.

71. And if you found no gas what would you attribute that to?—To the adequate ventilation.

72. In your experience, what advantage would be gained by the installation of a large exhaust fan at the Waihi Mine?—It would increase the velocity of the air-current, and would reduce the temperature of the air in the mine to a greater or less extent according to the outside conditions. It would increase the oxygen in the mine, which would vary according to the distance from the intake shaft and outside conditions.

73. The benefits would be that the temperature would be reduced and the oxygen increased?—Yes.

74. How is the Waihi Mine ventilated?—By natural ventilation, with the exceptions I have referred to—the crosscuts in Nos. 9 and 10 levels.

75. How many faces are supplied by natural ventilation?—The whole of the faces except those two.

76. Which are the upcast shafts and which the downcasts?—Nos. 5, 2, and 3 are upcast shafts, and Nos. 4 and 6 are downcasts.

77. Are any means taken to divert the air so as to supply an adequate amount required by the Act into the different working-faces?—There are brattices put in, and also doors.

78. Are these efficient?—I think they could be improved.

79. Have you had any complaints about the brattices being removed or torn down?—I have on several occasions instructed the manager to put up brattices for the purpose of sending the air into the stopes. Afterwards I was told by him that the men had torn them down.

80. What would you suggest to obviate this difficulty?—I would suggest that the doors be fixed.

81. Does the law permit you to order doors if, as you state, the ventilation is adequate?—Well, it is to force the air up into the stopes. That is why I would order the doors to be fixed up.

82. In your opinion, would it be practicable to install a proper system of mechanical ventilation in the Waihi Mine?—It would be impracticable with the present shafts.

83. Is the temperature highest at the lowest levels?—Yes, usually.

84. Will the temperature increase with depth in the Waihi Mine in connection with any future operations?—I think it will.

85. Would mining at a certain depth in that mine be practically impossible owing to the heat of the rocks?—I could not say that.

86. Have you used the hygrometer and anemometer regularly for temperature and air-currents?—Yes.

87. Do you find the temperature in the faces, particularly at the lower levels, decrease as the work of opening up proceeds?—Yes, as soon as they get the winzes through there is a gradual decrease in the temperature.

88. Have you had many complaints about hot places, requiring six-hour shifts?—Yes.

89. What do you do upon receipt of those complaints?—I generally go and see the places and judge the conditions of them myself, and if I consider the conditions are unfit for working eight hours in I give it as a six-hour place.

90. In judging those conditions what do you consider—the presence of air and the absence of gas?—Yes.

91. The changeability of the outside temperature?—I never take the temperature altogether into consideration, but rather the quality and quantity of the air and the position of the working-face. In rises where a man is working over his head all day long, if there is not sufficient air I declare that a six-hour place, and similarly with a winze.

92. So really your standard is what you consider a trying place, and whether it is really harmful to the man to work long in: you consider every feature, and not solely the thermometer?—That is so. I have not always taken the temperature.

93. Are you conversant with the mining regulations of Australian mines with regard to a fixed temperature?—Yes; I could quote them if you wished.

94. Are those regulations applicable to New Zealand mines?—I do not think they are, because we have so much humidity in the atmosphere.

95. Would recent thermal action in volcanic country have any bearing upon the subject?—It seems to have at Waihi, because the rocks are much warmer here than at Karangahake.

96. Are you aware of the reason for the opinion of the recent British Royal Commission?—Yes.

97. Was it favourable to a fixed standard?—No, unfavourable, because they considered the men readily adapted themselves to the circumstances.

98. In New Zealand do you think they readily adapt themselves to the circumstances by resting?—I could not say that. I do not know that they get any great benefit from six-hour places.

99. Now, as regards sanitation, are you acquainted with the system in the Waihi Mine?—I am.

100. How often do you consider the pans should be emptied?—Once every twenty-four hours.

101. Have you anything to suggest to prevent the odour from finding its way into the air-current?—I would suggest that the place should be partitioned off, and a door put on to keep the odour from finding its way into the air-current; also that disinfectants be used.

102. Where would you put the door?—In the crosscut.

103. As to bath-houses, do you consider baths necessary?—I do.

104. Would you recommend that their use should be made compulsory on the men?—Yes.

105. Suppose a man refused to wash himself?—Of course, you can take a horse to water, but you cannot make him drink.

106. Supposing the men would not use the baths, would it not be hard on a small company to have to provide them if they were not used?—Well, the Mining Act says that a company must provide accommodation for the men to dry their clothes, and the extra cost would not be much more.

107. As regards showers, how many men per shower do you think would be reasonable?—About eight, I think.

108. Would you recommend warm showers or cold?—Warm.

109. Have you any other suggestions to offer in regard to bathing-accommodation?—No, I think I have said all that is necessary. Hot water and bathing-accommodation ought to be provided.

110. Have you ever known the men to wash their working-clothes in the hand-basins?—Yes, at the Waihi Mine.

111. Do you consider this practice should be stopped?—I do think so, because at the time there were a number of men suffering from boils, and I think it is liable to spread the contagion to wash clothes and faces in the same basin.

112. If hot water were provided would more men use the baths?—Yes, I think so.

113. In your visits of inspection how do you find the stopes with regard to height?—They vary.

114. Do you find them generally too high?—Yes, too high for the safety of the men.

115. Would you like to have statutory power to enforce greater safety?—I would like to have the power to stop a stope when I considered it unsafe.

116. Have you ever drawn the mine-manager's attention to the danger of high stopes?—Yes, many times.

117. Does the Mining Act give you power to stop a stope if you consider it dangerous?—No, the manager has an appeal against my decision. He can appeal to the Warden.

118. What happens then?—The company gets all the expert evidence, and I have to depend on the miner, who has his bread-and-butter to think of, and consequently is afraid to side with me.

119. Would you recommend that section 261 of the Mining Act should be amended so as to cover high stopes and to prevent them being driven to such a height as would, in your opinion, render them dangerous?—I would.

120. Have you ever known stopes to be taken out on timber after reaching a height of 30 ft. or over?—Yes. When I came into this district some three years and a half ago some of the stopes were in a very bad condition as to height. Since then the company has filled them in, and the stopes are consolidated, and are taken out on timber.

121. Did you have to use your power to get them so taken out?—Yes, I insisted upon it.

122. Do you consider the present system of blocking out with square sets safe for the miners?—Yes, it is a safe and fair system.

123. Did you hear Mr. Gilmour's evidence regarding the quantity of air registered by him in the Waihi Mine?—I did.

124. He stated that 75,836 cubic feet were circulating to the best of his knowledge and belief: have you any reason to doubt that statement?—No.

125. Do you believe it to be a fair and reasonable statement to the best of your knowledge?—I should say it was a true statement, and a fair one.

126. Do you regard the existing regulations in connection with the ventilation of metal-mines satisfactory?—I do.

127. Do you find them workable and applicable to these mines?—I have never had any trouble in regard to them. Wherever there was any difficulty I have called the attention of the management to it.

128. Do you find any difficulty in administering the regulations?—None.

129. Have you ever heard any of the other Inspectors—Mr. Coutts or Mr. Bennie—find fault with the regulations?—No.

130. At the conference of Inspectors held in Waihi under the chairmanship of the Minister of Mines, two years ago last June, were there many Inspectors present?—I think they were all here but one.

131. What was the purpose of that conference?—To endeavour to better the conditions as regards ventilation, safety, and other matters pertaining to mining.

132. Were many of the recommendations of the conference subsequently put on the statute-book?—I do not think they were—not many.

133. Now, with regard to stopes, is it the usual practice throughout the Waihi Mine to keep the passes full of quartz?—Yes, where practicable, they keep the passes full of quartz to avoid accidents, because in the past there was a large number of serious accidents resulting from men falling down these passes. It also enables them to regulate the air-current. When the passes are full the air comes right up and travels across it.

134. How have you found the ladderways up to the stopes during your visits of inspection?—Sometimes I have found the rungs knocked out, the result of throwing down tools.

135. Can you suggest any means for preventing these ladders being destroyed?—Well, I reckon that where the passes are vertical a windlass ought to be fixed on top, or a shoot for sending the tools down to the level.

136. Are you of opinion that shift bosses or managers should examine the backs of stopes on their visits of inspection?—Yes.

137. Have you heard complaints about lifting the heavy timber used in these stopes from the chamber on to the trollies?—Frequently.

138. Can you suggest any other method?—I think, if there were tackle in the chambers, they could get the timber on to the trollies easier than by rolling it up as they do now.

139. Do you know the system they have in the Extended Mine, where they tilt the timber out at the bottom level?—No, I do not know it.

140. Would you recommend that a pulley be installed?—Yes, something to assist the men to lift it.

141. Have you had any experience of electric firing?—Yes; it is not so satisfactory, and since I became Inspector I have had many complaints about the unsatisfactory material. It could not be traced exactly to the fuse, but on one occasion I traced it to a defective cable. Not being well versed in this matter I sent for the Inspector of Explosives to obtain his opinion to see if he could account for the misholes. We overhauled the cable and caps. We took the cable to the surface, and found it was defective. A new cable supplied would only put off a given number of holes, and the Inspector of Explosives gave the men a lesson on joining the wires. He considered there was some fault in connecting up. The men did not take enough care to see that the joint was free from dirt. After that I did not receive so many complaints, but there is only a certain number of holes upon which they can depend to go off.

142. Has electric firing proved satisfactory or unsatisfactory?—Well, it is satisfactory for shafts, because you cannot use fuse, and that is about the only place where I would use it.

143. Are you in favour of shot-firers being appointed?—I think, if shot-firers were appointed, there would be complications. My experience is that a man who bores a hole likes to charge and fire it himself. I do not think that the appointment of shot-firers would please the men. If the hole did not bring down its burden they would consider it was the fault of the shot-firer.

144. How many holes do you consider it safe to spit with fuse?—Not more than six.

145. Have you any knowledge of accidents having been caused by spitting more than that number?—Yes; since I came into this district there have been several such accidents—some fatal, and others serious.

146. In the event of a misfire should the miner charging the hole be the person to report the matter, and either remove or fire the blast?—I think the man who misses the hole should be the man to return and fire it. I will tell you why: the man who charges the hole or holes knows the position of the face when he left it, as well as the directions of the various holes, whereas if another man comes to it he may get on to the gelignite unawares.

147. If that had been done the recent fatality in the Junction Mine would have been avoided?—Yes, I think that man's life would have been spared.

148. And you think the man who blasted the hole would be better able to find its position, and to know whether it had gone off or not, than a stranger from another shift?—I am sure of it.

149. Now, as regards engine-drivers, are you in favour of a second man being at the engine when men are being raised and lowered?—I have never known of an accident happening through the engine-driver being sick or fainting. My experience has been that they will not stand any interference one with another, and it seems to me that if there were two drivers there it would cause accidents rather than prevent them.

150. Do you consider engine-drivers should be medically examined once a year as to eyesight and liability to fits?—Yes, I think it is necessary.

151. You think they should be examined by a doctor, and have a certificate, to be indorsed every twelve months?—A qualified medical man should test their eyesight and see that their hearts are strong, and that they were generally in good health.

152. When more than one hole is fired, and less reports are heard than the number charged, what precautions would you take to avoid accidents?—I consider that the man who charged and fired them ought to go down and make a careful examination to find out which hole has missed.

153. Now, as to machinery and cages, do you inspect the safety-catches and overwinding-hooks and see if they are kept in good order?—I have a test made every quarter in my presence of all machinery under my charge, and I see the catches, grippers, and overwinding gear thoroughly tested.

154. Are all these tests made under working-conditions?—The cage is not full of quartz, but otherwise the test is made under working-conditions.

155. Have you known any grippers fail during your tests?—Yes, when I came into the district first. At that time it was the practice for the men to go round—say, at dinner-time—and examine the gear. But the grippers failed to act sometimes, and I notified the management that for the future I wished the catches tested once a week, and an entry made in the book as to their condition. Since then I do not think I have had any failures.

156. As regards accidents, do you consider the contract system the chief cause of a great number?—I do not think so. A man ought to take as much care of himself when working under that system as if he were on wages.

157. Are the majority of men working on contract?—Yes.

158. As regards signals, what is your opinion of the practice of allowing any man employed to give the signals?—I would not allow a man other than the one appointed for the purpose to do so, except in case of accident.

159. What is your opinion in regard to a uniform code of signals in gold-mines?—A uniform code should be adopted.

160. Do you know the Waihi ward code of signals?—Yes, I know them.

161. Is that a system which you would recommend?—Yes, down to a certain depth—say, 1,000 ft.

162. Was that code unanimously recommended by the conference of Inspectors of Mines?—Yes. I consider it a good code, because it is so satisfactory for changing from one level to another. Supposing you are going to No. 9 level, the number of the level must always be signalled first, and the signal is not so easily misunderstood.

163. Has that ward system worked satisfactorily?—Yes.

164. Is more winding done at Waihi than in any other mine in New Zealand?—Yes, except the coal-mines.

165. Therefore you consider the ward system has had a very adequate test?—Yes.

166. As regards the workmen's inspections, is such inspection of considerable assistance to you?—Well, I rather like the workmen's inspector to go round with me.

167. Do they carry out a very efficient inspection?—Yes.

168. Do they record correctly their opinions, and communicate same to the management?—I believe they do.

169. As regards winding-ropes, would you approve of the use of a spliced winding-rope?—No.

170. Why?—Because I do not think it should be allowed.

171. As regards sinking shafts, and penthouses, would you recommend that the provision of penthouses be made compulsory where cages are working above men—that is, penthouses of stone, timber, or other material?—I would.

172. Do you regard the night shift as more dangerous than the day shift: are accidents more liable to happen then?—Well, the records do not show that more serious accidents happen during the night shift.

173. Have you prepared a statement of verdicts of Coroners' inquests on mining fatalities, with the juries' riders?—I have. [Statement produced. Exhibit 10.]

174. *The Chairman.*] Where is the information taken from?—From my own records.

175. What period does this statement cover?—The period since 1909.

176. From whom did you obtain that data?—From the Coroner.

177. Based upon that statement have you evidence to show that the night shift does not produce more accidents than the day shift?—As far as I can remember, as many fatal accidents occur on the afternoon shift as on the night shift.

178. *Mr. Reed.*] Were you present at the meeting of the Australasian Institute of Mining Engineers held recently in Waihi?—I was.

179. When I read a paper on the ventilation of mines?—Yes.

180. Do you remember if I recommended or condemned the fixing of a statutory standard?—Condemned it.

181. Did a discussion follow the reading of that paper?—Yes, a short one.

182. Was any objection raised to my condemnation of a fixed standard?—I did not hear any.

183. *Mr. Cochrane.*] As to blasting with nitro-glycerine explosives, are you satisfied with the present law?—Yes, I think it is fairly definite as it stands at present.

184. With that one modification—that the man who charges a hole should be the man to go in?—Yes.

185. Have you anything to say as to copper prickers?—There is scarcely any other explosive used but nitro-glycerine compounds, and the Act forbids you to use a copper pricker.

186. You have measured the air in the various main intakes of the mine?—Yes.

187. You heard Mr. Gilmour's evidence?—Yes.

188. As to No. 4, can you tell me what you make the current as you found it at No. 4 shaft at the level?—No.

189. Did you hear Mr. Gilmour state that it was 30,000 cubic feet?—I heard him mention the amount, but I cannot remember what it was.

190. Are you in a position to give any corroborative evidence in regard to that?—No; but still I would not doubt his figures.

191. Would you be able to furnish a statement showing how many miners are supplied by each separate current?—No, I am not. I have never measured the air in the Waihi Mine except when I have been doubtful as to the quantity.

192. And did you on those occasions ascertain the number of men that current had to supply?—No, not in the main levels. The measurements I took in the levels were just to show me what air was going through.

193. Taking the mines in this district, is the ventilation always satisfactory?—Well, occasionally we get complaints, but, on the whole, it is satisfactory.

194. If it were not satisfactory in some cases would you have a difficulty in prosecuting successfully?—I have never had occasion to take legal proceedings, but I think I would have some difficulty. I am doubtful whether I could win a case under Additional General Rule 94.

195. *The Chairman.*] In what way do you consider you would have a difficulty?—In regard to the 100 cubic feet. I scarcely think the rule is definite enough.

196. What would you suggest?—The rule should be so amended that there would be no misunderstanding as to the quantity and where it is to be supplied.

197. *Mr. Cochrane.*] And that means?—100 cubic feet of air for every man employed.

198. In each split or each stope?—In the face.

199. Can you recommend any further provision to be inserted to provide for better air?—I do not know that I can.

200. Let me direct your attention to the question of winzes and rises being kept well advanced to give good air to the stopes?—Yes, I think that should be done.

201. And you consider it falls within the sphere of legislation?—I think it would be a good thing for the mines if a stipulated distance were mentioned.

202. Can you suggest any provision as to keeping the winzes well forward so that the stopes shall not remain long without good air?—The custom here, of course, is to connect the winzes before stoping is commenced.

203. But in some cases we found that is not so: in one instance the men would have to wait six weeks before the winze was down to give them sufficient air?—I consider the winzes ought to be put down to assist the ventilation, and kept well forward.

204. If you find the Act broken how do you proceed?—I generally give the mine-manager a chance. I notify him that he has broken the Act, and in some cases take action.

205. And what do you do in taking action?—First of all I have to state my case to the Under-Secretary and get authority to prosecute.

206. Have you sufficient power at present to deal with ladderways and haulage-roads?—Yes, I think so.

207. Then you said that accidents had increased since the Relief Fund was instituted?—I would like to qualify that statement by saying that prior to the 13th April, when the fund came into operation, I had no record of minor accidents. Since then it is necessary for me to be notified of every accident, and I think they must have increased.

208. Is it not very natural for them to seem to you to increase under those circumstances?—I suppose there would be some slight inducement for the men to remain off work.

209. Do you consider shower-baths sufficient?—Yes. Where rock-drills are in use I think the management should provide showers as well as hand-basins with hot water. It is impossible to get the grease off with cold water.

210. In regard to the height of stopes, do you desire the power to stop any stopes which you consider dangerous?—I do.

211. And not first to have the matter submitted to arbitration?—I want the power to stop them, and compel the management to keep them as I find them until such time as the arbitrators can see them.

212. As to the passes being full of stone, could the same purpose be effected by putting boards on top of the pass?—The boards are always liable to get broken. We have had a number of accidents through men falling down these passes. Since the passes have been kept full we have been free from accidents of that sort.

213. Would that not tend to give a smaller supply of air through the passes being choked up?—I think it is better as regards the air under the present practice, because the air is prevented from short-circuiting.

214. *Mr. Molineaux.*] Can you inform the Commission as to what quantity of air is being delivered by the rock-drills in the Waihi Mine?—The large-size drill would deliver 125 cubic feet of air per minute at 90 lb. pressure, and the same drill at 70 lb. pressure would deliver 97 ft.

215. Can you let us know the total number of days you were engaged on work other than inspection duties?—I can tell you only the total number of days I was inspecting. Up to the end of July this year I had been ninety-seven days in the mines.

216. *Mr. Dowgray.*] I think you stated to Mr. Reed that the condition of the mines had considerably improved since you took charge?—That is my opinion, more especially the Grand Junction.

217. Do you attribute that to a closer inspection on your part?—To my practice of making demands for the regulations to be carried out.

218. And you also stated that the cages were not tested to your satisfaction previously?—They had been tested, according to the Mining Act, once every three months. I found that that was not satisfactory, and have since had them tested once a week.

219. Do you attribute the improvement to closer supervision on your part?—I am not here to praise myself.

220. Who was Inspector of Mines previous to your appointment?—[Question ruled out by Chairman].

221. In regard to this Additional Rule 94, you intimated to Mr. Cochrane that it is not sufficiently clear?—That is, in my opinion. I do not think it is definite enough.

222. *The Chairman.*] Can you give us some idea as to wherein it is lacking: it says 100 cubic feet of air?—That is to "enter the mine," whereas I think provision should be made to compel the men to get the 100 ft. of air in the face.

223. You are prepared to recommend that that clause be altered?—Yes.

224. *Mr. Dowgray.*] In regard to the Court to be set up under section 266—the tribunal for inquiring into accidents—the Warden and two assessors, who shall be the holders of first-class certificates as mine-managers—do you think that position is satisfactory in view of the fact that there is a mine-managers' association formed at the Thames?—I have never known a case where it is detrimental to the miners.

225. Is it reasonable, under those circumstances, to expect such a tribunal to give an unbiassed opinion?—[Question ruled out by Chairman].

226. Do you consider that, in view of the circumstances, a more satisfactory tribunal would be the Warden, one mine-manager, and a representative of the miner's union?—I have never known any objection to the other—the present tribunal. I can only speak as to what I know.

227. In connection with section 261 of the Act, you want greater powers as to stopping stopes and other work?—I think I explained that it would be fairer if I had power to stop the stope until those who were appointed to decide the matter could visit and make an inspection of it.

228. Under the present section the Warden is the arbitrator: is he sufficient?—I think so. My point is that if I stop a stope, and there is any doubt about its safety, the company can object. After that there is an inquiry held, but in the meantime I cannot prevent them from putting men on and altering the conditions.

229. Have you ever had your ruling challenged in regard to the conditions of stopes—in the Waihi Mine, for instance?—Yes.

230. Were you the first to point it out, or was your attention called to it?—I cannot just remember. Probably my attention was directed to it.

231. Was it Butler's stope?—Yes.

232. Did the company on that occasion object to your finding?—Yes; but when they saw that I meant business they withdrew.

233. Was your attention directed to that stope by the workmen's inspector?—Probably it was.

234. Have you made many inspections with the workmen's inspector?—Yes, quite a number.
235. You did not always agree with him?—No.
236. What were the principal subjects upon which you differed?—Probably six-hour places.
237. In reply to a question put by Mr. Cochrane you stated that accidents were on the increase since the coming into operation of the Miners' Relief Fund: is it not a fact that prior to that date you were not in a position to know the number of minor accidents?—I admitted that. I have only had records of them since the 13th April.
238. Still, you said that you would not have thought it possible for there to be so many as you have received advice about?—Also judging by seeing more men about the streets with their hands tied up, and so forth.
239. Do you not think that your attention was more drawn to them because you had to administer the fund—that may have had something to do with it?—Yes, but previously I always made inquiries as to what was the matter.
240. In reply to Mr. Reed on the subject of the temperatures, when your attention was drawn by him to the outside temperature at the Extended Mine being 49° and 50°, you said that the humidity of the air on the surface on a wet day such as the day we were there was an argument against the fixing of a standard temperature?—That would be one reason.
241. Would you be surprised, on consulting your own table, to find that at the 960 ft. level—the bottom of the shaft—the temperature was 79½° wet and 83° dry, so that the humidity of the air had decreased as it descended the shaft?—But you were getting the air there through that crosscut in the Junction.
242. You think that accounts for it?—Yes.
243. We will take the Grand Junction Mine: you have the outside temperature 52° and 55°, a difference of 3°?—That is right.
244. And then you go down the mine, and at Ferguson's stope you get it 64½° and 70½°, a difference of 3° as compared with the surface?—The heat takes the moisture out of the air. I can refer you to stopes in the Junction where you will get 10° difference.
245. Then take Keen's stope: in one end it was 70° wet and 75° dry, a difference of 5°, while on the surface the difference was 3°; in the level there was a difference of 6½°; so that the humidity of the air at the surface cannot possibly have anything to do with the temperature of the air in the mine?—It depends upon the rock through which the air has to pass.
246. Under those circumstances the heat of the rocks would be no different?—That is proof in itself.
247. In regard to shot-firing by electricity, do you not think the unequal resistance of the detonators is responsible for the misfires?—I have had the detonators tried on the surface with the same battery, and in several instances they have gone off. I cannot explain what is the reason. I could not find out.
248. In connection with your interpretation of the British Royal Commission's decision on standard temperatures, do you not think their idea in not fixing a standard was something different to ours here?—I do not know; I have always held that the quantity and quality of the air is of far more importance.
249. That is so; but after reading the report do you not think that the standard they were considering was a standard at which the men could not work at all?—No.
250. The samples of air you took at the levels: you told Mr. Reed that they were taken from the worst places?—Yes, I made that point plain, I think.
251. Did you take any samples from the Mary lode of the Junction Mine?—Yes.
252. After they had been firing?—I took Adams's stope in the Royal level.
253. You did not take any in the Mary. I think one witness said that the Mary was worse than any in the Waihi Mine?—I took it west of the Mary lode for CO_2, and it gave 0·065 per cent.
254. Have you had to make any complaints in regard to the ventilation of the Waihi Mine?—Yes, a good many.
255. You heard Mr. Gilmour give evidence to the effect that his attention had only been drawn to the ventilation in Horan's stope?—He meant that that was the only case where his attention had been drawn to the matter in writing. I do not always give instructions in writing.
256. You have called his attention on several occasions?—Yes, I have spoken to him about such matters on several occasions.
257. He further went on to say that there was sufficient air for twenty-six men there?—No; but I took the air-measurements there myself.
258. With what result?—I found that there was more than ample air, but the stope was closed up when I took it.
259. Do you think the ventilation in the Grand Junction Mine has improved since the installation of the exhaust fan?—I think it has.
260. There is a greater volume of air?—Yes, a greater volume circulating up the levels.
261. Had you any occasion to complain about the ventilation prior to the installation of the fan?—Yes.
262. If you turn to your tables you will find that on the 28th July, 1911, you took a reading of the air in the main crosscut, No. 5 level, and got 21,350 ft., and when the Commission took it the other day they only got 16,293 ft.: how do you account for the difference?—The day would make the difference. It depends upon the surface conditions; it would read more on a fine day.
263. On the 19th January, in the main crosscut, No. 3 level, you got 6,154 ft., and in the same place the other day the Commission got 9,332 ft.: this time the difference is in favour of our reading?—The atmosphere accounted for that.
264. But our readings were taken on the same day, and yet in one case we got less than you and in the other we got more?—The mullock pass might have been open.

265. But it should have had the same effect on your readings: your readings would be taken near the shaft?—Yes, I took them near the shaft.

266. The readings taken at the main crosscut on No. 4 level show a difference of 3,000 cubic feet in our favour?—Of course, I cannot remember the conditions on the day I took mine, but as far as I know they were correctly taken.

267. In connection with the ventilation of mines do you not think it would facilitate matters, so far as you are concerned, if companies were compelled to keep a ventilation-plan after they had commenced operations a given time, showing the air-currents and doors, the plan to be brought up to date, say, once a month?—The position is this: the companies comply with the regulations, and there my duty ceases.

268. But the regulations should be altered. You have said so in regard to one matter?——

269. *The Chairman.*] In regard to that matter of the Act not definitely stating, as you say it does not, that the 100 ft. of air shall be provided in the working-face, has any Court interpreted that that section means only that the air shall enter the mine?—I have never heard of such a case.

270. *Mr. Dowgray.*] So you do not think that if companies were compelled to install ventilating fans it would assist you at all—take the Waihi Mine, for instance?—Well, the Waihi Company has a great many shafts.

271. If they showed the shafts on the plan?—The Act would require to be amended.

272. Would it not be better to have provision made?—Yes, perhaps; but it is not the same as in a coal-mine. You do not have the gas in a coal-mine.

273. But there is excessive heat in a gold-mine, and there is not excessive gas. We had Mr. Gilmour before us, and he could not tell us how these sections were ventilated?—Of course, the Waihi Company has not gone in for a plan system of ventilation.

274. Do you not think they should have a plan to enable you to see how the mine is ventilated?—I do not suppose there would be any harm in it, to show where these splits are.

275. *The Chairman.*] With the system of ventilation in the Waihi Mine could you go into any part of the mine and find out by measurements with any accuracy whether each man was getting his proper quantity of air?—I do not think you could if the best system possible were introduced, because the anemometer will not indicate less than 50 ft. In wide stopes you know by the candle perhaps that there is a draught, but you could not register it. Take, for instance, the Crown Mines when the Commissioners inspected it.

276. Do you know of any way that you could ascertain it?—By calculating the speed of the smoke. You could measure the air-current that way.

277. *Mr. Dowgray.*] Is that a reliable test?—I prefer the anemometer. In some places the smoke travels fast down below. It would be a difficult matter to get the exact reading.

278. *The Chairman.*] Practically speaking, then, the only way is by taking the quantity of air going in and the quantity coming out?—I take the passes underground and measure them, also in the ladderway.

279. *Mr. Dowgray.*] If the company were compelled to have a plan you could trace if anything went wrong?—It is difficult to show all the air-currents of the whole mine.

280. Have they ventilation-plans on the other side?—I do not know.

281. If it were so would you be prepared to put a similar provision in the New Zealand Act?—I have considered the quality and quantity. It is very hard to keep a plan up to date. The system of ventilating is continually changing; that applies more particularly to gold-mines. If you get a winze through it alters the system altogether.

282. Is the system of gold-mining in Australia similar to what it is here?—I do not know.

283. If they have provision there would you recommend it being embodied in our New Zealand Act? We are here to try to improve upon the present system?—I consider the mines here are adequately ventilated.

284. *Mr. Parry.*] In connection with a standard height of stopes you said, in answer to Mr. Reed, that you considered it should be 8 ft. on solid ground?—From the crown of the stope to the back.

285. Supposing the filling was not within 5 ft. of the stope?—It would be too high; it should be brought up.

286. How would you regulate that?—It would regulate itself. At the present time there is no regulation except the contract condition.

287. Do you not think it would be judicious to have a standard height from the solid to the back?—Yes, I would be quite prepared to make a standard height from the solid.

288. It would be easier to keep to?—Yes; I should say 10 ft. from the solid.

289. Is it not a fact that the temperatures in Waihi are on the increase?—I do not think they are—not generally.

290. In regard to the samples of air taken by yourself, did you have them tested to ascertain if there were any other impurities present?—Yes; one lot was taken where I was doubtful of it.

291. So that there may have been other impurities in the other samples?—I do not know what other impurities there could be except dust.

292. In answer to Mr. Reed you said the difference in temperatures in the Waihi and Junction Mines was due to the fact that the rocks in the Waihi Mine were warmer?—Yes, that is so, in the bottom levels.

293. Well, if the Waihi Mine is adequately ventilated, and the rocks there are warmer, how much has the temperature of the rocks in the Junction Mine decreased within the last three or four months?—It has decreased 5° or 6° in one particular part.

294. Would it not be decreased between 4° and 5° where the high temperatures were taken, with the exception of two places?—I suppose it would.

295. Why?—By the connection with the Extended and the crosscut right round to the Empire and back to the shaft.

296. Hence the strong circulation of air has reduced the temperature by 4° or 5°?—Yes.

297. Would that not also apply to the Waihi Mine?—It does apply as they open up.

298. But, still, the temperatures on the average are higher in the Waihi Mine?—Yes, in one or two places.

299. In eighty-seven places in the Waihi Mine there is an average of 79°: do you think you could get an average of fifty places in the Junction as high as 79°?—There are not so many places working in the Junction.

300. Do you think half the places in the Junction would average that?—Yes, probably more than half of them.

301. There were nine places in the Junction where we got an average of over 70°: would those be the warmest places there?—You were in some of the warmest places. There were no temperatures taken at No. 4 level, though.

302. So that, if the difference in the temperatures is thrown off from the rocks, then a larger current of air would reduce the temperature in the Waihi Mine at those places?—Yes, of course, it would.

303. What is your opinion of the connection between the Waihi Mine and the Junction as regards temperatures and better ventilation?—If the connection were made it would increase the velocity of the air-current, no doubt. As regards the smoke I do not know how it would affect the two mines. The weather conditions causes the air to vary. Sometimes it travels one way, and sometimes the other.

304. Supposing a connection were made, would you favour it being made compulsory, with the power vested in the hands of the Inspector, to close the door if the connection were found to be detrimental to the ventilation?—Yes, I think it would be fair to leave it in the hands of the Inspector.

305. Is it not a fact that it is difficult to ascertain the quantity of air in the Waihi Mine owing to the irregularity of the circulation?—Most of the places have the required quantity of air passing through, with only two exceptions, as far as I know.

306. Under the system of ventilation in the Waihi Mine would it not be impossible for you to prove a case against the company for not having the stipulated quantity of air circulating in the faces?—Of course, it would devolve upon me to prove that the air was not there, and, as I pointed out a while ago, it is a very difficult matter to measure it.

307. In the event of your prosecuting the company would it not be impossible for you to prove your case owing to that irregularity: one day there may be more than 100 ft., and only half that quantity on the next day?—I have not found it as bad as that.

308. Is it not a fact that in my presence you have attempted to ascertain the amount of air and found it impossible to get a reading, and we have gone back the next day and obtained a reading?—Yes, that has happened; the same thing happened with the Commission, but you could not say there was no air there.

309. What is the cause of that?—Sometimes it is the cages that affect it; that is what I put it down to.

310. That being so, are not the air-currents irregular?—That air-current was diverted into another course for the time being.

311. Does that not show that they are irregular?—At times they are irregular.

312. Supposing artificial ventilation were provided by means of a fan or blower, under a system of distribution could you not ascertain with greater certainty the amount of air distributed in a particular part of the mine?—No, it would just be about the same; it would be no easier under one system than under the other.

313. Have you ever had reason to speak to the management regarding the use of the knocker-lines by men other than the chamberman?—I cannot remember that I had. I could not tell you.

314. Not at No. 6 shaft?—Yes, I had some reason to complain there. I might state that the men were landing timber there, and anybody was allowed to send the skip away. I made the manager appoint a responsible man.

315. You say that more accidents happen on day shift than on night shift: is it not a fact that there are three times as many men working on day shift as there are on night shift?—I do not know the exact figures, but I suppose there are more men working on day shift than on night shift.

316. That would account for more accidents happening on day shift?—I have never heard the night shift blamed for being the cause of accidents.

317. Do you think a man is capable of looking after himself when working on night shift?—I think, when a man goes underground, it is his first duty to look after himself. I think he ought to have his faculties about him the same on night shift as he has on the day shift.

318. In regard to men washing their clothes in the hand-basins, that was in operation when you made a complaint to the company?—Yes.

319. Do you not think it would be advisable for the companies to provide washing-tubs for the men to wash their dirty clothes on Saturday evenings?—Most of them have places to wash their clothes.

320. What is the cause of their using the hand-basins if they have other places?—I have seen men using the hand-basins who did not seem to know it was wrong to do so.

321. Do you think, if there were adequate room to wash their clothes, they would use the basins?—The clothes should be washed apart from the bath-houses altogether.

322. In regard to a standard temperature, who do you think is the best judge as to the effect of hot places—the man who works there, or a man who comes along with an instrument and takes the temperature?—If it were left to a man himself he would not work more than six hours.

323. Who is the best judge, I ask?—I suppose the man would be the best judge—a man who has had some years experience, and who is acquainted with the conditions; though I do not think it should be left altogether to the man.

324. You think that a man not working in the place is in as good a position to decide the matter?—He ought to know the condition of the place when he enters it.

325. Have you had very much experience of hot places?—I have. I have worked in places where the temperature registered over 90°.

326. Where?—At the Thames.

327. Was that a dry temperature or a saturated temperature?—A saturated temperature.

328. How long did you work in that temperature?—About eighteen months.

329. How long ago was that?—About twenty-six or twenty-seven years ago.

330. What effect did that have upon you?—I should say it was rather warm.

331. Were they in the habit of taking saturated temperatures at that time?—No; but we had a thermometer there for our own information.

332. And did you consider that that temperature was too high to work in? How long were you working in it?—Eight hours.

333. Did you consider that was a long shift?—Well, there were no complaints about the length of the shift.

334. Were you working on wages or for yourself?—On wages.

335. Tell us what effect it had upon you: how did you feel after your day's work was done?—Tired, of course.

336. Did you feel any ill effects at all?—No, I cannot say that I did.

337. Did you work without your shirt?—Yes.

338. And by virtue of that experience which you gained then you contend that you are in a position to decide what effect a temperature has upon a man in any other place?—I do not always take the temperature into consideration; there are other conditions to be taken into account. If there is ample air of good quality I do not consider the temperature so much as I would without good air. I know of places which do not register more than 60° or 65° which I would have no hesitation in making six-hour places.

339. For what, then?—For lack of ventilation.

340. In the Waihi Mine?—No.

341. Have you discovered a place with a temperature of 60° in Waihi which you consider to be a six-hour place?—No.

342. Would it be on account of the gases or not?—Simply on account of a lack of air.

343. You think it is possible for a place to be unfit for a man to work in on account of lack of ventilation and yet be only 60°?—Yes, on account of air conditions—lack of air.

344. And if there was not sufficient air do you think it would not be more than 60°?—Not in the places I have referred to, because the ground was naturally cool.

345. You heard the medical evidence yesterday to the effect that working in hot places is likely to affect the heart?—Yes.

346. Have you heard complaints made by men as to their hearts being affected?—No, not personally.

347. Have you heard complaints at all from miners in Waihi as to working in hot places?—Yes, when I have been in your company I have heard men say it would knock a man out, that it was hot, and so forth.

348. Do you not think that it would be better working in a temperature of 90° on the surface than in the same temperature underground, provided the air were just the same?—Yes, I should say it was.

349. Would you sooner work in a temperature of 70° below than a temperature of 85° or 86° below?—It depends entirely upon the conditions.

350. Everything being favourable?—All things being alike I would take the low temperature.

351. Therefore you would sooner take the low temperature than the higher one?—Yes, the conditions being equal.

352. For instance, in the Waihi Extended Mine, where the temperature taken was 90°, how many hours do you consider a man should work in that place? Do you think that was too severe for a man to work in?—They did not have sufficient air there.

353. Of course, if they had a bigger current of air the temperature of the rock would have been reduced?—It would certainly have been better for the working-conditions if they had a bigger current of air.

354. So that it would not matter if the temperature were 100°, so long as the air-current were good, you would not consider that temperature too high for a man to work in for eight hours—you would not think it detrimental to him?—If the ventilation were satisfactory I should think the men would adapt themselves to the position and work accordingly.

355. Now, then, who is the man to see that they adapt themselves to the conditions?—The mine-manager—the employer.

356. So that the men have not the right to work intermittently?—An experienced manager would never object to a man going out.

357. Do you not think the management would object if men were seen walking about looking for a cool place?—In the Extended I have gone down and seen the men taking a rest.

358. If a man is on contract it is to his detriment to do so from a financial point of view?—Yes.

359. *Mr. Reed.*] There were differences between the readings taken by us in the Grand Junction Mine and yours. Sometimes you got more and sometimes we got more. Supposing a board was left off when one of us took a measurement, would that account for the difference?—Yes, but I believe it was due to natural causes.

360. Supposing the level was blocked up with trucks, might that not reduce the volume of air?—Yes.

361. Would not that air go to another level?—Yes, it would be diverted.

362. Is it not common for such diversions to occur in mines where the air passes through several levels?—I take it that if the air cannot get one way it travels by another.

363. Do you think it is possible to get the same quantity exactly?—No; I think, in order to make sure, you would have to take a number of readings and average them.

364. So that if the air does not go by one conduit it would go by another?—Yes, it would find the easiest way out.

365. As regards contractors taking a spell, have you ever heard a manager refusing a man permission to do so?—Personally, it has never come under my knowledge.

366. Do you know if it is a practice for managers to allow contractors to come up to the levels for a cool?—That I could not say.

367. Would it be necessary for a man to climb 1,000 ft. to get a cool when he is working in a stope?—No, I have never heard of such a thing.

368. Where do they get cool?—In the level.

369. *Mr. Cochrane.*] In regard to these samples sent for analysis of the air, what instructions did you give as to the analysis?—The last lot were for CO and CO_2.

370. And for any other injurious gases?—The first lot were analysed for their contents.

371. For sulphuretted hydrogen?—I did not mention anything.

372. Had such been present in the last lot it would not have been referred to?—Probably not.

373. How long have you been using the hygrometer?—Pretty well ever since I came here in 1909.

374. When did you first use it?—About nine months after I came here.

375. Then, in the case you quoted of the air being saturated at 90°, twenty-six years ago, how did you know that?—From my own experience.

376. Do you think the provision in the Mining Act regarding the 100 ft. of air per man is ambiguous?—Well, it is hard to establish proof.

377. *Mr. Dowgray.*] I am not quite clear as to the position you take up in regard to section 261: would you be in favour of that clause being amended so that you would be the sole arbitrator as to when a place was dangerous, and not refer the matter to the Warden?—That would put a great responsibility on the Inspector, and it does not give the company a chance.

378. *Mr. Parry.*] You heard Mr. Gilmour say yesterday that he thought it would be better if you were to furnish a report on your inspection of the mine: what do you think of that?—I think it would be taking some responsibility off Mr. Gilmour. I do not feel inclined to say that the mine is safe. I might not be out of the mine four hours when an accident happened. A man cannot see the mine in a day.

[Note.—For further Waihi evidence see that of Messrs. W. T. Grace and H. P. Barry, taken in Wellington on the 15th November, 1911, after Hokitika evidence.]

KARANGAHAKE (PUBLIC HALL).—1ST SEPTEMBER, 1911.

MATTHEW PAUL examined.

1. *The Chairman.*] You are Inspector of Mines for the district. You produce tables showing the temperatures and air-currents of the mines in this district?—Yes. These figures relate to the Talisman and Crown Mines. [Exhibit No. 11 put in.]

MICHAEL MARRINER sworn and examined. (No. 40.)

1. *The Chairman.*] What are you?—I am acting-secretary of the Karangahake branch of the Miners' Union.

2. Have you had any mining experience?—Yes, about twenty years; but I have not done any mining now this twenty years.

3. Upon what matters do you wish to address the Commission?—I wish to make a few remarks in regard to the number of accidents which have occurred in this district during the last two years. There have been 156 accidents during that time, from the 10th June, 1909, to the 30th June, 1911.

4. Can you tell us what were the causes of the majority of them?—Falls of earth, strains, and injuries to hands, heads, and every part of a man's anatomy.

5. Have you any first-hand knowledge as to how they occurred?—No, I was not present.

6. How long were the men off work, on an average?—I could not say. I have not gone into that matter.

7. Were there any fatal accidents?—Not during the last two years.

8. How long is it since there was a fatal accident?—The last one occurred in April, 1909.

9. How was it caused?—By an explosion in the Talisman Mine.

10. Do you know the nature of the explosion: was it the result of a misfire or a hangfire?—I cannot say.

11. Have you any suggestion to make as to means or precautions which may be taken to minimize the risk of accidents?—No, I cannot express an opinion on that matter.

12. Is there any other subject you wish to refer to?—No.

WALTER SMITH sworn and examined. (No. 41.)

1. *The Chairman.*] What is your occupation?—I am a miner.
2. How long have you been mining?—About fifteen years.
3. Where?—Principally in Ohinemuri, but part of my time I was at Waiomo.
4. Have you any certificates or do you hold any office in a mine?—I have a first-class mine-manager's certificate, but I do not hold any office in a mine.
5. How long have you held your certificate?—About eighteen months.
6. Which mine are you working in?—The Talisman.
7. As a miner?—Yes.
8. How long have you been in that mine?—I cannot compute the time exactly, but my experience extends over a period of about fourteen years in the mines here.
9. Now, on what matters do you wish to inform the Commission?—I have been delegated by the union to place before the Commission the questions of ventilation and sanitation in the mines. In the first place, the causes of accidents in mining are varied, but I wish to show that lack of ventilation is one of the chief causes. Accidents met with from inhalation of poisonous gases is the subject of special interest to miners on account of their frequent exposure while working underground. The best-ventilated mines are not entirely free from this danger, and as a consequence miners are sometimes overcome by breathing gases collected or generated in stopes or other parts of workings which cannot be wholly purified. I may add that compressed air is good to cause agitation if properly conducted. Miners, as a rule, are taught that wherever the candle will not burn it is not a safe place to enter. While that is so, they should also understand that this test is not infallible. There may be, and often is, an admixture of gases capable of supporting the flame of a candle and yet deadly when inhaled—viz., carbon-monoxide and sulphuretted hydrogen. I may here state that the combination of carbon-monoxide and carbon-dioxide increases their toxicity. Where explosives are used in large quantities, as they are in the mines, there are two gases given off which affect the miners—carbon-dioxide and carbon-monoxide. Monoxide is the one to be feared, because it will support the candle-flame and yet be deadly to the human organism. Therefore I would recommend that where large quantities of explosives are used a provision should be made compelling the use of sprays of lime. That would form carbonates with the gas and render it innocuous.
10. Do you find these gases in the local mines?—They are found everywhere where there is combustion, but I am very pleased to say that carbon-dioxide is not given off in these mines as it is at the Thames. But the truckers are the men most seriously affected as the result of handling the material.
11. What ventilating system would you suggest to improve the conditions for the truckers?—A lime spray or sulphate of iron should be used, as it would form carbonates.
12. Where would you suggest that it be used?—In the face after the material is broken. Considering that health is the first consideration, I think that all the men should be supplied with plenty of air as far as possible. A man breathing down in a mine is quite different to one breathing on the surface. His heart is affected, because he has to breathe perhaps twice as quickly. I have used myself as an experiment during the last five years, and I have found an advantage from deep breathing, the value of which should be impressed upon every miner. This leads to another point: I consider that the carbon-dioxide helps the dust to cause what is known as pneumoconiosis, otherwise known as miners' phthisis or miners' complaint. Therefore, if he can expel the gas from his lungs there is a greater chance of his being able to keep his health for a longer period. In regard to the dust problem I think water should be used with all holes, especially, of course, dry holes. You might, however, get it naturally wet, and then you would not need to use the jet. You cannot force a miner to use the water, and I think, therefore, a provision should be embodied in the law for their own protection. Most of the men are so careless of their health that they say a man is a fool when these things are suggested to them. In regard to the temperature in mines, I do not agree with a system of taking readings in a haphazard manner. I think there is a proper time to take these measurements which would give fair results to everybody. The reading should be taken at noon, for the reason that you then have the mine under ordinary working-conditions. If you take it coming in on the Sunday night shift, when everything is pure and there is nothing to resist it, the ventilation is better, and you get more pure air than you would under proper working-conditions. I wish to say also, in regard to temperatures, that 75° is sufficiently hot for a man to work in under good conditions—that is, the air must be fit for a man to breathe. It should be tested to find out the amount of carbon-dioxide it contains. Then I understand you have been asked to deal with sanitary matters. In this connection we have had a report from Dr. Mason, the Health Officer, in regard to the necessity for the care of sanitary conveniences in mines, and I think all concerned have not evinced the interest that should be taken in the matter. I refer to the men as well as to those representing the owners. The w.c.'s should have proper pans, and there should also be a specialist to look after these things, instead of it being left to the men employed on wages or contract to see that they are emptied. The point I wish to make is that carelessness in regard to these matters is likely to cause ankylostomiasis. It is known in Cornwall and on the Continent, and I want to ask this Commission to make some investigation regarding the matter, as far as New Zealand is concerned, as to whether we have the disease here. I am quite convinced that the flies which infest these places get into miners' cribs, and may deposit the eggs to be hatched inside of the person who eats such cribs. Miners walk through filthy places, where the flies inhabit, and it is possible, when the ladders are climbed, the eggs may leave their boots and get on the rungs of the ladders; the next man would then grasp the rungs, and might transmit the eggs to his mouth.

13. Have you any recommendation to make in regard to the matter?—I consider there should be a searching inquiry made to find if such a thing exists in New Zealand, and, for fear it does exist, provision should be made to enforce the use of proper sanitary arrangements.

14. Are the sanitary arrangements not satisfactory in the mines in Karangahake?—I was not referring to any mines in particular. I am satisfied that the arrangements are better than they have been, but in certain cases they are not what they should be.

15. Are the pans not emptied every day?—Not in every case. It is not done, for instance, in the Crown Mine.

16. How often are they removed there?—As often as the men think fit. They are supposed to empty them, but you know that what is everybody's business is nobody's business, and the result is that the matter is not attended to at all in the long-run.

17. *Mr. Dowgray.*] In connection with ventilation, is there any difficulty in getting each level to ventilate itself?—To overcome the difficulty it might be expensive, but as far as the problem itself is concerned I think it could be overcome.

18. Would you explain how it could be arranged?—By carrying the fumes and bad air direct to the upcast. Unless there was a fan in the shallow mines you would be at the mercy of the atmospheric conditions, but in the deeper mines you could carry the fumes direct to the upcast by an exhaust.

19. If you had an exhaust you would have to have a companion level, or would the top level do for a return?—Of course, it is a difficult thing. If there were fumes coming up there is no reason why they should not be collected by an air sollar or a brattice and taken out direct to the upcast. It is in practice, but not so much in gold-mining.

20. We know it is in practice in coal-mines, but there seems to be a difficulty in connection with gold-mines?—Well, that explains the problem.

21. It is a matter of expense?—Yes, in a coal-mine safety might depend upon methane, and therefore for the safety of the mine it would be taken away.

22. In connection with the ventilation of a mine do you not think it would facilitate matters if the companies were compelled to have a ventilation-plan showing air-currents, and doors, and stoppings?—Yes, you could then point out what improvements could be made.

23. And the workmen's inspector and the Government Inspector could keep themselves familiar with the whole circulation?—Yes.

24. Would you be in favour of a clause being inserted in the Act to that effect?—Yes, because I think it is necessary to show the air-currents in a mine.

25. In connection with sprays, you are in favour of its being made compulsory for the men to use them—they use them in a haphazard fashion now—and a fine should be imposed for not using them?—I do not know about the fine, but I think something should be done. I do not believe in the spray, but a jet should be used.

26. What is your opinion of the necessity for mechanical ventilation in deep mines where the air-currents are not always certain?—They are not always certain. In the summer sometimes you may get 80° outside and 80° inside. You must have some difference to cause a current.

27. And a system which is so uncertain is not reliable?—No, it is not reliable.

28. So, under those conditions, an exhaust should be used?—I am in favour of an exhaust in all cases.

29. What is your opinion of a braceman doing other duties?—I think it is very wrong. If he is appointed braceman he should do nothing else.

30. He should not be called away upon other duties?—No; we have had accidents happen through that.

31. Do you think that no man other than the braceman or chamberman should be allowed to use the knocker-lines?—I certainly do.

32. But it is done?—Yes.

33. Do you think that the little black fly is the fly that causes ankylostomiasis?—In my opinion it is. I have studied this thing for five years.

34. *Mr. Parry.*] In the event of the rock-temperatures being high, and it being impossible to cool them by a current of air, what steps would you take?—I should put cold water on them.

35. Would that not have a tendency to saturate the air?—Yes.

36. Do you think working in a high temperature underground has a bad effect upon a man's constitution?—I think I made that pretty clear before. If he gets the air at 70° it is expanded, and as you expand it you reduce its weight, and consequently you do not get the quality. Therefore you may only get half the oxygen which should be in the air, with the result that there is a severe tax upon the heart.

37. In the event of the temperature being high and the air still being good, do you think that would have an effect upon a man?—The air might be good and expanded, but still it would have an effect upon him.

38. And in those places what would you suggest?—Shorter hours.

39. What temperature would you suggest?—It has been suggested by men who have worked in those places that 75° should be the maximum for eight hours, bank to bank.

40. Would you consider that the readings of the air-currents taken while the cages are not in motion are a fair test of the amount of air delivered into a mine?—No, I would not; there is no resistance against it.

41. What is your opinion about ladderways or travelling-ways for air in those places: do you think they are large enough?—In some cases Yes, in others No. It all depends upon the number of men working there as regards ventilation.

42. Would it be better to deliver a greater quantity of air?—Yes; that is one of the three laws of friction.

43. Do you think that ladderways 2 ft. 6 in. by 2 ft. 6 in. are large enough?—Yes, in some cases, where the steps are small, and where only two or three men are employed.

44. Do you think 2 ft. 6 in. by 2 ft. 6 in. a sufficient size for a travelling-way?—Not for a main travelling-way.

45. What would you suggest as a sufficient size—for air, and taking everything into consideration?—It should be 4 ft. by 4 ft. in order to get a man out in case of accident. I would like to state, however, that in some cases the small ladderway has saved a man's life when he has overbalanced and has been able to touch the sides.

46. What is your opinion about the size of stope-blocks?—My opinion is that they should not be over 100 ft.

47. Why?—Because you have to make such long connections to get through.

48. Is there not also the difficulty of getting your material into those stopes?—Yes, if it has got to come from below.

49. If the blocks are high is there not more likelihood of timber being left out where it should be used?—Yes, because if a man feels exhausted he will not drag a stick up if there is any chance of doing without it, unless he is under strict supervision.

50. What is your opinion *re* shot-firers?—In many cases it would be a good thing—that is, where a large number of holes were to be exploded—but I would not advocate it for a stope where the holes are few.

51. Do you think it would tend to minimize accidents?—Yes, for this reason: we have men coming into the mining communities who are not practised in the use of explosives, and sometimes you find that where a round of holes is being fired there is not 6 in. of fuse to go before a man makes his exit.

52. What is your opinion about the height of stopes: do you think there should be a standard height?—I think you should always have some standard.

53. What would you suggest?—It should never be higher than a man can examine the back, because where it gets to, say, 20 ft. a man has no control over anything above him.

54. Do you think there is any great risk with one man only at the engine when men are being raised and lowered?—That is a debatable question. I have tried to reason it out, and it appears to me that there is a danger in that the man may faint and the engine be left uncontrolled.

55. *The Chairman.*] Have you ever heard or known of an instance of that?—No, I have never known of an accident, but I did hear of a man fainting, though there was no accident. Looking at it in the light of prevention being better than cure it would be a good thing to have a second man.

56. *Mr. Parry.*] What is your opinion about stopes being worked on timber and the filling not being kept up close?—I do not believe in the system.

57. And you suggest a standard height for that reason?—That is not the reason why I do not believe in it. It is because there is a danger of a man falling into space, and also because of the loss of quartz falling into opening and lessening production.

58. Can you suggest a standard height for stopes from the filling to the back?—Making allowance for the accumulation of dirt underfoot I would suggest 10 ft. You would then have full control over the backs.

59. What, in your opinion, is responsible for the major portion of the accidents in Karangahake and Waihi?—The contract system is blamed for them, and that is my opinion.

60. *The Chairman.*] Do you blame the contract system or the contract price?—The contract system and the contract price—one is the cause, and the other is the effect.

61. Does the fault lie with the system or the price?—The system is the cause of it. Men do things to make a living which they should not do. If the system was not in vogue they would not take the risks.

62. Still, you have not given us the reason why the contract system is the cause of the accidents?—The men put in a certain price, which is generally cut fairly fine, and if they find they are not doing too well they work their hardest and neglect precautions which they should take, in order to make, perhaps, an extra shilling per day.

63. Do you consider that the contract system is responsible for the greater rush and carelessness so as to create more danger to themselves than would be caused under the wages system?—Yes, I do.

64. Is it not really the price that is at fault? If they had a better price they would not require to rush matters so much in order to make the same amount of money? Do you think they would rush all the same?—I believe some men would. I am sorry to say I have that feeling myself.

65. *Mr. Parry.*] Do you think men working on 12 o'clock night shift are as capable of taking care of themselves as the men on the day shift?—Some men may be, but most men are not, because some do not get sufficient sleep.

66. Have you worked on 12 o'clock shift yourself?—Not as much as others.

67. Does it have an effect upon your system?—Yes; until I get warmed up to it I feel I would rather stay at home than go to work.

68. *Mr. Cochrane.*] In regard to sulphate-of-iron sprays, what is it you would recommend?—Just what is recommended in the Mining Act—that they be used with the material broken. It is mentioned that where water does not suffice sulphate of iron is to be used, but I do not know that the men get it.

69. Then what you recommend is stricter enforcement?—Yes.

70. Then, as to the using of water compulsorily, where would you specify it should be used?—In rises. In a stope it does not matter.

71. And with rock-drilling machines?—That is what I refer to.

72. Then, as to the temperature of 75° which you consider sufficiently high to work in, would that not have a very far-reaching effect on the working of the mine?—Possibly it would; in some cases better ventilation would be provided.

73. Have you any reason to suppose that ankylostomiasis has appeared in New Zealand?—I have no reason to believe it, but I have taken notice of what took place in Western Australia, where, I understand, they discovered two cases.

74. Are you aware that an investigation on the subject has been made in New Zealand?—No, I am not aware of it. There are things done which are not made known to us.

75. Now, as to the pans for sanitary arrangements, would you make it mandatory in the small mines as well?—I think in the small mines the men should be compelled to go outside if the distance is not too great.

76. Have you had any experience of electric firing?—Not actual experience, but I have been in the vicinity when shots have been fired.

77. *Mr. Reed.*] In addition to your first-class certificate you hold other certificates from the School of Mines, and among them one for ventilation?—Yes, I have a School of Mines certificate for ventilation.

78. And you suggest the lime spray to lay carbon-dioxide in the face?—Yes.

79. Will you tell us where does the carbon-dioxide come from: does it come from the men?—Yes.

80. From candles burning?—Yes.

81. From explosives?—Yes.

82. From fissures in the rocks?—Yes.

83. Where does the most of the carbon-dioxide come from generally?—In our particular case, where there is an absence of the carbonates in the rocks, it comes from the men, the candles, and the explosives.

84. Then, would you spray the men—that would only allay a small proportion of the carbon-dioxide?—A man only gives off 3 or 4 per cent. of carbon-dioxide, which mixes with the air round about him, and after an explosion, when a man is shovelling the material up, he takes the gas down into his system.

85. Would that not be a very small proportion from the men?—Yes.

86. So that the spray would cover only a very small proportion of the gas of the mine?—Yes, it would cover a particular place.

87. What about the trucking-roads and other portions of the mine where there was no water spray?—Well, if you render the gas in the faces innocuous, I do not think there would be so much carboniferous matter in the roads. It would not go along the level.

88. But does not the gas come from places other than the faces?—Yes.

89. How would you get over the difficulty, then?—By exhausting the air properly.

90. And your spray would only apply to the face?—Yes.

91. You stated that most of the accidents are due to the inhalation of gas?—That leads up to the cause of them.

92. What accident here has resulted from the inhalation of gas in your fifteen years' experience? Will you tell us of one?—The accident which occurred to Mr. Clavis.

93. How did it happen?—He went into a winze after firing a round of holes, and I take it that with the carbon-dioxide there was monoxide.

94. How do you know?—From the result.

95. Was an analysis made?—No; the man was the barometer.

96. How can a man detect carbon-dioxide?—By the candle.

97. What percentage of carbon-dioxide is necessary to be observable on a candle?—With from 8 per cent. up to 10 per cent. the candle goes out, and 12 to 14 per cent. causes death.

98. In regard to carbon-monoxide, what proportion is necessary to be observable on a candle?—I have read that it makes the flame more blue.

99. What percentage makes the flame burn more brilliantly?—I am not sure.

100. Are you aware that it is 12 per cent.?—No.

101. Could you tell us what proportion is fatal to life?—One per cent.

102. So is it not a fact that it takes twelve times as much carbon-monoxide to make a flame burn more brilliantly than it does to kill a man?—Yes.

103. As a matter of fact, no man has ever seen it—he would be dead before that?—That is so. But there are other things which would tell you the danger-limit before it reached 12 per cent.—for instance, a live mouse.

104. Have you tried them here?—No.

105. I think I interrupted you when you were describing the accident which was caused to a man by the inhalation of gas: how did it happen?—He fired a round of holes by electricity, and when they went to the winze there was water in it. My own explanation after the occurrence was that, as water takes in volume per volume under ordinary pressure, there must have been an excess of this gas, which the man must have inhaled, and we, not knowing how to render first aid in such a case, allowed it to remain in him. He was overcome by that gas and was choked.

106. Can you tell us another case of an accident being due to inhalation?—I myself have been overcome.

107. Did you suffer an accident?—I fell down a rise.

108. From the inhalation of the gas?—Yes; and that has happened to me on more occasions than one, although I have been able to maintain my presence of mind.

109. You stated, when referring to ventilation, that on the night shift everything is pure: how do you account for that—you were referring to the necessity for taking temperatures at midday?—I hope that the other gentlemen on the Commission have not misunderstood me. I

meant to infer this: that on Sunday night, or Monday morning at 1 o'clock, the air would be in a purer condition, because it would be circulating from Saturday afternoon until Sunday night, and therefore purify and cool the mine.

110. Now, if everything is purer at that time, should not the night shift be the safer?—Not on any other night shift than that, after the mine has been stopped for a day.

111. The night shift, not having as much vitiated air, would be the safer?—That is not so. You have to take into consideration dead-ends.

112. You stated, when speaking of ventilation, that in deep mines the current remains constant?—It is more likely to remain constant in a deep mine than in a shallow mine.

113. What do you call a deep mine—how many hundred feet?—Below sea-level. The Talisman is looked upon as a deep mine.

114. Is the Waihi Mine? There they have natural ventilation, which remains constant?—If you had a temperature of 80° in that mine on a hot day the ventilation would cease if the temperature outside was 80°.

115. In a mine like the Talisman do you think that the natural ventilation is equal to that produced by the two shafts in a mine like the Waihi? The Talisman has an adit and a shaft: are those equally good conditions as compared with the Waihi, where the shafts are on the same level?—You have an upcast shaft in the Talisman.

116. How do you account for the Talisman having such a great circulation of air?—One thing would cause it, and that is the difference in the temperature outside.

117. You recommended the playing of water on the rocks to cool them: in how much of the mine would you apply that water?—That would be a scientific consideration. In the Simplon Tunnel the water from the rocks was 140°, and they reduced that temperature to 70° by applying cold water to the stone.

118. In the Waihi Mine there are twenty miles of ways: would you suggest that the rocks there be all sprayed with water?—I consider that that heat is the result of sulphides.

119. But in the crosscuts there are no sulphides?—After you stopped the cooling system a plentiful supply of ventilation would be provided.

120. Would this deluging of the rocks make the conditions humid?—Yes.

121. Would it make it uncomfortable for the men and truckers?—Yes.

122. Do you not think that a greater volume of air would be better?—Yes, I think so. Therefore, I take it, they would open their levels out properly.

DAVID LEACH sworn and examined. (No. 42.)

1. *The Chairman.*] What are you?—I am a stationer at present, but I have had fourteen years' experience in different branches of mining, chiefly in connection with machinery.

2. How long ago?—Up till three years ago.

3. Do you hold any certificates?—Yes, I have a first-class stationary, a river engine-driver's certificate, and an oil-engine driver's certificate, also a winding-engine driver's certificate.

4. What matters do you wish to lay before the Commission?—I wish to place before you my experience in regard to the health of miners, amongst whom I have lived for the last sixteen years. As an outside observer in the first instance, and as a member of a friendly society since coming here, my attention has been drawn to the great number of accidents which miners suffer. I have not the evidence with me, but I could supply it to show that these lodges here have a greater amount of sickness on their books and a larger percentage of accidents than the average lodge in all other occupations. This is due to the miner being more liable to disease and accident.

5. Could you furnish us with a list of accidents and diseases, showing their exact nature?—Yes, I could get out that information. The accidents cover the whole range of injuries to which the miner is subject, but the great mass of sickness which the lodges have to deal with, apart from actual accidents, is due to lung troubles.

6. Have you had experience in regard to lung troubles during recent periods?—The trouble is becoming more rampant. Up to eight years ago lodges were far better off financially than they are now. The position is getting more and more acute, and in attempting to deal with the difficulty two propositions present themselves—viz., we will either have to increase the contributions or reduce the benefits. That is due to the fact that miners are more liable to accidents than men in other occupations. Other lodges are building up surpluses while we are going behind. I may say that this information is available to the Commission through the reports of the Registrar of Friendly Societies. Another observation I wish to make has reference to the age of miners. Ten years ago there were old men working in the mines, while now there are very few.

7. The average duration of life is diminishing, you think?—Undoubtedly. The nature of the work is more injurious, and therefore old men cannot stand it.

8. Do you think they are forced out by competition or by disease?—I take it that the effects of mining are such that their health is reduced, so that after a certain number of years they are no longer capable of holding their own in the competition.

9. Is working on the night shift more conducive to accidents than working on the day shift?—The accidents point to the fact that a man is not his usual self when working on night shift. His food does not agree with him the same, and he does not get as much sleep. His vitality is much lower, and it is therefore reasonable to suppose that there is a greater chance of accident. A man is more likely to make a mistake. Then, there is one point I would like to make in regard to the men engaged on my own work—that of engine-drivers. I have had as much as five years in succession working seven shifts a week, and at the end of the year I would take a fortnight's holiday. I consider that an engine-driver is at a great disadvantage in that his vitality becomes run down and he gets no holidays, not even the Sundays which are so necessary for every one

of us. I find that engine-drivers are not healthy, and after years of the occupation, particularly working seven shifts a week, they become more or less unhealthy. Engine-rooms should be well ventilated, and in some cases this matter has not been attended to; the same thing applies to stokeholes. Also, in underground engine-rooms there is room for a great deal of improvement—the places are damp and cold; and I think the men should be made fairly comfortable, so as to enable the driver to be always able to work at his best. Electric heaters should be installed in engine-rooms underground, as some form of heating-appliance is necessary for the comfort of the men. Suitable sanitary arrangements should be available near every engine-room, both underground and on the surface, particularly underground, where the men in charge of the engine cannot go away any distance, but must remain within call of the knocker-line all the time. Drivers on winches, in winzes and shafts where there are men working below, should not be called upon to leave their positions at the engine. Where there are not men working below it is not particularly important. Further, the methods of signalling are open to investigation, and I think there should be some better means of communicating between the driver and those below than we have at the present time.

10. Have you had any experience of the use of telephones?—No; but if they were available I think the driver would be able to communicate with the men on each level, which would lessen the risk of accidents. With regard to the extra driver asked for when men are being raised and lowered I think it is absolutely necessary, unless we wait until there is an accident and ten or twelve men are killed when changing shifts. It seems to me, however, that an extra driver will be of no use unless he has some control over the engine apart from the ordinary driver, but I think he could easily be given that control. Supposing I were standing behind the other driver, and anything happened to him, I could only control the engine by grasping the lever of which he has hold. I consider that this extra man should have charge of a single lever connecting with an automatic steam brake and a steam stop-valve, so that by one movement in a fraction of a second the steam could be shut off and the brakes applied immediately by the spare man, because there is very little chance of his being able to do anything with the ordinary working-appliances which are controlled by the other man. Then, I think an improvement ought to be made in connection with the protection of gauge-glasses on boilers. They should be surrounded with a strong guard. This is not a new idea, for they have them in many places. I also wish to say that compressed air is injurious to health. Its manufacture must have a tendency to alter its composition, because it has to be compressed under a very high temperature, and is thus robbed of its moisture. It comes into contact with the various oils that are used, and also with the packing in the joints, and I take it that it is far from suitable or conducive to good health, but rather the reverse. And, seeing that the air is to be breathed by men underground, I think greater care should be taken to secure good air at the intake of the compressors. Sometimes the air is taken from inside the engine-room, where injurious ingredients can get into it. The greatest risk is from the boilers, and the intake air should never be allowed to come into contact with the clinker taken out as the fires are cleaned. The intake should be some distance away from the engine-room. I wish to make one point regarding the danger to be feared from dust when men are working in rises with rock-drills. It seems to me that if sufficient encouragement were given an invention could be brought out in rock-drills supplying a jet of water from within the drill itself. I am told that a drill of this description was brought out, but as it did not cut well its use was discontinued. I think it would be a good idea to experiment with a view to providing an attachment on a drill whereby the water could come from within the drill itself. I place this point before the Commission as one worthy of research, seeing the great amount of danger which results from dust.

11. *Mr. Dowgray.*] What is your opinion in regard to a uniform code of signals?—It is absolutely necessary, because then, when a man once became conversant with that code, whichever mine he went to he would be conversant with them.

12. So that you think that a uniform code of signals should be provided in the Act?—Yes, I do.

JOSEPH MURRAY sworn and examined. (No. 43.)

1. *The Chairman.*] What are you?—A miner.

2. Have you any certificates?—No.

3. How long have you been mining?—Four or five years, off and on, here and on the West Coast.

4. Upon what matters do you wish to address the Commission?—I wish to speak on the subject of prevention of accidents. I consider that stopes should be no higher than, say, 8 ft., so that a man could easily work down with a pick all the loose stone. I consider also that there should be a proper travelling-way up into these stopes, sufficient to let men take steel up and down when working machines. There should be windlasses overhead to haul up the steel and timber. In No. 13 in the Talisman you have to take your steel for your machines up these small travelling-ways; there is no place to haul it up, and it simply has to be passed up from man to man. The top man cannot reach the top of the travelling-way, and he therefore stacks the steel in it, and leaves a small opening for the man to come through. I consider that system is very dangerous, for if the steel falls it will probably sweep all those men down the travelling-way. I would suggest that these travelling-ways should be fitted with windlasses overhead for hauling steel and timber required in a stope. The firing of shots also comes under the heading of accidents, and I think that in all stopes holes should be fired by hand, and not more than five at one time. Further, it is my opinion that after firing miners should not go back until half an hour has elapsed. In all rises, winzes, shafts, and dead-ends the use of the electric battery would prevent accidents. I would also suggest that the companies should provide a sufficient quantity of wooden tamping-bars on each level. I was working in the Talisman up till about seven weeks

ago, and have been in the Crown Mine since then. We found one copper bar there, but there is no such thing as a copper pricker. The copper bar was too heavy, because, in the event of a plug getting stuck down a hole, a man is apt to strike it too heavy a blow; therefore I think wooden bars ought to be used. For tamping nothing should be used but clay or water. The practice of tamping holes with paper, rags, and bags is detrimental to the men's health. In the Talisman I have had to cut up old bags which have contained lime, and when used as tamping it almost smothers you in the stope. Further, I would suggest the appointment of a man on each shift on each level as what is known as a "powder-monkey," to have control over the explosives, to hand out all explosives for use by miners, to get all fuses ready, to put caps on, and take the required amount of explosives to the different places. He should have a book, and insert therein a record of all misfire holes and the exact amount of ammunition that is used. If this were done the number of accidents from misfires would be greatly reduced, because I know from experience in the Talisman Mine on three different occasions I have found jelly* in the face. In fact, my mate one night was picking away in a big stope and picked into a plug of gelignite, which he showed me on the end of his pick. I reported the incident to the man in charge, telling him that the place was unsafe. He made inquiries, and the next morning he told me that the shift following us had not fired at all, though the day shift had done so. He could not, however, find out who was responsible. My reason for suggesting the "powder-monkey" is to prevent that sort of thing happening. He would know whether there was any misfires in any particular stope. We could consult the book when we went on shift before going up into the stope.

5. It should be written up at every change of shift?—Yes. I might mention that it is quite easy to do this; it is done on the West Coast, and works very well indeed. I also consider that the night shift has a great deal to do with accidents. In my own experience previous to coming here I worked only on two shifts—day and afternoon—and immediately after starting here on night shift I found it interfered with my health. It was impossible for me to sleep. I was staying in a boardinghouse and could get no sleep, the consequence being that I frequently went to sleep at crib-time. I think that the size of the trucks is responsible for a lot of accidents on the travelling-roads. In the Crown Mine a man has to push a truck bigger than a dray—in fact, at any rate, it holds more. It is called a "ton" truck. In my opinion no truck should carry more than half a ton. Even with half-ton trucks it takes three of us all we can possibly do to push them.

6. Are the roads uphill?—Yes, and on a curve. Of course, we could fix the road, but on contract system we have not troubled about that.

7. Who has to keep the roads in repair?—The contractor.

8. Who regulates the size of the trucks?—The company. I also consider that the companies should provide first-aid appliances underground on each level, and that in the event of a serious accident the doctor should not remain on the surface, but go below, and be paid by the companies. The doctor should supervise the sufferer's removal to the surface, because there is a complete change of air, and being brought to the surface might give him a shock and so do him harm.

9. Apart from the injury likely to be caused by being removed without first aid being rendered?—Yes; and I contend that the doctor should be the first man to render first aid below. By keeping first-aid appliances and bandages underground blood-poisoning would frequently be prevented.

10. Are the appliances kept on the surface?—I do not know.

11. There has been a suggestion that to keep them below would be injurious to the appliances, and that if they were kept on the surface it would take only ten minutes more to procure them?—I think they should be kept below on the levels within reach of the miners. On the West Coast you have to come to the surface.

12. But to have them in stock on the surface, so that they could be sent down and not become impaired by the dampness by being kept below?—There could be a place made below to prevent anything getting damp. Another matter is that lights should be provided by the companies where it is impossible to carry a naked light. I had an experience of that matter in the Talisman Mine. If you go down to No. 13 there are no lights, and I have seen as many as twelve or fourteen men on the ladders at one time. In consequence of its being dark the men walk on one another's hands, and a man drops his billy, which probably strikes a man below. It is impossible to carry a light there. I consider that bracemen and chambermen should not work at any other occupation, otherwise it is liable to cause accidents. In the Talisman, when miners are entering a cage, I have never seen such a man as a chamberman or braceman. I have seen a part-shift boss and part-shift braceman, who gives a nod to the engine-driver without using the knocker-line. At the bottom one of the men has to use the knocker-line to send the cage back to the surface. I have known a case, when the men were lowered half-way down in a cage, when the knocker-line rung one to the engine-driver, who stopped the cage suddenly. No one on the surface understood what was wrong, and the braceman called down to tell the men to pull the knocker-line. The men refused to do so; it was pulled from the bottom of the shaft, and the cage descended. The braceman told the men afterwards that they were supposed to pull the knocker-line. I remember one incident in the Talisman which would not have occurred if there had been a chamberman at each level. On one occasion we were told that there was water in the bottom of the shaft, but, not knowing how much, six of us entered the cage to go down. The braceman made it his business to be on the surface. We were lowered very slowly, and when we reached the bottom we found ourselves waist deep in water. When getting out of the cage we had to put our heads down, and our faces touched the water. Then we had to wade 100 ft. in it. I do not think any chamberman would stand there up to his waist in water. As to accidents with the

* A common term amongst miners for gelignite.

trucks, I consider the drive should be made larger, so that there would be plenty of room for a truck in motion to pass any one. There have been cases where men have been jammed. As to sanitation, I consider proper pans should be placed on each level and in the proper position. They should be off the ground, and should be cleaned out once at least in every twenty-four hours. The places should have wooden floors. In the particular mine where I am working now there are no sanitary arrangements at all. It lies with the contractors to take the pans below. The stopes are the only places where they are used. In some other parts of the mine the stench would knock you down. We were given orders to take the pans below, and my mate asked who was to empty them, and he was told that he must do so himself. I also know cases where the pans are only 7 ft. or 8 ft. from the places where the men have their crib, and sometimes these pans are left half full for months. Even the bosses tell you that they do not know who is to remove them when you ask if they be shifted. I also consider that a proper place should be provided below for men to have their crib in, and that a box be arranged for the waste paper and waste crib, to be cleaned out twice a week.

13. You say that you have had some experience on the West Coast: are the sanitary arrangements, where provided, regularly used by the miners?—I do not think it is right for me, at this distance, to say anything in regard to them.

14. It has been suggested that the miners have destroyed the pans?—I would not doubt that the pans have been destroyed in this ground by being buried in the stopes, but I have never known the miners destroy them on the West Coast. Another matter I wish to speak on is that of baths. Hot and cold baths should be provided, and basins to wash in. Many a time a man comes off shift with a cut in his hand, and if it is left without being washed blood-poisoning will result. Then, again, the water we use for drinking purposes should be improved. Many of the miners suffer from boils, myself included, and I put it down to the water we drink. I think that good drinking-water should be provided on each level, and should be brought from the surface, and not from any place in the mine, such as is the case at No. 13 in the Talisman. I am in favour of a second engine-driver being appointed, in case of an accident happening to the man in charge. There is no doubt that accidents have occurred which would have been prevented if there had been a second engine-driver. There was a case at the Energetic Mine at Reefton, when a braceman was killed when taking a water-tank below after baling out after the night shift. The driver was there, and after lowering the cage to the level for these men to push the tank off he started again and went up, with the result that one man was smashed to atoms and the other was lucky to escape. I think if an assistant driver had been there the accident would not have occurred. I think the suggestion is a good one.

15. Was not that accident the outcome of an inexperienced man being at the engine rather than an accident to the engine-driver?—That is so. I would suggest that there be some alteration in the law: Under the present Act a man has to practise a certain time hauling mullock prior to receiving his ticket. That should be altered. I would also add that telephones should be installed at each level to communicate with the office on the surface in the event of an accident or for any other cause. As regards firing shots I consider that, instead of the present system of firing at any time and anyhow, all firing should be done at crib-time or at knocking-off time. At present you have to breathe the smoke, whereas if this proposal were given effect to it would prevent the men having to do that. I consider that water should be used in all holes with a rock-drill.

16. *Mr. Dowgray.*] In connection with travelling-ways, can you suggest a suitable width for travelling-ways?—Yes, I would like to see a system of double passes instead of single passes—say, 6 ft. by 3 ft. in the clear, and centred up 8 ft. by 2 ft. A man could travel up those, and the stone could go down the other side. I would like to see bigger passes, which would make it easier to get a man out of the stope in case of accident. They should be 4 ft. by 4 ft. in the places where there are any number of men working.

17. If all ladderways were made 4 ft. by 4 ft. would that meet the case?—Yes.

18. Would you be in favour of the Act being amended so as to compel the companies to have these places lighted by electricity or covered lamp?—Yes; it should be compulsory for them to provide lights in travelling-ways where it is impossible to carry a naked light.

19. In regard to sprays for rock-drills, would you be in favour of compelling the men to use the sprays?—Yes, they should be compelled to use the water when boring any hole with a machine.

20. Would you be in favour of preventing a man from going back to an unexploded charge in less than half an hour?—There is no doubt that it would be very hard to prevent him going back under the contract system, but not on wages.

21. Would you be prepared to suggest that a penalty be provided for a man going back under half an hour?—I would go this far: I would put the man out of the mine altogether if he went back in less than half an hour.

22. It would be much more effective to appeal to a man's pocket than to his brains. Do you not think a fine would appeal to him better?—No; I would send him out of the mine.

23. Suppose you provided a penalty of £10 for each offence?—It might work, but I have my doubts about it. I would agree to your suggestion if I thought it were workable.

24. Is this system of shot-firing of which you speak in vogue in Reefton?—Yes, in the Consolidated and pretty well all the other mines, I think, the "powder-monkey" is in vogue.

25. *Mr. Parry.*] What is your idea of the system of district shot-firers?—I like the idea, but I think the man should be an expert with the battery—he should do nothing else.

26. But the idea is for the district shot-firers to load and fire all holes, and to have all the handling of dynamite?—I do not think it would work. You would find that it was impossible to control the ammunition and charge and fire all the holes; it is too much to expect one man to do.

27. Do you not think it would minimize the risk of accidents if only one man was held responsible for the loading and firing?—Yes, I do.

28. But you do not think it would be workable?—I would like to see the system, but I think the man with the battery should only have to connect his cable. I think that the "powder-monkey" should handle the fracture.

29. Have you had any experience of working in hot places?—Yes, I have worked in 82°, when the Inspector of Mines and the workmen's inspector were there. It was a very dry place in a dead-end.

30. And did it have any effect upon you?—Yes, it did. I used to get giddy, and I felt my heart beating quicker. Also, one feels as though one wants to lie down rather than work.

31. What is your opinion of a standard temperature being fixed?—Judging from that experience, if the temperature was 82° there, then I would make 70° the maximum for an eight-hour place.

32. And when it becomes over 70°?—It should be a six-hour shift.

33. Have you worked in any wet places where you have made use of oilers?—No, except when repairing the shaft.

34. Did you use oilers there?—Yes.

35. Are they convenient to work in?—No; you are hot underneath them and cold outside. A man perspires a lot, and you are saturated to the skin.

36. What do you think should be done when it is necessary to wear an oiler?—I consider that you should reduce the hours of work.

37. Do you think a man would take advantage of that simply to get a reduction of hours?—No.

38. What is your opinion about the system of bulling holes: do you think it is detrimental to a man's health?—Yes.

39. *Mr. Reed.*] With regard to the accident to Reginald Watts at the Energetic Mine to which you referred, was not Clarkin, the engine-driver, to blame?—That is so.

40. Was not the accident due to the winder raising the cage when they were getting the tank off?—Well, it came out in evidence that the cage was at the level, and they were getting out of it to remove the tank when Plummer lifted the cage another 50 ft.

41. The driver made the mistake of raising instead of lowering it?—He made a mistake by shifting it at all.

42. Was the certificated driver standing by at the time?—He was there, but he had no control over the engine. I am not sure if Plummer was a certificated driver.

43. The important point is that the two men killed Watts between them, and that one of them was a certificated man?—That is so, but he had no control over the engine.

44. What is the difference between that engine and an ordinary engine?—My contention is that the man standing by should have control over the steam in the event of the other man making a mistake.

45. Does that accident not prove that two men cannot do any better than one?—I think if Clarkin had had control he would have stopped the engine when he saw what he was doing. Immediately Plummer lifted the cage the other man reversed the engine and cut the man up worse.

46. Is that not an argument against having two men at the engine?—Clarkin should have had power to stop the engine altogether.

47. But would not Clarkin have been better to have been there by himself?—Yes, in that particular case.

48. Can you tell me of a case where a driver has taken a fit when in charge of his engine?—No.

49. Now, in this case where Watts was killed, there were two drivers: would you recommend two drivers or one driver?—Two drivers; but Plummer was no driver.

50. Was he winding?—He had not passed for a ticket. He was a very poor driver. Ticket or no ticket, he ought to have lost his position.

51. Should not Clarkin have taken charge of the engine?—It was impossible if the other man had hold of the levers.

52. Supposing a man is taken ill with his hands on the levers, how could the second man control it?—If he had control over the steam.

53. He did not do it in this instance?—But there was no such thing provided in that machinery.

54. So you would provide an alteration in the winding-engine generally?—So that the assistant engine-driver should have complete control over the steam or air separate from the driver.

55. *The Chairman.*] Do you know why he raised the cage: was it that he misunderstood the signal, or was the signal ever given?—There was no signal, because both the braceman and the chamberman were in the cage with the tank. Previous to going down they called out "All right," and there were no signals given at all. These men went to get out at the level.

56. Was there any misunderstanding?—There was a misunderstanding about Plummer shifting the cage.

57. It was not a mistaken signal?—I do not think there was any mistake about a signal from what I gathered.

58. *Mr. Parry.*] Was the man at the handle a certificated man?—No. The man at the lever was getting practice. If the other man had been at the handle it would not have happened.

59. You suggest two certificated men should be there?—Yes.

60. *The Chairman.*] Can you say how long the cage was stationary before he wanted it up?—No, I cannot tell you. It is some time ago now, and I only know what I remember reading of the case, but I think it was only a few minutes, as the second man had not got out of the tank.

61. So far as you know these men who were at the engine lifted the cage without either signal or sufficient reason?—He mistook the signal, which was to lower, and he lifted.

62. So that, practically, it was a mistaken signal by an inexperienced driver?—Yes.

63. *Mr. Molineaux.*] You consider that there should be two certificated drivers when changing shifts?—I do.

64. And you also consider that all winding-engines should be so altered so that both men should have complete control at the same time?—Yes, the driver should work the levers and the cage, and the assistant driver should have control over him, so that in the event of anything happening to the driver the assistant could shut off steam and, if necessary, apply an automatic brake.

65. You think there should be appliances so that two men would have complete control over the engine at the same time?—Yes. I consider that the driver should control the shutting-off of the steam, and, if necessary, also apply an automatic brake.

DANIEL JOHN O'NEILL sworn and examined. (No. 44.)

1. *The Chairman.*] What are you?—A miner.

2. Do you hold any certificates of any kind?—No.

3. On what matters do you wish to address the Commission?—Accidents, hot places, and sanitation. Stopes should not be more than 8 ft. high, so that a man can work down the ground with a bar. Travelling-ways should not be less than 4 ft., to enable timber and steel to be got into the stopes, as it is very dangerous in the present small places. A man often requires a stick, and it is too hard to go down to get it up. Then it is left untimbered, and the next shift meets with an accident. I also consider that all shots in winzes, rises, shafts, and drives should be fired by electric battery. In stopes not more than five holes to be fired at a time. The battery should not be used in a stope, because it endangers the walls by the concussion. If fourteen or fifteen holes are fired at once it makes the ground loose. Also, the company should provide a sufficient quantity of tamping-bars. One accident occurred in the Talisman Mine two years ago by a man using a copper tamping-bar. A supply of wooden bars should be provided at each level. This man was tamping a hole in a rise when the plug got jammed and it went off; it was not a very serious one, but it would have been if he had had more gelignite in the hole. I also consider that the night shift has a bad effect on a man's health. The soft country works a great deal more at night than in any other shift. I do not know why, but it is so.

4. Is it not that you notice it more because there is less noise?—I have seen the ground in a soft country falling more on night shift than on any other shift. I also consider that trucks should not be more than half a ton, and drives should be made so as to give enough clearance for men to pass the trucks while they are in motion. One of the men has been crushed by trucks since Christmas, but not badly hurt. If it had been a few inches smaller he would have had his chest crushed in. I also want to say that the doctors should go below whenever serious accidents occur, as the shock to a man being brought from a hot place to the surface without proper care is dangerous to him. Further, all first-aid appliances should be left in a box in a magazine or some other place underground for use.

5. Is the doctor employed by the company?—I do not know.

6. How would you suggest the doctor be compelled to go below?—That the company should pay him to do so in all cases of serious accidents.

7. How would you make it compulsory except by contract with the doctor?—When the company were applying for a medical man the friendly society and the company could explain to him that it would be necessary for him to go underground in case of serious accident. The braceman and chamberman should not be employed at any other occupation but at the brace and chamber. I also consider that the depth of stoping-blocks should not be more than 100 ft., because if a block is, say, 200 ft. through, it is far more dangerous to put the rise through to the next level than it would be to put it through 100 ft. It is difficult to get men to go and work in these rises more than 100 ft.; it is almost impossible to get men to work in them, because the ventilation is not so good. I also consider the rises should not be more than 80 ft. apart.

8. With what object?—It would give better ventilation. When a man is working, say, with the rises 200 ft. or 300 ft. apart in a dead-end, he gets very bad air. I also consider that a standard temperature should be fixed at 75° dry and 70° wet.

9. Do you understand the difference between the wet and the dry bulb?—I understand this much: that where it was 80° wet bulb I have found it very difficult to work at shovelling.

10. Have you seen the temperature taken with the wet bulb?—No; but I have known miners ask the Inspector, and he has told them it was 79°, 80°, and 81°.

11. Has he given the wet-bulb temperature?—No, I think it was 80° dry.

12. So that you have had no experience of hot places where the wet-bulb temperature was taken?—No. I want to say, in regard to ventilation, that I think the best means possible should be used to get the bad air out of dead-ends.

13. You are not an authority as to the best method?—No. In regard to tamping I consider that only clay and water tamping should be used. It should also be compulsory on the men to use the spray in machine holes. I also say that no man should be allowed to return to the face before half an hour after firing shots.

14. Does it make any difference how many shots you fire?—Well, the most I have seen is about ten, but, of course, that is not a round of machine holes. You are not able to sleep for the effect of the fumes. I also consider that proper sanitary pans should be provided in each level, and cleaned out by the company at least once in every twenty-four hours. This is not done here. The bosses here tell you to empty them yourself, but most of the men refuse to do so. I also want to see crib-boxes installed and cleaned out by the company.

15. And what about their use by the miners? I have seen scraps scattered all over the place; the miners do not use them even when they are provided?—I have never seen crib-boxes. It should be made compulsory on the men to use the crib-boxes. The men should be protected against themselves: they should be made to use them. I also consider that hot and cold water should be installed in the change-houses, and that one bath be provided for every ten men, and one basin for every five men.

16. And, generally, do you think that where it is made compulsory on the companies to provide them it should also be compulsory on the men to use them?—The men here go into the change-houses. I have seen very few men going home to change. Sometimes, however, when a man goes in to change, he finds he has no clothes to wear—somebody else has taken them. Then the drying arrangements are bad, and the clothes get burnt. I am also in favour of a drinking-receptacle being placed in each level, and water supplied from the surface, with a proper tank with an airtight lid on it. I would also like to ask the Commission to take steps to have the subject of ankylostomiasis investigated by the Government. Further, I think that all engines should be fitted with an automatic brake, or that an assistant engine-driver be appointed.

17. That is, on the lines suggested by Mr. Leach?—Yes. I also consider that there should be a telephone installed in each level, so as to be in communication with the driver in case of accident or when men require a cage when the braceman was not there. Also, I would recommend that the telephone be connected with the doctor's house in case of accident.

18. *Mr. Parry.*] Do you think it would cost very much more to supply the mine with drinking-water from the town supply?—I have no idea of the expense. There is plenty of water apart from the town supply.

19. *Mr. Fletcher.*] Have you a doctor resident here?—Yes.

20. By whom is he employed to look after the men at the mine?—I do not know who employs him.

21. Have you a medical association here?—No, none that I know of.

22. Supposing that there were a medical association, and the owners subsidized it to assist the miners to get a good doctor, would the workmen be agreeable for some of the companies' officials to be represented on the committee?—I am not in a position to say what the men would be prepared to do.

FREDERICK CHALLIS sworn and examined. (No. 45.)

1. *The Chairman.*] What are you?—A miner.

2. How long have you been mining?—Seventeen years.

3. Have you any certificates?—No.

4. Where have you gained your experience?—At Thames and Ohinemuri.

5. Upon what matters do you wish to address the Commission?—I might state that I agree generally with everything which has been said by previous witnesses, and I simply wish to enlarge upon one or two matters.

6. What are the particular points which you wish to deal with?—First of all, in regard to the height of stopes, I am of opinion that they should not be more than 10 ft. from the solid, which would leave about 8 ft. of material to work upon, and that all stopes should be filled instead of using timber for taking out the material. Also, all shots in rises, winzes, shafts where rock-drills are used, and drives should be fired by electricity, and shots in stopes should be fired by hand.

7. That is a recommendation?—Yes, that should be made compulsory, and that any rise which exceeds 50 ft. should be fired by the electric battery. There should be an experienced man to operate these batteries and to fire the charges. As regards the night shift I think it should be abolished altogether, because a man who goes to work on night shift is not physically fit. I think the officials of the company will agree with me that such men are not fit to do their work. After they have done their work they cannot get their sleep or eat their food. All stoping-blocks should be not more than 100 ft. apart—that is, from level to level—because where there is a greater distance than that the men have trouble in getting a sufficient quantity of air into where they are working. At the present time we have here stoping-blocks which run into 200 ft., and the men in them have a poor chance of getting sufficient ventilation before their rises are through. Further, there are very few men who care to work these long rises, on account of not having sufficient air. There should also be assisted ventilation in all dead-ends. A proper receptacle for holding water for drinking purposes in each level, with a pannikin or some other utensil, should be provided.

8. *Mr. Parry.*] In regard to winze-sinking, what is your opinion as to the necessity, when a winze becomes over a certain depth, for steam winches to be installed with a view to minimizing the risk of accident?—Air winches or steam winches should be put in these winzes to get the material out, and for the man also.

9. Is there not a special air-winch constructed for that purpose?—I think so.

10. *Mr. Molineaux.*] Have you had any experience of firing with electricity?—Yes, a little.

11. Do you think it is safer than ordinary fuse in certain places?—Yes, I would make it compulsory to use it in certain places. We often have as many as thirty or forty holes to fire, and it means that a man has to go backwards and forwards into the fumes, whereas if electricity were used that difficulty would be overcome by firing the whole place out at once.

12. Are not misfires one of the greatest dangers in connection with explosives?—They are.

13. How can you tell in a round of holes fired by the fuse if you have had a misfire?—The man can tell by counting his holes; he knows how many there are.

14. So that with the ordinary fuse he can tell?—But with the electricity the danger would be minimized. There would be no fire attached to the charge once the electricity was disconnected. There would be no more danger except that the explosive would be there.

15. Is that not a very considerable danger?—I think there is the same danger with the fuse.

16. If you were going back into a stope where you knew there was a misfire you would be more careful?—Undoubtedly.

17. You have not that advantage if electricity is used?—As a rule, when working in a stope or rise, a man generally looks to see if there are any misholes, but in a shaft he cannot find out, because as a rule the charge is buried.

18. In a stope the collar of your hole may be cut away, but the charge may remain inside?—Yes, that happens very often, but still a man can generally detect the presence of the charge.

19. In what way?—When the collar is blown out it leaves a vent and shows where the hole was. Then you can use your water to wash out the place and find the charge if it is there.

20. In spite of the difficulty of discovering whether there has been a misfire you still consider electricity the safer?—Yes, I think the majority of accidents have happened through firing by hand, where the men have not sufficient time to get away from their charges.

21. You object to rises being 200 ft.?—Yes.

22. Are not winzes generally put down to meet these rises?—Well, in many cases they are, but I think that if a rise can be carried through without sinking at all they generally do it.

23. I understood you to say that your objection to these high rises was that they are not adequately ventilated?—That is so. There is not sufficient ventilation apart from the compressed air with the machines, and that is not good for a man.

24. Then it is actually a question of ventilation?—Yes. Where the man can get sufficient air it is right enough for him to work.

25. What would you consider sufficient air?—I am not capable of dealing with that point, but when a candle will not burn it is time to get away.

26. Have you ever worked under those conditions?—I have worked under conditions which went very close to putting the light out.

27. That is not a common occurrence?—Rather a common occurrence, I should say.

28. In the mine you are working in at the present time?—I believe so. I have not had the doubtful pleasure of working in very many rises, but my experience has not been too good.

29. You consider that 10 ft. should be the standard height for stopes?—I mean from the solid, which would mean about 8 ft. of material to work.

30. Would you make that compulsory?—Yes, because it would give a man a better chance of testing the back of his stope. He would be able to work down all the loose stuff.

31. What do you consider should be the penalty for breaking that rule?—A man should be put out of the mine for doing so.

32. Who are the worst offenders in this matter, the contractors or the working-men?—Well, I think they are all blamable.

33. Have you considered the other alternative—namely, that the height of a stope be decided by the Inspector of Mines?—Well, it would be a good thing for the Inspector to work on this rule. At the present time he has no standard height. If the men knew it was the law I do not think they would infringe it. They may do so in the Inspector's absence, but I doubt it.

34. You mean to say that you think the Inspector is not a good judge as to whether the ground is safe or not?—I think the miner best understands the safety of the ground. It stands to reason that the man who works the place is the man who should know it best.

35. Even though the man may have been working only for a few months?—I meant an experienced miner.

36. What proportion of the men are experienced miners?—I am not prepared to say.

37. Are half of them experienced?—I should say so.

38. You would not say that a greater percentage than that are experienced?—I would not like to say one way or the other.

39. *Mr. Reed.*] Those miners who are not experienced would be trusting to luck?—Well, as a rule, an inexperienced man is generally put with a man who knows something.

40. Always?—I do not know.

41. Then if two inexperienced men get together?—I do not know.

42. Would it not be better to trust to the Inspector than to work on your rule?—Of course, I am not trying to run down the abilities of the Inspector. When I made the statement that a man should know his place best I meant an experienced miner; but when you put it that two inexperienced men may be working together I do not know how to get over the difficulty.

43. You know No. 13 level in the Talisman: there is a pipe goes down there with drinking-water: is that good water?—We are led to believe so. My experience in No. 13 level only covers about two months; but as the result of either the temperature or the water I came out in a mass of boils and pimples.

44. Did the water do that?—I believe so.

45. Now, you recommended an open receptacle for the water: would that not also become warm?—I think a tap would be the best.

46. As to the open receptacle, what is to stop bacteria from getting in?—That suggestion was an oversight on my part.

47. If you had said a tank covered that would have been sound?—Yes.

48. And as to the pannikin, is it wise to use one?—No.

49. A closed pipe carrying fresh water is better than a receptacle of any kind?—Would you suggest that every one should drink at a tap?

50. But you do not put your mouth to the tap?—The average man does, I think.

51. Well, he ought to have more sense?—I think so, too.

52. *Mr. Parry.*] As to your suggestion of a standard height for stopes, would it not tend to protect the inexperienced man?—I think it would.

53. In regard to the high blocks, is not the great distance timber has to be hauled the cause of men doing without timber?—Yes, I think in many cases men do without timber because it has to be hauled so far.

HENRY MARSHALL sworn and examined. (No. 46.)

1. *The Chairman.*] What are you?—A miner. I am also chairman of the Karangahake Miners' Union.

2. Which mine are you working in?—The Talisman.

3. How many years' mining experience have you had?—Twenty-six.

4. Where was it gained?—In Ohinemuri, Te Aroha, and Australia.

5. On what matters do you wish to address the Commission? The views of the miners have been put fairly fully by the previous witnesses, and unless you have something to add it will have the same effect if you merely corroborate their statements?—Yes, I am prepared to corroborate them. I wish to say also, however, that the proposals made to the Commission were discussed by the miners' union and decided upon at a meeting of the union. They are as follows: "Accidents: Height of stopes to be not more than 10 ft. from the solid. Travelling-ways to be not less than 4 ft. by 4 ft. All rises, winzes, shafts, and drives to be fired by electric battery; and stopes to be fired by hand, not more than five holes to be fired at one time. Companies to supply sufficient quantity of wooden tamping-bars. That men be appointed to take charge of all explosives, and all misholes to be reported to these persons on each level. Night shift: That night shift be abolished, on account of ground being more dangerous and also physical conditions. Trucks: Not more than half-ton trucks to be used in any mine, and drives to be made to give clearance for men to pass while trucks in motion. First aid and doctor: That company provide doctor to visit mine to give first aid to men meeting with serious accidents underground. Lights: Company to provide lights in mines where it is impossible to carry naked light. Bracemen and chambermen: Not to be employed in any other occupation. Ventilation: Depth of stoping-blocks not to be more than 100 ft. Temperature: That standard be fixed at 75° dry and 70° wet. In all dead-ends assisted ventilation be used. Miners' complaint: That only clay and water be used for tamping, and it be compulsory for men to use sprays in all dry holes. That men be not allowed to return to face less than half an hour after firing (that refers to firing machine holes and not hand holes). Sanitation: That proper sanitary pans be provided at each level, and cleaned by the company at least once in every twenty-four hours. Waste crib-boxes to be installed and kept clean by the company. Change-houses: That hot and cold water be installed with baths, and that one bath be supplied to every ten men on a shift, and one basin to every five. Drinking-water to be provided at each level. All engines to be fitted with automatic brakes, and, if not, an assistant driver to be in attendance when winding men. Telephones to be installed in case of accidents in all levels in mines."

6. How many miners have you in your union?—In our branch we have 425 members.

7. How many were present at that meeting?—About eighty; the hall was full.

8. Was the resolution unanimously agreed to?—Yes, there was not a dissentient voice.

9. Were the proposals discussed?—Yes, it took till nearly 12 o'clock to finish the business.

10. And you think these are the views of the miners in the field?—Yes, I do.

11. *Mr. Parry.*] As a man who has had a good deal of experience in this district, what do you think is the cause of the major portion of the accidents?—There is no doubt that the contract system is responsible for most of them.

12. Why?—Because the payment depends upon the amount of quartz a man gets out, and if he stops to put in timber it reduces the quantity of quartz got out.

13. Then the men are careless when working under the contract system?—Yes, undoubtedly.

MATTHEW PAUL sworn and examined. (No. 47.)

1. *Mr. Parry.*] Do you think it would minimize accidents a good deal if the men had winches installed in winzes over a certain depth?—I rather think it would be a considerable saving to the men. I have a good deal of sympathy with the men working in deep winzes, and I think if air-winches were provided it would tend to save the workmen.

2. *Mr. Reed.*] It has been stated that the night shift is responsible for more accidents than the day shift. Now, I have before me your annual report to the Government for the last year, which contains a list of accidents in your district. I will quote you the names of the men injured, and will ask you to tell the Commission, with particulars, when accidents happened. F. Whyte and J. O'Malley were killed by falling down the pumping-compartment of the No. 4 shaft at the Waihi Mine, day shift. George Henesy was killed in the morning at the Waihi Company's Victoria mill. Charles Cavanagh died from injuries received by falling down No. 6 shaft at the Waihi Mine?—I do not know when that accident occurred, but I think it was in the evening time.

3. Matthew Berryman was killed by falling out of a cage in the Waihi No. 2 shaft?—Yes, that was when coming up in the day shift.

4. J. C. Chapman was caught in the machinery at the Waihi mill?—I do not know, but I think that was in the day shift.

5. When did the accidents to Thomson and Dyer happen?—On the day shift.

6. The accident to Lucas?—I do not know which shift that was on.

7. The accident to Walker occurred on which shift?—Day shift.

8. Proban's accident?—Day shift.

9. Mark's accident?—Day shift.

10. Currie's accident?—Day shift.

11. Gribble's accident?—I do not know which shift.

12. McIntyre's accident?—I am not able to say which shift it occurred on.

13. McClymont's accident?—Afternoon shift.

14. Brown's accident?—Afternoon shift.

15. Does not that positively refute the statement that the majority of accidents happen in the night shift?—I say the majority of them in 1910 occurred in the day shift.

16. Is that a correct statement?—Yes.

17. None of them occurred on the night shift?—No.

18. Is the statement true or untrue that the majority occur on the night shift?—It is untrue so far as my experience goes.

19. *Mr. Parry.*] Coming to 1911, what fatal accidents have taken place in 1911?—In my district there have been three.

20. At what time did they occur?—The accident in the Grand Junction to Anderson occurred between 8 and 11 o'clock on the day shift.

21. And the others?—The accident to James Samson was in the night shift in the Waihi Mine.

22. And the other one which happened to Bullock?—It was a blasting accident, and happened in the day shift.

23. Taking, now, the serious accidents for 1911?—I am not prepared to give that data without consulting my registers.

24. The accident to Moran was a serious one, which occurred in the 12 o'clock shift?—I could not say.

25. As regards the accidents in the night shifts, is it not a fact that the great number of the accidents in 1911 compares very unfavourably with the previous year, when you consider the number of men working on the night shift?—I cannot say without the records.

26. Is it not a fact there are not a quarter as many men on the night shift as there are on the day and afternoon shift?—That is so; most of the men are employed on the day shift.

27. So that that would account for the number of accidents on the day shifts as compared with those on the night shift?—I do not know.

AUCKLAND (MAYOR'S ROOM, MUNICIPAL BUILDINGS), 4TH SEPTEMBER, 1911.

MATTHEW PAUL examined.

1. *The Chairman.*] You are Inspector of Mines for the Coromandel District?—Yes, the inspection of the mines at Coromandel is part of my duties.

2. You produce a list of the temperatures taken by you in the Coromandel mines?—Yes. [Exhibit No. 11 put in.]

JOHN PICKERING PRESCOTT sworn and examined. (No. 48.)

1. *The Chairman.*] What are you?—I am secretary of the Miners' Union at Coromandel.

2. Are you a miner by occupation?—Yes.

3. How many years' experience have you had?—Sixteen or seventeen.

4. Do you hold any certificates or any office in connection with the mine?—No.

5. Which mine are you working in?—The Hauraki Reefs.

6. How long have you been there?—About two months in that mine.

7. Previous to that where were you working?—I have worked in all the mines in Coromandel.

8. Is your experience confined to Coromandel?—No; I have also been mining in New South Wales.

9. You are aware of the scope of our inquiries: have you any information to lay before the Commission, or any suggestions to offer, say, as to ventilation?—Yes, I think that in most of the mines at Coromandel there is great need for improvement in the matter of ventilation.

10. What is the system of ventilation in vogue at Coromandel?—Well, in most cases where it is possible to procure natural ventilation that is done, but where they have to resort to mechanical means the methods are very crude.

11. What are they?—By forcing air in by means of a water jet. I have seen furnaces resorted to, but not frequently.

12. Have you given the subject of ventilation any consideration at all with regard to devising some means?—No.

13. Well, from your working experience as a miner, have you anything to suggest on the subject?—Not more than that in all cases where it is possible to procure natural ventilation it should be done.

14. As regards accidents, have you anything to say to the Commission as to the cause or prevention of accidents?—No. Fortunately, in Coromandel we are very free from accidents. I suppose there are less accidents on the Coromandel field than on any other field in New Zealand; but I think the stopes should not be taken above a certain height, for I consider that high stopes are the cause of many accidents in mines. It should be possible for a man to sound the back of his stope to make certain of its condition.

15. Have you any opinion to offer as regards shot-firing, as to the use of fuse or electricity, and also whether shot-firers should be appointed to fire all shots?—I think electricity should be used when more than six shots are to be fired at once.

16. Would you make that apply to all places?—More particularly in rises and winzes. I would not go so far as to say that it is necessary in all places.

17. Do you think the appointment of shot-firers would tend to minimize the number of accidents or facilitate working?—Well, speaking from my own experience, I believe in a man firing his own holes. He has a better idea of what is required in the matter of the quantity of explosives, and he should be responsible for the firing of the hole.

18. How long do you say a man should remain out of a face in case of a misfire or hangfire?—It is very hard to say. Of course, we know that the Act provides three hours, but I do not know that I have ever seen that time allowed.

19. What do you consider a fair time?—I do not think a man should go back under half an hour. If a shot does not explode in half an hour it will not go off at all; but I should insist upon the man who fires the hole attending to it until it has exploded.

20. Now, as to sanitary arrangements?—There is a great need for sanitary arrangements underground. At the present time nothing at all has been attempted in that respect, and I think it is absolutely necessary that some provision should be made.

21. Have you any bath-houses?—We have one bath-house at the Hauraki Mine where I am working, because we are working in a low level. Mr. Shepherd has installed a bath-house at Coromandel.

22. Is it used to any great extent?—Yes, I consider it is a blessing to the men. I think they should be compulsory in every mine, because it is of benefit to the health of the miners.

23. Have you had any experience in the taking of temperatures?—No.

24. Have you seen temperatures taken?—I saw Mr. Shepherd take it once.

25. Have you had any experience of inconvenience from working in hot places—have you been affected by the high temperature?—Yes, I have had experience of hot places and bad air. There is one portion of the Hauraki Mine near the surface where the effect upon a man is very bad. Upon one occasion I was seized with vomiting while working there, and that I consider was the result of the excessive heat.

26. You do not know the temperature?—It was considerably over 80°, I think.

27. How long ago?—About five years ago. They are not working that portion of the mine now, but it is just as hot as it was then.

28. How would the average heat of the mine now compare with the temperature then?—There is no comparison. That was a very excessive temperature.

29. That is to say, that the temperature of the mine now is considerably less?—There is the same temperature in those levels, but the heat on the lower levels is not so great now.

30. Have you anything to say in regard to wet working-places?—I would like to see it clearly defined as to what constitutes a wet working-place. The present system is not altogether a good one. I do not think either the men or the manager should decide as to what is a wet working-place. The present system is for the manager and the workmen's inspector to decide between themselves, and, though up to the present we have had no difficulty, I would like to see it clearly defined as to what is a wet working-place. In the event of the manager and the workmen's inspector not being able to decide, it is necessary to send to Waihi to bring the Inspector of Mines to settle the matter. When we write to Waihi it is possible that the Inspector may not be able to visit the place for several days after the complaint was made, and during that time the men may have passed through the wet working-place, so that the Inspector does not see the place under the same conditions which prevailed when the complaint was made. It is possible for this sort of thing to occur frequently.

31. Have you any practical suggestion to make on the subject?—It appears to me that unless the water is coming down in a shower the miner is not entitled to any consideration at all. I maintain that if the water is only up to his knees it should be considered a wet place. Further, there seems to be no consideration for truckers at all who are continually working in water throughout the shift.

32. To what depth?—Well, it is very often up to his middle.

33. Is not that rather an exaggeration?—No, certainly not. The company on one occasion, on account of economy, was only employing one engine-driver, and they used to bale for eight hours, but the water was allowed to rise for the rest of the time. The men went down at 8 o'clock in the morning, and by the time the engine-driver started to haul it was 9 o'clock, so that by the time the men climbed down and landed in the chamber the water was up to their middle, and they were compelled to wade through it for 100 ft. Then they had to work in a dry place for eight hours in that condition. The chamber was in practically the same state when the men were coming off shift at 4 o'clock. These men were working under those conditions and received no consideration at all.

34. You would not call that a wet place—it is simply a matter of baling out the water from the chamber. What is your suggestion as to a wet place?—Well, I should say, if a man in working gets wet up to his knees, he should be given some consideration.

35. Where the water comes from underneath?—Yes.

36. And where it comes from overhead?—Well, if a man is wet through at crib-time he should be entitled to a six-hour shift.

37. In which of the levels in that particular mine do the men work up to their knees?—It frequently occurs in the lowest level, and also in the upper levels if the drains are not capable of carrying off the water. They have to walk through a considerable amount of water to get into their stopes.

38. *Mr. Dowgray.*] In regard to the trucking-roads, do the truckers have to work over their boot-tops in water?—I have known several of them have to do so.

39. Have you ever known the men to suffer from sore feet as the result?—Yes, I have often heard the men complain of injury to their feet, and also as to kidney troubles from working in the water.

40. Do they lose time through it?—Yes, I have done so on more occasions than one.

41. Is there no attempt made to drain the roads in your particular district?—Attempts are made, but I do not think they are as successful as they should be. I consider the conditions could be improved.

42. What is your opinion in connection with bracemen and chambermen being employed at other work?—I do not think they should be otherwise employed at any time. Their duties are sufficient to occupy all their time. I think a braceman, before he is allowed to work as such, should have some underground experience, and when appointed should be kept at that work alone.

43. He should have definite duties allotted to him?—Yes.

44. He should have some experience underground before being appointed. For what reason?—So that he would know the requirements of the miner, and be able to realize the danger of sending tools or timber down in the cages. He would know the danger that a miner is liable to in the event of anything giving way better than a man with no experience.

45. Have you ever known any accidents to occur through an incompetent braceman?—No; but I have seen some very miraculous escapes.

46. Do you think the knocker-line should be used by any person other than the one appointed for that particular duty?—No. The man in charge of the knocker-line should be always there to ring the men away, otherwise they would not have sufficient time to get into the cage. They should be in the cage before any attempt is made to ring them away.

47. What method have you of signalling? Does the engine-driver give a return signal to the braceman?—I could not say that. I have never paid much attention to it.

48. In connection with shot-firing, do you think there should be a time stipulated within which men should be prevented from returning to faces after they have fired?—Well, there is a time stipulated already in the Mining Act.

49. But I mean, after the shot has exploded?—Well, I think that could be best determined by the nature of the place. Sometimes it might be an hour and a half before the place is fit for a man to go back again.

50. *Mr. Parry.*] You say that it would be better for a man to fire his own shots than for a shot-firer to be appointed for the purpose. Do you mean that with a view to ensuring the safety of the men?—What I meant to imply was that the man who had the mishole should be the man to attend to it.

51. Do you not think it would minimize the risk of accident if the firing for one particular district were placed in one man's hands?—I do not think it would. Of course, I can only judge the matter from the places I have worked in. I do not know what the conditions are like in other districts where there are big mines such as the Waihi, but from my own experience I think the man who is working the face is the man who should do the blasting there.

52. What is your opinion as regards the appointment of an assistant engine-driver?—Well, I suppose it would be a very good thing to ensure safety in places where they are winding numbers of men.

53. What do you think the average size of ladderways should be?—I think that must be determined to a great extent by the nature or size of the lode being worked.

54. Do you think that by increasing the size of the ladderway you would tend to improve the ventilation?—Most decidedly.

55. You said you were free from accidents?—I believe we are freer from accidents, or at any rate as free, as any mining district in New Zealand.

56. What system do they work on at Coromandel?—The wages system.

57. What do you think is the cause of the accidents in Waihi and Karangahake?—They are caused by the rush due to the contract system, and the height to which they carry their stopes.

58. *The Chairman.*] Have you had any experience in Waihi?—I worked under similar conditions in Opitonui, where the mode of working was the same as it is in Waihi. I am convinced that the contract system has a great deal to do with the number of accidents.

59. *Mr. Parry.*] How do you find the health of the miners in Coromandel?—Fairly good. No miner's health is too good. You can generally pick out a miner by his appearance.

60. Do you regard mining as a healthy occupation?—No, by no means.

61. *Mr. Cochrane.*] With regard to the instance you gave us of men wading through water, was that a frequent occurrence or a case of emergency?—As far as I can make out it was a regular thing for some time, when they were only winding water for one shift.

62. With regard to the period which must elapse before miners return to hangfires or misshots, do you suggest that the three-hour period should be reduced?—Well, I do not know. Perhaps it is a big thing for me to recommend that an amendment be made in the Mining Act; but I do not know why it was made three hours, because if the hole does not explode in half an hour it would not go off in three.

63. You say that natural ventilation should be provided in every mine at Coromandel if possible. Is not that the system at present?—In most of the mines it is, but in a few they have resorted to mechanical means.

64. What mines have mechanical ventilation?—I do not know. There is a mine where I have been working—the Hauraki Reefs—where they have a water jet.

65. Then, as to the exclusion of consumptives from the mines—not those suffering from miners' complaint alone—would you be in favour of the exclusion of consumptives?—If I might be excused I would prefer to refrain from dealing with that matter, because there was a great deal of trouble with regard to the proposed compulsory examination.

66. *Mr. Reed.*] As regards fatal accidents at Coromandel, how long ago is it since the last mining fatality occurred?—The last fatal accident I remember was about eight years ago.

67. So that you have not had a fatal accident at Coromandel for eight years. Do you not think that is a remarkably good average?—Yes; I have already said that we are very free from accidents.

68. Do you not think that the present system of inspection is efficient in providing against accidents?—Yes, the prevention of accidents is fairly satisfactory on our field.

69. Do you not think it is remarkably efficient?—Yes, certainly.

70. As to where these men get wet, where were they going to?—To their work in the Hauraki Reefs.

71. Did the men go down through the surface levels?—They simply climbed down the shafts. The cage was not put into use until the Inspector forced the company to provide it.

72. Was it compulsory for the men to walk through the water—was there not another way?—There was some other way up among the hills, but they would have had slush to contend with.

73. So that it was not necessary for the men to walk through that water?—Well, it was as bad one way as the other, and the men preferred the water.

74. You said the ventilation was bad or could be improved. Now, will you tell us in what respect the ventilation was indifferent—were there any noxious gases?—I cannot be expected to determine the presence of noxious gases.

75. Could you not do so with a candle?—Yes, there must have been a good deal of bad gas in the air.

76. Can you tell us where that has happened?—I have frequently seen it—not only in one mine, but in many of them.

77. Did you feel any ill effects?—Yes.

78. In the stopes?—Yes, and also in dead-ends and when driving crosscuts.

79. Have you observed the candle burning dimly when it was not being moved?—Yes, I have known the men to use more than one candle.

80. Did you report that to the Inspector of Mines?—Yes, and he immediately took steps to have it remedied.

81. *The Chairman.*] How long was that ago?—Some little time back.

82. *Mr. Reed.*] In Coromandel do you carry out your workmen's inspections properly?—No, we do not have the mines inspected regularly. We are only a small body, and we cannot stand the expense.

83. Do you carry out workmen's inspections at all?—If there is a complaint made to the union the workmen's inspector goes along to the manager.

84. How long is it since the last workmen's inspection was made?—The last one was made about eight weeks ago in connection with an accident.

85. And before that what time had elapsed since the previous workmen's inspection?—Of course, we send a workmen's inspector to make a report in regard to wet places. Those reports come in frequently.

86. So you only send the workmen's inspector round in cases of accident or complaint?—That is all we are able to do at the present time.

ANDREW CRAWFORD sworn and examined. (No. 49.)

1. *The Chairman.*] What are you?—A miner.
2. How many years' mining experience have you had?—About ten, on and off.
3. Where did you gain your experience?—In Australia and New Zealand.
4. How long have you been mining in New Zealand?—About four years and a half.
5. Where?—In Waihi.
6. What length of experience have you had in Waihi?—Three years and a half.
7. And the remainder?—At Coromandel.
8. In which mine?—The Old Hauraki.
9. On what subjects do you wish to address the Commission?—As to sanitation. I would recommend that the places where the miners have their crib should have concreted or boarded floors, because it is the habit of miners to be continually spitting, and very often they throw down their tea and bits of crib, but it is the spitting I have the most objection to. I would recommend that the floors of all places for crib should be either concreted so as to be flushed, or boarded. I would also refer to ventilation. At the present time it is very inconvenient for the miners to go down out of hot places and sit in a draught at crib-time, so I would recommend that the crib places be put where there is no draught. There is another point which has special reference to the Waihi Mine, and that is as regards the winzes, which I consider too deep for the men to pull the material in these deep levels. It is beyond the strength of a man to pull material from 120 ft., and I would suggest that the company should be compelled to put in air-winches where it is necessary for pulling the material more than 60 ft., so as to relieve the miners in these deep blocks.
10. Have you any suggestions to offer as regards accidents or their prevention?—I would favour the battery system of firing, also the appointment of shot-firers. I had experience in Western Australia of the shot-firing system, where no shoveller or trucker was allowed to use high explosives. If there was any firing to be done in a mullock pass a miner would be sent down to do the firing for them, so that if a trucker had not had experience in the handling of explosives a man with some knowledge of the matter would be sent down to do it. I have worked with a hundred mates, and there is a great deal of diversity of opinion as to the length of fuse which should be used. I believe that the battery should not be used in stopes, but in winzes, rises, and shafts. They might also be used in hard drives, where you would have to take out the cut afterwards. I would not recommend their use in Coromandel, because we never have more than two holes to fire at once, but in Waihi I would recommend the use of the battery, as I have already stated.
11. Have you had any experience of hot places? Do you know anything about taking temperatures?—No.
12. What has been your experience of hot places?—I had one experience on the Royal lode at Waihi. There they had to install compressed air, but I would rather work with natural ventilation than with compressed air. As the result of working under those conditions I went down in weight, lost my appetite, and suffered from sleeplessness. I am convinced that it is not so healthy working with compressed air.

13. Have you any further suggestions to offer?—As regards the engine-drivers I believe it would be beneficial to the miners if a second engine-driver were appointed. I would recommend that a winding-engine driver should be submitted to a medical test once a year to see if he were suffering from heart-disease or any nervous trouble. It might be a great strain upon an engine-driver on a first-motion engine, and therefore I would recommend that the medical examination shall take place, say, once a year to see if he is all right. Of course, as miners, we always look to the apparatus attached to the cage for our safety in case of accidents.

14. *Mr. Dowgray.*] In connection with travelling-roads and ladderways, are they sufficiently wide at present?—It depends upon the size of the stopes. In Waihi they should be 4 ft. by 4 ft. They generally act as airways.

15. In connection with shot-firing you recommend that from practical experience?—Yes, from practical experience in the Golden Horseshoe Mine in Western Australia.

16. There was no difficulty in working on that system?—No; I believe it helped to minimize the accidents.

17. In the event of a misshot who should go back to it?—In ninety-nine cases out of a hundred I think any old miner would prefer to go back himself to the hole. I myself would rather wait an hour and return to the mishole than allow another man to go back. My reason is that it is dangerous for a man who has not fired the hole to go groping round. I have had a good deal of experience of looking for misholes in winzes.

18. In connection with the braceman and chamberman being employed at other duties, you heard what the previous witness said on the matter?—It seems to me that if they were not permitted to be otherwise employed they would have a good deal of spare time, and it does not seem right that they should be sitting there doing nothing all the shift.

19. And as to the chamberman?—Well, he should be there to receive all messages and send them up, and do all the lowering. The knocker-line should be in the hands of the chamberman.

20. *Mr. Parry.*] Have you ever worked in a place where the temperature was taken?—No, I have not. The temperature may have been taken, but not to my knowledge.

21. *Mr. Cochrane.*] As to the size of winzes, would you have them made 4 ft. by 4 ft. in all cases?—No. In Coromandel, for instance, where we are working on small leaders, 2 ft. by 2 ft. 6 in. for the travelling-ways would be sufficient. In Waihi, however, on the Martha or any other big lode, I would recommend that the travelling-ways be larger than they are, and also airways.

22. Then, as to the chamberman, supposing you have a chart and one drive with two men working, would you have a chamberman to do the signalling for these two men?—No, I think the company should be studied in a case like that. The chamberman could do other work.

23. *Mr. Reed.*] As regards the Boulder Mine, how long is it since they started the system of shot-firing by shot-firers?—It is over six years since I had knowledge of it, and I think it had been in existence then for three years.

24. And have they shot-firers in other mines in Kalgoorlie?—Yes; but they were driving on a different system.

25. Was it a fact that the shot-firers told the men to sit down while they did their shot-firing?—I do not know.

26. Do you think it will be likely to happen?—I do not remember a case.

27. How long were you working in a mine with the shot-firing system?—Eighteen months.

28. Were they working by contract or day labour?—Under the contract system. They were boring by the foot, say, in drives. The shot-firing system was not universal there because the men did fire their own faces. In other places in the mine where machines were used, after the face was bored out, the machines would be removed and the face would be fired out by the shot-firers. I think it minimized the danger, because they were all experienced men who handled the gelignite.

29. As regards the bank-to-bank system, could the miners relieve one another at the face? Would you suggest that for the gold-mines, to enable the miners to point out the condition instead of describing it verbally at a distance? That would not mean a loss of time for the men?—I would make a suggestion that a board or slate should be placed in every level, where the miners could leave the information for the shift coming on. If there were, say, only four men on the one level, they would go away with the first cage without seeing the other men coming on, and I believe there should be some means of communication between the two shifts. We always inform the chamberman of misholes.

30. Would it not be better to actually point out the place than to trust to a man's descriptive writing and literary ability?—Probably.

HENRY COPE sworn and examined. (No. 50.)

1. *The Chairman.*] What are you?—A miner.

2. How many years' experience have you had?—Twenty-seven.

3. Where?—In New Zealand.

4. In which mines?—During the last twelve or fourteen years I have been working in the mines in the Coromandel district.

5. On what matters do you wish to inform the Commission?—As to sanitation and the better inspection of mines. We have no sanitary arrangements, and I think they are necessary.

6. What have you to say as to the necessity for better inspection?—Well, I think the district is too large for one Inspector; he has too much to do.

7. That is to say, what you wish is more frequent inspection and not better inspection?—Yes, more frequent inspection.

8. Have you any other matter to bring before the Commission—ventilation, for instance?—No, I think the ventilation in our mines in the Coromandel district is about as good as can be got.

9. Have you had any experience of accidents to yourself or to your mates?—I have had a good many myself.

10. Have you anything to suggest as to their cause or prevention?—I think myself that if there were a little more care taken there would not be so many accidents.

11. By the men themselves?—Yes. I think a good many accidents would be avoided if we had a system by means of which a man would be required to prove his ability and experience before he was allowed to work as a miner.

12. Do you find that the men do not take sufficient precautions to test their places to see that they are safe and sufficiently secure?—I think a man should be capable of doing that without trusting to any one else before he is allowed to work in a mine by himself or with another man.

13. Have you anything to suggest?—There is one other matter. I would like to see some provision made so that in case of accidents a stretcher or some such convenience should be provided to carry away injured men.

14. Where would you have these kept—on the levels or on the surface?—On the surface, where they could be easily got at.

15. Have you any first-aid appliances?—None at all.

16. It has been suggested that first-aid appliances and stretchers should be provided: you agree with that?—Yes.

17. *Mr. Dowgray.*] In connection with your statement that a number of accidents are the result of carelessness on the part of the men there may be a wrong interpretation placed on your words. What you meant was that the accidents were the result of the men's inexperience?—Well, I have known men, when working below and sending timber down, to do so very carelessly. The first thing you hear is "Look out below," and down comes the lot.

18. That is due to lack of experience?—Yes, it is different from carelessness; but, still, there is a great deal of carelessness on the part of men who know better.

19. In regard to inexperienced men you think there should be some way of dealing with them, or that they should have a certain amount of experience gained through working with experienced men before being given a place of their own?—Yes, that is so. I have been jammed on several occasions as the result of carelessness on the part of others, and I have had nine mates in three weeks.

20. What happened to them?—As soon as they got used to the work they were drafted away to some other place.

21. *Mr. Reed.*] Have you observed the ages of the miners in Karangahake and Waihi?—I was never there.

22. Are the miners as experienced now as they were ten and twenty years ago?—Not as a general rule.

23. Would you be inclined to attribute the number of accidents to the youth and inexperience of the men?—I would.

24. *Mr. Cochrane.*] Have you any suggestion to make with regard to more care being taken to prevent accidents?—Well, I think myself the better way to deal with the matter would be for the manager or official in charge of the mine not to allow any man to work except by himself, unless he had confidence in him. You put two mates together now, and perhaps one is careless and the other careful: the latter cannot be always watching what his mate is doing. I would suggest, therefore, that before a man is allowed to go to work in the face that he should prove he has had some experience.

25. *Mr. Dowgray.*] Do you work day-wages in Coromandel?—No; I have only worked day-wages two years out of about twenty-five.

26. Is there a difficulty experienced by men getting on in years in obtaining employment?—Yes.

27. *The Chairman.*] That difficulty is not confined to mining?—No.

28. *Mr. Dowgray.*] So that it is not experience the men are lacking, but muscle?—That is so.

29. What have you to suggest about the better inspection of the mines?—I say that if the mining industry is worth carrying on it is worth looking after. While the district is so large the Inspector has not the time to inspect a mine properly.

30. It is simply a matter of more Inspectors?—One is not sufficient, and if two were found insufficient they should have three. More frequent inspection of the mines is required.

31. Or that the country should be cut up into smaller districts?—Yes.

32. *Mr. Reed.*] Can you specify one case where the inspection has been inadequate during the last twelve months?—Well, I would like to go further back than the last twelve months.

33. Well, say two years, since the present Inspectors had their districts altered?—At the present time we have sixteen registered mines working in Coromandel.

34. But I am referring to your complaint about insufficient inspection: can you specify one case?—Well, not as far as our present Inspector is concerned. I am not casting any reflection upon him, but I want to see a more frequent inspection of the mines all round.

35. Have you lost anything by the Inspectors not visiting more frequently?—Not with the present arrangements.

36. If things are satisfactory now, why alter them? One witness has stated that there has not been a fatal accident for eight years: do you not think that is very creditable?—Yes, as far as the inspection goes.

37. As regards the Coromandel field, is it not very decadent?—Well, I do not know.

38. Is the number of men working there not decreasing every year?—Yes.

39. At the present rate will there be a mining-field there at all, say, ten years hence?—I do not think so.

40. Then why increase the number of Inspectors?—If we got the Inspectors increased, and the Mining Act properly carried out, there would be ten times as many mines working.

41. *The Chairman.*] In what respect have the laws not been carried out?—There are a great many mines which have been destroyed in the top workings and levels, and for what? Just because the last companies which were working them took down the ladderways and stripped the mines of all the timber, thus letting the ground come down in the levels.

42. *Mr. Reed.*] That is not a breach of the law?—I do not know. The Inspector is here; he can tell you.

43. *The Chairman.*] How long is it since the timber was drawn?—The last timber drawn was about three months ago.

44. *Mr. Dowgray.*] Why do they draw this timber, and to what extent?—They draw it to sell it. As a result the country is all coming in.

45. Does that endanger any other country?—It makes the mine valueless unless you have plenty of money to retimber all the ground.

46. *The Chairman.*] Even if a man draws the timber in his mine and abandons it that is not a breach of the Act?—Well, I want provision made to prevent them from doing so.

47. What would you recommend in regard to the matter?—That the Warden should not accept the surrender of any mine until the Inspector had examined and passed it, so as to prevent the drawing of the timber and the destruction of the mine.

JAMES COLLIE sworn and examined. (No. 51.)

1. *The Chairman.*] What are you?—A miner.

2. How many years' mining experience have you had?—Seventeen years, off and on.

3. Where?—Coromandel, Waihi, and Waitekauri.

4. Which mine are you working in now?—Hauraki Mine, Coromandel.

5. How long have you been there?—About eighteen months.

6. What matters do you wish to bring before the Commission?—I consider that the brace-man should have a knowledge of working underground before taking on the responsibility of the brace.

7. What experience do you consider necessary—Eighteen months.

8. Anything else?—I would suggest that the mine-managers should take the temperature of the mines at least once a week, and that it should be reported for the information of the miners—say, in the change-house. As far as a man's health is concerned, every effort should be made to obviate the dust nuisance as much as possible. That is all I have to say at the present time.

9. *Mr. Dowgray.*] You heard what the previous witness said about travelling-ways: have you anything further to add in regard to that matter?—No, I can say nothing further than has already been said by Mr. Prescott, that 2 ft. 6 in. square is ample for our small lodes.

10. Have you had any experience in mines where there have been shot-firers whose duty it was to fire all shots?—No.

11. *Mr. Parry.*] Do you think it would have a tendency to minimize accidents if the shot-firing for a district were in the hands of one man?—It might do so in a big mine, but there is no occasion to have them in small mines.

12. Have you ever seen any temperatures taken?—No.

13. You have not seen the Inspector of Mines take them?—No, although I believe he has done so.

14. Have you had any experience of working in hot places?—Yes

15. Would you sooner work in a hot place than in a cool place?—Decidedly not.

16. *Mr. Cochrane.*] Where would you have the mine-manager take the temperatures?—Throughout the mine in all the working-faces.

17. *Mr. Parry.*] Have you anything further to suggest?—No.

18. You have heard the evidence given by previous witnesses: do you corroborate it?—Yes, I am prepared to corroborate the statements made by the secretary of the union and Mr. Crawford, but I am not in a position to understand the circumstances as explained by the last witness. I cannot speak as to that.

HENRY FRANKLIN SHEPHERD sworn and examined. (No. 52.)

1. *The Chairman.*] You are mine-manager of which mine?—The Old Hauraki.

2. How many years' experience have you had?—Twenty-two years' mining experience.

3. And as manager?—About sixteen years; but for three years I was not managing.

4. What is your opinion as to the time which should be fixed for misholes and hangfires?—I think half an hour is long enough: if a shot will not go off in half an hour it will not explode in three hours.

5. Have you any opinion to offer as to ventilation?—In our own mine we have natural ventilation. We confine the air from each level to that level. It comes up a separate airway, and the foul air is discharged into the return.

6. Do you take the temperatures or air-measurements?—I have taken some temperatures, as has also the Inspector of Mines.

7. How did your figures compare with his?—They were practically the same. The highest temperature I got was 74° dry.

8. What have you to say about the sanitary arrangements: I understand there are no sanitary arrangements at your mine?—They are not satisfactory. The miners use the sump. I was

going to install pans, but when I heard that the Commission was sitting I decided to wait. I think a septic-tank system would be satisfactory if it could be worked. I simply offer that as a suggestion.

9. Have you any opinion to offer as to the appointment of shot-firers to fire all shots?—I think the men who drill the holes should fire them. I have not had any experience with the shot-firer. We have found no difficulty in connection with the present system.

10. I understand you have been free from serious accidents: have you had any minor ones?—The most serious accident which has occurred under my management was a broken leg sustained by a man about two months ago, as the result of a piece of rock coming off the wall of the drive.

11. What have you to say as regards the suggestion that mine-managers should take the temperatures and post them in the change-houses for the benefit of the miners?—I do not know what to think about it. I am not aware of any advantage which the miners would gain thereby, but I would make no objection to its being done if I thought it would serve any good purpose.

12. *Mr. Molineaux.*] What is your opinion about the connecting of adjoining mines for purposes of ventilation: do you think regulations should be made to enforce that?—It depends upon the method of ventilation. It would certainly be an advantage for a mine with one shaft, but whether it would be to the advantage of the adjoining mine I cannot say. It depends upon the ventilation.

13. You can imagine cases where it would be of advantage to both properties, can you not?—Well, in the case of our mines in Coromandel we have an adjoining property worked from our lowest level, and it certainly would be of benefit for them to make a connection, and if we were to work that part of the mine where they are working it would be of advantage to us, but otherwise it would not.

14. With regard to the engine-drivers, do you consider that it would tend to minimize the probability of accidents if there were two engine-drivers at the engine when shifts were being changed?—During my experience we have had no accidents with one driver. We find everything works quite satisfactorily.

15. You do not think it is at all necessary to have a second man available?—Not in the case of the smaller mines. I would not like to express an opinion in regard to the larger mines, because I do not know the conditions.

16. But if it were advisable in the big mines would it not be advisable in the small mines also?—I cannot express an opinion, as I have not been manager of a big mine, but it certainly is not necessary in our case.

17. *Mr. Cochrane.*] What is your opinion as to the medical examination of engine-drivers, say, once every two or three years?—I think that would be a good thing.

18. Then, as to connecting adjoining mines, you have been asked as to the advisability of that for purposes of ventilation. What is your opinion as to that proposal for second outlets as a means of escape?—It would be a good thing.

19. And as to drainage, with, of course, compensation for the water coming in, what is your opinion as to connecting mines for that purpose?—I think it is advisable to have one drainage pump, if one were sufficient, to cope with the water. That is what we are doing at the present time, and the adjoining company is paying a contribution.

20. *Mr. Reed.*] If one company seriously objected to have a connection made, would you be in favour of compelling that company to submit?—I would not like to express an opinion upon that point.

21. *Mr. Dowgray.*] What is your opinion of the braceman and chamberman being employed at other duties?—Well, so long as the braceman is within sound of the signals there should be no objection. I do not think it would be advisable for the braceman to be a mile away, but I can see no harm as long as he is within sound of the signal.

22. And as to the chamberman?—In our case it would be very awkward if we had to have a special chamberman. We have one man who is delegated to ring the trucks away and also run the trucks.

23. What kind of communication have you between the chamberman and engine-house?—The ordinary knocker-line.

24. And as to a return signal between the engine-house and the chamberman?—There is no return signal excepting with a rope. If there is any danger, or if the cages are wanted below, they shake the rope on the level and wait for a reply. The cages are never shifted from the level without shaking the rope, unless signalled.

25. Do you not think it would be an advantage to have the signal to the engine-house as well?—We find it safe to shake the rope. If the cage is wanted the braceman shakes the rope; you can hear it 100 ft. along the level.

26. That might answer in your particular mine, but would it be suitable in a big mine?—I do not know anything about a big mine.

27. What is your opinion as to the necessity for manholes in long drives—say, 400 ft. or 500 ft.—to provide refuge for the men when firing?—I should think that electrical firing-apparatus should be used in that case, and also that small safety chambers should be driven.

28. At what distances apart?—It would depend upon the nature of the drive—whether it was a straight or a crooked drive. When driving on a reef it would hardly be necessary.

29. If it were a straight drive what distance would you suggest?—About every 200 ft. or 300 ft.

30. *Mr. Parry.*] Do you think it would be more satisfactory both to the management and to the men if a standard temperature were fixed to constitute a six-hour place?—I do not know. I have not had any conflict with the men as to six-hour places.

31. But, speaking generally, do you think it would be more satisfactory to have a standard fixed?—I dare say it would.

32. As regards working in wet places, have you and the workmen decided on what constitutes a wet place?—We have not drawn up any hard-and-fast rules. If the men asked for a place to be treated as a wet place I have never refused it. They have never asked for it unless it was a wet place.

33. And when the men considered it sufficiently wet they asked for six-hour shifts, and you have always given them?—Yes.

34. Why?—I considered it was a six-hour place.

35. Do you think a man is a sufficient judge as to what constitutes a wet place?—Yes, between the men and the manager.

SAMUEL CARLYON sworn and examined. (No. 53.)

1. *The Chairman.*] What are you?—Mine-manager of Kapanga Mine, Coromandel.

2. How many years' mining experience have you had?—Forty-six.

3. And as manager how many?—Something over twenty-four years, at intervals.

4. How long have you been in the present mine?—Sixteen or eighteen months.

5. Prior to that where were you managing?—At Whangamata.

6. On what matters do you wish to inform the Commission?—I do not know that I have anything to say further than what you have already heard. From what I have gathered everything that has been said respecting the Coromandel mines has been very favourable.

7. *Mr. Dowgray.*] You agree with all the suggestions which have been made?—Yes, I do not know that any of them are out of the way.

8. *Mr. Molineaux.*] Have you had any experience in the taking of temperatures more than with the thermometer?—No.

9. *Mr. Parry.*] Do you think that it is safe to work from the bottom of the Kapanga in a level 1,400 ft. without another outlet?—We are not in that distance.

10. What distance are you in?—Close on 600 ft.

11. Have you any deeper levels?—I have, but not in the Kapanga. We are cleaning out the 1,000 ft. crosscut to see whether the gold is there. There has been a tremendous amount of money expended in the mine this last five years, and they have had no returns. It has all gone in repairs.

12. What is the depth of this shaft where the crosscut is?—1,000 ft.

13. What depth is your well-hole?—9 ft.

14. Do you think that is deep enough?—Quite sufficient.

15. In the event of an inrush of water?—I do not know that there is any danger of that. I made all preparations for that contingency when I went there first. The water used to come in from the creek, but I flumed the creek from beginning to end, and now we have no trouble.

16. In the event of your striking another current of water or inrush?—There is plenty of provision for the men to get away by the drive and the ladderway, in the shaft and winze as well, to get up to the next level.

17. What system of ventilation have you?—Natural ventilation; the air comes down the shaft.

18. Is there any assisted ventilation to provide air at the face 600 ft. from the shaft?—The only air is that which comes down the shaft.

19. What is the temperature at the face?—82° to 83°.

20. How many hours do the men work?—Six hours. I have four men working, and they take hour about. Two men go into the face for one hour, and the other two men go in for the next hour. That is the way I do it to give the men a chance. There are four men doing two men's work. Everything is worked on the day shift.

21. You think that temperature warrants that being done?—Yes, otherwise I would not do it.

22. Then practically they work only three hours at the face?—They work six hours, but they take it hour about.

INVERCARGILL COURTHOUSE, 16TH SEPTEMBER, 1911.

CHARLES ARTHUR PORT sworn and examined. (No. 54.)

1. *The Chairman.*] You are a miner?—Yes.

2. You have had a good many years' experience?—Yes, about forty years of alluvial-mining experience, mostly at Round Hill and Longwood.

3. Now, what is it you wish to bring before the Commission?—Well, there is the matter of the fatal accident which took place at Round Hill some time ago, and I think it would be a good thing if something could be done to prevent such accidents occurring in future.

4. I may point out that the Commission cannot inquire into any particular accident, nor can we review any finding that may have been given in regard to it. We will hear the fact of the accident, and any suggestions that you consider would tend to minimize the chance of such an accident occurring again, but I want it to be understood that we are not here for the purpose of reopening any particular inquiry, or considering anything in the nature of an appeal against a finding?—I have no desire to open the matter again, but as you are taking evidence on accidents I think it is only right that any suggestion which can be made should be made to you. I may say that after the accident I wrote to the *Witness*, and in my letter set out the suggestions which I have to offer to this inquiry. There should be some mode of signalling from the men if a man should get trapped.

5. In order to put the matter in order, will you state to the Commission the facts of the accident?—Yes. I may tell you that I was not present at the time of the accident, but I was at the inquiry. Two men—Joseph Bates, a married man with a wife and two children, and Frank Smith, a single man—were sinking a second lift on the 4 p.m. to 12 o'clock midnight shift, and

some time during that period they were both entrapped by a fall of sludge, and either smothered by the sludge or drowned. From what I saw of the place I concluded that a slip occurred through there being no solid ground or barrier to keep a slip from coming in. I think they were both overcome at the same time, and there was no third person to give the alarm. If they had only been entrapped a third person could have rendered them assistance. In some of those places where two men are working on night shift one is sometimes called away in the ordinary course of work —perhaps to wash mats. Then, again, if one of the elevators gets blocked and a man goes to free it he may get trapped, in which case he would get drowned almost for certain. At Round Hill, or at any of the elevating mines I have seen at work, I have not seen any provision for signalling for help. I think that a line should be fixed which a man could pull in case of accident, and that a barrier should be built so that a man could support himself. Despite the accident the company has taken no steps to make any such provision, and I think it is only right that statutory provision should be made to safeguard the men.

6. Where would you have the signal connected with?—You could have it from one claim to another. It was suggested at the inquest that there should be a bell somewhere about the mine, but that did not meet with the approval of the other side at all.

7. Do you suggest, then, that at no time should there be less than two men about the elevator? —Yes, unless the elevator is so guarded that a man could not be drawn into it.

8. Have you any other suggestion to offer?—No, not in regard to that matter, but there is one other subject which might come within the scope of the Commission, and that is the matter of accommodation. For years at Round Hill the workmen had nowhere to take their meals. If they work eight hours there is a meal intervening. A few years ago, when the miners' union was formed, the union, on behalf of the men, asked that there should be a shelter-shed erected where they could take their meals.

9. Do they have to change at the mine?—No, there is no change-house there, and I do not think, speaking from my experience of alluvial mining, that the men would use them if they were provided. To change on the surface is not so necessary as it would be for men coming from underground workings.

10. Would you recommend that a house be provided for men to take their meals in?—Yes. I may say that the company put up two tents or frames, but they had no flies over them, and were very unsatisfactory. The tents were about 10 ft. by 8 ft., and had no floors or tables. There was no provision for the men to warm a drop of tea. The last time I went into one there was about 2 in. of water on the floor, which one had to step into. You can understand what condition such a place would be after having been used for months, as the result of crumbs and scraps left there all that time.

11. *Mr. Cochrane.*] Did the evidence at the inquest clearly show that the accident was caused by a slip?—No.

12. Did the evidence point to the fact that there was no slip, but that the men were drowned? —No; I went down with the Coroner and saw the place.

13. Did the Inspector of Mines, Mr. Thomson, state that there was no slip?—I believe he said that, in his opinion, there was no slip.

14. From your observation was there slush and gravel, or simply water?—There was slush and gravel. Without trenching on the previous inquiry, I may state what is perhaps now publicly known. These two men were sinking in an old paddock where the ground had been worked and afterwards filled in with sludge. The elevator was brought up to the face, and there was no solid bank where the men were working under the elevator, and nothing whatever to prevent a slip. I may say I asked Mr. Thomson at the inquiry if he would go to work there, and I said I would not do so with my twenty years' experience of that very sludge. That is why a second inquiry was asked for, and I think it is only right that another inquiry into the matter should be held. I think when that inquiry is held arrangements should be made to summon persons to give evidence, and not to leave it to them to do so voluntarily. That is why I would rather not go into the matter now. I think the suggestions I have made here as to the signal and the barrier would be satisfactory. Timber is very cheap at Round Hill, and there should not be much trouble in giving effect to the suggestions I have made. Assuming that one of the men was free, the other might have supported himself while his mate went for help. At Round Hill the bed-rock is decomposed diorite, which is very slippery. At the main elevator, apart from the place where this accident occurred, if a man were walking beside the race and slipped off, there is nothing to prevent him from going head first into the elevators; there is no provision for such a thing, and never has been. My suggestions as to precautions to be taken to avoid future accidents are set forth in my letter to the *Witness* of the 10th May last, which is as follows: "To the Editor of the *Otago Witness*.— SIR,—As a sympathizer with the bereaved relatives and friends of the victims in the above-named calamity, I fully appreciate the views expressed by the correspondent 'Victoria Cross,' published in the *Otago Daily Times* of the 28th instant, and approve of his sentiment and action. The former, too, are much in accord with the report and reference of your contemporary, the *Southland Daily Times*, of the 24th instant. Knowing well the men and the place where the poor fellows perished by that slow and horribly painful death, mentally and physically, like others who have read the reports above quoted, may I ask, What of the future? Can no steps be taken, nothing devised and done to prevent an almost certain like fate to others similarly employed as those poor fellows were, unless some sufficient means are taken to prevent a recurrence of the calamity? At the inquest three suggestions were made—viz.: (1.) That no sinking of second lifts should take place at night in dangerous ground. This was added as a rider to the verdict. (2.) That three men instead of two be employed on night shift. To this an objection was raised by the company's representatives on the score of cost. (3.) That an alarm-bell be erected, so as to summon help when needed. This suggestion found little favour. I will now try and deal with these suggestions seriatim. I am not sure the rider in the *Western Star*, from which I quote, is correctly reported;

but, assuming it is, I think the sinking of all lifts should be discontinued except by daylight, and then only with a watchman in charge on top. His duty it should be to keep a close watch on any ground likely to slip and endanger the men engaged in sinking. The passing by the jury of the warning does not make it law, and when such a rider is added which does not find favour with the party against whom it is made, or who would be penalized by it, it is likely by them to be honoured more in the breach than by its observance, and even be referred to as a gratuitous insult. It was stated by the company's representative that 'there was no need for a third man, as his time would be wasted, and this would detract from the profitable working of the mine,' and that he could have done no more than poor Smith had done. Let me here say that Mr. Hart, the manager, later on, when giving evidence, said the victims might have had one more chance of life by a third man going for help to the township, three-quarters of a mile away. Could not a third man, if there, have rung a bell or set it ringing automatically? It was further stated in evidence the 'sinking the lift was no more dangerous than pulling timber out of the lift when the same got blocked' (as they frequently do, this company's claim being all in bush lands). Assume that the lift gets blocked whilst one of the men is away for an hour or more at a time washing the mats on the gold-saving tables at the main elevator many chains away. When the lift blocks the nozzle-man has to go and clear it. If whilst so engaged he slipped—as the manager said he supposed Bates did—and, like him, got jammed, who would then assist him? The roar of the water rushing through the elevator, with the rush and fall of water all around the gold-saving tables, with the plunging and washing of the mats in the sand-boxes, would in all probability prevent any cry for help reaching the man engaged on the tables. With the extra water coming in from the breaking-down nozzle, the man freeing the lift would soon be drowned. Does this show any necessity for a third man? And here let me tell your readers this is not the first fatal accident of this nature in this company's mine. Witness the death of Robert Stewart some years ago, whilst working alone on night shift. When the paddock was pumped out the position of the body indicated that he had perished in the same dreadful manner as Smith and Bates. There was no one to tell the tale. At the inquest on Smith and Bates, who were working by electric light, it was given in evidence that the lights that night were sufficient; in fact, one witness said tip-top. If the artificial lights are as above described, why cannot a third man be profitably employed on the night shift when, say, five or more may be in daylight? As a further means of giving the men a chance of escape I suggest that a barrier somewhat like a panel of post and four or five rails, or preferably chains, be placed a little in front of all the elevator intakes, and that on each side of the race leading to the elevator similar posts and chains be stretched, so that in the event of a man slipping and drifting down to the lift he would have something to grab, and thus save himself being carried into the lift. Had there been such a protection poor Bates might have held himself or been strapped up and thus supported; Smith might have been free to go for help, or been more free to try and extricate poor Bates. This is assuming Smith was not pinned by the sludge and timber at the same time that Bates got into difficulties. It would have provided Smith with support and leverage to try and free himself. And it must be borne in mind that there was no clear evidence that Bates's foot was ever in the suction-pipe. His body was forcibly pulled out of the encasing sludge without any one seeing how or where Bates was fast. His leg may have been broken in extricating his body, or by poor Smith in his endeavour to free him with a crowbar. As a further and necessary means of making the work less dangerous it is quite easy and inexpensive to protect the workmen and plant in the following way: Prior to filling up the worked-out paddock by running in sludge and stripping, and when erecting the trestles to carry the second lift let the legs and a few extra posts be well sunk in the ground, forming a semicircle round the proposed site of the new lift. These posts could be easily stayed or braced by several strands of fencing-wire fastened round the posts and to posts or logs as anchorage, and by this means no obstruction would be placed on that side of the lift and the ground to be worked. Behind the posts facings of scrub should be placed, thus preventing any slip or continuous flow of sludge into the lift blocking it and fatally entrapping the men. In reference to the alarm-bell, it may interest some of your readers to know that in 1893 there was in this company's claim an automatic float alongside the elevator, whereby when the lift was blocked it formed a connection and switched on an electric bell; and at night time, in addition to the bell, it switched on an electric light, which was transmitted through red glass as a danger signal. Does this suggest anything to those interested? At a further date, when I am fortified with certified copies of evidence, I will again address you on this and mining matters at Round Hill.—I am, &c., CHARLES A. PORT."

EDWARD COOPER LEARY sworn and examined. (No. 55.)

1. *The Chairman.*] What are you by occupation?—A public accountant. I am also attorney for the Round Hill Mining Company.

2. Have you had any mining experience?—No practical experience. I wish to make a statement to the effect that my company is prepared to do anything in reason to safeguard the lives and health of the men, but it is a very difficult matter to arrive at what can be done in the direction of minimizing the risk of accidents, and so on. In regard to the accident which occurred, so far as I can make out no means have been pointed out whereby it could have been averted; but the company is prepared to take any action necessary.

3. What have you to say as to a house for the men to have their meals in?—Well, my opinion is that if the men had a house they would not use it. There is a shelter there, and plenty of timber about, so that they could always have a fire going if they wanted it. If we did have a permanent shelter it would mean removing it every time a new paddock was opened.

4. As a matter of expense, would the company have any objection to providing a rough shed for the purpose?—I would like to know the opinion of the men as to the need for it, and whether it would be used if it were provided. I may say that Mr. Port was not really mining during his twenty years' connection with claims. If the men thought a shed was necessary the manager would certainly be quite agreeable to provide it.

5. We are dealing with the question generally, and not with the Round Hill Company in particular?—I can only speak from my own company's point of view. I do not think it is necessary to make it compulsory upon every company.

6. *Mr. Dowgray.*] You made reference to Mr. Port as having been connected with mining for twenty years: he gave his experience as covering forty years?—It depends upon what you call "mining" experience.

7. I believe you admitted that you have had no practical mining experience?—No, I have done no work there except my visits to the mine.

8. The whole of your experience has come from the manager's point of view in dealing with the company's business?—Of course, I have dealt with matters from the accountant's point of view also.

9. You heard that the men, through their union, had been pressing for some place to take their "crib" in?—Yes, but it has never come under my notice. I have only been connected with the company for three years.

10. If the men have a grievance do they come to you or go to the manager?—To the manager.

11. They may have made this request to the manager and you not know anything about it?—Possibly.

12. You said that if there were a respectable shelter-shed at the mine the men would not use it?—I doubted it.

13. Have you ever been in any place where there was anything of the kind?—No, I have had no experience of such a thing; I have never seen a shelter-shed.

14. If there were a shelter-shed of the sort as described by Mr. Port would you take your meal in it?—It would depend upon the weather. There is a very good shelter-shed at Round Hill, where I have had my lunch.

15. What was the weather like?—There was a high wind blowing.

16. You might have done it as a matter of experience?—No; I went there as a matter of course when I was on a business visit to the mine.

17. You said you did not think it was necessary to bring in legislation dealing with the matter?—Not to compel my company.

18. You said your company would provide a shelter-shed: is that not an argument for legislation being brought in?—No, I do not think it would be necessary in every case.

19. Can you tell us how it would not be necessary in every instance?—In many places the men can get shelter without having a shed provided specially for the purpose. For instance, this shed I speak of is used for other purposes, such as storing explosives and tools.

20. *The Chairman.*] Supposing there were a provision made to the effect that at the request of the Inspector of Mines suitable houses should be erected?—I think that would be a very good idea; the matter should be left in the hands of an impartial man. I think the Inspectors would act fairly in the matter, as they do in regard to other matters.

21. *Mr. Cochrane.*] Did you hear the last witness's statement as to the condition of the shelter-shed?—Yes.

22. Do you contradict it or not?—I do not think I have ever been in the shed in very wet weather, but I think it should be satisfactory. If he is referring to the shelter-shed under the elevator I do not agree with him.

23. But as to the tent?—Although it has a fly on it, it may not be all it might be for the purpose of dining in.

FREDERICK HART sworn and examined. (No. 56.)

1. *The Chairman.*] You are the manager of the Round Hill Gold-mining Company?—Yes.

2. How long have you been a manager?—About eight years.

3. What experience have you had in mining?—About thirteen years.

4. Do you hold any certificates?—No.

5. Have you any suggestions to offer in regard to the matters dealt with by previous witnesses?—Yes. With regard to the tents referred to by Mr. Port, they are heavy duck tents, 8 ft. by 10 ft. They had flies on until recently. They were built with wooden frames, to be carried about to different parts of the paddock.

6. How far were they from the working-face?—Sometimes about 10 to 15 chains. It would be impossible to build a shed to be carried about the paddock.

7. How long do the men have for lunch?—Half an hour—those who work on wages and ordinary shift men. There is another reason why we do not build sheds for the purpose, and that is because you cannot carry them over trees, races, and stumps; it is impossible to carry a shed about like you can a tent.

8. Could you not have a movable shed on a sledge or at a convenient place, but not in the paddock?—At the tables would be the handiest place. There is no reason why there should not be a shed there. The reason for using the tents was because they could be carried about the paddock.

9. *Mr. Dowgray.*] You said the tables are 20 chains away?—Well, anything from 5 to 15 chains away from the working-faces.

10. You said the men get half an hour for meals: if they had to travel, say, 10 chains, would they do so in the company's time?—Sometimes they take three-quarters of an hour; we are not strict to ten minutes or so.

11. Would they have to travel backwards and forwards in their own time?—Strictly speaking, they ought to.

12. Do you think Mr. Port gave a faithful description of that tent?—Well, lately the tent has not been used for that purpose—the men hang their clothes in it; but as the men wear gum boots a little water on the ground would not matter very much.

13. Do you think a tent in which you require to use gum boots is a suitable place to take your meals in?—It is not so bad as that. Last night I went down in my slippers.

14. *The Chairman.*] It would only be used in wet weather?—That is so. And as for keeping the tent clean, that is for the men to attend to.

15. However, do you not think it an unreasonable proposal that the men should have a suitable place?—Certainly not.

16. *Mr. Dowgray.*] What is your opinion as to the other suggestions made by Mr. Port as to the barrier and means of communication?—Well, I would be in favour of having a bell connected with my residence for giving an alarm.

17. *The Chairman.*] What is the distance from your residence to the mine?—Close on a mile, I think.

18. How far are the claims apart?—About 32 chains.

19. So that an interchange of bells would be satisfactory?—No, the claims are not both always working.

20. *Mr. Dowgray.*] What is your idea of the necessity for having three men on the night shift?—It is not necessary.

21. For what reason?—There is not enough work for them to do. With two men on a shift, half the time the second man is not working steadily.

22. In the particular place where this accident occurred the third man would have been of value?—Yes.

23. *Mr. Cochrane.*] Some questions have been placed in my hands. Have there been flies on either of the tents during the last eighteen months?—Yes, on No. 2 tent, though the fly was not pulled tight. There has not been a fly on No. 1 tent for about twenty months.

24. During the dust and sand storms where have the men been in the habit of taking their meals?—At times in the open, at other times in the shed underneath the tables, and also sometimes in the tent.

CROMWELL COURTHOUSE, 21ST SEPTEMBER, 1911.

ROBERT MCINTOSH sworn and examined. (No. 57.)

1. *The Chairman.*] You are a mine-manager?—Yes, mine-manager for the Arrow Flat Gold-mining Company.

2. You were for some time Inspector of Mines under the Government for this district?—Yes, for Otago and Southland.

3. How long were you Inspector?—I was Assistant Inspector for about eight years, and Inspector for two years.

4. Do you know the scope of this inquiry?—Yes.

5. Are there any suggestions you would like to place before the Commission?—I would prefer to give my evidence in reply to any questions which the Commissioners may desire to put to me, and will be glad to offer suggestions in regard to any matter which may crop up.

6. *Mr. Molineaux.*] With regard to the ventilation of gold-mines, have you found it satisfactory?—The ventilation of the gold-mines here is carried out by natural means, and I have generally found it satisfactory. There have been occasions when there have been slight blockages of air in the mines, due to natural causes, but very rarely.

7. Natural ventilation has invariably been satisfactory?—Yes, it has not been necessary to put in any mechanical ventilation.

8. Have you found it necessary to suggest, or can you suggest, that a standard temperature be fixed for reducing hours of work for hot places?—I think that is a very debatable point, and I am not prepared to say anything on the matter except that it would be a very difficult thing to arrange.

9. The occasion has not arisen in connection with mining in this district for fixing a standard temperature—such a case has not come under your notice?—No.

10. With regard to explosives, has it come under your notice that there are many misfires?—No, they have not come under my notice in my inspection of quartz-mines. They may have occurred. They are generally single shots, or two shots at the most. The men in this district are mostly skilled men, and when they are putting in only one or two shots they take extra care.

11. Do you know if there have been any accidents at all through the use of explosives?—I can call to mind one fatal accident which occurred when a man was preparing a charge. He was injured about the head and mouth. The only question which arose was as to how he was preparing the charge.

12. What explosive was used?—Gelignite.

13. Under the circumstances you do not consider it necessary to legislate with regard to the number of holes to be fired at one time, or whether they should be fired by electricity or by fuse?—As to the mining operations in this district, where there are only a few shots fired at a time, I do not think it necessary, but I am certainly of opinion that where a large number of shots are fired there should be some control.

14. You have not heard of accidents being caused through firing shots by fuse in shafts?—No, it has not come under my notice.

15. In connection with the working of sluicing claims can you suggest any means or appliances which would tend to prevent accidents?—With the present method of conducting sluicing operations it would be very difficult to lay down hard-and-fast rules. My own impression is that the inspection covers everything that is required.

16. *The Chairman.*] That is, the present system of inspection by Government Inspectors?—Yes.

17. *Mr. Molineaux.*] In the working of high faces is there any danger?—Yes, in the cleaning out of the bottom, when they work the nozzle right under the face. We have had an accident of that kind.

18. Would it be practicable to fix a limit as to the height to which the bottom should be worked?—No. When a paddock is being taken out, if the men are not too greedy, there is not so much chance of an accident. But with the water-power in their hands they work right under the face, and that is where the danger lies.

19. In sinking a tunnel is there a danger of the men being drawn into the elevator?—Yes, experience has proved that.

20. Can you suggest anything to minimize the risk of accident from that cause?—No, except more careful attention on the part of the men, and better supervision on the part of the manager.

21. With regard to the illumination of sluicing claims, during your term of office as Inspector were the claims sufficiently illuminated?—Yes, generally speaking.

22. By what means?—By flare-lamps, and in the larger claims by arc lamps and electric lights. At Nevis there are two electric-lighting plants.

23. Do you consider that under ordinary circumstances hand-lamps are sufficient to ensure safe working?—In sluicing claims during night-work a man's work is generally confined to a particular spot; the nozzleman is working all the time in one place, and the jetman in another. As long as the men have their particular places sufficiently illuminated all is well.

24. With regard to dredge-work, can you suggest any appliances to minimize the number of accidents?—We certainly could apply the matter of improved lighting-appliances to the dredges, inasmuch as kerosene-lamps are not a very dependable quantity always. There is a great deal of water splashing about, the lamps get covered with mud, and the glasses are liable to get broken. But, still, as a whole the lighting on the dredges is very good.

25. You consider the present regulations could with advantage be amended so as to require the better lighting of dredges?—I think it would be hard to do it, because any improvement would mean increased cost. I think a constant supervision of the dredges meets the case. Probably if there were not such good supervision the lighting would be inferior to what it is now.

26. In view of your experience as an Inspector of Mines do you think greater power should be given to Inspectors?—I think they should have extraordinary powers.

27. In what way?—In the way of dealing with small breaches of the regulations; they should be able to bring such cases before a Justice of the Peace at once. I feel sure it would raise the status of the Inspector as he was travelling his district. It is a very important point.

28. At the present time what course does the Inspector pursue in connection with these small breaches of the regulations?—If he considers it necessary he reports fully on the matter to his superior officers, and then there is the usual course adopted of consulting the Law Office, after which he receives instructions from Wellington as to the action to be taken.

29. You consider that the Inspector should be granted the power to prosecute?—Yes; in most instances the case could be taken before a Justice of the Peace, and if he felt it was beyond him the matter could be taken before a superior Court.

30. *The Chairman.*] What do you mean by a superior Court?—A Magistrate.

31. But that is the same Court?—Yes, that is so.

32. Do you not think that, as regards cases in which the Inspector had summary jurisdiction to institute proceedings without reference to headquarters, such cases should be taken before the Warden?—Yes, but probably the matter could be brought before a J.P., to save time where the breaches are small. These small breaches should be taken more notice of.

33. Yes, but you are cutting out the Crown Law Officers in Wellington, and you are bringing proceedings practically before non-experts—Justices of the Peace. I do not wish to cast any reflection on the Justices, but do you not think it advisable, where you do not get a legal opinion beforehand, that the case should be brought before a legally trained man?—I think the Inspector should have the privilege of taking legal advice. It was the smaller breaches of the regulations I was referring to.

34. *Mr. Cochrane.*] In regard to quartz-mines, when you were Inspector, what was the greatest number of men employed in any one mine?—Probably ten or twelve men.

35. So that such a small number of men would not require a very large current of air?—Quartz-mines in this district are usually very shallow.

36. What is the depth of the deepest quartz-mine from the surface in this district?—I could not say offhand.

37. Can you say the approximate depth? Have you any quartz-mines over 200 ft. deep?—I think not, but I am not sure of the Barewood and the Waipori mines.

38. *Mr. Reed.*] Do you know the Barewood Mine?—Yes.

39. They are down about 500 ft.?—I could not say.

40. As regards the dredges, if you look at section 254, subsection (37), it says that "once in every twelve months every boiler shall be subjected to an hydraulic test": that applies to a dredge. It also requires that a book shall be kept in which shall be recorded the date and description of such test. Is that done on these fields?—Not to my knowledge. I had no control whatever over boilers, otherwise there would have been dual control with the Inspector of Machinery.

41. As far as you know the boilers are not tested?—They are periodically tested by the Inspector of Machinery.

42. As a matter of fact, between the Inspector of Mines and the Inspector of Machinery there is no hydraulic testing done?—Not that I am aware of.

43. *The Chairman.*] Have you ever seen a book such as is required by that section to be kept?—No, I have never seen such a book. I have never interfered with boilers.

44. *Mr. Reed.*] A frequent cause of accident on dredges is the oiling and repairing of machinery while in motion: is there anything you can suggest to prevent that class of accident? We have nothing in the statute at present to prevent the men from oiling machinery while in motion?—There is one regulation which says that these things shall be done to the satisfaction of the Inspector, but it is hard for him to see it carried out when his visits are so infrequent. The only way would be to introduce legislation making it illegal for a man to go about the work while the machinery is in motion. That would be a difficult thing to regulate. You have to move about the machinery when it is working. I think that employees should be prohibited from oiling while the machinery is in motion.

45. There is machinery—some stationary engines, for instance—that cannot be oiled unless in motion? We considered this matter in the Head Office, and found it a rather difficult matter to legislate upon?—It is difficult with the main engine. Men often lose fingers and finger-nails. It would be a serious thing to stop the main engine.

46. You would be in favour of legislation being introduced to prevent oiling, or repairing, or adjusting any dredge machinery while in motion?—It requires limitation; it would have to be subject to the approval of the Inspector.

47. But the Inspector could not be there at every contingency?—Then a general rule could be made. That is a case where an Inspector's powers ought to be sufficient to enable him to deal with the matter.

48. *The Chairman.*] Would you suggest that power be given to an Inspector to frame rules to govern the dredge in his own district?—Yes, provided they are not allowed to recoil on the Inspector himself. No matter how careful you are you cannot control six or seven men all the time.

49. Different conditions may require different rules. There is no power under the Act for the Inspector to deal with it?—I think that would be covered by the regulations I suggest that all these appliances shall be subject to the approval of the Inspector.

50. *Mr. Reed.*] Would you suggest that the words "oil or adjust any movable machinery of a dredge" be inserted in Rule No. 6?—I would like to state that when you visit Alexandra, if you see the Earnscleugh Electric No. 1 dredge, you will there see how it is possible to safeguard the men against accident by machinery.

51. Is it not a fact that men go aloft on windy days, with the result that their clothes get caught in the machinery?—I think the average dredgeman's clothing is not fitted for his work.

52. What is the defect about their clothing, and what would you suggest?—They generally wear old suits, and I would suggest close-fitting overalls.

53. Why?—Because there would then be no loose ends to catch in the machinery.

54. Have there been fatal accidents due to the loose garments being caught?—Yes, accidents have been ascribed to that. If they were close-fitting dungaree overalls the risk of accident would be reduced.

55. *The Chairman.*] Do you know these combination overalls? Can the men work comfortably in them?—Yes, in the ordinary course of dredging-work. Possibly when the men were coaling the suits might be inconvenient. But on a dredge there is not very much room to move about the machinery, and I think if the suits were worn it would have the effect of reducing the risk.

56. *Mr. Reed.*] Can you tell us how the law as to head-lines is observed, also with reference to the wearing of lifebelts by the men: do they comply with the requirements of the Act in those respects?—Yes.

57. In connection with the working of hydraulic elevators, do you approve of an inexperienced man being left alone near an elevator without an experienced person in charge?—I am aware that on certain claims there is only one man on a shift, and I think that if the results obtained justify the working of the claim there should be two men.

58. Suppose both of those men were inexperienced?—It is very difficult to get experienced men in this district.

59. Would you be in favour of a regulation making it compulsory that there should always be an experienced person in charge of operations at night on an alluvial claim?—Yes, provided it did not increase the cost to a great extent.

60. But we are looking at it from a life-saving point of view. In connection with that Round Hill accident those two men who lost their lives were inexperienced?—I have no knowledge except that they were experienced.

61. Are you aware that Mr. Thomson, your successor, stated that he could have relieved the pressure and saved those men in ten seconds?—It is the customary practice in those claims, when anything gets stuck, to blow it out, but I am not aware how much water there was.

62. In the course of your inspections did you find the Act and regulations generally observed in the interests of human life?—Yes, though at the time of the boom there were a great many unreliable men placed in charge of mining operations. I think at present there is a fine class of men about the dredges.

63. *Mr. Dowgray.*] In reply to Mr. Cochrane you said that on an average the quartz-mines here do not employ more than ten men each?—Yes.

64. Have you had any experience of working in hot places?—No.

65. Have you had any experience of taking temperatures with the wet and dry bulbs?—I have had no experience of it in any of the mines.

66. You will not be in a position, then, to tell us the effect upon the human frame?—No, I would not like to enter into the matter of temperature at all.

67. Am I to understand, from your reply to Mr. Reed as to lighting, that you would be in favour of lights on dredges being improved if it were not that it would add to the cost of working?—Yes; that is, to a certain extent. I think, for the dredges, if it were possible to get electric light at small cost it would be far superior to kerosene.

68. In regard to experienced workmen being in charge of elevators, is that a matter of cost also?—I would not put it that way altogether. I mean, provided that there were only two men it would be all the better if one were experienced.

69. *The Chairman.*] If there were only one man is there not all the more reason that he should be an experienced man?—Except in large claims, after a man has been a few days or a few weeks at the work he becomes experienced.

70. *Mr. Dowgray.*] In that case quoted by Mr. Reed the men were not experienced?—Unfortunately, that was merely a matter of conjecture, because there was no saying what predicament those men were in.

71. *The Chairman.*] Failing the Inspectors having the power to make these regulations, would you be in favour of the manager putting his men through a form of instruction?—I do not think there would be any improvement by the manager instructing the men, inasmuch as the instruction to be given is simply their daily work.

72. *Mr. Dowgray.*] In connection with that accident it would appear that the men did not know how to clean the valve: there must have been something wanting in their knowledge?—Yes.

73. I understood you to say there was some difficulty in getting experienced men: what is the cause?—It is the result of the want of constant work, which in turn is due to the water-supply being so unreliable.

74. You suggested that the men working in dredges should wear special clothing: who should purchase the clothing—the company or the men?—The men themselves. There should be regulations requiring them to wear those clothes.

75. Who should be saddled with the cost?—The men have to wear some sort of clothes, and dungaree suits are not very costly.

76. In cases of payment of compensation for accidents does it not rebound upon the company to pay the compensation?—No; the insurance companies pay if they take the risk. If it is shown that there was any negligence on the part of the company, of course, it is a different matter.

77. *Mr. Molineaux.*] When Inspector of Mines were you ever required to undertake other work apart from mining-work?—I have had to undertake other classes of work for the Mines Department, but not outside the Department.

78. In what way?—Reporting on and certifying to different contracts for roads and bridges, and reporting on water-races for the Wardens.

79. *The Chairman.*] Did those contracts come under the Public Works or Mines Departments?—It was for Mines Department expenditure.

80. *Mr. Molineaux.*] Can you inform the Commission what part of your time was occupied in that work?—It occupied only a small percentage, but it naturally increased my working-hours a good deal.

81. *The Chairman.*] Did it rob you of time which should have been devoted to mining-work?—To a certain extent. It took away from the efficiency of the inspection. If I were coming to this district on county work it was necessary for me to send word, and thus my approach was heralded long before my arrival.

82. *Mr. Molineaux.*] Do you consider that the inspection of the mines is as much as a man can carry out?—Yes, I think the Inspector could be fully employed without being called upon to do any of this extraneous work at all.

83. Are you acquainted with the conditions in regard to such extra work in other parts of the Dominion?—Not first-hand, but I have a general knowledge.

84. Do you think that an Inspector should be asked to expend his time in such work?—No. I may say that, in the case of another officer with whom I was connected, as well as myself, there was no limit to the time we were employed.

85. *Mr. Dowgray.*] I understand from your answer to Mr. Molineaux that it was almost impossible for you to pay a secret visit to a place like this when you had these extra works to attend to?—Yes, secrecy was out of the question during the last few years.

86. *The Chairman.*] Was that attributable to the roadworks inspections, and so forth?—Pretty well.

87. Is it the custom for you to notify the County Councils when you are coming?—Yes, you must get into touch with the County Clerk.

88. Do you consider that your visits to the mines should be secret?—Yes, I consider that in the best interests of every one it is more just to all parties that it should be so, because there can be no suspicion then of preparation being made for the visit of the Inspector.

89. Then I understand that in your opinion the inspection of mines could be carried out more efficiently if the Inspector were relieved of these extra duties?—I think so.

LEWIS HARRIS sworn and examined. (No. 58.)

1. *The Chairman.*] What are you?—I am secretary of the Rising Sun Gold-dredging Company.

2. You have had a number of years' experience?—Yes, about twenty years, mostly at Luggate and the Nevis high lead.

3. What experience have you had as a miner?—About twenty years of alluvial mining in the early days.

4. Have you had any experience of underground mining?—No, only at Skipper's and Macetown.

5. How long ago?—In the "seventies."
6. You have had no recent experience?—No.
7. Have you had any experience of working in hot places?—Yes; once when we were driving for air we could stay only about ten minutes in the place.
8. Have you seen temperatures taken so as to know what the temperature there would be?—No.
9. Have you anything to lay before the Commission?—There is one thing I would like to say. In regard to accidents, especially on our dredge—the Rising Sun—I think if a man met with an accident there it would be his own fault, because there is plenty of room. In regard to alluvial claims, both those claims have electric light, and it is also installed on the Rising Sun dredge.
10. What do you say in regard to the necessity for the men to wear something in the nature of combination overalls?—I cannot say. Some of the men work in their shirt-sleeves and some in jumpers, but they are pretty careful. There is an old saying that familiarity breeds contempt. Perhaps the wearing of these close-fitting clothes would minimize the risk of accident.
11. Do you know the combination overall?—No. Of course, I know that accidents in machinery in factories or anywhere else are the result of people being dragged in. In regard to the oiling of machinery, I think our men generally do it at the change of shifts, when the engine is stopped. Of course, the main engine is always going.
12. You would make it compulsory that the bulk of the oiling should be done at the change of shifts?—It is done now.
13. But it may be done as a matter of work or convenience?—I could not say; that is for the dredgemaster to say. Mr. Scott, the dredgemaster of the Hartley and Riley, is present, and will be able to speak on the subject.
14. *Mr. Dowgray.*] Are there any sanitary conveniences on that dredge?—Yes; we were compelled to put them in at the time Mr. McIntosh was Inspector.
15. From your experience it is an improvement to have electric light on these dredges?—Yes, decidedly.
16. You think they should all be lit with it?—Yes, if they can afford it, but it is not every company which can afford it. They have to get their dynamos from Home. It is far safer to have electric light—the men can see what they are doing. I am certainly in favour of electric light if a company can afford it.

ROBERT SCOTT sworn and examined. (No. 59.)

1. *The Chairman.*] You are a dredgemaster?—Yes.
2. What certificates do you hold?—A dredgemaster's certificate.
3. How many years' experience have you had?—I have been a dredgemaster for close on thirteen years, here and on the West Coast.
4. Have you anything to lay before the Commission, either by way of suggestions for minimizing accidents or generally in regard to dredging?—There is one thing I would like to call the attention of the Commission to, and that has reference to the making-fast of boats in currents, which, if generally practised, would be an improvement. Sometimes when there is a back eddy the boat has to be tied to a post by the stern, and there have been accidents caused through letting go the bow of the boat before the stern. I think the risk of accident would be avoided by having a bollard at the stern of the boat, and making it a rule that the rope must be taken over the bollard and made fast over where the bow is tied. A man could not then let the bow-rope go before letting go the stern. If the boat were tied by the bow and the stern a man, not knowing that the stern is tied, may let go the bow-rope and out goes her bow, and that is where the risk of accident comes in.
5. Is not your suggested method in use now?—Yes, but it is not compulsory, and I think it should be. There have been two men drowned that way to my knowledge.
6. You have heard the suggestion that the men should wear dungaree overalls on the dredges?—Yes, but I do not think you could legislate for that, because the men wear no jacket, but simply work with their sleeves rolled up. The trouble is principally caused by the trousers and loose laces getting entangled in the machinery. I do not think you could legislate as regards a man's clothes. One man may be careful enough, while you would have to chase another all the time to get him to keep his clothes buttoned up.
7. *Mr. Molineaux.*] With regard to stopping the machinery on a dredge for oiling purposes, do you think that is necessary?—Yes, though there are cases where it is not necessary to make that provision, because some of them oil only at the change of every shift. There are, however, dredges which run right through without stopping. There is provision already for that class. I think myself, as far as my experience goes, it should be left to the Inspector of Machinery, because a rule which may apply to one job will not apply to another.
8. They do not find it necessary to stop the ocean-going boats to oil?—That is a different matter altogether. We have gear on dredges which is hanging out on framing, which is not the case on steamers. It is the hot bearing which causes the trouble.
9. Supposing a bearing is running hot through the man not having oiled it when he should have done; he knows the boss will reprimand him, and in trying to oil it he will climb into places while the machinery is in motion where he has no right to go. Should he not be able to get to any bearing to oil it?—It is utterly impossible in some cases.
10. *Mr. Reed.*] You are aware that accidents are somewhat frequent through men repairing and oiling machinery while in motion?—Yes.
11. Now, you have stated that you would leave the matter to the Inspector of Machinery: has that method of leaving it to an Inspector proved insufficient? If not, how have these accidents happened?—I could not say much upon that. I know that the Inspector has made me put up fences to avoid accidents, and I think he could deal with this matter in the same way.

12. But an Inspector cannot always be present?—Perhaps not. There is one thing which should be insisted upon, and that is the lighting. A man goes up above with a hand-lamp to attend to something, and when he gets hold of it perhaps his lamp goes out. Then he does not know where he is catching hold. I think that if you compel them to have an efficient system of lighting you will do more towards avoiding accidents on dredges than by any other means.

13. Would you specify what is efficient lighting?—I consider that electricity or acetylene gas is efficient, but not kerosene.

14. Would you be in favour of electricity or acetylene gas only being employed about dredges?—Yes.

15. But does not an acetylene-gas lamp go out too?—Not if it is protected. I think I was the first to use acetylene gas on the West Coast; that was nine years ago. Of course, there is not much wind over there.

16. Are the acetylene-lamps harder to relight than the kerosene-lamp?—No.

17. Are you referring to a portable acetylene-lamp?—No, to one laid on. But I had a lamp in a well with 30 ft. of tubing on to it, and I think it was even better than the electric light, because I could move it.

18. Would you be in favour of all machinery being stopped during oiling or repairing operations?—No, I think that would be asking too much.

19. Could you formulate regulations to exclude those portions of the machinery that might be permitted to be always going?—No; I think it should be left to the Inspector to decide when he inspects each dredge.

20. To make rules for each dredge?—Yes.

21. You would favour a rule being prepared by the Inspector for each dredge separately?—I really thought the Inspector had that power now. He has power to compel the manager of a dredge to fence off dangerous places. Of course, you cannot repair while the machinery is in motion.

22. *The Chairman.*] I understand you wish the rule to be enforced in the same way as the other regulations at present are enforced?—Yes, that the Inspector should specify what he requires in connection with each particular dredge—what may be oiled and what parts may not be oiled while in motion.

ALEXANDRA COURTHOUSE.—23RD SEPTEMBER, 1911.

EDWIN RIDLEY GREEN examined.

1. *The Chairman.*] You have some tables to submit to the Commission?—Yes, I produce three tables, showing (1) the dredging fatalities in the Southern Mining District during 1909, 1910, and 1911; (2) the non-fatal accidents on dredges during the same period; (3) the accidents in quartz-mines, and (4) accidents in alluvial mines during that period. [Exhibit No. 16 put in.]

JOHN HENRY DAVIDSON sworn and examined. (No. 60.)

1. *The Chairman.*] You are secretary of the Otago and Southland Coal-miners' Union?—Yes.

2. What are you by occupation?—A miner.

3. Working in Alexandra?—Well, I am secretary of the union now, but I was originally a miner.

4. You do nothing else now but act as secretary to the union?—No.

5. In the course of your duties as secretary have you found anything at all which you wish to bring before the Commission—any matters which you consider requires improvement or remedying?—No.

6. You have found things satisfactory in your district?—We do. We have no complaints to make. If anything requires attention we inform the Inspector of Mines, and it is always satisfactorily arranged.

7. *Mr. Dowgray.*] What is your opinion in connection with the lighting on dredges as a matter of safety? It appears that some of them are lit by kerosene-lamps?—I do not know that it makes much difference how they are lit. I have heard no complaints about the lighting, but I am not in a position to speak on the subject.

8. As secretary of the union do the dredges come under your supervision?—Yes.

9. You have never heard any complaints from the men in regard to the lighting?—No; any complaint that is made to us is sent right to the Inspector of Mines, and our experience has been that they are always looked into by him.

10. Do you find that the visits of the Inspector of Mines are conducted in a secret manner, or does everybody know when he is coming?—I could not tell you. I do not know when he is coming.

LOUIS ANDERSON sworn and examined. (No. 61.)

1. *The Chairman.*] You are a dredgemaster?—Yes.

2. How many years' experience have you had?—Over twenty-two years.

3. How long have you been a dredgemaster?—Over twenty years.

4. You hold a certificate?—Yes, a dredgemaster's certificate.

5. Is there any matter which you can suggest to the Commission to improve the conditions under which dredges are worked?—No, I do not think I have anything to suggest. Everything seems to be carried on satisfactorily.

6. *Mr. Molineaux.*] Can you inform the Commission as to what is the usual manner of mooring a boat alongside a dredge in a swift-flowing river?—Well, we generally have a painter on board.

7. To moor the boat by both bow and stern?—No.

8. Is there not a danger of the bow-line being let go first?—Sometimes; if a man is careless that might happen.

9. Is it not the usual practice to make the stern-line fast to a bollard?—Not in my experience.

10. If that were done would that not have a tendency to reduce the possibility of an accident?—No, not so far as my experience goes. We do not have a stern-line in our boat.

11. And you think there is no danger of letting the bow-line go first if the boat is moored bow and stern?—No, you would travel on the side-lines back and forward if you want to go ashore.

12. I am talking about a boat?—I understand.

13. Have you known any instances where accidents have happened through bow-lines being let go first?—I have not seen it, but I have heard of such accidents happening in this locality.

14. Can you offer any suggestion as to how that could be obviated?—No, I do not know any man working on a dredge who would be so forgetful.

15. But it would be a safeguard if a man had to let go the stern-line before the bow-line?—Yes, most decidedly. In a swift current I would not allow a stern-line on a boat so far as I am concerned. When you are taking coal aboard, of course, sometimes you do, but at any other time you do not want any stern-line at all in a current.

16. *Mr. Cochrane.*] What are the most dangerous operations in dredging now?—Well, the river is supposed to be dangerous because of the boating question.

17. Is that in regard to coaling?—Not only then, but at almost all times.

18. More dangerous than the oiling of the machinery?—Well, of course, when machinery is in motion it would not be safe to oil it, but you generally stop it.

19. Have you any suggestions to offer as to the danger in boating?—No, because I think every precaution is taken so far as boating is concerned, and any accidents which happen cannot really be avoided.

20. *Mr. Reed.*] Would you be in favour of a regulation to prevent men oiling or attending to machinery while in motion?—Well, as a general rule, they have the dredge stopped every shift for oiling.

21. Are you aware that a good many accidents have occurred through men working about machinery and oiling and adjusting it while it is in motion?—There are a few, I admit, but accidents will happen at any time.

22. As you make a practice of it, would you be in favour of a regulation being made to the effect that all machinery should be stopped?—Yes; and other dredges about here do it also.

23. So that it would be no hardship if it were made compulsory?—No.

24. In connection with men getting drawn into the machinery by their clothing, would you be in favour of a rule being made that all men on dredges should wear a tight garment, either coat or jersey?—Well, I do not know. Perhaps it would be safer, but I have known men caught when wearing engineers' suits.

25. So that you would not be in favour of men being compelled to wear tight-fitting clothing such as engineers' suits?—No.

26. As regards boilers on dredges, do you think they should be examined and tested periodically?—Yes, they are tested every twelve months. In Victoria they test them every three months

27. Is the Victorian test the same as ours?—No.

28. Which is the better test?—The New Zealand one.

29. Do they carry out an hydraulic test here?—No, I have not seen it carried out here.

30. But they do in Victoria?—Yes, there is no other test there.

31. Then do you not think the Victorian is the better system?—Not to my idea.

32. But suppose you wish to work a boiler with 60 lb. of working-pressure, and you test it with 90 lb. of water, is it better that a boiler should burst with water and injure nobody than burst with steam and kill everybody near it?—I admit that; but if you test a boiler with cold water you have to renew the tubing very often.

33. But a boiler usually has a safety factor of 10—that is, if it is to work with 100 lb. pressure it will probably require a pressure of 1,000 lb. per square inch to burst it. Do you not think it would be a very inadequate test to test it with 150 lb.?—It is generally tested with a great deal more pressure than that.

34. But if a boiler bursts under such a small pressure do you not think it is better out of the way?—Perhaps so.

35. You have not had any boilers burst locally?—No.

36. Supposing one did burst would the men be killed?—I am afraid they would.

37. Then there would be a great many complaints?—Yes.

38. Is the practice of wearing lifebelts when carrying out head-lines followed?—Yes, so far as I know.

39. The men are more careful on the dredges than they used to be?—Yes, they are careful.

40. The inspection is very thorough and complete?—Yes.

41. *Mr. Dowgray.*] You are aware that the law provides for a hydraulic test?—Yes.

42. What is the reason for the law not being carried out in that respect?—I do not know.

43. You know it is in the law, and that the results of the test must be recorded in a report-book?—Yes.

44. Is that done in the dredges here?—Well, I have never seen it done. You might do it for your own safety.

45. What Inspector did you refer to?—To the Inspector of Machinery.

46. Does he not insist upon your keeping a report-book?—No.

47. How does he inspect a boiler?—He examines it all over.

48. He first looks at it?—And taps it with a hammer.

49. Do you consider that is an efficient test?—Well, if the man is experienced he knows by the sound if the boiler is in a satisfactory condition.

50. If it satisfies the Inspector of Machinery you are quite satisfied?—That is so.

51. In no instance has an hydraulic test been insisted upon here?—Not as far as I know, but the boilers are generally tested in that way when they are new.

52. What is your opinion as to the lighting of these dredges with a view to averting accidents?—I admit you cannot beat electric light, but on some dredges kerosene-lamps are used. In some cases I admit the lighting could be better.

53. Would acetylene-lamps be an improvement?—Yes, they are better than kerosene-lamps.

54. Would you be in favour of legislation being passed to compel an improvement being made in the lighting of these dredges?—I do not think I would go so far as that, but certainly electric light or acetylene gas is better than kerosene.

55. It might prevent accidents if there were better lighting on the dredges?—Well, there have not been any accidents as the result of insufficient lights.

56. What has been the nature of the accidents which have come under your personal observation?—Well, I have had no accidents in all my dredging experience.

CHARLES WEAVER sworn and examined. (No. 62.)

1. *The Chairman.*] You are a dredgemaster?—Yes, in the Electric No. 2.

2. How many years' experience have you had?—About sixteen or seventeen years.

3. On the Molyneux?—Yes.

4. *Mr. Molineaux.*] Your dredge is driven by electricity?—Yes, we have two dredges driven by electricity.

5. Will you tell the Commission what precautions against accident are taken in connection with the power?—Well, certain instructions are issued to our workmen with regard to handling the lighting and dead cables—that is, when the power is on. If anything goes wrong with the cables so that they cannot communicate with the power-house they have to use rubber gloves, mats, and tongs. There is a switch on board to disconnect the power, and also on the shore to disconnect the leads from the bare wire into the cables, and from thence on board the dredge. If there is no communication between the power-house and the dredge, by using these articles—the rubber gloves, mats, and tongs—the men can disconnect the power at their will. Then, if there are any repairs required, they can lower the cables with safety.

6. How long does it take under ordinary conditions for a man from the dredge to reach those switches on shore you speak of?—In our instructions we allow a quarter of an hour for a man to come ashore from the dredge, or, rather, a quarter of an hour is allowed from the time any damage takes place to a cable. For instance, at the power-house we have ground-lines which indicate anything wrong with the cables or power-lines. In all probability the man at the power-house knows before the man on the dredge. He would then switch the current off; but if he does not do so the man on the dredge is rung up from the power-house and informed as to what is the trouble. If there is no communication between the power-house and the dredge the power is shut off at the power-house. He then looks round his power-line, for it is generally there that the trouble takes place. We have never had any trouble with the transmission-line. He knows then that the power will be switched on again in a quarter of an hour. He has a quarter of an hour to get ashore to those switches and pull them out. He uses the gloves, mats, and tongs to do so, and he can with safety switch off the power even after twenty minutes.

7. And how long under ordinary circumstances does it take a man to get to those switches ashore from the dredge?—Seven minutes.

8. Is there always more than one man on the dredge who understands the taking-out of those switches?—Both men are instructed in the work. There are two men on each shift.

9. How many men have you working in the afternoon and night shifts?—There are usually two men on each shift, and sometimes there are also five or six men repairing. The two men are the winchman, who attends to the bucket-chains, and a greaser, who looks after the greasing of the motors and all other gear. The winchman is usually in charge, and has the chief control of the machinery.

10. In the course of your experience in dredging what is your opinion as to the principal cause of accidents?—Well, in swift-flowing rivers most of the accidents have been in the streams.

11. During the last two years have there been any accidents of that class?—No, not that I know of. There is always an odd case, however—the unaccountable accident.

12. Do you consider there could be any improvement made in the boating on these rivers—any improvement that might tend to prevent accidents?—No, I do not think there is any improvement needed if the men are experienced.

13. Is there any difficulty in getting experienced men to work on the dredges?—Yes, there is some difficulty in getting good men just now; there is just about the requisite number of men engaged in dredge-work.

14. How long do you think a man takes to become experienced in boating?—Well, on a swift-flowing river a man generally needs from two to three years before he can be termed an experienced man.

15. There has been a considerable number of accidents caused by oiling and repairing machinery while in motion: can you give us any suggestions on that point?—Well, as far as my experience goes, the accidents are caused by the manner in which the men approach the bearing. In the case of wheel gearing, if they approach from the side on which they are running together, there is a tendency for anything to get into the gearing; it is natural for it to haul into it anything it may come into contact with. But if they are approached from the opposite side there should be little danger even if a man fell up against the wheel. I think that a suitable

covering should be provided to obviate any trouble of that sort. Other things which have given trouble are collars, studs, and ends of spindles or shafts. The Inspector has given instructions to have the collars hooded or protected. A collar is apt to catch in a part of a man's clothing so as to twist his arm round.

16. Would you suggest that the men should be compelled by regulation to wear close-fitting clothes?—Well, there is not the slightest doubt that a proper close-fitting sleevelet would obviate a great deal of the trouble, but even with them a button may not be fastened, and that is as bad as anything. Still, I think it would be an improvement.

17. You think there is but little danger to careful men?—Yes, a great deal depends upon the care a man takes. Some men, on the impulse of the moment, will put their hands in between the spokes of a wheel, and you cannot provide for that sort of thing.

18. At what intervals is it usual to wash mats on dredges?—In former years our own practice was to wash them on Saturday mornings, but as the winter approaches we usually do it on Friday afternoons.

19. They are not washed daily?—Not on any dredges I have ever had to deal with.

20. With regard to the testing of boilers on dredges, do you consider that a very thorough inspection of the boilers is made by the Inspector of Machinery? Is the inspection at present made not of more use or benefit than would be the test by hydraulic means?—Well, they usually inspect the boilers under steam once every two years, and they also make an inspection with a dry boiler. If there is anything which they consider a defect they reduce the pressure of the steam.

21. As a dredgemaster, do you consider that course is satisfactory?—I have seen boilers reduced in pressure, and there has not been any trouble in connection with it.

22. You have never known of any accidents which might have been averted had the hydraulic test been carried out?—I have never seen it put into operation here.

23. *The Chairman.*] Have you ever known of accidents through boiler-explosions?—Not in this district. I fancy I have heard of them on the West Coast, but I think that was the result of putting gelignite on top of a boiler to heat it.

24. *Mr. Molineaux.*] Do you consider it likely that an hydraulic test over a working test is likely to strain a boiler?—Well, I know that in connection with the first hydraulic test they make of boilers there is a considerable amount of water escapes, but they do not seem to give any bother afterwards in regard to the rivet-holes and caulkings.

25. *Mr. Reed.*] Mr. Molineaux made reference to the "very thorough test" which is made by the Inspector of Machinery. Now, subsection (37) of section 254 of the Mining Act states that "once in every twelve months every such boiler shall be subjected to an hydraulic test, and the date and full description of every such test and cleansing shall be entered in a book." Were you aware that that was in the statutes?—No, I was not aware of that.

26. Is that carried out in the district?—No.

27. Would you regard the test that is carried out as a very thorough test? It is a breach of the law?—I consider that the man who tests the boiler has all the particulars about it and the pressure it is going to stand, and he knows exactly what it is capable of doing. There is no doubt that that is what you might call a double test, and would be a very thorough test.

28. Do you know what a factor of safety is?—Yes.

29. Would you consider a new boiler should have a factor of 8 or 10—that is, that the breaking-strain should be about ten times the working-pressure?—Yes.

30. In connection with the hydraulic test, are you aware that the hydraulic test is about one and a half times the working-pressure?—Yes.

31. If the water test is only about one-fifth of the breaking-strain?—Well, I understand that the boiler inspector would reduce the pressure and insist upon the lesser pressure being the maximum if he thought there was a defect in the boiler and it was not capable of carrying the full pressure.

32. The Act does not specify the hydraulic pressure: that is left to the boiler-tester, is it not?—Yes.

33. Supposing you wish to work that boiler at 100 lb. of steam and it was tested at one and a half times that pressure, and the boiler were to burst at 150 lb. of water, would you not regard it as better that way?—Yes, that is so; but I have never seen boilers tested that way before.

34. Would you be in favour of removing the hydraulic test from the statute-book?—Well, on the face of it it looks as though that is the proper thing to do, but I am not in a position to say whether that should be done. Still, there may be some answer of which we do not know.

35. Do the boiler inspectors take some time?—Well, I know they are pretty particular.

36. And the Inspector just looks at the boiler for a short or long time as he pleases?—In our own case the Inspector sends word that he will arrive on a certain day, and you must have everything nicely cleaned up, and he generally makes a thorough inspection.

37. But he does not observe the law?—He certainly does not use the water test; but I have known cases where they have reduced the pressure.

38. Are you aware of the mining law in other countries as regards hydraulic tests?—No.

39. Would you be surprised to learn that in every State of Australia and nearly every British country the hydraulic test is compulsory?—That may be so, but I know there are boilers coming here from outside which would not stand that test.

40. Would you expect a boiler from America to do anything else?—I think it ought to do.

41. Would you be in favour of the statute being altered to prevent the oiling of machinery while in motion?—No.

42. Why not?—Because there is a considerable amount of gear on a dredge to which very little has to be done; and, moreover, all the bearings on our dredge are quite sufficiently guarded for any person with care to oil them without stopping the machinery. But for oiling all friction and main gear on a dredge or an engine, with the exception of those two particular things, the machinery should be stopped. With a centrifugal pump or an elevator, and many classes of bearings which are easy to get at, there is no necessity for stopping the dredges for oiling purposes.

43. So that you would be in favour of a regulation to prevent oiling those particular parts when the machinery is in motion?—I would be in favour of stopping the engine for oiling friction gear; it is impossible to oil it satisfactorily otherwise.

44. You are aware that accidents happen through men getting drawn into the machinery?—Yes.

45. Are not those proper guards you spoke of compulsory now?—That is so.

46. Then, in cases where those accidents happen, they are improper or unsatisfactory guards?—Well, they are not improper guards in the sense that the Inspector of Machinery authorizes their use in certain cases. Sometimes the guards are taken down, however, and not put back again; I have seen accidents happen as a result of that neglect on the part of the men. The provisions have been carried out as required by the Inspector. As a rule, it is the things which are likely to get caught in a man's sleeve which are first pointed out by the Inspector and required to be guarded.

47. Do you know anything of the accident to Patrick Gallagher on the Enterprise dredge?—No.

48. *Mr. Cochrane.*] Have you been in charge of dredges which used steam for power?—Yes, I have been in charge of steam dredges since 1876.

49. Is the supplying of coal to dredges not a very dangerous operation?—At times there is a little danger, but not usually in paddock dredges.

50. But in the river?—Yes, in swift-flowing rivers.

51. Is it very dangerous?—Not more so than the ordinary working of a dredge.

52. Have you any recommendation to make for greater safety in regard to that?—Well, the Inspector requires certain provisions to be observed—for instance, you must have lifebelts, ropes, boat-hooks, and life-saving appliances; and he insists upon these being kept ready for use in case of accident.

53. And do you think that meets the case?—Yes, I think the only thing not provided for is a faulty boat and an inexperienced man.

54. Then, as to gearing, I think you recommended suitable coverings or guards?—Yes, for all gearing outside main friction gearing.

55. Do you consider, then, that the present arrangements are not satisfactory?—No, our company has been running for some six years, and we have a greaser who attends to all the machinery and greases all the gear. We have two of these machines working, and we have not had many serious accidents to the men. We have always kept suitable guards on any wheels likely to give trouble.

56. Do you consider the present regulations sufficient?—Yes, I think they are.

57. Now, as to the hydraulic test for boilers, in your opinion is the present test by the Inspector of Machinery sufficient?—So far as my experience has gone it is.

58. *The Chairman.*] You are judging from results?—Yes.

59. You have never met with accidents?—No; directly any defect appears in the boilers the head of steam is reduced.

60. *Mr. Cochrane.*] Are you in favour of or against the high-pressure test?—I would not like to give an answer to this question.

61. *Mr. Dowgray.*] In answer to Mr. Molineaux you said you had rubber gloves, mats, and tongs for working the electrical switches: have you had them very long?—Yes, two years or more.

62. How long has your dredge been working by electricity?—Six years.

63. So that for four years you did not have those appliances?—That is so.

64. You also stated that there were certain rules posted up for the workmen to observe?—Yes.

65. You as dredgemaster look to the men to observe those regulations?—Certain instructions have been posted up, and latterly we have gone further and asked the men to sign them as having read and understood them. The men thoroughly understand what is in these instructions. If they were not asked to sign them they might just see the notice and forget about it in ten minutes.

66. Still, you as dredgemaster look to them to carry out these rules?—Yes, and they generally do so.

67. And if they do not carry them out they are unfit for the job?—Yes.

68. And yet you admit to Mr. Reed that as dredgemaster you do not carry out the requirements of the Act?—In what way?

69. In regard to the hydraulic test, which the Act requires to be made by the mine-managers and dredgemasters and entered in a book kept for the purpose, and which is to be open for inspection by the Inspector?—He generally gives us a certificate, and that is the only receipt we get.

70. You think that if this hydraulic test were insisted upon the boilers would burst?—They might.

71. *The Chairman.*] Have you ever been asked for the record of the hydraulic test either by the Inspector of Machinery or the Inspector of Mines?—No.

72. *Mr. Dowgray.*] You did not know there was such a section in the Act?—No.

73. In reply to Mr. Reed you said that some of these guards on the machinery are at times pulled down and not replaced, and that accidents have occurred as the result?—Certainly.

74. Then, if they were not replaced, was not that due to the negligence of the dredgemaster?—Yes.

75. *The Chairman.*] Would you be in favour of the law being amended so that the Inspector of Mines should have power to make regulations to deal with particular dredges, either as to oiling machinery or generally, and that failure to comply with those rules be made compulsory?—I think that would meet the case.

76. And for the Inspector to lay down for each dredge what parts could be oiled while in motion and which parts should not be oiled except when the machinery is stopped, and that he should be able to enforce those regulations the same as he can enforce those under the Act?—Yes, I think that would meet the case.

77. *Mr. Dowgray.*] In regard to the lighting of these dredges, as to kerosene and electricity?—Well, in former years it was mostly kerosene that was used. I do not know that any accidents happened through the machinery not being sufficiently lit up, but in later years they have gone in for electricity and acetylene gas, and I must say the acetylene has given good results. We have always been lit up with electricity.

78. That is a matter upon which the Inspector should be able to make regulations similar to other matters?—Yes. I might mention that a dredge lit by kerosene would cost about three times as much as electricity to give the same light.

79. And as to acetylene?—That is about the cheapest form of lighting.

80. Would you be in favour of a clause being inserted in the Act compelling the use of acetylene or electricity?—I do not know enough about acetylene. I know of one case at Black's where it blew up. I would prefer to keep to the light I know best. There are a good many objections to kerosene; it means a lot of glasses and cleaning. We find that to install a small electric-lighting plant is more effective—you get more light for less money.

REEFTON COURTHOUSE.—20TH OCTOBER, 1911.

THOMAS OTTO BISHOP examined.

1. *The Chairman.*] You are the Inspector of Mines for this district?—Yes.

2. And you have statements to put in in regard to the mines in the district?—Yes, analyses and measurements of the air in the mines. [Exhibit No. 22 put in.] You will notice that the analyses are not dated. With one exception the dates are the same for the measurements as for the air-analyses.

MARK FAGAN sworn and examined. (No. 63.)

1. *The Chairman.*] What are you?—I am workmen's inspector for the Inangahua Miners' Union.

2. Do you hold any other office in the union?—I am also secretary of the union.

3. What is your membership?—One thousand and five.

4. Does that represent all the miners in the field?—Well, there are, roughly, seven hundred and fifty to eight hundred miners in the union; the rest of the members are labourers employed at other occupations about the mines.

5. Does your union include the whole of the miners in the district?—Yes.

6. You say the membership is seven hundred and fifty?—From seven hundred and fifty to eight hundred; it fluctuates.

7. You know the scope of this Commission: have you discussed the matters which you wish to bring under our notice?—Yes, we have held meetings and decided upon certain recommendations which we wish to make to the Commission.

8. Have you the authority of your union to speak in regard to these matters?—Yes.

9. Have you had any personal experience of mining?—Yes, I have had seventeen years' experience as a miner—four years and a half in quartz-mines in New Zealand, on the Coast; and I have also worked in copper-mines, silver-mines, and quartz-mines in Western Australia, Victoria, Tasmania, New South Wales, and Queensland.

10. Do you hold any mining certificates?—No, my occupation has simply been that of a practical miner.

11. Now, what do you wish to bring before the Commission?—Firstly, I wish to refer to the frequency of accidents in mines. For instance, during the two years between June, 1909, and June, 1911, there have been 215 accidents in these mines.

12. That is, in the local mines?—Yes, accidents to members of the union.

13. Can you classify the accidents? How many were fatal?—Three have been fatal.

14. How long ago?—All of them in 1910.

15. Have there been any serious accidents, disabling men either permanently or partially?—Yes, such as accidents by explosives, which have caused a man to lose the sight of one eye, and men suffering from rupture.

16. How many men were permanently disabled?—None.

17. Then, partially disabled, as to be continuously disabled so that there was no chance of recovery, such as the loss of an eye?—I could not give you the exact figures.

18. Out of that number I suppose a great many were minor accidents?—Yes.

19. Have you them divided up?—There were thirty-seven accidents described as "poisoned hands," due to poisonous pieces of quartz getting into the blood when a man's hand was cut.

20. Can you tell us with any degree of certainty how these accidents occurred—the fatal ones first?—Two were caused by a premature explosion while the men were firing a large machine round of holes in a dead-end. I think there were eleven holes bored, and they were attempting

to fire the lot with ordinary fuse. There is nothing to show what actually happened, but in the case of the fatal accident to the two men in the Energetic Mine in 1910 three of the holes they were firing were not spit at all. The leading hole went before they could spit the last three holes, and both men were killed. The third fatal accident—in the same mine—was caused by an uncertificated person having hold of the winding-engine. In regard to minor accidents it is interesting to note that the accident payments made during the two years I have quoted amounted to £1,193 18s. 4d.

21. In regard to that explosion have you any suggestion to offer with a view to minimizing the risk of accidents of that class?—Yes, I think that those men were attempting to fire too many holes, and from the evidence given they were attempting to fire them in too great a hurry. They were contracting, and, judging from the evidence, it would seem they left pretty late. What I suggest is that it should not be left to a man to fire his own holes. There should be certain men—shot-firers—set apart for that purpose—men who would go round and have nothing else to do.

22. Have you had any experience of a mine where shot-firers were employed?—Yes, in Western Australia.

23. In which mine?—The Great Boulder.

24. Were they constantly employed?—Only in portions of the mine.

25. How was the work carried out in those portions of the mine?—Principally by day-labour.

26. And how many men would one shot-firer attend to?—It would depend. I was working in No. 1 level, and there were about fifteen pairs of men in that level, and there was a magazine there for the fracture.

27. Who charges the holes?—The shot-firer.

28. And how did that system work with regard to loss of time? For instance, a shot-firer might be wanted in different places at once: how was it arranged?—They get half an hour, roughly, to do the work. It has to be done during crib-time, between five minutes before crib-time and while the men are having their crib.

29. Has the shot-firer not to hurry over the work and fire a lot of holes?—He would have to do so if the district were too large.

30. Have you had any experience in New Zealand of shot-firers?—No; but I have heard of them being employed in coal-mines.

31. Do you know of any shot-firers being employed in any of the metal-mines of New Zealand?—No.

32. Have you had any experience of electric shot-firing?—Yes.

33. What is your experience of that?—I think it is a good thing, and it should be the only method by which a round of holes should be fired in shafts, or in any place from which it is difficult to get away.

34. Have you any opinion to offer as to the use of electric batteries for firing a large number of holes?—Yes, that is what I mean.

35. And for a straight drive where you have a round of holes to fire such as you mentioned just now?—Yes, I think that should be a place where a battery should be used.

36. How many holes do you consider it is safe for a man to fire with the ordinary hand-fuse?—I should say it would not be safe for even an experienced man to fire more than five.

37. With all reasonable care?—Yes. It may be that it is in a rise, say, up 150 ft., and he has to climb that distance before the first shot explodes.

38. But I mean in development-work—in a straight-ahead drive?—I should say that five fuses should be the limit. Of course, some men are experienced and will boast that they can spit fifteen or twenty, but it generally happens that they try it once too often.

39. Have you had any experience of instantaneous fuse?—No.

40. You have not seen it used?—No; I have heard of it, but I have had no experience of it.

41. You are not in a position to offer an opinion as to whether it is dangerous or whether it should be used with restrictions?—The only time I have heard of its being used was when those two men were killed with it on the railway-works near Westport.

42. Have you any other suggestion to offer in regard to minimizing the risk of accidents when firing?—No, except the compulsory use of the electric battery in shafts and development-work.

43. Would the use of the electric battery do away with the necessity for shot-firers?—I should think that then the shot-firer would be more necessary, because it is necessary to have a man thoroughly conversant with the work.

44. Have you found any difficulty in manipulating the electric battery?—It takes a man with some knowledge. I have found that the men do not care about using it; they have no confidence in it. I urged the Inspector of Mines to make the Blackwater Company provide electric batteries, because in that mine it was difficult to get away by the ladderways. The men had to climb 125 ft. to 130 ft. to get away. We had a difficulty in getting the men to use the battery—they were frightened of it. For that reason I say that where batteries are in use it is necessary to have shot-firers.

45. And as to misfires with the battery?—I have not seen any more unexploded gelignite in a working-face after the use of the battery than with fuse.

46. Have you seen as much?—I have seen it from both.

47. Did you ever know of hangfires with the electric battery—the shot to hang for an appreciable time?—No; in every case where I have had occasion to use the battery it has either exploded or else it has been a misfire.

48. Now, as to other accidents: have you anything to suggest as to the winding accidents—that is, without reopening the whole question? We know the fact that a man was killed, and

an inquiry was held into the matter. Have you any suggestion to make with a view to preventing such an accident occurring again, or minimizing the chance of its doing so?—No, I believe an amendment has been added to the Mining Act to make a recurrence of that accident impossible.

49. Which is that?—Whereby no one is allowed in the engine-room except the certificated driver while men are being raised or lowered.

50. You think that is a sufficient safeguard?—Yes, I think that will prevent a recurrence of such an accident as that.

51. Have you any other suggestion to offer under the heading of engines and winding?—I would like to discuss the new code of signals, which I do not concur in. I think if it is allowed to remain in force it will lead to accidents. In the Globe Mine, at the new shaft, there are, roughly speaking, from seven hundred to eight hundred extra knocks per shift of eight hours required under the new code as compared with those required under the old system. The old code was much simpler, and I do not know of any accident occurring by reason of it.

52. You consider the old signals were quite effective?—Yes, they were better. I do not know what signals were in force in other parts of New Zealand. I do not think these are an improvement. And under this heading I would like to point out that an engine-driver, who has perhaps got his ticket driving on a field like this, may have been driving for four or five years, and will have become used to the signals. There is a likelihood of either the engine-driver, or the chamberman, or the braceman getting mixed up when asked to work on a new set of signals. It is dangerous to ask those engine-drivers to listen to seven hundred or eight hundred bells more than he has been accustomed to. The knock on this field for "Men on" has been "three and a pause and 1," while under the new code it is a straight four; and when I point out that a straight three means quartz it will be seen that that is likely to be mistaken for a straight four. I think the pause is apt to give a degree of safety. Another thing in connection with knocking for a cage of mullock: a chamberman might be getting dirt from a given level and they may have been winding pretty fast, and he may have sent his last truck up, but the driver above, of course, does not know that, and before the chamberman gives the fourth knock the engine-driver may take the cage away. I think the three and one is the better signal, and the straight three for mullock. The new code is too much like a straight four. It certainly is not as good as the old signal.

53. Have you an engine-drivers' association or union, or do they form part of your union?—Some of them are in our union, but they have a union of their own; but they intend to speak for themselves. I know there has been a good deal of dissatisfaction.

54. Are you speaking on their behalf?—No, on behalf of the workers underground.

55. Have you anything further to add in regard to winding?—Under that heading might come the cages in use on this field. At back and front they are open in nearly every case.

56. Is not that provided for?—I do not mean on the side of the shafts—I mean where guides or skids come into contact with the cage, and with portion of the cage being open it would be a very bad thing in the event of a cage striking a loose skid when descending. A man may have his back to the skidway. If a guide happened to be swinging in the shaft there is nothing to stop the guide going up through the cage and cutting through the man. It may swing clear of the cage and be swinging about in the shaft, and get into the cage in that manner. It is quite possible that the cage may just pass the loose guide and it may swing into the cage. There is also nothing in the Mining Act to compel the presence of an engine-driver whilst men are underground. It says that he shall not leave his engine while it is working, but there is nothing to compel the presence of an engine-driver while men are underground. It frequently happens in small mines, and when development-work is being done on night-work, to save engine-drivers' wages, that the evening shift engine-driver will lower the night shift and go home. Then perhaps there would be anything from five to ten men below and no driver on the surface, and I contend that if an accident happened the men would be in a very bad position. A man may get a cut and be bleeding to death, and there would be no driver there to wind him to the surface. Therefore it is necessary for the Mining Act to be amended in that respect. Another thing is that provision should be made to compel the owners to prevent a chamberman and braceman to remain at their posts. I have seen it happen on this field in small mines, where the braceman would lower the shift and then go below himself. In my opinion the braceman should be in charge at the mine all the time and not leave his post, and the same should apply to the chamberman.

57. Do you have a chamberman for each level?—No, one chamberman for one mine. Then, in connection with this matter, I think the Mining Act should make provision to make it compulsory for levers to be placed on all knocker-lines. The present is a dangerous practice. The men have to get out into the shaft to pull the knocker-lines. The levers should be placed in all chambers. It would not only be easier for the chamberman, but there would not be the same risk.

58. Would the use of levers tend to make the knocks more distinct and regular?—I think so, and also a man would not have to put his head out into the shaft when he wants to pull the knocker-line. Under that heading, also, I think it should be distinctly stated that none but the person in charge—that is, the chamberman—should interfere with the knocker-line. The Mining Act at present is not sufficiently clear on that point. I think a stiff penalty should be inflicted on any person other than the chamberman interfering with the signal-line. My reason is that in small mines, and sometimes in the larger ones, a man who is a boss thinks he has the right to do as he likes in the matter of ringing up and down the shaft, and by ringing himself to the surface he may be the means of injuring the chamberman or somebody else.

59. Practically, you think the cage ought always to be in charge of the chamberman?—Yes. There should be a stiff penalty provided for any man but the chamberman interfering with the knocker-line. In some mines in this field a very loose system exists in regard to this matter, and every Tom, Dick, and Harry catches hold of the knocker-lines. I do not say that applies to

every mine on the field, but I think the penalty should be provided, because the engine-driver does not know where he is. Then, you asked me if I had anything to suggest as to accidents in connection with firing. I have frequently noticed on this field when inspecting that there are no tamping-sticks used in the stopes. I have seen nothing but a scraper to put fracture into the hole. The Act should be amended to provide for the supply of tamping-sticks on all levels. The onus should be upon the company to provide them. In some mines here, if a man wants a wooden tamping-stick, he has to go into the bush and cut one himself. Then, again, I do not think there is any provision in the Mining Act to compel a company to keep first-aid appliances at the mine. A man may get hurt underground, and I think it should be compulsory that each company should have ambulance and first-aid appliances on the surface always ready for use. I would suggest that they should be kept in the engine-room, and that the engine-driver should have charge of the key, which should be accessible to the men below at all hours of the day and night.

60. Have you any suggestion to offer in regard to the make of stretcher? Have you seen the stretcher at the Big River Mine?—Yes, I think such a stretcher should be provided at every mine in the field. It is known as Bain's patent. An injured man can by that means be lowered or raised after being strapped in. If a man had a leg broken it would be a very painful operation without the stretcher to bring him to the surface. I find that during the last two years thirty-seven men have suffered from what have been described in the medical certificates as poisoned wounds. On this field there are no facilities at the mines for the men to bath after leaving their work. There is no warm water provided. A man may get a cut when below, and with no warm water to wash it, and in a cold climate like Reefton, he may sleep all night with the poisonous matter in the wound, which results in the wound festering. That would not happen if there were proper means at the mines for cleansing wounds.

61. You do not know that that is the cause of these poisoned wounds—it is only your own idea? The doctor will be called, and he will be able to say as to that?—I am speaking from personal experience on this field. I have had it happen to myself.

62. You recommend that bath and change houses be provided?—Yes, undoubtedly. I think, as far as bath-houses and change-houses are concerned, it should be compulsory for each man to have at least a dressing-room in bath-houses to be provided at all mines. Each man should have at least 2 ft. to 2 ft. 6 in. in which to dress, and the rooms should be in charge of some person whose duty it should be to keep them clean. There should be lockers to keep their clean clothes in. It should be compulsory on all mine-owners to provide these bath-houses, and I suggest that there should be no plunge-baths and no tubs. My experience is that men will not use plunge-baths. I had an aversion to them myself. Bath-houses should have shower-baths fitted up, with hot and cold water, and concrete floors, with a fall for the water to run away, and a person should be appointed to keep them clean. An objection to the use of the tub is that perhaps a man may not let the water run away after washing, and the next man does not care for washing another man's slime off. For that reason I would recommend that bath-accommodation at mines should consist only of showers, so that the men would leave it clean.

63. Have you anything to suggest as to accidents from falls from roofs and sides?—Yes; I would say that it should be made compulsory that no more than one set of ground be broken in a stope at one time. That is necessary on account of the new machines being introduced on this field. If some such provision is not made for these new machines there will be an increasing tendency to break two sets of ground at once instead of one, and perhaps three or four.

64. What sort of new machines do you refer to?—They are known as the Wall machines. Then, I think it should be made compulsory, wherever a windlass is used below, for a pawl or sprag to be on it, so that in the event of anything happening to the man using it the windlass could not get away or hurt the man. The compulsory use of it on all windlasses underground should be insisted upon. Then, there is another matter I wish to refer to which concerns this field. It is customary to use wooden rungs on the ladders, and I think they should be made of iron for the safety of employees passing up and down. The travelling-ways, too, in my opinion, should be at least 4 ft. by 4 ft., and mine-owners should be compelled to provide them that size, so that the provision of the Mining Act in respect of stagings every 25 ft. could be complied with. At the present time I know of travelling-ways 90 ft. long without one staging. If you take steps to compel a mine-owner to put in stagings he will tell you that if you do you will debar him from pulling timber up the pass. A proper staging should be put in every 20 ft., so that a man could rest if he felt faint or tired when travelling a long distance up a ladderway. Then, a number of accidents that have happened to the members of the union have been in the nature of strains and ruptures. We have had cases where chambermen have been ruptured through grappling with big timber in a cage, and I would suggest that some provision should be made that where heavy timber is to be put on to or removed from a cage a chain or block should be used either in the chamber or on the surface.

65. Have you known chains to be used?—Yes, there is one in use on the surface in one of the mines here now.

66. But not down below?—No, it is at Blackwater. It is a very good arrangement. The work is very much less laborious and less dangerous. There is another matter which I think should be attended to. Provision should be made in the Act to alter the present system of protection at each chamber. The present method is to put a bar across. It should be compulsory for gates to be provided instead of these bars. The plat may have a dip towards the shaft, and in one case I knew an accident to be just avoided. A number of trucks come out of a crosscut, and each one bumps the one in front until the first one gets to the shaft, and there is a big risk of them falling down the shaft altogether. I think the gate would be much safer than the bar at present in use. I think, too, there should be communication between the engine-driver and the man below, either by speaking-tube or telephone, in every shaft. Sometimes men are below 1,700 ft. or 1,800 ft., and there is not even a back knocker on. I have known such communication as I suggest provided in Western Australia.

67. You want one at every level?—Well, the chamberman leaving one level could put his block in and take it on to the next.

68. Have you anything to say in regard to ventilation, either particularly or generally?—Yes, as to both. That is a problem which we find very difficult to deal with here, especially where development-work is being carried on. In connection with rising, and driving, and development-work there is always more or less dynamite-smoke present, and the ventilation is not always good.

69. What remedy have you to suggest?—The compulsory use of exhaust fans for providing artificial ventilation. On this field there are two or three months in the year—January, February, and March—when the ventilation is worse than at any other time, and we have known one mine to be shut down altogether during February on that account. The candles would not burn in it. You are dependent upon what might be termed natural ventilation. You have to contend with climatic conditions, and in a mine that has two shafts—an upcast and downcast—the fact that the cages are working perhaps in the upcast causes the air-current to be very erratic. I think that the upcast in a shaft should be used for no other purpose than as an upcast.

70. Have you anything to say as to splits of air for the different levels?—No, the only exhaust fan I have seen is the Roots blower. In the Globe Mine here there is plenty of air going through the old shaft—sufficient to blow your candle out—but there does not seem to be enough oxygen in it. It is vitiated or used up going through the mine. In regard to ventilation, I would like to say a good deal of rising is done on this field, and I think the present system of rising should be discontinued—that is, taking a rise up with two compartments only. You have to depend upon a little compressed air blown to you, and there is absolutely no chance of natural ventilation reaching the men, because there is perhaps 20 ft. of mullock in the mullock-way or second compartment, and I am satisfied that it should be compulsory that where rises are put up a box should be carried in the centre of the rise, consisting of three compartments, so that a continued circulation of air should be provided. In my opinion, also, rising should be limited in distance. At present, as far as the Mining Act is concerned, there is nothing to prevent the owner of a mine from rising 10,000 ft. if he likes. It is the most unhealthy work. They should be compelled to sink, at any rate, one-third of the distance.

71. Have you anything to say in regard to temperatures?—Yes, I think it is very necessary that a standard heat should be fixed for this country.

72. Do you know anything about the wet and dry bulbs?—Yes; I have taken temperatures in this field with the hygrometer.

73. What have you to say as to a standard?—I say a standard of 75° or 76° is just as hot as a man can work in.

74. That is, fully saturated?—Yes, fully saturated.

75. How are you going to get over the difficulty of variation? Supposing you have the dry bulb at, say, 79°, and the wet bulb at 76°, with, say, three points between them, what are you going to do in a case like that? If you fix the standard at 76° fully saturated that would not meet a case in which you had 76° wet and 79° or 80° dry?—Well, I would say that, as far as that is concerned, I have not too much faith in air-testing. I think a man doing hard work there is the best judge. He knows how his candle is burning, and he knows how he feels.

76. But different men feel different effects. You could not have a man as a standard?—Hardly. Some men can stand more than others, but all the same, whether a man is a weak or a strong man, I think he is the best judge. He can tell when a place is not fit to work in. There are sensations which he gets which are not recorded in an air-tube. A man cannot live in an air-tube. I have seen tests taken where the air was quite nice, but the place was not nice to work in. I base my opinion on a number of years' experience. I have been engaged mining myself, and I think that after all the candle is the best test as far as air is concerned, and when the candle will burn blue it is time to leave the place.

77. Do you get many of those places?—Yes, in the rises.

78. Is it a matter of temperature? You see you might have a high temperature and still the candle may burn quite brightly?—Yes, if the air is about.

79. When you come to consider a temperature standard you have got to keep it clear of a quality standard. It is the deficiency in quality which affects the candle?—It is the lessening of the quantity of oxygen.

80. Are you not confusing the two standards—the quantity standard and the quality standard?—I would like to see a temperature standard.

81. There was a suggestion made by a professor in Dunedin that the best test was the temperature of the man. If his temperature went up above normal, and his pulse-beats increased rapidly, that was the best test of the place being unfit to work in?—I do not see that that would be a practicable test. Every time there was any dispute you would have to bring a doctor to the mine.

82. No, a man could take his own temperature. But, supposing you fix the standard temperature, who is going to decide?—The Inspector of Mines. I take it that if we had a fixed standard the Inspector of Mines would be able to say, "You are over your fixed temperature; you must alter the conditions here."

83. Could he not also take the temperature of the men?—I would rather see the temperature of the place taken.

84. The professor whom we examined in Dunedin said that, when once a man's temperature rose to a certain point, it was a clear indication that he ought to be out of it: have you never heard of such a thing before?—No.

85. What have you to say as to a quality standard of air as against a temperature standard of heat?—I should rather see a temperature standard of heat fixed.

86. How are you going to get over the variation between the wet and dry bulbs when one is up to the standard and the other much higher than it? The opinion has been expressed that, with the dry bulb at 80° and the wet at 76°, the conditions are not so bad as with both bulbs at 76°, fully saturated?—Yes, I admit a difficulty arises there, but as far as this field is concerned I have never found them vary more than 1½°.

87. For instance, here in the tables put in by the Inspector of Mines we have such readings as this : 75° and 75·1°; 68·3° wet and 69° dry; 63° and 64°; 78° and 79°; 68° and 69°: so that practically there is only about a degree of difference on this field?—Yes, that is so; that is the rule all over the Reefton field.

88. In cases where there are two or three degrees of difference do you know how it is going to be overcome?—I should say that there is something wrong with the air if there were 4° or 5° of difference, and then there should be some provision made for testing the air in that place. While on the subject of ventilation I should like to see a standard in candles fixed. According to my own experience of working in dead-ends and rises a very nasty smell arises from the use of inferior candles underground. I do not say they are cheap candles, but I think that none but the best candles should be used where a man has to breathe the fumes given off by them.

89. Have you anything to say as to sanitation?—Yes, I think it is a very important matter as far as underground work is concerned, and a matter that frequently affects the health of the persons employed below. It has frequently struck me very forcibly that a man who is running a factory—whether it is in Wellington or Greymouth does not matter—is subject to the supervision of the Inspector of Factories, who inspects the premises to see that the sanitary conveniences comply with the Act, and are kept clean and supplied with disinfectants, while a mine-owner has been known on this field to employ a hundred and fifty men below but pay very little attention at all to the sanitary arrangements; and yet there is more danger of disease in the case of the mine than there is in the factory, which is up in the sunshine. I would suggest that where sanitary conveniences are made the place should be concreted and whitewashed, and one person at least in every mine employing, say, more than forty men below should be told off to attend to those places.

90. Do you mean that the class of sanitary arrangement should be expressly defined and not left indefinite?—Yes; and where there are more than forty men employed below that a man should be told off for the work. My meaning is that for a mine where less than forty men are employed the man could do other work as well, but where forty men or over were employed below a special man should be told off to do that work and nothing else.

91. Have you anything to say as to the present system of investigating fatal accidents—the constitution of the Court and the general system of inquiry?—Yes, I think that the present constitution of the Court is not representative. Section 266, subsection (4), says, "The inquiry shall be held before a Court consisting of the Warden sitting with two assessors (appointed by the Warden), who shall be the holders of first-class certificates as mine-managers." I think the two assessors being mine-managers is unfair. I think the workmen should have a representative. It frequently happens that there are only seven or eight mine-managers on the field, and that they form one happy family. I think it is very necessary that the workmen should be represented by one of those assessors.

92. You mean that there should be one mine-manager and one representative of the workmen?—Yes.

93. How is he to be nominated?—I should say by the organization or the union that he belonged to. It should be the president or some official.

94. That would make him a fixed nomination. Under the present Act the assessors are appointed by the Warden. The difficulty about fixing a regular person to act as assessor would be that there might be a case where he was interested. If it were the secretary or president of the union that official would be a constant member of each inquiry?—Yes, that is so.

95. That arrangement might lead to trouble in a case where his own friends or relations were killed. Do you not think it would be better to leave it as it is—with the Warden to appoint—with the change you advocate?—I would like to see it made certain that the assessor would be a practical man.

96. Of course, you would have to leave it to the Warden to nominate a practical man, and one as nearly independent as he could find?—I do not mind so long as the workers have one representative.

97. Now, with regard to the powers of Inspectors of Mines: there has been a suggestion made to us that Inspectors should have larger powers—that they should have summary powers of instituting proceedings in case of breaches of the Act, and that generally their powers should be extended to enable them to deal with a number of difficulties that exist in regard to the impossibility of making definite standards and rules for local conditions?—Yes, as far as the powers of Inspectors of Mines are concerned, I think that their position under section 261 of the Mining Act is a farce, for their powers are limited to such an extent. Section 261 nullifies all their powers. We had a case in point in Reefton not long ago. That section says that where he finds anything defective or dangerous he shall notify such to the mine-owner, and shall "require that the matter complained of be forthwith remedied. He shall also report the same to the Minister and to the Warden." Well, that is done, and "if the owner objects to comply with such requisition he may, within seven days after the delivery thereof as aforesaid, send his objections in writing to the Warden." He can work on for another seven days, notwithstanding the fact that the place might be dangerous in the opinion of the Inspector of Mines, who is a practical man, and that the manager has been notified by him to that effect. Then, subsection (*c*) of that section says, "The Warden shall fix a time for the hearing of the objections, and shall cause notice to be given to the owner and to the Inspector of the time so fixed." That may mean another six or seven days'

delay, and so it may be fourteen days from the time the Inspector originally objected to the working of the place. Then, after the order is made by the Warden, according to subsection (*e*), if the owner fails to comply with it, and such failure continues for fourteen days after the date of the order, he commits an offence, so that he can go on for another fourteen days. That means he can work for nearly a month altogether after the Inspector has objected to the place; he does not commit an offence until the twenty-eighth day after the Inspector certifies the matter to be dangerous. I think that section should be altered. I do not think the manager should be debarred from lodging an objection to the Inspector's requisition, but I do say that the Inspector, being a man with the qualifications to judge, should have the power to say that those conditions are unfit for a man to work in, and to compel the manager to withdraw the men. It should be compulsory then for him to withdraw the men, but he should have the right of appeal, and the place should not be worked until the inquiry is held. The section should be amended so that effect must be given to the Inspector's recommendation right away.

98. Have you any recommendation to make as to the alteration of the times? Take the seven days allowed the manager to appeal. Is that necessary?—Certainly not. I should say that ought to be forty-eight hours; but I contend that he should stop the place.

99. But I mean apart from that point altogether. Supposing that power is not given, is there any way of limiting the period?—Well, the seven days could be reduced to forty-eight hours.

100. Then, would you suggest reducing the period within which the Warden should hear the objection? But there is no time-limit there?—No, it would be difficult if he had a big district.

101. But where human life is in danger he must attend to it; the parties could appear before him anywhere. It does not require a sitting of the Court. It could be taken before the Warden summarily?—Well, I think there would be no objection to forty-eight hours being fixed as the time for the mine-owner to submit his objections.

102. And would you suggest that a time-limit be fixed for the Warden to hear the case? What would be a reasonable time?—As far as this district is concerned it might be fixed at four days.

103. Then, what time do you suggest, after the Warden gives his decision, should the mine-owner be compelled to comply with the Warden's order?—I should say, immediately. It should be an offence for him to continue to work under those conditions after the Warden has given his ruling.

104. You must give him a certain time to remedy the defect: what time do you say—"forthwith"?—Or within twenty-four hours. There is another aspect of the case: the Inspector of Mines may be a practical miner, but the Warden may know absolutely nothing about the work, and then you would have a qualified man saying that a place is unfit to work in, and yet he has to go before the Warden and ask him whether he is right or wrong.

105. It is a matter of evidence before the Warden. I doubt whether the Warden would rely wholly upon his qualifications. What do you suggest—that some one should be associated with the Warden on the appeal?—I suggest that a Warden on a mining field should have a practical mining knowledge.

106. Supposing the Warden could call to his assistance an independent certificated man with practical knowledge to sit with him and help him to arrive at a conclusion. It might make the procedure more cumbersome?—I would not be in favour of that. I would recommend that he should have practical mining knowledge for dealing with mining cases of that sort. I think that is essential.

107. Have you anything to say as to the use of rock-drills, poppers, and so on?—One of the causes of the cases of miners' complaint I have known has been the use of rock-drills.

108. What is your opinion in connection with the dust trouble in cases where hand-steel is used?—I think the Mining Act should be amended to make the use of water with hand-steel compulsory. At present, unless a company is using rock-drills, you cannot compel the use of water underground. On this field, in the Big River Mine, the ventilation is what the Inspector of Mines would describe as adequate—in fact, it is regarded as the second-best ventilated mine here, and yet it is getting dustier with depth.

109. You think water is necessary in all cases?—Yes, wherever there is dust. There is a new drill being introduced now for boring "uppers," called the Wall machine. I have seen it working at a fairly good pressure, and with it it is not possible to allay all the dust.

110. The sprays are used?—Yes; but even if the spray goes right across the hole it must miss some of the dust. The spray of water is split by the drill.

111. If it is kept pretty close up to the hole?—I do not think it is possible to kill all the dust when boring "uppers."

112. How could you do any better with hand-steel to kill all the dust?—I would abolish dry drilling—whether by hand or machine—to-morrow if I could. I do not say it is possible. By some means we should try to prevent men from dry drilling. As far as miners' complaint is concerned, I notice that in all cases the men who suffer by it are those employed on development-work—those who work in the dustiest places. We also attribute it partially to men having to walk two or three miles to their homes without changing their clothes. They come out of a mine where the temperature is perhaps 70° or 76°, and go home sweating through a cold atmosphere, and their clothes are quite stiff before they get to their camp. Thus they catch cold, which may be the start of miners' complaint. In connection with this matter I would like to see it made compulsory for a spray to be used in all places, whether there is hand-labour or machines used, and all ladderways in these dry mines should be sprayed. Then, there is the matter of the mullock which is broken in one level being used in the next. It is sometimes fairly dirty when tipped into the pass, and the trucker suffers from it. I think provision should be made to thoroughly wet all mullock in transit from one level to another. As regards miners' complaint also, I find that my

experience goes to show that it is the contractor who catches it. The contract system is responsible for a good many of the cases of miners' complaint. In their greed they rush back and eat smoke, as they would not do under the day-wage system. It is the man who works the hardest who succumbs the quickest to miners' complaint: that is my experience.

113. *Mr. Dowgray.*] What is your opinion of section 264 of the Mining Act, which gives the miners power to employ check inspectors?—I think it is altogether inadequate.

114. In which direction?—Well, it is contended by the mine-owners on this field that the words "once at least in every month" in paragraph (*a*) of subsection (2) of section 264 of the Act limits the workmen's inspection to once a month. If that interpretation is right the workmen might as well be without the right of inspection. If the mine-owner has defective places in his mine he can hang them up until the workmen's inspector has come and gone—he can time the inspector's visit to a nicety. I contend that if these inspections are going to be of any service to the workmen the inspectors should have free facility to inspect a mine at least once a week.

115. It has been suggested in other places that the workmen's inspector should have increased powers, inasmuch as he should have the power to stop a place until it was visited by the Inspector of Mines?—I believe also that that power is needed, because the Inspector of Mines here has a large district, and his work carries him away for four and five weeks at a time. He might be in Marlborough, and men might be working here under unsatisfactory conditions, and the workmen's inspector is powerless under the present circumstances.

116. You think he should have the power to stop a place?—I do.

117. In reply to the Chairman you said the height of rises should be limited, but you did not state the height to which you would limit them?—I consider that if rising were limited to 70 ft. it would decrease the number of cases of miners' complaint. I attribute miners' complaint a good deal to rising. It is the most unhealthy development-work a miner can do. In view of that I would advocate that rises be limited to 70 ft., with the proviso that there should be three compartments.

118. You said that knocker-lines should all have levers: is there only one knocker-line?—There is one in each compartment. If you are knocking away the south cage you use the south line, and if you are knocking away the north cage you use the northern line.

119. *Mr. Parry.*] In regard to ladderways you advocated that they should be 4 ft. by 4 ft., giving sufficient space to put landing-stages every 30 ft.: do you mean by that the ladderway or shaft used for travelling purposes alone, and not for putting steel and timber up and down?—Certainly; I think it would be nothing but right to have a travelling-way in each block for travelling purposes alone.

120. *The Chairman.*] You mean 4 ft. by 4 ft. for ladderways?—Yes, to allow for the change in the ladders. The present ladderways are so small that if you were to attempt to put a staging in every 25 ft. or 30 ft. you would block them.

121. *Mr. Parry.*] Apart from the travelling-way do you think it would be advisable to have a place to pull timber and tools up?—I do.

122. Do you think that would have a tendency also to improve the ventilation in the stopes?—Yes, because if you are dependent upon the two-compartment passes for ventilation—as they are in the mines now—then the effect of putting in staging would be to block the vent. If there were stated places for pulling up timber you could do away with the winch or the pulling-up of timber and tools hand over hand.

123. In regard to temperature, do you advocate a dry and a wet standard?—Yes, I would suggest a fixed dry and a fixed wet standard.

124. During your experience at what time have you found the most accidents occur underground?—I do not know that I have noticed that more accidents occur on one shift than another. Of course, the number of accidents is regulated by the number of men employed, but I should say that they are more liable to happen in the night shift than in any other shift, because then a man has not all his faculties about him.

125. During your experience underground have you found that, as a rule, the standard of vitality is lower in a man working under the contract system than when working on the wage system?—Most decidedly. A man working under the contract system will go home quite used up. I have done so myself.

126. *The Chairman.*] I do not quite understand your answer as to having two standards of temperature—one wet and one dry?—Well, I would suggest that experts decide at what point between the two temperatures there is too much moisture, and then fix that as a sufficient margin between the two. You would have to have a dry and a wet standard. If the difference were too great it would point to the fact that the air was not altogether right, and then there could be a test made of the air.

127. You mean to get over the difficulty by fixing a standard for the wet and one for the dry bulb?—Yes.

128. *Mr. Molineaux.*] I understand you consider that power should be given to check inspectors to stop places?—Yes, when the Inspector of Mines is out of the district.

129. Then you think the check inspector is more qualified to judge as to the safety of a place than the mine-manager?—Yes, I should say he was equally competent, and in some cases more so.

130. In that case do you not think it is only reasonable to ask that check inspectors should hold a mine-manager's certificate to show that he is qualified?—No, I would not say that. I say there are men in the ranks of the miners to-day who are as capable, and more so, than some mine-managers in determining whether a place is unsafe or not, and who have no certificates. As far as a certificate is concerned it does not carry any weight with me. There is a man working in the Energetic Mine who admittedly has a thoroughly practical knowledge of mining, and yet he has failed to gain a certificate.

131. Then I judge that you consider it should not be necessary for a mine-manager to hold a certificate: why should he require to hold a certificate?—I do not know, but, of course, there are a great number of men under him. He is in charge of men every minute of the twenty-four hours.

132. But you are asking for powers as great as a mine-manager's—you are backing your knowledge against his?—I think a man can be a competent check inspector without having a ticket. The power to stop a place would only be used when the Inspector of Mines was out of the district.

133. *The Chairman.*] It could be used at any time, though?—It would only be used, I take it, where the Inspector of Mines was out of the district, and where life was at stake and danger involved. If the Inspector of Mines were in the district all you would have to do would be to go to him.

134. *Mr. Molineaux.*] What qualifications do you consider a check inspector should have before being elected by the union?—He should have a thorough knowledge of practical mining. In my opinion he should be a man who had worked in all departments of mining underground.

135. Then if he has all those qualifications why should he not be prepared to pass the examination and prove his qualifications?—Well, I take it that the average body of miners would not elect him if he did not have them.

136. Then why not ask him to pass the examination and gain the certificate to show that he has these qualifications?—That is to satisfy other people. I would not be in favour of that.

137. Why not?—Because they change so often; the men frequently leave the district. You would want an inexhaustible supply of certificated men.

138. You have already stated that there is a number of men with those qualifications: it would be no hardship?—But from the union's standpoint more is required of a check inspector. He has a good deal of clerical work to do.

139. *The Chairman.*] If you have to appoint a man with clerical ability as well, how are you going to make sure that you get a thoroughly practical man capable of undertaking the duties?—He is known to his mates. Perhaps he has worked with two hundred or three hundred of them, and he gets their vote because they have confidence in him.

140. But you are asking for powers as great or greater than those of the Inspector of Mines?—I would not say as great as the Inspector of Mines, because he is the referee in all cases. I say, in the absence of the Inspector of Mines, if a place were dangerous, the workmen's inspector, in the interests of the health and safety of the men, should have the power to withdraw the men.

141. But do you not think that if you ask for that power the workmen's inspector should satisfy the Mines Department, by an examination conducted by the Department, that he is a competent person to exercise the power proposed to be given him—that he is qualified to judge—apart from merely being appointed by the union? Do you not think that would be reasonable?—I think it would be reasonable if the Government paid half the workmen's inspector's salary. They would certainly then have the right to ask him to pass an examination; but if the workmen's inspector is to be wholly paid by the workmen, then they, and they only, should be the people to ask him for his qualifications.

142. I do not see the connection between the matter of payment and that of qualifications; but, apart from that, you see you are really asking that these workmen's inspectors may stop work in any part of the mine, while the Government will not give the Inspector of Mines that power unless he satisfies them that he is competent to determine what is a good and what is a bad place. You ask that some person should have the same power who has practically no proved qualification other than his appointment by the workmen?—The proofs of his qualifications would be that he had been in the district a good long time, and that perhaps seven hundred or eight hundred men knew him and knew of his qualifications.

143. You might appoint a mine-manager for the same reason, but that would not comply with the requirements of the Mining Act. You might be able to get any number of men quite capable of managing a mine, and who had been there a long time, but you would not be able to place him in charge of a mine merely for those reasons?—But you hold him responsible for life all the time.

144. *Mr. Molineaux.*] I understand you would limit the height of rises to 70 ft.: will you kindly explain your reasons?—Because rising is a very unhealthy form of development-work. More dust is consumed by the miner at that particular class of work than at any other. Also because, when you get above 70 ft., and get as far as they have in this field, it is a difficult proposition to climb to and from your work. The men are confined in a place 4 ft. by 6 ft. 6 in., with hardly enough air going, and yet it is breathed over and over again by a man and his mate. And you have to put a candle on its side to make it burn. I think 70 ft. is quite high enough to rise under those conditions.

145. In rises such as you speak of you say it is difficult to keep a candle alight: how are they ventilated?—By a limited supply of compressed air coming in only two or three times a shift.

146. Granted there was sufficient ventilation in the rise, do you still think that it should be limited to 70 ft.?—I believe if my suggestion of this morning were adopted—that all rises should have three compartments, with a centre mullock-way to be full of dirt, and with a current of air going—it would be possible to go higher.

147. So that if there were adequate ventilation as you suggest, with three compartments, you can see no reason why the rise should not be taken up 150 ft.?—I would stop before that, because of the danger of shot-firing.

148. With regard to shot-firing, what is the greatest number of shots which you and your mate have fired together?—I have fired nine.

149. You mean eighteen together?—No.

150. You have not fired more than nine between you?—No, a man might fire more for years, but he would do it once too often.

151. I did not quite catch the number of holes you considered it safe to fire with ordinary fuse?—I said five.

152. If the fuse were made larger is there any reason why a man should not fire more shots?—Well, it would add to the fumes.

153. But it would not add to the danger of an explosion?—I think if you get a defective piece of fuse it does not matter whether it is long or short. Fuse simply bolts sometimes.

154. But is that not one of the risks you must take? That might happen to a man who is firing only one hole?—Yes. I knew a man in Tasmania who was firing only one hole and lost his eye. He had only 10 ft. of fuse. And yet some men say that all fuse is tested, and that none of it is defective.

155. How long do you consider it would take you to charge a round of machine holes, two in a stope?—It all depends upon the size of the rounds.

156. Say ten holes?—I have never made a calculation of that, but I would not like to be racing against time.

157. Do you think four hours would be too long?—No, I would not entertain that for a moment.

158. Well, say two hours?—I do not think I would work long for a manager if I took two hours over that job.

159. Well, how long?—You have to get your tamping and get ready. I think that if you had not too many preparations to make a round of ten holes, with two men, should be fired in half an hour.

160. Would you prefer to fire a hole yourself rather than let another man fire it?—I would say that even if I did bore a hole a shot-firer, if he were a good man, would be as competent to fire it as me.

161. Do you not consider that it would be better to have a number of men to qualify as shot-firers? Supposing you made a provision whereby a man was required to have two years' experience in and about a mine and six months in a face before he was considered competent?—I take it that a manager would not appoint a man to the position unless he was thoroughly qualified. He would have to be in the manager's employ for a considerable time.

162. But at the present time nearly every man is a shot-firer?—Yes; and I believe that tends to increase the number of accidents.

163. Under the regulations gazetted on the 7th September last how are winding-engine drivers to gain their experience?—I take it you refer to the provision intended to prevent persons other than certificated men being in charge of engines when men are being raised and lowered. A man might gain his experience by winding mullock.

164. And he would be able to sit for his examination without having hauled men at all?—Yes.

165. Then when he gains his certificate he has never hauled men up and down a shaft?—No; but it is only fair to say that on this field a new engine-driver is never allowed to raise or lower men, even if he comes loaded with certificates, without one of the old hands being with him. I say engine-drivers should practice on mullock, and even when he has satisfied the examiner that he is a fit and proper person to have control of an engine with human freight the other drivers should remain with him until they are sure of him.

166. Yes, but why should he not gain that confidence before he gets his certificate?—There is a big risk in it.

167. You cannot tell until you see him do it?—Well, I would rather see him do it with another man.

168. *The Chairman.*] If a man gained a certificate, under this regulation he would be entitled to commence winding men, and no person could be in the engine-room with him?—I take it that it would not be right for a man to wind men under those circumstances.

169. How is he going to practice unless he is entitled to do it: how can he gain his confidence?—I see no way other than that when a man takes charge of an engine another man should stay with him.

170. But under that regulation you cannot have the other man there?—Well, that wants altering.

171. And under the regulation he would have to get his certificate without winding men. Then he would be winding men without having had any previous experience, and no one else can be with him?—That seems a weak point. I say it is not right to allow a man to take on a strange engine.

172. Then you think the regulation requires to be recast in some way so as to enable a man who has had no previous experience in winding men to gain that experience with a qualified man?—Yes, but I say that he should not do any practising until he gets his certificate.

173. You recommend that a man should first get his certificate and then that he be allowed to practice before being left in charge of an engine for winding men?—Yes.

174. *Mr. Molineaux.*] In regard to that question, let me put it in another form: supposing a certificated driver were held responsible for the actions of a man whom he was showing, would you then object to the learner raising and lowering men before he sat for his examination?—That would be putting the responsibility on the driver instead of on the employer. No, I would not be in favour of that being done. I would hold the man who employed him responsible.

175. With regard to bath-houses and change-houses, if it is made compulsory upon the companies to provide them, would you be in favour of its being made compulsory for the men to use them?—I do not like the word "compulsory" at all.

176. Not even in regard to the company being made to erect them?—That is a different matter. If they erect the baths the men will be only too willing to use them if proper facilities are provided, but to make it compulsory upon the men would be interfering with their freedom.

177. Then, in the event of not more than 50 per cent. of the men using the bath-houses, would you consider the company warranted in incurring the expense?—Yes.

178. If less than 75 per cent. use them do you think the company should have the option of shutting them down?—That would be rather hard on the seventy-four men. It would not be any more expensive to heat the water for 100 per cent. than for 75 per cent.; but I think the company will have no reason to cavil on those grounds.

179. *Mr. Cochrane.*] Coming back to the question of temperature, were you speaking as a specialist or as just a practical miner?—As an experienced miner.

180. And I think you asked that an expert should decide the point?—When I said an "expert" I meant the Inspector of Mines.

181. Then you told us there were two deaths from a premature explosion at, I think, the Energetic Mine?—Yes.

182. How did that accident occur: can you give any explanation?—Well, it is in doubt still as to how it happened; but from the evidence it would appear that two men were charging something like ten or eleven holes, and three of them remained unlit, and the leading hole must have gone off and killed them.

183. It is implied that it was due to defective fuse?—That is in doubt, but it is thought so.

184. Then you said there were shot-firers at the Great Boulder Mine: how many men were served by one shot-firer?—Roughly speaking, there were thirty or forty men in the level.

185. Then you say that at the Blackwater Mine the men were afraid to use the batteries?—Well, batteries are not common on the West Coast; it is quite a common thing to meet miners who have never seen them.

186. Was that the reason why they were disinclined to use them?—Yes.

187. You say you would compel the engine-driver to be always present when men are underground, and you would also allow the chamberman only to use the knocker-lines and speaking-tube or telephone. Now, if you have a case where there is perhaps a night shift to carry forward development-work—say, two men and a trucker—would you require these things then?—Yes, while there is life below.

188. Even if you have a good ladderway leading down do you not think that is burdening the industry?—No, I do not think so. If there were only one man below——

189. But take my question—not one man but two?—I would still insist, because most of the mines are 1,800 ft. deep.

190. But take the case of a mine 2,000 ft. deep?—It is my contention that there should be a man at the engine.

191. Then, as to misfires, would you be in favour of reducing the time for returning from three hours to one hour?—I think that the man to go back and fire the hole again should be the man who has the misfire; it should not be left to the stranger. And as to the time to be taken, I would certainly not be in favour of reducing it from three hours to one hour.

192. In cases of infectious pneumoconiosis or tuberculosis would you be in favour of the exclusion of the sufferers from the mines, in the interests both of themselves and the other miners, if they were suitably provided for otherwise?—Yes, they should not be below. And the medical men here go one further and say that they would order the Health Officer to remove the men from underground.

193. Do you say that subject to the qualification that they are suitably provided for?—Yes; the person responsible for taking away the miner's life should give him something else.

194. *Mr. Dowgray.*] Returning to section 261 of the Mining Act, I believe you said, in reply to the Chairman, that you were in favour of the Warden having certain qualifications?—When I said that I had in my mind's eye a case of defective ventilation which was brought before the Warden some time ago, where the Warden admitted from the Bench that he knew nothing about mining, and it seemed to me ridiculous that the Inspector of Mines should require to come to such a man and ask him to decide.

195. Did the Warden visit the place?—Yes.

196. And on examination of the place he gave a decision?—No, he would not give a decision.

197. Would you be in favour of the Warden undergoing an examination?—I think a Warden on a mining-field should have a knowledge of his business.

JOHN TRUSCOTT sworn and examined. (No. 64.)

1. *The Chairman.*] What are you?—Shift boss in the Globe Mine at the present time.

2. How many years' experience have you had?—Thirty.

3. Where?—In New Zealand and Western Australia.

4. What matters do you wish to bring before the Commission?—I wish simply to give my experience of electric batteries. I have used them with both high and low pressure, and consider that for shaft work they are very good, but for anything else I prefer the hand fuse.

5. How many shots do you think a man could safely fire?—Well, some men are fairly nervous, and cannot fire so many as others, but for my own part I have fired twelve and sometimes as many as sixteen, though I do not say that every man can do that. I should say, however, that there is no danger in firing eight or nine holes.

6. Have you had any experience of the shot-firers?—No, in no mine where I have been working have there been shot-firers.

7. How long is it since you used the battery? Where did you use the last one?—In the Crown Mine at Karangahake.

8. How long ago?—About fourteen years.

9. Is there anything else you wish to speak of?—In regard to firing with the battery, as against firing with the fuse, I want to say that I have found as much fracture when firing with a battery as with a fuse.

10. What did you attribute that to?—I really could not say what is the cause of it.

11. *Mr. Molineaux.*] Have you had any misfires with electric firing?—Yes, I had one experience of it when using a low-pressure battery.

12. How did you account for it?—I really cannot say.

13. You have had misholes when using fuse?—Yes.

14. What is the usual cause of them?—At times defective detonators, and at other times bad fuse. I have known fuse to run within 2 in. of a cap and then go out.

15. Have you had any experience of instantaneous fuse?—No.

16. Have you seen it?—No; but I would not care to use it.

17. Why not?—It is too quick. I would rather have the ordinary fuse, and cut it a proper length.

18. Do you consider that under any circumstances instantaneous fuse could be used to greater advantage than electric batteries with the ordinary fuse?—Well, I cannot say, because I have had no experience of the instantaneous fuse.

19. With regard to charging a round of machine holes, say, in a large stope, how long do you consider it would take to charge and fire six holes?—That all depends upon the men themselves.

20. How long would it take you yourself?—I can fire from six to eight holes in half an hour—that is, I could charge and fire them in that time if I had everything there.

21. What is the longest time you have known a hole to hang fire with the ordinary fuse?—I have never seen them, but I have heard of them hanging fire for four hours.

22. *The Chairman.*] What is the longest time you have known them to hang fire in your own personal experience?—Between an hour and an hour and a half.

23. *Mr. Molineaux.*] In case of a misfire what is your usual procedure?—Well, like most men, I give it twenty minutes or half an hour, and then withdraw the cap and fire the shot again.

24. You consider that is the safest method—of course, I am speaking of nitro-glycerine compounds?—Yes, I think that would be safe enough.

25. Safer than boring and charging the explosion?—Certainly, I would prefer to draw the cap.

26. *Mr. Cochrane.*] It has been suggested that the time for returning to a misfire should be reduced from three hours to one hour: what is your opinion on that point?—I think it would be perfectly safe to make it one hour.

27. Do you think it would be better than three hours?—Yes.

28. You have had a good many misfires with the fuse?—Yes, a few.

29. And also a good many when firing with electricity?—Yes.

30. Does not that point to the ordinary fuse being more defective than the battery?—I would not like to say. I cannot give you any opinion on the point. I am here only to give my experience.

31. But you have just recommended a reduction in the time for returning to misfires?—I did not recommend it; I said it would be safe.

32. Are you aware that there was any difficulty in connection with the use of the batteries at the Crown Mines fourteen years ago?—No.

WILLIAM PHILLIPS sworn and examined. (No. 65.)

1. *The Chairman.*] What are you?—A miner.

2. How long have you been mining?—Over thirty years.

3. What matters do you wish to bring before the Commission?—That working in these mines for any length of time is very injurious to a man's health. It has done for me.

4. What is it you are suffering from?—From lack of wind.

5. Are you in the doctor's hands?—Yes, I have been under his care for the last eighteen months.

6. How long is it since you last worked?—Five weeks; but I was not underground then.

7. How long is it since you first felt the shortness of breath?—About eighteen months before I knocked off work.

8. Up to that time did you have average health?—Yes, good health.

9. Where were you working?—In the Globe Mine.

10. On what class of work?—Stoping, rising, sinking, and every sort of mine-work.

11. What were the general conditions under which you worked in regard to dust?—Well, I have been in places where the dust was very bad.

12. But you had water?—No, not then. I am speaking about the conditions five or six years ago. I have been twelve years in that mine.

13. Does the doctor say you will not be able to return permanently to your work?—Yes, Dr. Conlon says so. Four years ago he examined me and said my lungs were quite sound, but when he examined me again twelve months ago he advised me to go into the hospital, and never to go underground again. The manager always gives me a job on top, but now I am unable to even walk to my work.

14. Since the time the doctor last examined you what were the average conditions under which you worked? Were you working in specially dusty places?—I have been in dusty places.

15. Were you drilling with rock-drills?—No, with the hand-steel.

16. Of course, you had no water at all?—No.

17. What is your opinion with regard to the necessity for using water with the hand-steel?—I think a spray of water would be very good where the place is dusty.

18. Do you think it is necessary whether they are using rock-drills or not?—Yes, especially along the levels, where it is very dusty.

19. *Mr. Fletcher.*] Will you please tell us your age?—I am nearly sixty-five.

20. How long have you been employed gold-mining?—For thirty years.

21. *The Chairman.*] What were you doing prior to that?—Coal-mining and alluvial mining.

22. But you have had over thirty years' experience in quartz-mines?—Yes.

RICHARD BURKE sworn and examined. (No. 66.)

1. *The Chairman.*] What are you?—A miner.

2. With how many years' experience?—Eighteen.

3. Where?—In Victoria, New South Wales, and during the last two years in New Zealand.

4. Where are you working now?—In the Blackwater Mine.

5. Do you occupy any position in the mine other than that of a miner?—No.

6. Are you a member of the union?—Yes, a member of the Inangahua Workers' Union.

7. Do you hold any office?—I am on a sub-committee.

8. What is it you wish to bring before the Commission?—I wish to speak as to sanitation and various other matters.

9. Did you hear the evidence of Mr. Fagan?—Yes.

10. Do you agree with him?—I quite agree with him on most points.

11. Then you can add anything you wish to what Mr. Fagan has said?—I would like to see the bath-rooms in our mines kept cleaner than they are at present. Also, I would like to see the spray used where machine holes have been fired in an end.

12. Do you recommend the use of sprays in all cases?—Yes, whether they are hand-drilled or machine-drilled holes. I would limit the extent of rises to 100 ft. I consider rising is one of the most dangerous works in connection with mining, and after it gets 100 ft. you do not know whether your stage may be blown out. There may be nothing covering your head. Further, as a partial prevention of miners' complaint, I would advocate the abolition of all contracts underground.

13. What complaint do you refer to?—Miners' phthisis.

14. How does the contract system affect that?—Men are only too eager to rush back into the smoke and dust after firing a round of holes under the contract system. I would also like to recommend that not more than five holes be fired at any one time.

15. Do you mean under all circumstances?—I mean by using the fuse, because after you spit your first two holes the smoke begins to accumulate, and if you have to fire ten or eleven you have to grope for your final holes.

16. The law now is that you cannot fire more than six holes without using electrical firing-apparatus: do you say that that six should be reduced to five?—Yes. I would also recommend the stopping of the spitting of fuses with fracture. I would like to see the fracture sent down the shaft different to what is done at the present time. A man gets on the cage with perhaps eighteen or twenty tins of fracture, and I think the fracture only should be lowered in the cage. An alteration should also be made in regard to the sending of tools down loose in the cage to the chamberman. I would like to see the recommendation of Mr. Fagan given effect to in regard to the engine-driver being always at his engine when men are below. I have had two experiences of drivers being absent from their engines at such times.

17. Where?—In Victoria.

18. How long did you have to wait?—In the first case nearly three-quarters of an hour, and in the second nearly two hours.

19. What depth were you down?—In the first case 250 ft., and in the second 275 ft.

20. Was there a ladderway?—Yes; but in the first instance a man had his leg broken, and in the other case the man fell down the ladder-shaft.

21. Was he the only one down below?—No, there were twenty-five or thirty men there.

22. *Mr. Molineaux.*] I understand that you consider that five holes are as many as a man can with safety fire with the ordinary fuse?—Yes, it is quite sufficient.

23. Five holes in a rise?—Yes, in a rise or an end. I would prefer to see it made only four holes in a rise.

24. In regard to bath-houses and change-houses, do you consider that the men should be liable to a fine if they do not use them?—Well, I think so, because by not using them he would be injuring his own health.

JOHN DIAMOND sworn and examined. (No. 67.)

1. *The Chairman.*] What are you?—A miner.

2. Where do you work?—The last mining-work I did was in the Globe Mine.

3. How many years have you been mining?—I have been quartz-mining for thirteen years, and alluvial-mining all my life before.

4. What matters do you wish to bring before the Commission?—I have been working in mines during the last thirteen years, rising, sinking, and driving levels, and I think rising is the most unhealthy work a man can do.

5. What recommendations have you to make?—In working in rises with machines a man consumes a lot of dust, and in all such places jets should be used. I have never used a jet when working in a rise in the Globe Mine.

6. Is there anything to prevent you from using a jet in a rise?—No, certainly not.

7. If you used a jet would it tend to minimize the dangerous nature of rising?—Yes, it would keep a lot of dust down, especially with machines.

8. What sort of machines do you use?—Just the common rock-drills

9. Have you used them without water?—Yes, about two years ago, in a rise from No. 10, the water was never used. We were contracting.

10. What are you doing now?—I am in a hospital.

11. How long is it since you worked?—I have only done three days' work since the 19th April of this year.

12. Are you suffering from miners' disease?—Yes, from lung trouble.

13. How long have you been laid up?—Since the 19th April, 1911.

14. How long is it since you first felt the effects of the trouble?—Well, about two years ago last July I went down to Dr. Conlon to see if I was suffering from lung trouble, and he said that I was perfectly sound, and that what I was suffering from was simply a cold. I came to him fifteen months afterwards, and he told me then that I must go to a hospital.

15. In the meantime what had you been doing?—I had been working in rises and levels.

16. In dust all the time?—Yes, pretty well. The last contract I had was for driving a level with machines, and that was the last work I did in the mine.

17. Were there no water jets used at all?—I used a jet in the level in No. 10.

18. Is there any other matter you wish to bring before the Commission?—No, except with regard to this medical examination. Dr. Scott has said that he would recommend the medical examination, but in my case it did no good. I went to the doctor two years ago and asked him if I was suffering from lung trouble, and he said "No." But fifteen months afterwards he said I was not fit to go back into the mine.

19. Do you advocate a periodical examination?—No, my case shows that there is no good in them.

20. Supposing you had gone back again before fifteen months had elapsed do you not think that you would have had a chance to get out of the mine earlier than you did?—I do not know. When I felt the disease coming on again I went back to the doctor.

21. But the point is this: supposing you had gone after six months would it not have been better? It does not follow that the doctor's examination was not effective the first time?—But he gave me a full examination.

22. Perhaps in six months he might have been able to detect symptoms of lung trouble on examination. Do you not think this is an argument in favour of a periodical examination?—You would have thought that if I had been suffering from the disease he would have known.

23. Well, perhaps you may have contracted it afterwards. Do you not think that if you had a periodical examination there would be a better chance of detecting the beginning of the trouble?—I do not know.

24. Have you anything further to add?—I reckon that when working in stopes, with a lot of hammers and a good deal of blasting, they should use the spray, especially in the mines round about Reefton. Wherever there is dust they should use the jet. When they are trucking the rock out of the rise it is enough to suffocate them. Every time they fire it raises the whole of the dust in the stope.

25. You worked under those conditions all that time?—Yes.

26. How old are you?—Nearly thirty-seven.

27. *Mr. Parry.*] You say that you have been working thirteen years in Reefton?—No, about eight years.

28. During that time have you been working on wages or contract?—Mostly on contract.

ALFRED WINTER EVANS sworn and examined. (No. 68.)

1. *The Chairman.*] What are you?—General manager of the Consolidated Goldfields of New Zealand.

2. Do you hold any certificates?—I do, a Transvaal certificate as a mine-manager, a New Zealand mine-manager's certificate, and a university degree as Engineer of Mines.

3. How many years' experience have you had?—Sixteen.

4. How long have you been in charge of this mine?—I was here from March, 1909, till January, 1910, and I returned on the 8th June of this year.

5. What matters do you wish to bring before the Commission?—First of all, the matter of change-houses. I consider it should be compulsory for every miner to change before proceeding underground, and again on arriving at the surface after completing his work, for the sake of the health of the men.

6. What accommodation would you consider necessary for that purpose?—A change-room, with lockers, and heated by hot water or some other means. And baths should be provided in which all the men could wash.

7. What number of men to a bath would you have?—Well, if there were one shower for, say, every twenty men it would be ample, because they do not all arrive at the surface at the same time, and it is only a matter of being under the shower for a couple of minutes.

8. That would be forty minutes?—Yes. They arrive on top about six in a cage, and do not all go into the change-house at the same time. They may be talking on the surface for a few minutes.

9. Have you any other recommendation to make?—I think it would be an excellent idea if every man who is working as a miner and handling explosives were compelled to pass an examination and to hold a blasting ticket which would enable him to handle explosives.

10. Who should examine him?—The Government Inspector of Mines.

11. And what standard would you set up — what subjects?—The handling of explosives, the use of explosives, and any general questions as to bad ground, dangerous hanging ground, as to what he would do under certain conditions, and also on the general laws regarding underground mining, so that there would be no excuse for his being ignorant of the law.

12. There has been a recommendation made that all rises should have three compartments —one for travelling, one for mullock, and one for ventilation?—I think you would be increasing the labour of the men who have to put up the rise. You would have to increase the size up to 10 ft. if you wanted to have three compartments; in other words, you would make it a young shaft.

13. What is your opinion about the height to which rises should be taken?—I think that any height is suitable provided the air is sufficiently good and that the logging sets are kept fairly well up to the face—say, within 4 ft. or 5 ft. of it.

14. What means would you adopt to put air into these faces?—Compressed air, with one compartment, as is used on this field. We have taken samples of the air, and I think I am right in stating that the analysis of the air taken from a point 119 ft. above the cap proved it to be practically as pure as the air on the surface.

15. And how far was it from the discharge of the compressed air?—I do not believe the air was on, but I would not be sure upon that point.

16. Have you any opinion to offer as to the use of small auxiliary fans?—I have no opinion to offer upon that matter. But I wish to recommend that where a miner is supposed to use a spray underground by law, and it is found by anybody in charge of the work that he has failed to do so, the manager should be at liberty to fine him.

17. That is, to make a deduction from his money?—To make a deduction from his money and to hand it over to the Inspector of Mines, or to have the man reported to the Inspector of Mines and allow the Inspector to fine him. My experience is that the men do refuse to use the spray.

18. It is the function of the Court to impose the penalty. Do you think the manager or the Inspector should have summary power to prosecute before the Court?—They should have the summary power of inflicting a fine, in the same manner as an Inspector of Mines in the Transvaal has, if the man has been convicted before. The man has the right to appeal to the Minister of Mines.

19. *Mr. Molineaux.*] You are acquainted with these regulations of the 7th September, 1911. I should like to have your opinion on clause (5A), which says that "In raising or lowerings persons the rate of speed shall not exceed 200 ft. per minute when the cage or other conveyance is within 100 ft. of the surface, bottom, or stopping-place, nor 500 ft. per minute when it is in any other part of the shaft"?—Well, the first part, I think, is a fairly reasonable demand—that is, 200 ft. per minute within 100 ft. of the surface or bottom; but I fail to see any point in reducing the speed at any intermediate place.

20. *The Chairman.*] What would be the average working-speed at intermediate points now?—I could not say offhand.

21. Is 500 ft. a minute low?—Yes, rather low.

22. *Mr. Molineaux.*] Do you think it is advisable to have any limit for hoisting men?—Yes, I think so.

23. But you consider 500 ft. a minute too low?—Yes.

24. What is your opinion of the standard of 8 ft. 6 in. fixed for stopes in these regulations?—I would like to say in regard to that matter that I have had no experience in Australasia outside Reefton, and consequently do not feel competent to express an opinion apart from this particular district.

25. *The Chairman.*] What is your working height?—About 6 ft.

26. So that you are under the maximum?—Yes.

27. *Mr. Molineaux.*] With regard to this code of signals have you any remarks to make?—I think it is pretty hard on the engine-drivers, the bracemen, the chambermen, and also on the employers, because if you are hoisting three hundred trucks a day under the old system you would have to pull the bell three hundred times, whereas under this new system you will have to pull it over twelve hundred times.

28. There was a code used generally throughout this field before this code came out?—Yes, we had a code on this field, but I do not know that it was uniform in all the mines, though the main signals for hoisting, and so on, were uniform all through. I think the signals for the levels in a few cases were different.

29. And you consider the code used up till recently was very much more satisfactory?—Yes.

30. *The Chairman.*] What do you think as to the suggestion for having a lever upon the knocker-lines for signalling?—Well, if the lines are laid properly there is no occasion for that. They should be balanced properly. Still, there would be no harm in having the levers.

31. *Mr. Molineaux.*] With regard to explosives, what is the greatest number of holes you consider it is safe to fire with the ordinary fuse?—Well, I have fired over fifty myself in one face.

32. Are there any conditions under which you consider electrical firing safer than ordinary fuse firing?—Well, I have never had any experience of electrical firing.

33. Have you had any experience with an instantaneous fuse?—No.

34. With regard to engine-drivers, do you consider they should be debarred from raising and lowering men until such time as they have passed their examinations and received their certificates?—No, because I think they require more confidence in the hauling of men than for hauling mullock. A man may be all right if he is only hauling dirt, and if he has an opportunity occasionally of hauling a load of men when he is learning he is more apt to gain confidence.

35. Do you consider it is absolutely necessary, from a point of safety, that a man should have been employed in raising men, with a certificated driver beside him, before he sits for his examination for the certificate?—Yes, I do.

36. *The Chairman.*] Have you any recommendation to make in regard to that matter? The man might get a certificate without any experience. He would have to begin to raise men without any experience of it at all?—I do not think it is right. He should have a certain amount of practice with a qualified man beside him.

37. What recommendation would you suggest to vary that regulation? Would you make an exception in favour of a learner?—If a man is learning driving, and obtains the authority of the manager or person in charge, and has been on the engine hoisting mullock for any length of time, I do not think there should be any objection to his practising under the personal supervision of a qualified man.

38. But, apart from that, you agree that no other person should be allowed in the engine-room or be permitted to interfere with the man winding?—Nobody should be allowed to interfere with the driver, because he is absolutely responsible for the engine and for the human life he pulls.

39. *Mr. Molineaux.*] In regard to explosives, do you consider that the appointment of shot-firers would tend to diminish the risk of accidents?—No, I do not think so; every miner is supposed to be a qualified man.

40. Do you think it is practicable to distinguish, by means of an examination, between the experienced and the inexperienced man?—You could tell if a man is apt to be careless by putting him through a series of questions, for instance, as to how he would open his case of dynamite. If he told you he would use his boot or his hammer you would know that he was not acquainted with the law in regard to the handling of explosives.

41. With regard to misfires, what do you consider the best procedure?—Well, under the usual procedure I have been accustomed to you are not allowed to pull out the fuse, which would probably come away in your hands, but you can draw your tamping to a certain extent, to allow you to fire it again, in the hope that the concussion will explode the hole.

42. You consider that a sufficient amount of tamping can be withdrawn with absolute safety?—Yes.

43. *The Chairman.*] How close would you go to the charge?—The distance is immaterial as long as you are not going to reach your primer cartridge which holds the detonator. Of course, it has to be done in a careful manner. If a man is careless and begins to scrape it out there is apt to be an accident; but, on the other hand, he is safe enough if he takes a piece of wood and scrapes it out sufficiently to put in another primer.

44. How close would you have to go to make sure of your second primer exploding the hole?—The distance would vary—say, 6 in.

45. But the detonator is not fired by concussion?—No, if you heat the detonator it will go off.

46. But it is the firing of the fuse that sets the first detonator off?—Yes; but at the same time, if you were to put another detonator on top in a second primer, and put that alongside, it would explode the first one.

47. *Mr. Molineaux.*] I would like to have your opinion of the present hydraulic test for steam boilers. Do you consider it efficient?—Yes, I think it is an efficient test, though I have not seen it done out here. There has not been any hydraulic testing since I returned.

48. Do you consider it as efficient as a thorough inspection?—No, I do not think it would be.

49. What defects in a boiler would you consider likely to be exposed by the hydraulic test?—The weeping of the rivets.

50. Would that be a sign of weakness?—No, it would not be a sign of weakness. If the boiler is not absolutely true it is a defect. A leakage of steam would result.

51. Would you expect to find leaks under the test even in the best-made boilers? The conditions are so different from those of a boiler working under steam?—Yes.

52. Consequently, do you not think it probable that the hydraulic test would injure the boiler?—I do not know that it would, because you have a factor of safety in your material, and as long as the test is not going to exceed the factor of safety I do not see how the test will damage the boiler.

53. You understand I am referring to an annual test?—I thought you were referring to the test the boiler passes when coming from the foundry. As an annual test I do not think there is any use for the hydraulic test.

54. *Mr. Cochrane.*] In regard to the fine you would impose upon men who did not use the sprays, what would you fix it at?—It depends upon the number of convictions. The first time a man would probably be warned; the second time the fine might be 10s.; and for the third or fourth offence the Inspector of Mines might ask for £5. I would fix the maximum at £5.

55. Then it has been suggested that the present period for returning to misfires should be reduced from three hours to one: what is your opinion on that point?—Well, I think it is a very wise suggestion indeed. If your hole is not going to explode in an hour it is extremely improbable that it will explode at all after the hour is over.

56. It has been suggested that the engine-driver should always be present in the engine-room when men are below, no matter how few?—Well, if you have any number of men underground, I think a man ought to be on his footplate or at his engine the whole time for the safety of the men underground.

57. If there were ten men below would you have a man there?—That is a matter I would not care to express an opinion upon.

58. Then it has been said that men strain themselves taking heavy timber from the ladders, and it is contended that one man is not sufficient to deal with it. Have you anything to say as to that?—I do not think there is anything in that contention. Of course, occasionally you will have a very heavy leg or cap. If there is any heavy timber to go down you usually have more than one man—perhaps three of four—to handle it. Of course, if a chamberman has to handle a large amount of heavy timber by himself it would be a strain on him if he had to move

it any distance, but if he only has to take it out of the cage and lean it up against the side there is no necessity for assistance. As a matter of fact, they run the pick into it and haul it out that way.

59. As to the size of travelling-ways, what is your opinion as to having travelling-ways (not passes) 4 ft. by 4 ft.?—For what purpose, in and out of the stopes?

60. Yes, and for better ventilation?—I do not see that that is going to help at all. If a block of ground has been properly developed it will have rises and passes, and you can get ample ventilation up there.

61. *The Chairman.*] I think it was in regard to ladders?—In that case, as the stopes advanced above the levels, and therefore the length of ladders increased, it is always possible to make the journey never more than one-half the length of backs—that is, when the stope is at the half-way point between the levels it is always possible to work down from the level above, and not up from below.

62. *Mr. Cochrane.*] What is your idea as to the necessity for fans for providing currents of air in the larger mines?—If you have natural ventilation which is sufficient I see no necessity for having fans.

63. But if it were not sufficient what then—would you be in favour of installing large fans?—It would depend upon the particular mine, and the method of working that mine, as to whether it would be advisable to install fans.

64. Then are you in favour of having the winzes well down to meet the rises?—No.

65. For what reason?—In the first place, I do not see any necessity for winzing, at more than three times the cost of rising, when the men can obtain the same amount or equally good air in the top of the rise, and they do not have to work in the wet. If you are winzing there is always a certain amount of water in the bottom of the winze. If you have a misfire hole the silt from the water in the bottom of the winze or the shaft is apt to silt up the hole. There may be a block of dynamite in there, unexploded, and you are apt to drill into it. You have to take your chance of that. But in rises you can see exactly how your holes have come. You can feel with a charging-stick to see if there are any cartridges.

66. But do you not think it is advisable—because the ventilation in the heated air is less likely to come down from the rise, whereas in the winze it tends to rise upwards—for better ventilation?—No, because I do not admit that the ventilation in a rise is at all detrimental to health.

67. It is generally the worst-ventilated place in the mines?—If you have no means of bringing any air up there, but not if you have compressed air to disperse any noxious gases found there.

68. *Mr. Dowgray.*] In connection with the winzes is it not a fact that the hot air will stop there, and it will take more compressed air to shift the hot air then in the winze?—The hot air will always rise, that is quite true; but if you are prepared to lead up your fresh air into the working-place, and can then put the same or better ventilation in a rise with compressed air, then there is no necessity to sink.

69. The dust plays an important part?—But if the mine-managers had the power to bring a man before the Inspector of Mines for refusing to use the spray it would meet the case.

70. Would you be in favour of mine-managers undergoing a course of law to qualify them for inflicting a fine?—There is no need for that. You have it in the Act at present that a miner using a machine has to use the spray, and if he does not do so the manager knows that he (the miner) is breaking the law.

71. Do you consider that when anything becomes law it should be compulsory on both sides?—Quite so. If the Mining Act provides that the men must use sprays they must be supplied by the company, or the company should be fined.

72. *The Chairman.*] And anything that is compulsory upon the mine-owners to supply should be compulsory upon the men to use?—Certainly.

73. *Mr. Dowgray.*] We will turn to subsection (37) of section 254, in regard to boilers. You stated, in reply to Mr. Molineaux, that you did not think the hydraulic test was a good one?—No, I said it was an excellent test.

74. But if applied annually?—I said there was no necessity to apply it annually. When you turn a boiler out of a foundry you have to put it under that test to show that it is in first-class order, and that it has the safety factor. You are not going to run any great risk of your boiler bursting; but if you are going to apply that test every year you are putting a strain on it more than it has to stand.

75. When you get a boiler made is it not guaranteed to stand about ten times its working-pressure?—No, that is not the rule in South Africa. I do not know the rule here.

76. What is the rule in South Africa? Is the hydraulic test carried out there?—It is carried out there if the Inspector of Machinery wants it done.

77. Do you think it is the best test?—Yes, for a new boiler.

78. If a boiler is going to burst with one and a half times its working-pressure is it not better to burst under the test?—No, because it is mighty seldom you get up to one and a half times. If you have a 140 lb. boiler you are not going up to 210 lb. often.

79. In connection with the matter of the engine-drivers you said, in reply to Mr. Molineaux, that the learner ought to practice winding men. Would it not be just as well for him to practice at the same speed as with men?—No. When I was shift-bossing I was anxious to learn winding. I did some driving, but I knew there was only reef on board. I used to do that every night for an hour. Then the driver asked me to run up a load of men at half-speed. The fact that I knew the men were aboard, and that if anything happened I would be responsible or the driver, put a great deal more strain upon me, I am sure. The mere fact that there were men aboard, and not reef, will put you under a great strain. You are looking out for something going wrong.

80. But if you have been practising for a long time?—I made a suggestion that a man should be hauling mullock for some time before he is allowed to haul any men. I do not say that a man should go on to learn by hoisting mullock for two or three days and then say, "I know the ropes now, and I will have a shot at hoisting men." I do not agree with that.

81. Would the men have the same confidence in a driver if they knew he had only practised hauling mullock?—Certainly, they would not.

82. *Mr. Parry.*] You said you would be increasing the burden of the mine by having three compartments: would you explain to the Commission how these men get their timber up these rises?—They have several methods. The old method was to get up to the top of the rise, lower down a rope which was fastened to the logs, and so haul them into position. Another way is to have a windlass at the bottom, carrying a rope up over a pulley, and haul it up in that way. A third way is to use an air-winch.

83. In what way does your company get the timber up to those high rises?—At the present time by Holman hoists.

84. *The Chairman.*] After a certain height is reached would you be in favour of hauling it up hand over hand?—That is not a question for me to decide; but it is a very simple matter to rig up a windlass at the bottom and a block overhead. The mine-managers are only too pleased for the men to do it, because they are going to get on with their work all the faster.

85. Do the men have to be supplied with the timber at the foot of the rise?—At the bottom of the rise.

86. If the men want block-and-tackle and windlass can they get it?—Yes, if they request it.

87. *Mr. Parry.*] With regard to the workmen's inspector, do you think he should have more power than he has at present?—No, I think he has quite sufficient.

88. You do not think that the workmen's inspector should have the power to fine the company in the event of their not carrying out the Act?—What for? Is the workmen's inspector the representative of the Government?

RICHARD CROWLEY sworn and examined. (No. 69.)

1. *The Chairman.*] What are you?—An engine-driver.

2. In what mine?—The Energetic.

3. What certificate do you hold?—A winding certificate.

4. What experience have you had?—Nearly two years' winding experience altogether—that is, as a probationer and a certificated driver.

5. Do you represent the union?—Yes, I am president of the Reefton branch of the Westland Engine-drivers' Union.

6. How many members have you?—We have about thirty-five in the Reefton branch.

7. Have you been delegated to voice the views of your union?—Yes.

8. What do you wish to bring before the Commission?—Well, my union has instructed me to protest against the new code of signals which has been given to us this last week or so, to lodge with the Commission our objections, and to give reasons why we object to the new code. In the first place, the most important change is the provision of a four-bell signal for hoisting men to the surface. We object to that on the ground that it is similar to another signal that is very often used in the course of hoisting operations, and we are liable to be confused with the two signals. The other signal to which I refer is five bells for changing levels, and we hold that the signal in the old code was more efficient and less liable to be misunderstood when it was given. It was three bells and then a pause, and then one bell. The next objection we have is to giving three bells to hoist material. The old code provided one bell for this signal, and one bell was more efficient than three; it was less to listen to, and it was a minimum of signal for a maximum of efficiency. The next objection we have is to the five-bell signal for changing levels, because it is very confusing, and we have enough bells to listen to as it is. We cannot see how this five-bell signal is going to make any difference in the work or to minimize accidents, because under the old system all signals to levels assumed men on board, and the way it is worked now they do not.

9. This code assumes the same thing?—Well, it does not say so on the code we have. There are no instructions on it. It is left for the driver to assume anything he likes.

10. That assumption is clearly included in this new code. It says, "It must always be understood that there are men on the cage in the interlevel signals"?—Well, on the code I worked off to-day there was no such instruction as that. It just gave the signals and the numbers of the levels.

11. Is this information given on your notice: "When ringing the cage from a level to another level the number of the ward must be rung first, and then the number of the level in that ward"?—No, there is nothing like that on our code.

12. Will you look at this printed code, included in these new regulations?—[Regulations examined by witness.] There is not so much on the signal-board at the mine as there is on this, and there are no instructions on it at all. It simply gives the signals and the numbers of the levels.

13. Do you understand the instruction that when ringing the cage from one level to another the ward system must be used?—What do you mean by the "ward" system? I have never heard the term "ward" used in connection with practical mining, nor do I understand it. It is quite foreign to me, and I do not think any winder on this field would understand a man below if he rung the ward signals according to this new code. In regard to these three bells for hauling up a cage, I want to say that in the old code we only had a one-bell signal, and it proved all right, working satisfactorily for the last twenty years. It was simple, and if there is anything we engine-drivers want it is simplicity in signals. We contend that the one-bell signal to haul the cage is preferable to the three-bell signal provided in this code.

14. What do you understand by the interlevel signals?—Under the old code all signals to levels assumed men on board, but there are no such instructions in the new code.

15. But it is here, in the new code, as printed in these regulations?—Well, we have to work by the calico signals at the mine, and it is not there.

16. What do you understand is meant by the proviso, "It must always be understood that there are men on the cage in the interlevel signals"?—We assume that there are men on board the cage when we get the signal to come to the level.

17. That is what you would understand by this new instruction?—Yes.

18. Then that is practically the same as your old code?—That is the point I want to make—that the five-bell signal is unnecessary.

19. You only assume men on the cage when an interlevel signal is given?—Yes; but with this four-bell signal you get no further instructions—it just says, "Men on cage."

20. Supposing the cage was standing at No. 5, and you got the signal to go to No. 8, where it was intended to lift men, you would shift the cage from 5 to 8. What signal would you expect to get?—I would get five bells, and then the number of the level.

21. You would get five bells first?—Yes, because this new code says, "Five bells, change level." When the man below rings the five bells he wants to change the level, and the driver assumes that and waits to get the number of the level to which the cage is to go. Supposing it is No. 8, he will get three more bells, then two and a pause, and three more again.

22. That is to lower to No. 8: what are you going to do with the cage when you get it there?—Leave it there till I get another signal. I think a driver would need two clerks to put down the number of bells. I have never seen this code till to-night. According to it, to take the cage to two levels, the driver would have to listen to twenty-six signals, whereas under the old code he would get only eleven.

23. And they would vary according to the numbers of the levels you wanted to go to?—Yes.

24. Supposing you wanted to go from No. 8 to No. 9, and take men down to No. 10, how many signals would you have to give?—Twenty-eight. If there had been anything wrong with the old code we could have readily understood their changing it; but with a certificated man in charge there has only been one fatal accident, and that was brought about by putting two men on the platform while the shift was being lowered. Of course, another accident occurred when the man in charge was not certificated. I do not see any provision in this new code for blasting. That is something we want in a code of signals, and also a signal for turning on and off the air—it is very important where pipes may burst.

25. *Mr. Dowgray.*] In regard to the signal four bells for "Men on cage," should they not give other three bells to haul the men up?—That is a matter of opinion: the regulations do not say so.

26. *The Chairman.*] Supposing you get a four-bell signal, and you know there are men on the cage, do you know what you are to do with them? It seems to me quite clear that the only assumption you can make is that there are men on the cage—there is no other assumption allowed you?—No, provided you have not any special arrangement with the chamberman.

27. But you ought not to require to make any special arrangement with the chamberman?—No, not with a proper code, but this is not a proper code.

28. *Mr. Molineaux.*] Taking these signals for the levels, what was your knock under the old code for No. 2 level?—I do not know; we have no No. 2 level where we are.

29. What levels have you?—From 3 down, without counting 5.

30. What is your knock for No. 4 level?—Four and one.

31. And by this new system?—It is one and four.

32. You can see that one bell followed by one bell is No. 1 level—that is simple enough?—Yes.

33. Then these knocks between levels are satisfactory?—Yes.

34. Your trouble seems to be with the knocks to stop and raise?—Yes. The main trouble is that in the system now in vogue they have taken the one-bell signal to hoist mullock.

35. What were your old signals?—Two bells, "Lower"; three and one, "Men on board—hoist to surface"; four bells, "Blasting"; five bells, "Turn on air"; six bells, "Turn off air." And for the levels—No. 1, four and three; No. 2 was never used; No. 3, two and one; No. 4, four and one; No. 6, three and three; No. 7, three and two; No. 8, two and two; No. 9, two and three; No. 10, two and four; No. 11, four and two. For No. 12 level the proposed signal was three and four, and for No. 13 four and four.

36. Of course, you are accustomed to those signals; but when you come to look at these new ones do you not think they are simpler between the levels?—Yes, we admit that, if you take the five-bell signal out of them.

37. You understand what a ward is?—One of the Commissioners says it is a group of five levels.

38. Now, when you were learning to drive, how did you get your experience?—By actual practice.

39. Under a certificated man?—Yes.

40. Did he allow you to raise and lower men?—Yes.

41. And where was he when you were raising and lowering men?—Standing alongside me.

42. In such a position as to be able to control the engine in the event of your making a slip?—Yes.

43. Do you consider that a man could become competent to take an engine "on his own" without having previously raised and lowered men in the presence of a certificated driver?—Yes, he would be able to handle an engine all right, but it would be different when he was lowering men. If he got his certificate first, and then obtained a position as a winder, one of his first duties would be to raise or lower men, and I doubt if he would be able to do it.

44. Then you think he should have some experience of raising and lowering men before he sits for the examination?—Yes.

45. With regard to the raising and lowering of men, do you consider that it would tend to minimize the liability to accidents if there were two certificated drivers together on the platform?—No.

46. Why not?—Because it is a duty of the utmost importance, and, as far as possible, the engine-driver should be entirely by himself when he is doing it. When two men are together like that the man at the handles talks to the other man sometimes on matters which have just occurred during a shift, and his attention is thus diverted.

47. As a matter of fact, then, you would rather have the engine-room to yourself?—Yes, certainly.

48. *Mr. Parry.*] Did it ever occur to you that there is a great risk incurred by one man raising and lowering men?—It is possible, certainly, but that is a matter which it is easy to overcome, because at the present all drivers have to undergo a severe medical test, and if there is any likelihood of anything of the kind happening it is not hard to get a driver to subject himself to the medical test.

49. Have you ever heard of such an accident taking place?—Well, I was only told the other day of an accident of the kind in England a few years ago, where a man dropped dead at his work.

50. Do you think it would be advantageous to have direct communication from the chamberman to the driver by telephone or speaking-tube?—Yes, it would be an improvement on the present system, because knocker-lines are liable to break sometimes.

51. And it is handy sometimes to have communication with your chamberman?—Yes.

52. *Mr. Molineaux.*] What is your opinion of the speeds mentioned in clause (5A) of Regulation No. 1?—Well, as far as speed is concerned, we think that it is advisable to leave that to the discretion of the driver. It says in this regulation that the maximum shall be 500 ft. a minute, but there is no reference to the place where the conveyance or cage is being worked. If a driver is winding out of a shaft in bad repair, and the cage when travelling at 500 ft. a minute struck a guide, there is a big chance of those men being killed, because that pace is a great deal too fast in an ill-kept shaft.

53. That is the maximum speed?—Yes. I do not see that exceeding 500 ft. a minute would be dangerous in a shaft in good repair.

54. But you consider that the speed could very well be left to the engine-drivers?—Yes, because there is always a check on them, not only in the condition of the shaft, but also in the objection which the men would have if they considered they were being raised or lowered too fast. If the men think they are being pulled up and down too fast they will speak to the management, and if the driver persists the result is obvious. This regulation fixes a maximum of 200 ft. a minute when coming to the top or getting to the stopping-place. I think that is rather low, because it would take a long time to raise or lower any number of men at all if that pace were observed. And, further, it is a great nervous strain on a driver when he is lowering his shift, and he likes to get the work over as quickly as possible. He is not going to drive recklessly, because he has to think of the ticket he holds.

55. What is the average speed in a good shaft?—Well, I would say that 800 ft. a minute is not an excessive speed by any means in a well-kept shaft. To minimize the risk of accident the only way, in our opinion, is to keep the shaft in good repair. If the object of these regulations is to prevent accidents in shafts through excessive speed in winding, then the maximum would have to be placed so low as to make it impracticable, because if your shaft is in bad repair even 200 ft. a minute will go very near to killing a man, for a driver cannot tell at the instant when his cage strikes anything in the shaft—it may have travelled 20 ft. before he knows. I consider that for a shaft which is well kept the maximum of 800 ft. a minute is not too fast.

56. And as to the approach, at what distance should he slacken, and to what speed?—It should be left to the driver. If the men think they are coming up too fast they will soon tell him. The first consideration, as I said before, should be the state of the shaft, and if it is in good repair there is little chance of accident. But this speed provided in these regulations will not prevent accidents if the shaft is bad.

57. *The Chairman.*] I wish you to read this suggested code of signals, which has been submitted to the Commission by the Inspector of Mines. [Exhibit No. 23, "Suggested Code of Signals," perused by witness.] Have you any recommendation to make in regard to that code?—It is certainly a simpler code than the one already in existence, but I think it may be modified further yet.

58. Would it not be well if your Engine-drivers' Union were to meet and draft a code of signals to be submitted to the Commission before it leaves the district?—Yes, we would be prepared to do that if you wish.

THOMAS OTTO BISHOP sworn and examined. (No. 70.)

1. *The Chairman.*] You are the Inspector of Mines for the district?—Yes.

2. How long have you been Inspector of Mines?—Four months.

3. First of all, you have heard the evidence of the last witness in regard to this new code of signals. Have you anything to say respecting them?—Regarding the signals recently gazetted I think that for the numbering of the levels it is a great improvement on the old system on account of its uniformity and simplicity. The last witness appeared to me not to quite understand that the number of bells in the model column in these regulations are not to be given when giving the signals. Then, sir, I have here a suggested code of signals, which has been approved by all the mine-managers on the field. I should like to place this code before the Commission as an exhibit. [Exhibit No. 23, "Suggested Code of Signals," put in.]

4. You recommend that this code be adopted as being simpler than the present one, and the mine-managers consider it would be perfectly satisfactory?—Yes, that is my opinion also.

5. And it could be made uniform?—Yes. It has been suggested to-day that the accident signal in this suggested code should be made nine bells instead of seven, so as to make it distinctive from any other signal. That may be done. To avoid the No. 11 level signal clashing I have left it out altogether and gone from No. 10 to No. 12. It is always to be understood that men are on board when the number of the level is rung. I would also add that no one should give those signals except the chamberman.

6. And as to levers on knocker-lines?—They would be quite workable, and it would be easier if they were provided.

7. Have you any suggestions to offer on your own behalf, either in regard to matters which have come under your notice as Inspector or prior to your appointment—any clauses in the Act which require amendment?—Yes. Subsection (42) of section 254 should, I think, be made to apply to every mine worked by a shaft. The subsection reads, "In every mine which, in the opinion of an Inspector, is liable to an inundation or inburst of water, such additional rises, chambers, drives, and other workings shall be constructed as are necessary and as are prescribed by the Minister or the Inspector, in order to ensure the escape of workmen from the lower workings or their safety in the mine during the period of any inundation or inburst of water." I would make that apply to any shaft irrespective of danger from water. And while I have the Act open at this particular place I would like to make an explanation in regard to subsection (43). It has been stated to-day that some one was to blame for not having that subsection enforced. It provides for platforms in ladderways, and says, "Ladders (and, when necessary, convenient platforms connected therewith)."

8. *Mr. Dowgray.*] But it was subsection (30) which was referred to?—But subsection (43) appears to apply to these ladders leading up into the stopes. Those words "when necessary" give the Inspector discretionary power, and in my opinion those platforms are in use on this field when necessary. I have had some put in at my request, and where they have not been put in I do not consider they are necessary.

9. *The Chairman.*] What is a "travelling-way" within the meaning of that subsection?—Every ladderway leading from a level to a stope. They are temporary travelling-ways while that particular stope is being worked. Subsection (30) specially uses the word "permanently."

10. In a mine where the men are lowered down in a cage, and do not, as a general thing, use the ladders, would you consider there was a permanent travelling-way at all?—Yes, because those ladders are provided for exit in case of anything going wrong. They are permanent for the life of the mine; whereas those others are only for use while the ground between the two levels is being worked out.

11. Would you suggest that "permanent travelling-way" should be more accurately defined?—It does not appear to be necessary. The permanent travelling-ways are in the main shaft. They are the only travelling-ways that are ordered by the Mining Act.

12. Is there a permanent travelling-way in each of these shafts?—Yes, there is a ladder compartment there. Then, in regard to section 266, subsection (4), which relates to the official inquiry into fatal accidents, I would like to suggest that the inquiry be held by the Warden alone, and not, as is already required, by the Warden sitting with two assessors, who require to be certificated mine-managers.

13. If two assessors are considered necessary would you suggest any change in them?—In that case it would be only fair, as has been requested by a previous witness, to give a workmen's representative a seat on the Bench. But, personally, I think the Warden, being a trained legal expert, with the ability to decide on evidence, should constitute the Court without calling in mine-managers, who are asked to deal with what is practically a manslaughter charge against a member of their profession. Then, I wish to make reference to paragraph (*a*) of subsection (1) of section 254, which provides for water sprays being made compulsory where rock-drills are used in a mine. I would suggest that they be made compulsory in every mine, if considered necessary by the Inspector, whether rock-drills are used or not. There is another matter I would like to suggest, and that is that no oil-engine should be used underground in a mine which depends upon natural ventilation alone. There is an oil-engine underground in a mine in my district, and I have no power to deal with it under the Act as it stands at present.

14. What is your objection?—The fumes are delivered into the upcast. The bottom of that upcast is open, and at present the fumes from the oil-engine are delivered into the open bottom connected with the higher workings. I am afraid that in the summer, if the current reverses, there will be danger to the men. In making these remarks I am speaking from practical experience of a similar thing. It has been suggested several times to-day that if it is made compulsory for the management to provide sprays and other matters it should also be made compulsory for the men to use them. That is made compulsory already by section 256. Then, section 261 has also been referred to, and I think it would be better if it were amended. The amendment I would suggest is that the Inspector of Mines should have the power to stop the work pending the hearing of the appeal.

15. What about the times at present provided?—The times would shorten themselves naturally if that were done.

16. What about the seven days which the owner has in which to send his objections to the Warden?—That could be shortened considerably; there is no need for it.

17. In connection with the power to stop a place, what do you think of the suggestion that the workmen's inspectors should have power to stop places?—Well, subsections (*a*) and (*b*) of section 262 make it an offence if workmen do not notify any danger which they may become aware of in any place. There is also a section in the Coal-mines Act which gives the workmen practically the power to stop a place. They are told they must notify the management of any defect in their working-place, and they shall not work there until the danger has been removed.

18. Would you suggest that the same power be given to metal-miners — that the provisions of the two Acts be made uniform?—Yes; but I think a slight alteration in this subsection (*b*) would meet the case. While on this subject I would like to say a few words regarding the power of workmen's inspectors to go down a mine only once a month. Subsection (*b*) of section 271 says, "In the performance of his duties and functions under this Act, the Inspector, or any person appointed by him in writing, shall at all convenient times have full and free access to any such mine or machinery." Now, I would suggest that if the workmen's inspector wants to inspect a mine more than once a month he might come to the Inspector of Mines and obtain authority in writing to do so. I think that would meet the difficulty, at any rate, to a certain extent.

19. On reading that subsection, where it says "The Inspector, in the performance of his duties and functions under this Act," it appears to me that you would then be appointing the workmen's inspector to discharge your duties?—Well, I once had occasion to use that section when I wanted another opinion beside my own upon a matter. I took a certificated mine-manager.

20. Yes, that is quite in accordance with the spirit and intention of the Act; but would you go the length of giving a general power to the workmen's inspector under this section to perform your duties under the Act?—No, I do not think I would go that far; but it occurred to me that this section gave the workmen's inspector an opportunity of seeing anything which was reported to him, say, a week later than he had made his monthly report. If he made a complaint to the Government Inspector perhaps he might be allowed to go down.

21. I am afraid that you would be putting your duties on to the workmen's inspector?—It had not occurred to me in that light.

22. Would you advocate that power be given to you to give increased opportunities of inspection to the workmen's inspector if you considered it necessary? At the present time he is entitled to go down at least once a month. Would you have that section amended so as to give you power to give him permission to make inspections more often than that?—I do not see any objection to giving him direct power; but, assuming that he does not get direct power, I would be prepared to give him the other.

23. What power would you give him—unlimited power?—Simply the power to carry out his inspections more frequently than once a month.

24. How many?—I would leave that to the Inspector of Mines. The workmen's inspector should be called upon to give some reason for his extra visits.

25. That means that he would be able to inspect at such times as the Inspector of Mines would give him power to do so?—Yes, that is what I mean.

26. Now, it has been suggested that larger powers should be given to the Inspector of Mines to deal with the matter of ventilation, and, generally, more specific powers in order to meet difficulties which might arise in the way of fixing standards. In the first place, what is your opinion of a fixed standard of temperature?—I do not like a fixed standard for temperature. I think it is better not to have a fixed standard.

27. Then, in lieu of a fixed standard, would you be in favour of more extensive powers being placed in the hands of the Inspector?—Yes, if we are not to have a fixed standard the Inspector must have more powers to decide a six-hour place.

28. Would you advocate a temperature standard or a quality standard of air?—A temperature standard depends upon the quality standard. You may, without injury, have a high temperature in clean fresh air, and the same temperature in vitiated air would be injurious, so that it is exceedingly difficult to fix a standard temperature. I have been in places in mines where the temperature was comparatively low according to mining standards, and yet I have considered that such places were not in a fit condition for working in.

29. What do you attribute that to?—That is a rather difficult question to answer. There is no doubt that bad conditions do obtain sometimes which are rather hard to explain. Possibly humidity and stagnation of the air have a good deal to do with it. For instance, if you are in a hot room and wave a fan you do not cool the air, though you may not feel it so hot.

30. It has been suggested that Inspectors of Mines should have summary powers of prosecution—that is to say, that without reference to anybody else, if they find bad conditions they should, on their own initiative, be empowered to institute proceedings, such cases to be taken before a Warden or a Magistrate. Have you anything to say on that point?—The present machinery is rather cumbersome. For instance, if I go down a mine and see a man committing a breach of the Act or regulations I have to obtain permission from the Head Office before prosecuting. It would be better if I could deal with that man myself.

31. You have heard the suggestion that Inspectors or mine-managers should have summary powers of inflicting fines in such cases. What have you to say on that point?—I should prefer to bring the man before the Court. And, of course, what applies to prosecuting a man for a breach of the Act also applies to prosecuting his employers. Speaking as to the ventilation question, there is considerable ambiguity in the amount of air prescribed for workmen. The Act says that 100 cubic feet per man per minute shall be provided. Personally, I interpret it to mean that if there were a hundred men working in a mine there must be 100 cubic feet of air for every one of those men passing through the mine. But another interpretation is that there need only be 100 ft. of air passing through altogether and going to each man in turn.

32. How would you remedy it? How would you suggest the section should be recast?—It would be a good idea to make the standard of quantity secondary to the Inspector's opinion. At present there is a standard fixed, but the Inspector may demand more if he thinks it necessary. I would make it so that the Inspector might demand so-much, and in no case should it be less than the standard quantity.

33. Would you suggest anything in regard to the quality of the air?—You mean a standard of analysis?

34. Supposing you put it this way: that every mine and every part thereof shall be well and efficiently ventilated, and so on, and in no case shall there be less than a given quantity of air of a given quality?—Yes, I would agree to that; and the given quality might be the standard fixed by the British Royal Commission. I certainly would not have it any lower than that.

35. You think that would assist you in enforcing good ventilation?—Yes, it would give Inspectors increased power.

36. *Mr. Cochrane.*] Have you any opinion to express with regard to electric firing?—I have had some experience with electric firing.

37. Do you consider it better than firing by means of the fuse?—In some cases I think it is.

38. In what cases?—In cases where there is a difficulty in getting away from the shots I think probably electric firing is safer than fuse firing.

39. Do you consider it more effective?—No, I consider it less effective in certain classes of work.

40. In which classes?—I had experience of driving a tunnel 13 ft. wide by 9 ft. high, and in that case we tried electric firing and found that we had to fire four times to get an effective firing. We were firing from twelve to twenty-three holes, according to the nature of the ground, and when it came up to twenty-three holes we had to fire as many as four times to get an effective break.

41. Does not that point to deficient voltage?—No; it means that to do their work the holes must go in succession. With electric firing your holes go as one instantaneous blast, and they are more liable to cut each other out. I have seen misfires by electricity, when I have had a series of holes coupled up altogether.

42. Have you seen statistics showing the relative failures of fuse and electricity?—No, I have not studied the subject in that way.

43. Then, as to the time for returning after misfires, what is your opinion as to reducing the period to one hour?—Well, it might be reduced, because, though the Act states that men shall wait three hours, I know that they do not. I have never waited that time myself.

44. And do you think they might probably wait one hour if it were fixed at that?—I do.

45. What have you to say as to the box system in rises, as is general throughout the Thames and Waihi districts, or would you wish to see that system before expressing an opinion?—I do not know what is meant by the box system, but I have put up three-compartment rises on this field.

46. How did that answer for ventilation?—Well, we had no artificial ventilation in that rise, and a three-compartment rise with no artificial ventilation is better than a two-compartment rise. It is quite possible to ventilate a two-compartment rise.

47. Is it not often the case that one compartment is choked with stone?—It often is, though there is no need for it. It could be made a stipulation that as fast as the mullock is put in at the top it should be taken out at the bottom.

48. Do you think that would be an improvement?—If you have not any artificial ventilation it certainly would, but I would not make it compulsory in all cases. If the manager is prepared to put in artificial ventilation there is no necessity. I do think that the men in a rise should have any amount of fresh air, and they can get that without making a three-compartment rise of it.

49. Have you any opinion to offer as to keeping winzes well down to meet the rises?—It has not occurred to me that it is necessary to do that on this field.

50. Then, in regard to the table which you have submitted to us, in some cases the ventilation is slightly under the standard. You give the Progress Mine with the quantity of air per man as 89 and 98 cubic feet?—That is taken in different ways. One is taken in the intake, and the other in the return. It is impossible to measure all the intake in the Progress Mine, because there are leakages going off in other levels.

51. Do I understand that it is up to the required quantity?—I think it is just about up to the 100 cubic feet on the lesser interpretation. If you will look down a little further on that table you will notice that in connection with that mine I have divided the air into sections. I was not able to do that in any other mine, because they are not arranged in that way. There are twenty-three men served by that 5,103 cubic feet. Then, the quantity of air measured in No. 10 level is the quantity coming out above the No. 11 or Pioneer stopes. On the day I took those measurements there were thirty-four men and 3,537 cubic feet, giving 104 cubic feet per man. I took the temperatures there, and they varied from 75° to 78° wet bulb, and from 77° to 79° dry bulb.

52. Did you notice the men not working were perspiring there? What did you consider was the condition of that place for men who have to work there?—That was the place I had in mind when I was speaking as to the standard. The conditions could be very easily improved. It was below the maximum standard of temperature, and yet objectionable.

53. Is that not an argument in favour of the standard for temperature?—That was below the standard of temperature usually recommended. I think it is rather an argument against the standard.

54. Do you think the conditions were all right, then, in those stopes?—I do not consider that was a satisfactorily ventilated stope.

55. Have you anything to recommend to obtain better ventilations?—My recommendation would be that artificial ventilation should be made compulsory in all quartz-mines of any size. I believe in having any amount of fresh air in a mine. The more air you give the men the better results you will get.

56. Perhaps you heard one witness desire travelling-passes, winzes, and rises to be 4 ft. by 4 ft.: have you anything to say as to that?—I do not think there is any real necessity for that. That brings in the question of those platforms again.

57. Do you think it would be advisable to have the ambiguity removed, and have you any recommendation to make as to there being no vertical ladders in any travelling-roads, whether

permanent or otherwise?—According to the Act it is now provided that no new vertical ladders shall be put in in a permanent way. Sometimes in a stope it is impossible to avoid putting in a short ladder. It would mean a divergence of the pass. I may say that I only know of one man having fallen off a ladder, and he admitted that he thought he was at the bottom. I have never heard of any other accident of that sort.

58. Do you think it would be advisable to have the ambiguity removed from these two sections regarding the ladders?—Certainly, all ambiguity should be removed.

59. Now, coming to the question of check inspectors having power to stop places, would you be in favour of the Inspector of Mines having that power if he considered the places dangerous?—Yes.

60. You mentioned that you were in favour of more frequent inspections by check inspectors. Is it not likely that the Inspector of Mines may be absent, otherwise the check inspector would naturally get him to inspect?—Yes, there is that difficulty.

61. Would you be in favour of reducing the time to once a week, or do you think that would be too often?—Of course, there are check inspectors and check inspectors. If a check inspector carries out his duty in as fair and just a manner as he possibly can, then I see no objection to giving him the right to go down as often as he pleases; but, as was pointed out by a witness to-day, the check inspector occupies rather a peculiar position. He has to be selected for many qualities. He has to be the secretary of his union, and also a qualified practical miner, with some years' experience; and I think a man who has not the practical qualifications is apt to be elected to this position over the head of another man who has. I am simply saying that this doubt arises.

62. Do you think the case might be met by providing for a fortnightly visit?—I am not in favour of limiting the time at all. I do not see any objection to giving him the power to go down as often as he pleases, provided he is a man capable of doing his duty.

63. *The Chairman.*] Supposing the Inspector of Mines, apart from putting the workmen's inspector through an examination, were satisfied that he was qualified, would you be in favour of giving him the unlimited right of making inspections whenever he pleased?—Well, that is placing rather much on the Inspector of Mines. It is practically making the Inspector of Mines the examiner of the workmen's inspectors.

64. If you are satisfied with his mining qualifications would there be any objection to giving you power to give him permission to visit the mine as often as he wishes? He could get his power from you, and you could give it according to the man's qualifications?—I do not think that responsibility should be placed upon the Government Inspector. The check inspector should get his power from the Mining Act direct. In special cases he might get it from the Inspector of Mines.

65. Supposing you gave him the general power what check could you put upon his qualifications?—Well, this is the age of examinations. If the check inspector were asked to pass an examination similar to that of a deputy, conducted by two members of the Board of Examiners, it might be a good idea.

66. *Mr. Cochrane.*] I was not quite clear as to what you meant by the standard of quantity being subject to the Inspector of Mines?—The Act says that the amount of air provided shall be 100 cubic feet per man, or, in case the Inspector of Mines is not satisfied with that amount, he has power to demand such increased quantity as he deems necessary. I would reverse the order and make the standard such as the Inspector deems necessary, and in no case shall it be less than 100 cubic feet per man per minute.

67. Then, I will place an hypothetical case before you. Supposing you find the air in a mine to have sufficient oxygen and no deleterious amount of carbonic oxide or acid, and yet the men complain of feeling bad effects, how would you account for that in a place where the air-analysis was good?—I know that such cases do exist, and I admit that I cannot account for them.

68. Does it point to a defect in the taking of the samples or analysis?—It may. We take very small samples. It may be due to not getting a fair sample. I take them myself.

69. How long have you been taking samples?—Since before I was appointed Inspector.

70. *Mr. Molineaux.*] I understand that you consider it would be advisable if there were artificial ventilation in these mines?—Yes.

71. Taking the two deep mines here—the Energetic and the New Big River—do you not consider them efficiently ventilated?—I consider they are fairly well ventilated mines, but not sufficiently well ventilated. I think there should be more air passing through every mine in this field.

72. Notwithstanding the fact that they show 105 and 124 cubic feet per man?—Yes, that is so.

73. But there is no reversal of current in these mines?—There is a cessation of current in summer, and if you will turn to one of those tables of mine you will find it.

74. What do you consider the best method of dealing with misfires with nitro-glycerine compounds?—I think the safest way is to draw a portion of the tamping and put a second primer in.

75. Do you consider that the appointment of shot-firers would minimize accidents?—No, I do not consider the appointment of shot-firers is necessary.

76. With regard to this code of signals, it has been suggested that there should be another item added—namely, four bells to mean that blasting is to be carried on?—Yes, that might be added; it was in the old code.

77. Would you consider that an advantage?—Yes, it might be of use in shaft-sinking. Of course, with the system of shaft-sinking in vogue here it would not be of use except for calling for compressed air.

78. You expressed yourself in favour of there being levers on the knocker-lines?—Yes, I think it would minimize the labour of ringing.

79. Would it not shorten the life of a rope?—It would depend upon how they were attached.

80. It would be a greater strain on the rope?—Yes, perhaps so, but that did not occur to me.

81. And the liability of breakage would be greater?—Yes, it would be a question of examining it more frequently.

82. *The Chairman.*] Could you not put in a long splice and put the lever on to that?—Yes, there is no reason why that should not be done.

83. *Mr. Dowgray.*] Would you be in favour of the workmen's inspector having the power to stop a place until your return, if you were absent from the district for some time?—I have to be absent sometimes for two or three weeks at a time, but I am never out of reach of telegraphic or telephonic communication for more than twenty-four hours. Without the workmen's inspector having proved his qualifications in some way it seems to me to be rather unfair to give him the power to dictate to the mine-manager to that extent.

84. You are assuming that every check inspector requires to have the necessary qualifications to be also the secretary to the union?—I was under that impression, but I was only speaking of my knowledge of Reefton.

85. That is not so. You used the words "check inspector." Why should be be called "check inspector"—does he check you?—Well, it is because the term has come into general use. I have never given a thought to the meaning of it.

86. In regard to the tables you have supplied us with, it would seem that the air had already been used up in No. 9 level before it went to the stopes in No. 10?—That air measured in No. 9 had served twenty-three men working between No. 10 and No. 9 levels.

87. Which means that some of the air has been measured three times?—Yes, it is the same volume ascending from one section to the other.

88. *Mr. Parry.*] The suggestion that you have made here to-night is the outcome of a careful study of the distribution of the air in those mines that mechanical ventilation should be installed wherever men are working?—That is so.

89. And you also admit that there are places and times in a mine which require a decrease of working-hours?—Yes, there are places in mines where men are entitled to work only six hours.

90. And you think that a six-hour place should be fixed?—Yes, there are places where six hours should be fixed.

KUMARA COURTHOUSE.—28TH OCTOBER, 1911

JAMES ALEXANDER MURDOCH sworn and examined. (No. 71.)

1. *The Chairman.*] What are you?—Mayor of Kumara, a solicitor, and an owner of several alluvial claims in this district. I would like to say that it is pleasing to me to see the Commission in Kumara. This district is a most important one from an alluvial point of view, and has a prosperous future before it on account of the completion of the Trans-Teremakau Water-race, which the Commission inspected this morning. Under the heading of accidents in mines I would point out that on alluvial fields accidents are not so common as on quartz- or coal-mining fields. For the last twenty years the only accidents I can call to mind in this district are as follows: One by which a man named Thomas Hughes lost his life in a sluicing claim at Kumara. That accident was inevitable. I could not make any recommendation which would meet with all the risks taken by Mr. Hughes. The next accident was to a Chinaman named Gum Woo, who was working in a tail-race at Westbrook Terrace when the sides broke in. The tail-race had been safeguarded in a way which was considered reasonable. I could not suggest any further safeguards. The next accident happened to a Chinaman named George Kum, who fell 50 ft. to the bottom of a tail-race on the Greenstone Road. Next a European named John McKeegan, when wheeling a barrow over a plank, was precipitated 20 ft. as the result of the plank breaking, and received injuries which caused his death. In regard to this accident, also, I am afraid I cannot suggest anything which could be done to avoid such an accident recurring. The next was an accident to John McGlone, who was clearing stones from the bottom of a high sluicing face when a stone ricochetted from the face and struck him, fracturing his skull. I cannot think of any further accidents just now, but, speaking generally about those I have mentioned, I cannot suggest any recommendations which would obviate the risk of such mishaps. There is no doubt that in all sluicing claims the men have to take risks, especially when clearing the stones from the face. This field is a very extensive one, but the accidents during the last twenty years have been very few. With regard to the inquiry held into fatalities, the *personnel* of the Court is the Warden and two mining assessors appointed from the mine-managers in the locality. I would like to suggest an alteration so that the miners themselves should be represented by a practical miner without requiring that he should hold a certificate.

2. Do you think that would be a better Court than the Warden alone?—Yes. Of course, this is a democratic country, and we do not like to deny the miners representation, though I think it would practically bring it back to what you suggest; but under the present system you have two certificated mine-managers whose class is really on its trial. On the other hand, you would have a representative of the management and one from the miners, which would result in the decision being left to the Warden, but he would have the advantage of being able to consult two practical men after hearing the evidence adduced.

3. It has been suggested that all Wardens in mining districts should have some practical mining experience?—Yes, I have read the evidence tendered to the Commission by Mr. Fagan at Reefton, and I would like to say that I differ from his views. While I admit there is a good deal to be said in favour of a gentleman occupying the position of Warden having practical experience, I can point to one instance where the Warden received his appointment having no previous practical experience, and yet he is, in my opinion, one of the most able Magistrates and Wardens who have sat in these Courts, and is giving the greatest satisfaction to the profession and suitors generally. Of course, under the Mining Act a suitor has the right on application to have his case heard before assessors either in the original jurisdiction of the Magistrate's Court or on appeal to the Appellate Court, but that is a procedure which is very seldom adopted. If

I might be permitted to say so I think the failures, so far as Wardens are concerned, have occurred in the past where men have been selected from the legal profession who were not making a decent livelihood, and received their appointments either out of sympathy or by favour. There is another matter which affects this district very materially. It comes under the heading of accidents in mines. Captain Richards, the Inspector of Mines for this district, holds that under the Mining Act he has the right to see that any subsidized tunnel or shaft shall be of a certain size for the safety of the men sinking the shaft or tunnel. Under the section in the Act you will find that a ladderway has to be provided, and a shaft must be of a certain size to allow of a ladderway and also a hauling-compartment. But under the regulations subsidies are provided for a shaft as small as 5 ft. by 3 ft.

4. *Mr. Reed.*] 4 ft. by 3 ft.—is it as small as that?—Yes, where no timber is required. Well, that is the regulation, and the Inspector is quite right in contending that the section of the statute is not overridden by a regulation made by Order in Council. He has suggested 10 ft. by 5 ft. as the necessary size of a shaft, although he does not lay it down as a hard-and-fast rule. Of course, that precludes a miners' association or a miner of limited means prospecting even with the aid of the small subsidy that is given by the Government. I think the Commission should consider this as coming within their scope, and recommend that the section be altered so that where shafts are driven only for prospecting purposes a smaller size shall be sufficient.

5. *The Chairman.*] That would simply mean exempting from the section all prospecting-shafts?—Yes.

6. That applies, apparently, only to dry ground: where it is wet the shaft must be 5 ft. by 3 ft.?—They are nearly all timbered; but, at any rate, you will see that under the section of the statute the Inspector of Mines has thrown upon him the responsibility of the whole matter; and yet the regulation provides for shafts 5 ft. by 4 ft. and 5 ft. by 3 ft. It is an impossibility to have a ladderway and manhole in a shaft 5 ft. by 3 ft.

7. *Mr. Parry.*] In regard to the accidents which you say have occurred in the high faces in these claims, do I understand that the dirt and stones are taken down by means of a pick or other tool or by water?—By water.

8. And when men are taking down the face and stones there is a liability to accidents. Is it usual to take a face straight down?—In some cases the ground does not fall as straight as in the claim you saw to-day. In "puggy" ground it falls entirely different to what it does in alluvial wash, which falls straight.

9. But in order to get over that difficulty would it not be safer to work your face in a slant—to take the top first?—That is not practicable. Very often the understratum is softer, and you must burrow there to bring the other down.

10. Well, the risk has to be run all the same?—Yes, but when cleaning out the face the water is off.

11. *Mr. Reed.*] In regard to the size of the shafts which you referred to, if prospecting is considered a mining operation proper do you think the Inspector has any alternative but to insist upon a large shaft?—I think the interpretation clause precludes us from discussing that point; it is a mining operation.

12. And the Inspector has no alternative, then?—Even if he did not interfere with a person sinking a shaft it would affect all persons working under prospecting subsidies.

13. How would you propose that the men should descend in these 5 ft. by 3 ft. and 4 ft. by 3 ft. shafts?—I was in Rimu in '81 and '82, and the men there descended with the ordinary loop in the rope, and I do not know that there was ever an accident there.

14. Did they not use the bucket?—It was not so safe as the loop.

15. Do you know of any accidents through men using the loop?—No.

16. And you consider it perfectly safe?—Yes, in a small shaft it is better; a man can jam himself with his foot on one side and his body on the other.

17. Would you be in favour of the regulation being amended to allow men to travel with the loop in prospecting-shafts?—Yes.

18. To what depth?—I would leave that to the Inspector.

19. Would you insist upon two men being at the windlass?—Over a certain distance, yes.

20. How many men are engaged in mining about this district?—About a hundred.

21. Within what radius of Kumara?—That includes Kumara, Dillman's, Cape Terrace, Westbrook Terrace, and Larrikins.

22. And you stated that accidents here are very rare indeed?—Yes. Those I enumerated are all I can call to mind during the last twenty years, and, as I said, they were inevitable.

23. Have you a miners' association here?—Yes.

24. Have they made any representations in regard to accidents?—No.

25. *Mr. Dowgray.*] Do you know of the circumstances which led Mr. Fagan to give the evidence you quoted in regard to the necessity for Wardens having practical experience of mining? You only quoted from the newspaper report. What would you think if you had a Magistrate who, after taking evidence and visiting the scene of the accident, admitted that he knew nothing of mining, and then refused to give a decision?—It would be very hard for the parties.

26. In the event of an Inspector of Mines declaring that a certain place was not fit to work in, and the manager declaring it was, the case is taken before the Warden, who, after hearing both sides, visits the place, and then says that owing to his lack of mining knowledge he is not able to give a decision?—He has all the powers in these matters of a Judge of the Supreme Court, and even after both sides have exhausted their evidence he has the power to obtain competent expert advice. I can hardly conceive of a Warden taking up that position.

27. It may be hard to conceive of such a case, but it is a fact nevertheless, and it was that case which caused Mr. Fagan to express the opinion that Wardens should have practical mining experience?—I admitted that there was a great deal to be said in favour of it.

HENRY STUBBS sworn and examined. (No. 72.)

1. *The Chairman.*] What are you?—A miner.
2. With how many years' experience?—About twenty.
3. In what line?—Sluicing.
4. Where have you gained your experience?—Mostly in Kumara, but I was also for six years at Barrytown, near Greymouth, sluicing.
5. In the course of your experience have you known of many accidents from falls of earth or machinery?—No, I have never seen but have heard of them.
6. Have you known of any from machinery or in shafts?—No; I have heard of them, of course, but have never seen any.
7. Have you any suggestions to offer in regard to the ventilation of shafts, or their conditions generally?—No. The conditions here vary very considerably: sometimes the air is good, and sometimes there is a lack of air and they put a water-blast in, but that is not often necessary. You may be in blue reef, and then it is necessary to have more air.
8. How do you conduct your air in most cases?—In ordinary galvanized pipes about 4 in. in diameter.
9. Have you anything to suggest in regard to the tribunal which inquires into fatal accidents? Under the present Act the persons who constitute the Court are the Warden and two certificated mine-managers. Supposing a man were killed in a face, do you think the Court to inquire into the matter could be improved by having a miners' representative or by leaving it to the Warden alone?—Well, you see, on this field most of the sluicing is done by the owners of the claims themselves. I think in only two cases a manager is employed. In my own party four of us are owners. If a man were hurt in the Long Tunnel claim, for instance, it would perhaps be advisable to get independent assessors other than a manager. It would, I think, be advisable to have a miners' representative on the Court.
10. Have you anything else to bring before the Commission?—No.
11. *Mr. Parry.*] How many members have you in your miners' association?—I could not tell you exactly; about thirty or forty.
12. Do you find this sluicing-work healthy, as a rule?—Yes, I think so. But, of course, it is hard work—harder, I think, than coal-mining or reefing.
13. How many hours do you work?—Sometimes eight and sometimes ten. We are owners.
14. Are there any wages-men?—As a rule, very few; but if we keep a man working an hour extra to-day, to-morrow he is allowed to go away an hour earlier. There is no hard-and-fast rule as to hours.
15. You are all owners?—Yes, pretty well. I wish also to say that I indorse the remarks of Mr. Murdoch in regard to the size of shafts. A shaft may be put down 60 ft. or 70 ft., and if no gold is found the work is finished and nothing more is done with it. It would be a waste of money if these large shafts were insisted on.

HOKITIKA COURTHOUSE.—28TH OCTOBER, 1911.

JOHN MALONEY sworn and examined. (No. 73.)

1. *The Chairman.*] What are you?—A storekeeper and draper.
2. Have you done any mining?—Yes.
3. For how many years?—I have been quartz-mining for two years and a half or more.
4. Where?—I have been quartz-mining in Auckland and at Ross and Paparoa.
5. What is it you wish to bring before the Commission?—What I would like to say is that we should try to prevent miners' disease.
6. That is, the disease which arises from the inhalation of quartz-dust?—Yes. There are many young men who are almost powerless to-day, and yet five years ago they were quite strong and healthy. I wish to refer to one case in particular of which I know—that of a man named James Craze. That man, I am sure, could have been the champion boxer of New Zealand, he was so strong; and yet to-day, though he looks fairly well, I am certain he will do no more hard bodily labour.
7. What do you suggest should be done?—I do not know how to prevent it, but I think we ought, here and now, to form some kind of fund to help that man. We ought to gather money for him so that he will not feel dependent upon others.
8. That is altogether outside the scope of our inquiries. We are here to consider any suggestions which may be offered with a view to guarding against the disease?—I do not know how to guard against it.
9. Have you had any experience in dusty mines?—Yes; I, along with five others, was working twelve years ago driving what is called an "end" in Auckland.
10. In which mine?—The Woodstock Mine, Karangahake. Before we had finished our contract five out of the six of us were spitting blood. We were using water, but still we were affected. Had there been no water there it would have been worse—in fact, it would have been impossible for us to work at all. The water kept it cool.

ARTHUR HICKS RICHARDS sworn and examined. (No. 74.)

1. *The Chairman.*] You are an Inspector of Mines?—Yes, for the Westland Mining District.
2. How many years' mining experience have you had?—About forty-four.
3. And as an Inspector?—Between fourteen and fifteen. [Exhibit No. 26, "List of Accidents," put in.]

4. How long have you been in this district?—Fourteen years last July.

5. Previous to that you had quartz-mining experience?—Yes.

6. Have you any opinion to offer on the question of ventilation?—I have always considered that the better the conditions were made for the miners the better would be the results we would get from their labours.

7. Have you any suggestion to offer in the direction of improving the present regulations?—Only that I would like to see exhaust fans put into mines generally, when they get down to any depth, to assist the natural ventilation.

8. Have you any opinions to offer as to underground sanitation?—I believe in maintaining the sanitation underground by the pan system.

9. It has been suggested that a truck should be used in a dead-end, with a shovel and dust to be used?—I believe in using plenty of dust.

10. The objection of the men to the pan system is that they do not care to follow one another on the seat?—They would have to do so on a truck.

11. No, they would use the shovel?—I do not believe in it.

12. You think the pan system would be better?—Yes, if proper cleanliness were maintained.

13. Have you any opinion to offer as to change and bath houses?—I think shower-baths would be most suitable.

14. How many men do you think one bath would be sufficient for?—Fifteen, because they are not all coming off at one time.

15. Have you any opinion to offer in regard to accidents?—No, I do not think so. The care taken since I have been an Inspector, and before when I was a mine-manager, was fairly good, and the accidents in this district are the lowest on record.

16. None of them were preventable?—No; they were accidents in the true sense of the term. Each of the two fatal accidents was fully inquired into.

17. Have you had any experience of what is known as miners' phthisis?—I have never met a single instance of what I consider miners' phthisis which could be attributed to working underground, and I have been going underground now for over forty years.

18. On the question of the investigation of accidents, what do you think the tribunal should consist of? What is your opinion of a tribunal consisting of the Warden and two mine-managers, as at present?—I think myself that the miners should have a representative there as well as the mine-managers.

19. The Warden, one mine-manager, and a miners' representative?—Yes.

20. *Mr. Reed.*] It has been claimed that there are more accidents on the night shift than on the day shift in quartz-mines; it is said that men working at night-time are more liable to accident than if they were working on the day shift. What is your opinion of such a contention?—I cannot say that that is so from my experience.

21. I would like you to say whether this matter has been mentioned to you by me before—whether we have discussed it together?—No.

22. Your opinion, based on your experience, is that there are not more accidents caused by working at night than on the day shift?—Yes.

23. And you do not consider the night shift more dangerous than the day shift?—No; though from my point of view I would do away with the night shift, as I am sure that men can do more work in the day than they probably will at night. I am positive of that from my own experience. But as for more accidents occurring to men on the night shift than on the day shift I fail to see that that is so. I have never noticed it, at any rate.

24. We found that the temperature in the Waihi Mine in the stopes was very high and humid: can you suggest to us any means by which that temperature could be reduced? Of course, a volume of air would do it, but the difficulty is to get that volume of air in?—The only way I can suggest it could be done is by having a powerful exhaust fan.

25. Do you think that men working on piecework or contract are more liable to accidents than men on day-wages?—No, I always preferred contract work when I was working.

26. Do you think that men on contract rush their work and put themselves in dangerous positions more so than men on day-wages?—No, I do not think so at all. My experience has been that they work with more judgment when they are working for themselves.

27. In regard to winding-engine drivers, do you believe in a man who is practising for his certificate gaining his experience by winding men?—I believe in men who are practising to be engine-drivers working in company with a qualified man at first.

28. And would you allow that uncertificated man to practice on men?—Not until he had at least three or four months' winding experience. He should have thorough confidence in himself. One man will gain that confidence much quicker than another.

29. Do you think practising on men unknown to them is fair to those men?—Where you have an experienced man standing close to the lever it is all right.

30. Do you think an experienced man could prevent an accident always?—Well, invariably so.

31. Suppose the cage were 20 ft. from the bottom of the shaft, and the inexperienced man caused it to descend that 20 ft., do you think the experienced driver alongside would have time to recover the position in such a short time?—Not in 20 ft.; but he is standing there with his eye on the indicator, and immediately it gets within a certain distance of the bottom he would at once take the lever himself. He would not let it get within 20 ft. without doing so.

32. Are you aware that men were injured in the Grand Junction Mine the other day through falling 16 ft.?—Yes.

33. As regards blasting in quartz-mines, are you in favour of the appointment of shot-firers—men to go round and do nothing but fire the shots?—No.

34. Why not?—Well, if a man is competent to drill holes for his shots, he is competent to fire them.

35. Do you think the men would appreciate the appointment of shot-firers?—No. I saw the practice in operation in Gippsland for over twelve months.

36. Did the miners like it?—No.

37. As regards the quantity of explosives that may be taken into a face at any one time, do you think the present provision in the Mining Act is satisfactory on that point?—Yes.

38. It says that there shall be only 16 lb. taken in: is that provision adequate?—In one canister, yes.

39. And supposing they wanted more?—They would have two canisters.

40. About the testing of boilers, have you had boilers under your supervision tested?—I have.

41. What do you think of the hydraulic test?—I do not like the hydraulic test except for a new boiler. Afterwards it should be the hammer test, wherever you can get into the boiler.

42. Do you think the hydraulic test hurts the boiler?—Yes.

43. Even if the boiler is sound?—You are likely to strain it.

44. A weak boiler; but what about a sound one?—You might not do any injury to it, but your sense of hearing should be good enough to test it.

45. You are in favour of it, then?—Not for an old boiler.

46. What about the speed of winding men in shafts?—It depends upon the depth of your shaft. If you are winding over 2,000 ft. the vibration of your wire rope would be greater than if you were winding only 500 ft.

47. Do you believe in penthouses in shafts where men are working under winding conditions?—Yes, I believe in having a penthouse wherever you are sinking below a level.

48. Have you ever known Bickford's instantaneous fuse to be used in mines?—No.

49. Have you any knowledge of its being used outside?—Only in large quarries.

50. Do you consider it safe?—No, not for general use.

51. In regard to the baths for the men, do you think it is a proper thing that the companies should provide shower-baths for the men?—Yes, I approve of their having warm shower-baths.

52. And would you approve of its being made compulsory for the men to use them?—Yes, both for the companies to provide them and for the men to use them. It is useless unless the men are made to use them.

53. Do you think it would be a fair thing to ask the men to contribute a small amount for the maintenance of these baths?—I do not think so.

54. You think the company should bear the expense entirely?—Yes.

55. As regards winding, do you think it is advisable that in winding men there should always be two winding-engine drivers present in case one should be seized with a fit?—No.

56. Have you ever heard of a fatal accident caused by a man having a seizure of that sort?—No, I have never heard or read of one.

57. Would you be in favour of winding-engine drivers submitting themselves to periodical medical examinations as to their eyesight?—Yes, I have always advocated that.

58. *Mr. Cochrane.*] You have told us that you favour the installation of powerful exhaust fans in mines?—Yes.

59. In all large quartz-mines?—Yes.

60. There is a quantity standard of ventilation provided under the present Act—100 cubic feet of air per man per minute. Do you believe in that standard of quantity?—Yes.

61. Are you aware of a quality standard having been advocated by the Inspectors of Mines—not less than 20 per cent. of oxygen?—There was a standard advocated by them, but I do not remember what it was exactly.

62. Do you believe in a quality standard such as that?—Yes.

63. Then the question of temperature has been raised: do you believe in a temperature standard?—Yes, 85° dry bulb, and 86° wet bulb.

64. And if it rose above that would you shorten the shift or withdraw the men altogether?—I would withdraw the men.

65. And what would you do then?—I would withdraw the men until I could lower the temperature by some means—compressed air, probably.

66. If you could not put in a sufficient quantity of fresh air to reduce the temperature would you withdraw the men or reduce the shift from eight to six hours?—I would withdraw the men if I could not alter the conditions, and keep them out of the place until I could do so. I would not put men there if I would not work there myself.

67. Have you seen any statistics as to accidents on night and day shifts?—No, I have certainly not noticed that there is any difference.

68. Are you in favour of the use of electric batteries for firing a round of shots?—I am not.

69. Would you give your reasons?—Simply because if you fire with electricity the shots go instantaneously, and the charges do not do the work.

70. It is not on the grounds of the danger that you object to the electric firing?—No.

71. Do you consider it is safer than firing by fuse?—I would fire by fuse all the time if there was a proper distance for the men to get away.

72. *Mr. Dowgray.*] In reply to a question by Mr. Reed you said that if a man found that 16 lb. of explosives was not sufficient for his purpose he could take in another canister containing another 16 lb., and if necessary a third?—Yes.

73. Is it not a breach of the law to take in more than 16 lb.?—No; the Act says that no canister shall contain more than 16 lb.

74. In your opinion he can take in two, or three, or four canisters if he requires it?—Yes, if he were careful.

75. I believe you stated also, in reply to Mr. Reed, that you believed in penthouses in shafts?—I do.

76. I notice in your list of accidents a reference to a fatality to Alfred Steadman in the Ross shaft. Was there a penthouse in that shaft?—No, they were not sinking. He came out from a recess, and something fell on him from above. It was a chair that they were winding with before they got the cages in, and there was one of those chairs for guiding the bucket into position. It got hung up and then fell.

77. They were sinking the shaft, though?—No, they were only cleaning it out and repairing it.

78. Was it a cradle for winding in the shaft?—Yes, it got hung up.

79. Was it made of iron or wood?—Wood, strapped together by iron bolts.

80. Is it customary to use these things in sinking shafts?—Yes, it is quite common.

81. Is that the first accident that has occurred through the use of such a thing?—Yes, the first I have ever known.

82. In reply to Mr. Cochrane you stated that you had never studied the question by statistics as to the number of accidents occurring on the night shift and day shift?—I have never done so.

83. You also said, in reply to Mr. Reed, that you thought the men were more careful when working under the contract system than when working on wages?—No, I did not say that. I said that it was to his own interests to be careful.

84. What do you mean—that it is to his own interests financially or as to safety?—Both financially and from the safety point of view.

85. In a speeding-up process is it possible for a man to provide a sufficient amount of timber, for instance, when he is looking after his own interests financially?—Yes.

86. There is no contracting on this field?—Yes, there is. Often low levels are driven by contract.

87. When you were speaking about the contract system were you referring to Waihi or this field?—I was one of the original shareholders at Waihi, but I did not have any contract work done there. I had a lot of it done at Thames and Kuaotunu, also in Tasmania and Gippsland. I was contracting there for years, and always preferred it to wages work.

88. *Mr. Parry.*] As regards the night shift, do you think the abolition of the night shift would be conducive to better health?—I do not think it makes any difference.

89. Then you do not think it has a bad or detrimental effect upon the men?—No, it is all the same when you are underground.

90. Have you worked very much on the night shift?—Yes, for eighteen months right on end.

91. And you felt as good at the finish as when you started?—Yes.

92. Do you think it is likely that a man under the contract system, making barely a living-wage, would take as much care of himself as he would when working for a daily wage?—Yes.

93. You do not think it would have a tendency to make him careless so long as he made good money?—No.

94. *Mr. Dowgray.*] In reply to a question by Mr. Cochrane I believe you stated that you were in favour of a fixed standard temperature of 85° dry and 86° wet?—Yes.

WELLINGTON (PARLIAMENT BUILDINGS).—15TH NOVEMBER, 1911.

WILLIAM FRANK GRACE sworn and examined. (No. 75.)

1. *The Chairman.*] What are you?—General manager of the Waihi Grand Junction Gold-mining Company.

2. What experience have you had?—About twenty-eight years.

3. Primarily, the question to be considered by the Commission to-day is that of holing through: we will hear you on that subject. What have you to advocate in its favour?—I consider that holing through from one system of workings to another, in most instances, is advantageous.

4. That is, as a general principle?—Yes.

5. Have you gone into calculations regarding the probable effect in your own particular case?—We know that the holing through into the Extended has been very advantageous to both companies.

6. Have you calculated the probable effect of holing through into the Waihi?—Well, I do not see anything against it. It would certainly increase the ventilation in the eastern end of the Waihi Mine and our western end.

7. Have you considered any change it would make in the air-current? Would it make any change, or merely an increase in volume?—It would augment the general volume in both mines. It might also make a difference in the uptakes and downtakes—probably it would—but that is a matter which would have to adjust itself. It is impossible to forecast that. It depends upon the lightness or heaviness of the air in the shafts.

8. *Mr. Reed.*] Would you not be satisfied to leave such an important matter as the compulsory connection of two mines to the Inspector of Mines?—I am afraid the question of connection ought not to be made compulsory.

9. Are you aware that in Queensland a section exists in the statute making the connection of mines compulsory if ordered by the Inspector of Mines?—Yes.

10. Have you anything to say against that?—Well, it has worked very well in Charters Towers. I do not know the reason why they were not connected before. It is to a mine's advantage. I do not think it was a question of objection by the Brilliant St. George.

11. But if, as you say, it is impossible to forecast the benefit, why not leave it in the hands of the responsible Inspector?—I did not say it was impossible to forecast the benefit. What I said was that it was impossible to forecast the direction of the air-current.

12. In the event of fire would not the ventilating-drift carry the flame a great distance?—In a mine which was heavily timbered I do not think it would be advisable to hole through.

13. Well, suppose this drift required timbering?—The amount of timber used would not cause a serious fire.

14. Have you any opinion as to the direction of the current?—That is a matter of which we cannot speak with any degree of certainty.

15. The current would go in the direction of the greatest drag?—Certainly.

16. So that, in the event of your having a very powerful ventilator, it would go that way?—Yes.

17. And one of you would get the bad air from the other?—Yes; but if the volume of air going through the two mines combined is greater than the present volume you must get an advantage.

18. But if it left the Waihi to come to you it would be Waihi return air you would be getting. You would not like to vitiate your intake?—If I could get more air through, and was able to dilute it, I would not mind at all. We would both probably get more air.

19. But it is against good practice to vitiate the air?—Do not we do so at the present time?

20. It is a thing to avoid if possible?—Certainly, but the great thing is to get a good volume of air.

21. Are you aware that the Waihi Mine has been on fire once or twice?—I believe they have had a fire in the timber.

22. In addition to the air is there not a danger of poisonous gases coming into your mine?—The chance of fire is so small that it is negligible.

23. Supposing a door were put in in the connecting drive, and a fire occurred, would it not be impossible to get to that door?—It depends upon how the doors were put in.

24. We are also obtaining evidence in connection with electric winding: will you explain to the Commission how the recent accident happened at your mine when the cage fell?—I would hardly say the cage fell; the brakes were not applied quite soon enough.

25. How was that? Why were they not applied soon enough?—Well, your Inspector of Mines made inquiries into the circumstances, and doubtless has reported on the accident.

26. Is it a fact that the current was cut off suddenly and caused the cage to fall?—The current does not control the brakes. The current did cut out.

27. You have a magnetic brake?—Yes.

28. That magnetic brake would be thrown out of action?—No, that brake is worked on another circuit.

29. Are you in favour of these automatic brakes?—Certainly.

30. Is it not a fact that automatic brakes take away from the responsibility of the driver?—I do not think so; he never depends on it alone.

31. Are you aware that the modern practice in Europe is against the use of automatic brakes?—A man is supposed to use his air-brake; we have three different air-supplies.

32. On the occasion of this accident the air-brake also gave out?—No.

33. It did not operate effectively?—It did not absolutely stop the cage.

34. At what depth did the brake fail?—At about 17 ft. from the bottom.

35. About half a revolution of the drum?—Yes.

36. Is there no arrangement you could have, such as a lamp, to indicate when the current was cut off?—I do not think this accident was caused by the current being cut off.

37. Was it not extraordinary that the two brakes gave out at the same time?—The air-brake did not give out; the man did not put it on early enough.

38. You think, then, the accident was caused as the result of the man not applying the brake quickly enough?—I presume so.

39. The man was not quick enough to take advantage of his brakes before the cage struck the bottom?—Apparently he put on the brake too slowly.

40. To obviate such an accident what would you suggest?—I do not think I can suggest anything. It was one of those unforeseen things which cannot be provided for.

41. You are acquainted with the Rill method of stoping?—Yes.

42. Does that necessitate or imply down holes or wet holes?—Yes.

43. There would be less dust with down holes?—There should be.

44. Would there be less phthisis contracted with them?—Yes.

45. If the places were stepped in that way would that mean that falls would be less frequent?—I believe it is the best method which can be adopted; it is adopted everywhere where the ground is suitable. The stope is worked on a series of steps.

46. The distances which the levels are apart are determined by the inclination of the vein?—Certainly.

47. Would it be advisable or reasonable to have one fixed distance for levels regardless of the thickness of the vein, the nature of the walls, or the inclination of the vein?—Certainly not; you cannot fix it, for every part requires a different distance.

48. As regards the temperature in metal-mines, will you give us your opinion as to how the temperature in stopes can be reduced to a reasonable degree?—By sufficient winzing to increase the volume of air; but you will never get the temperature low in a place like Waihi, where the climate is damp.

49. If you make winzes larger will it not increase ventilation?—Yes, if you make a winze big enough you make it an opencut.

50. By sending through a greater volume of air would it not create more dust?—I do not think it would dry the workings, but the greater the velocity of air the more dust is held in suspension.

51. What is your opinion as to running brattice down a wide stope so as to carry your cool air round the face and back down another winze?—I am afraid you would not be able to keep it there.

52. If you could would you recommend it as a good scheme?—It might be worth trying. I have never tried it in our mine.

53. I do not mean in a winze, but in a stope?—I am afraid it could not be worked.

54. Are you in favour of more doors in levels?—I think we do the best we can. We know the men work better if they get good air.

55. Would you recommend a fixed standard of temperature for metal-mines?—No.

56. Why not?—How can you fix it? You must take the climatic conditions into consideration. I have seen it 98° in Western Australia, and I would sooner work in that temperature there than in 86° here.

57. I was referring to Waihi: what would you regard as a temperature at which men should cease work there?—You cannot fix it.

58. Would you allow men to go on working in any temperature?—No, sometimes you would have to stop work.

59. Would you be in favour of reducing the hours according to the wet-bulb temperature?—No, I think the men accommodate themselves to the temperature.

60. When they are working on day-labour perhaps, but how can they do so when contracting?—They know the nature of the ground, and allow for that by asking for a higher price.

61. But when tendering a man may allow for a certain temperature, but in between times it might rise?—Not as a rule; the temperature does not go up quickly.

62. Would you be in favour of a regulation winding-speed when the cage is approaching the surface?—There ought to be a reduced speed for winding, as it is bad for the engine to start and stop quickly.

63. As to the compulsory lighting of travelling-roads, how many miles of travelling-roads have you in your mine?—I could not tell you, but it runs into a good many.

64. Would it be ten miles?—No, I do not think so.

65. Would it be five miles?—Yes, I think so.

66. To light that distance by fixed electric light would entail an expensive electric-lighting equipment, would it not?—I would not put in electric light; think of the wiring which would have to be done. It would be better to have candles or lamps.

67. Suppose the law required the lighting of your roads would it be safe to hang candles up in them?—No.

68. Would you regard it as an absurd requirement?—Yes.

69. Would kerosene-lamps be dangerous?—Yes, they would be dangerous for fire.

70. Would you suspend candles along the roads?—I would not like to do so.

71. Then electric light is the only alternative?—Well, even that is dangerous, to have it all over the place; there is always the chance of short-circuiting.

72. What would be the capital cost of lighting five miles of travelling-roads?—About as much as lighting up a small town.

73. Would it prevent accidents to any extent?—I should not think so.

74. Would it be more likely to cause accidents?—I should not like to have wires all over the place.

75. Did you ever hear of such a proposal as the lighting of travelling-roads in any country?—No.

76. In regard to bath-houses, you have warm showers at your mine?—Yes.

77. Are they satisfactory?—We have had no complaints.

78. About what proportion of the men use them?—Pretty well all the men.

79. Are they kept clean?—No, the men are careless and leave the water running; though, generally speaking, I think the baths are all right.

80. Do you think it would be well if the men had to contribute, say, half the cost, and had a say in the management of the baths? Would they be more likely to take an interest in them and keep them cleaner?—I do not think so. I may say that it is only one or two men who misuse them.

81. Would you think it wise for the men to have a say in the management of these bath-houses?—No.

82. And you would not advise that they should contribute half the cost?—No, because then they would want to have a say in their management.

83. *Mr. Molineaux.*] Could you suggest any amendment with regard to electric traction underground?—The height above the rails for the bare wire seems too great. It is almost impossible in the ordinary metalliferous mine to drive high enough.

84. Could you reduce the height of the wires with safety?—Yes.

85. Do you consider the present regulation prohibitive?—Yes, it has absolutely prohibited us from using a locomotive underground, because the height was too great between the rail and the wire.

86. Then the regulations state that the road which is used for electric traction shall not be used as a travelling-road?—Modified, I believe, they do make that provision; I have not the Act here. That was the reason I could not put in a locomotive. I dropped the idea on that account.

87. With regard to connecting the Grand Junction with the Waihi, can you tell me what would be the distance between the two drives horizontally?—It would have to be an inclined connection—say, between 75 ft. and 100 ft.

88. Who do you consider should pay the cost of this connection?—The cost should be mutually arranged if it is going to be of mutual advantage.

89. Referring again to the ventilation, I understood you to say that you consider a fixed standard is not practicable: do you consider that a quality standard might be fixed with advantage?—Well, the volume is the main thing, I consider, and that, of course, practically means quality. Of course, most Mining Acts fix a volume.

90. *The Chairman.*] Do you believe in a fixed volume?—I believe it is a dead-letter, because the volume is generally above what is fixed.

91. How much air do you think a man is really able to use?—About 22 ft. a minute, I think it is.

92. In what condition would be leave the remainder?—It would be vitiated.

93. But to what extent?—Very nearly one-quarter of the total oxygen would be absorbed.

94. *Mr. Molineaux.*] With regard to rises, do you consider it is practicable to limit the height of rises?—Sometimes it is more advantageous to rise than to sink.

95. May I take it that you do not consider it is practicable to limit the height of rises?—Certainly not.

96. Do you think a rise can be ventilated efficiently without being a three-compartment box rise?—Yes.

97. As to ventilating fans, do you think it necessary to keep a fan going night and day seven days a week?—No.

98. *The Chairman.*] Under no conditions?—Yes, if you had a gassy mine, of course, it would be advantageous.

99. But supposing your temperature were fairly high?—I do not think the air is cooled by circulating, but where you get the air vitiated the fan would improve it in the off-times. You must give the fan some chance to be overhauled.

100. *Mr. Molineaux.*] With regard to stopes, do you consider it is practicable to limit the height of stopes?—Well, if the ground breaks away up above the limit, what are you going to do—shut up the mine? It depends upon the ground.

101. Do you think it would be a great disadvantage if stopes were limited to, say, 10 ft. from the filling?—It is going to make mining very difficult and expensive, and I think the regulation would never be observed.

102. But you will admit that a high stope is a source of danger?—Yes, if it is too high and cannot be sounded.

103. Then you would limit it?—Yes, the management would naturally do so themselves.

104. You consider it would be better left to the management entirely?—Yes.

105. What do you consider would be the effect of a standard height being fixed for stopes?—It would make mining almost an impossibility.

106. On account of the cost?—Yes.

107. Do you consider firing by electricity to be safer than firing by ordinary fuse?—In certain places, yes—in wet shafts and winzes, for instance.

108. What is your opinion of the proposal to limit firing by fuse to a certain number of holes?—I do not think it is going to work very well, because I do not like the idea of charging all the holes and then firing only some of them. Six holes, as in the Act, is a very small number to be fired simultaneously.

109. Do you consider more could be fired without danger?—I think so, though it depends on the man's capabilities.

110. What do you consider safe for a man of average ability under average conditions with fuse?—I should say ten.

111. And you think that a greater number than that could be fired more safely with electricity?—Yes, I think so, on an average.

112. What tamping do you consider is most satisfactory?—No organic substance should be used. I do not advise the use of rags.

113. Would you prohibit the use of rags?—Yes. Damp clay is all right, and sand is all right.

114. Would not sand be likely to cause dust?—No.

115. Damp sand or dry?—Damp.

116. Do you consider water by itself efficient?—Yes, as efficient as anything solid.

117. What do you consider is the best procedure to take for dealing with misfire holes?—Bulling the holes out.

118. Supposing they are tamped with clay?—I would not draw the charge.

119. Do you think it is safer to bore another hole in the vicinity or to draw a portion of the tamping and recharge?—If you can draw the fuse it is safer.

120. In straight drives do you consider that manholes are necessary?—No.

121. But in straight drives where firing is going on in the face?—Well, we have worked up to 800 ft., and in a tunnel much longer than that, and there has been no danger.

122. *The Chairman.*] Was there any covering at all—timber?—No.

123. *Mr. Molineaux.*] Do you not consider that the provision of a manhole, say, every 100 ft. would be a safeguard?—No, I do not think it is necessary. A man should allow plenty of fuse and plenty of time.

124. *The Chairman.*] What is the longest distance you have known stone to carry?—It is a difficult thing to say. Possibly some hundreds of feet for small stones.

125. *Mr. Molineaux.*] Referring again to winding, could you recommend any appliance which would tend to reduce the liability to accidents to men in the lowering cage at the time of an overwind?—Well, the cage would come down on the catches if they were out. I do not think you could improve the present arrangement. With our electric engine, before the top cage gets up, the magnetic brake is on.

126. Since you cannot put that appliance on a steam-engine can you suggest any appliance to lessen the chance of accident by preventing the descending cage from striking heavily on the

catches at the bottom of the shaft?—Except that catch to prevent an overwind, which stops both drums, I do not see how you could arrange anything of that sort.

127. *Mr. Cochrane.*] With regard to connecting shafts for ventilating purposes, you have found considerable improvement from connecting with another mine?—Yes.

128. Do you find great improvement?—Yes.

129. Are you aware that the same has resulted in Victoria from connecting shafts?—Well, I presume it has; I know it has in Queensland and Western Australia.

130. Are you aware that on connecting up a third shaft the air has often baffled, and the ventilation has been destroyed?—Well, it may be disturbed temporarily, but I do not know that it has been finally disadvantageous.

131. Before you had the fan you had about 38,000 ft. of air circulating?—I think it was more than that; I could not give you the figures now.

132. Was the result of installing the fan a very small increase in the volume in that particular shaft?—It increased the volume in that particular shaft very largely.

133. Even more than 40,000 ft. to 47,000 ft.?—It doubled it, I think.

134. We had the Queensland Act quoted: I shall now quote the Victorian Act. Would you be in favour of this: "All drives by which any two or more mines are connected shall, if considered necessary by an Inspector of Mines, be kept open for ventilation and for escape"?—It is the same provision as is in the Queensland Act. Yes, I think so.

135. Would you favour this: "But the Chief Mining Inspector may order any connection between mines to be closed where he considers that the ventilating conditions will be thereby improved"?—I think the management should be left to deal with that, because it is for them to decide. They are watching the ventilation of their own mines.

136. But it might be good for one and bad for another. The Inspector would be an impartial judge. Would you favour that clause?—Yes, possibly it might be satisfactory, though it leaves a great onus on the Inspector.

137. "Upon the order of an Inspector of Mines, made with the concurrence in writing of the Chief Mining Inspector, owners shall construct such connecting-drives where the works are not more than 300 ft. apart for ventilation and escape at their joint expense." Would you favour that?—I would sooner have it left to the mine-managers first.

138. And, failing their agreement, to the Inspector of Mines or Chief Inspector?—I suppose it would come to that, but it must go to an impartial body. It is a very difficult thing to decide.

139. I think you said, if the volume is greater there must be an improvement in the ventilation?—Yes, that is what I contend.

140. But if the smoke from two or three mines were turned into another would that not be detrimental?—I think you would find that the increased volume would make it mutually advantageous even then.

141. In regard to the shaft accident at the Junction Mine, would it not be better if the engine-driver depended upon the ordinary brake?—Well, the air-brake is the ordinary brake.

142. You would have the other brake as well?—If the engine is suitable for the appliance, and an electric engine is suitable. The brake is worked on the same principle as the Westinghouse brake.

143. Then you told us that 22 ft. of air per minute was the minimum to support life?—Yes, I think that is so.

144. Well, what margin above the bare amount necessary would you allow?—Well, it is fixed by law in most countries at 100 ft.

145. Do you think that is too great?—No, I think that allows a fair margin.

146. And you do not approve of a fan running constantly?—No.

147. What exemptions would you recommend?—I do not think there is any advantage gained by running it on Sundays. There would be no time for overhaul.

148. Would you exempt any other time?—It is no use running a fan after six or seven hours after the men are out of the mine.

149. Would you recommend running it for some time before the men enter the mine?—It depends upon the conditions of the mine. If it is a gaseous mine you must run it always. If there is only carbonic-acid gas from the men breathing there is no need to run the fan for long after the men leave work or before they start.

150. How long would you run it?—If your fan is taking up only a very small volume of air it is not necessary to run it very long. If the volume of air running by fan is only a small proportion of the air passing through the mine, and there were no natural gases emitted from it, it would be unnecessary to run the fan after men left work, and the Sunday's spell would practically allow time to fill the mine with fresh air by natural ventilation.

151. Then, as to the number of holes to be fired by fuse, I think you said up to ten?—Yes, as an average.

152. Do you often fire over ten at once?—I cannot say exactly what the practice is in our mine, but I know more are often fired in tunnels.

153. It is not very frequently that you fire more than ten, at any rate?—No.

154. In straight drives have you ever seen stones projected more than 200 ft.?—Not large stones, but small ones.

155. How much over 200 ft.?—I could not say exactly, but I have known stones to come back that distance in a very hard porphyritic rock.

156. Are not the conditions in collieries and metal-mines very different as regards the necessity for running fans on Sundays?—I consider the conditions are very different.

157. As to firedamp?—Yes; then you must run your fan on Sundays.

158. *The Chairman.*] Then, as to the matter of connection, what do you propose? I understand you to say that it would be difficult to make it compulsory to connect. And it is compulsory connection you want—that is, the right to compel companies to connect?—Yes, in a good many instances, but not absolutely. For instance, in a mine where there is very heavy timber, like the Broken Hill mines, it might not be advisable.

159. You are asking this Commission to make a recommendation as to the right to compel underground connection: well, I take it that is compulsory connection?—Well, in our case I think it would be advantageous, but you could not make it binding on all mines.

160. But we cannot make it binding only as between the Waihi Company and yourself?—Well, you would have to have some arbiter—either the Minister of Mines or the Inspector of Mines. It is a very difficult thing to do, I admit. Certainly in Queensland it was made compulsory, and it proved very advantageous.

161. What limit would you put to this compulsion to connect: is it to be limited to two or three mines? Are you not likely to set up complications?—No, I do not think so. You could take two or three mines, or three or four; it depends upon the connections.

162. Who is to deal with that?—It is a difficult thing to decide.

163. Supposing you had a number of mines connected, and you found there was difficulty about the air-current, who is to decide what alteration is to be made? In a statutory provision you must make it general. You want some machinery in the Act to control the connection of these mines and to regulate the working of them. What proposal could you make which would be satisfactory?—I suppose eventually it would have to be submitted to some absolutely independent expert. It would be a matter of the amount of advantage or disadvantage.

164. Supposing for each district you could get a Board set up, consisting, say, of the mine-managers of each of the important mines, with some other representative, and the Inspector of Mines; divide the country into districts—ventilation districts—and Boards similar to Drainage Boards, to draw up rules for the ventilation of the mines in the district, such rules to be agreed to and have the force of regulations: do you think that would meet the case?—It is very difficult to make a scheme like that work.

165. But it is very difficult to make it statutory altogether?—Yes, it is very difficult, I admit.

166. *Mr. Dowgray.*] Did I understand you to say that the advantage of holing through, as a general principle, lay in the greater volume of air obtained?—Yes.

167. The more openings a mine has to the surface the better the ventilation will be?—As a rule, yes.

168. And the strata of the Waihi district is getting hotter as you go down?—I would not say that—not more than the ordinary increase. I think our No. 5 level is cooler than No. 4.

169. The rock-temperature there is higher than at Reefton?—The rock-temperature is a high one, I admit.

170. You are against the Inspector of Mines enforcing connection?—I am not in favour of leaving it entirely to the Inspector of Mines.

171. Would you be in favour of a Board consisting of the Inspector of Mines, the Warden, and the workmen's inspector deciding it?—No; I think the management should have a say in the matter.

172. In reply to Mr. Molineaux you said that a volume of air always signified quality?—It affects the quality, of course. I was speaking of air going into a mine.

173. Is it cheaper to rise than to sink winzes?—It depends upon the ground. If you have tight, wet ground and have to put a pump down it is more expensive to winze than to rise.

174. Apart from the wet ground you have to pull up the material?—Yes.

175. And that is one of the reasons why you advocate rising before winzing?—No, it is easier eventually to rise than to winze.

176. Have you any three-compartment rises in your mine?—Yes, all our rises are box rises.

177. Do you consider that a good system?—Yes, it is the best, I think.

178. *The Chairman.*] Do you think it advisable that it should be made compulsory that they should be all on that system?—No, certainly not; it depends on the working-conditions of the mine.

179. *Mr. Dowgray.*] What is the reason why you use box rises?—Because we find it advantageous in that particular mine; but if the conditions changed, and the reefs were flatter, we should not want to use that system.

180. In connection with the fan, one of the reasons you advanced for the fan not being run continually was that you would have no time for overhaul?—Partly.

181. But if the mine is a hot mine would the fan not have a tendency to cool it down?—Not always; new workings are always hotter than others.

182. Does it not only cool the outer crust of the level?—Yes.

183. In regard to making manholes in long straight drives, would it not be a costly item?—Yes, a waste of money, in my opinion.

184. In regard to fixing a standard temperature, one of the reasons you advanced against that was the difference in climatic conditions?—Yes.

185. Are you positive that the temperature outside a mine has something to do with the temperature in the mine?—Certainly.

186. And you said you had five miles of travelling-roads in your mine?—I said five miles, roughly—it would be about five miles.

187. Do you call trucking-roads travelling-roads?—If you mean roads for men to walk in we have more than that.

188. How many shots is it possible to fire by electricity?—As many as you like if you have the battery and the caps to suit.

189. How many have you seen connected up?—Actually, I do not know; but I have seen some submarine explosions, and there they have thousands. I believe our electric firers are made for from twenty to forty. There are two sorts made by the Nobel people.

190. Do you consider there is a limit to the volume of air passing through a given entry?—It depends upon the pressure.

191. In connection with the standard temperature, have you seen the last report on the goldfields of New Zealand?—I do not think I have perused it.

192. There the Inspecting Engineer recommends a standard temperature?—Does he? [Witness perused paragraph in report referred to.] The recommendation of the Inspecting Engineer is all right.

193. But his recommendation is for a standard temperature?—Under certain conditions.

194. *Mr. Parry.*] Have you read this report from Victoria on miners' phthisis and atmospheric conditions. [Report handed to and perused by witness.] What is your opinion of that?—In that particular instance there is no difference.

195. You consider that is a fair test?—Certainly; but I do not know who were the people who made it.

196. The atmosphere in that instance had no influence on the temperature below?—Apparently.

197. In regard to ventilation and the question of connecting those two mines, it is your opinion that the connecting of those two mines would be advantageous to both?—Yes, I think so.

198. Do you think there is any man in New Zealand, either practical or theoretical, who could give an opinion with certainty as to what the actual effect would be on both mines, and the ultimate advantage?—Well, I do not suppose any man could absolutely swear to it.

199. But do you think any man could give an absolute opinion before the mines were connected?—No, I do not think so.

200. It would only be a speculative opinion?—Yes.

201. And it would be a good idea to try the connection in order to see the result?—Certainly.

202. Mr. Reed put it to you that the Rill system is in the interests of health and would minimize the dust, and you said "Yes"?—Yes, because you get more down holes with the Rill system than in any other way.

203. That is an important factor in minimizing miners' phthisis?—Yes. It is always important to look after the men's health.

204. Well, then the boring of "uppers" has a bad effect upon men?—Yes, they are more dusty.

205. Do you approve of the use of poppers?—I approve of the least exposure to dust.

206. And yet poppers will not bore wet "uppers"?—Certainly; the men can have other drills—rock-drills.

207. Do you think the box system of raising is safer and healthier to work in than the system you have at present?—It depends upon the mine, the flatness of the reef, and so on.

208. Do you think it is easier to ventilate a rise with the box system?—I think the air-drill supplies a large amount of air in the rise.

209. Mr. Cochrane asked if you considered that the air may be baffled by the connecting of three shafts, and then he used as an answer a statement that the drives might not be of sufficient capacity to carry the ventilation?—My opinion was that they would adjust themselves to the new conditions.

210. *Mr. Reed.*] As regards these stope drills or poppers, what do you suggest with their use as an efficient method of allaying the dust?—The spray is the best thing.

211. Can they be worked with a spray?—Yes, I think so.

212. How should the spray be operated?—Across the neck of the hole.

213. Are the men compelled by you to use these stope drills?—No.

214. Do you prefer the poppers?—Yes.

215. Are you aware that the popper is employed on the great goldfields of the world?—Yes, everywhere, I believe.

216. Have you heard of any serious complaints against the use of these stope drills or poppers as to the dust nuisance?—Only here.

217. Have you heard of their being condemned in the Transvaal or in Western Australia?—No.

218. You have had an extensive experience in the Transvaal and in Western Australia?—Not in the Transvaal, but in Western Australia.

219. As regards penthouses, when would you use them in shafts?—In a shaft that is an actual shaft being sunk whilst the upper levels are working.

220. Did you ever hear of the compulsory use of penthouses other than when work was being carried out in upper levels?—No.

221. Would you regard such a proposal as impracticable?—I do not know how you could put them in to be of use.

222. *Mr. Parry.*] You have never seen penthouses enforced by an Inspector of Mines above the men working in a shaft?—Never in shaft-sinking pure and simple when the upper levels were not being worked simultaneously.

223. Have you had any experience in New South Wales?—No.

224. Did it ever occur to you that there is no get-away for the men in the event of steel falling out?—But you could not haul above a penthouse. How are you going to get the stuff up?

225. In the other compartment?—Where are you going to put the penthouse?

226. Keep on moving down and carry the penthouse with you?—I have never heard of such a thing.

227. What chance would the men have to get away otherwise?—No chance.

228. And would the penthouse not be an advantage?—I do not see how you are going to fix it.

229. Not with stones?—You would be putting in penthouses all the time and not sinking the shaft.

230. *The Chairman.*] According to your suggestion where do you put the penthouse?—Below the lowest working level.

231. Even supposing you were putting down a three-compartment shaft could you not put the penthouse in one of the compartments?—It would not be any good unless it is kept right down on the bottom, and it would take longer to put it in than to sink the shaft

232. How much of your mine or travelling-ways is wired for electric light?—I do not think we have any of it, because where we have the current with a fan on it it is not wired for lighting purposes. You cannot light with electricity near your working-faces.

233. Have you had any trouble or complaints from your engine-drivers as to the new code of signals?—No. As a matter of fact it does not affect us, except as to No. 6 level.

234. Have you anything to say as to gates or bars on cages?—I am against them absolutely. I have seen more accidents with them than without them.

235. The regulation requires gates?—Yes, but they have not told us what sort of gates they want us to put in. It is always safest to let the men go up and down without gates. There is another question about the speed of winding. We have an engine able to wind 2,500 ft. a minute, but the regulation requires us to keep it down to 500 ft. whilst hauling men. That is a great restriction.

236. What would you suggest?—I should say it should be fixed at half the engine's winding-speed whilst winding men. That would be a very safe rule.

237. And how would you define the winding-speed of an engine: would you classify the engines?—Yes, classify them according to their winding-speeds, and halve them for winding men. I say the 500 ft. regulation is all right for small engines, but the restriction to half-speed would be perfectly safe.

HUBERT PERCY BARRY sworn and examined. (No. 76.)

1. *The Chairman.*] You are the superintendent of the Waihi Gold-mining Company?—Yes.

2. How many years' experience have you had?—Twenty-two years in mining work, and some time before that in mechanical engineering.

3. Will you please tell the Commission what you wish to say in regard to the question of holing through?—When this matter first came up I drafted out some ideas and consulted our mine-managers. We admit that there might be cases where it would be advisable to hole through, but I do not think it is advisable to hole through from the Waihi Mine to the Grand Junction.

4. You do not think it is possible to make it compulsory by statute?—No.

5. How would you regulate it?—One objection I have to connect with another mine is on account of the danger from fire, which also includes the danger from smoke. It is not the actual flame which might be dangerous.

6. You mean the smoke from fire, not that from blasting?—Yes.

7. Could not that be overcome by having iron doors?—No, even on a ship where they are close to the doors it often occurs that they are left open in an emergency. I reckon that connection is too dangerous, even with a door. Then, as to the question of the air, the only object of one mine in connection with another is either to get rid of their foul air or to get fresh air.

8. It is not to benefit the other mine?—Well, that is my opinion. In our case we object to take foul air or to give fresh air.

9. The objection to take foul air is a more valid one than that to give fresh air: if you could be compensated for your fresh air what would you say to it?—We require for our own mine all the fresh air we can draw down.

10. But the suggestion is that by holing through you would draw down more?—I do not think air circulated through our mine would be of any advantage to another mine. With natural ventilation I think our mine would be an upcast; I cannot say it will be, but it is reasonably probable. Considering the long distance we are from the Junction downcast it would not be satisfactory.

11. Supposing the natural ventilation was your way, and the fan was running the other way, would not that tend to minimize the advantage?—We admit it is quite possible that they could draw air from our mine, but that would be to our detriment. I think that both mines are too big to rely on each other. There are certain cases where small mines might gain an advantage by connecting, but our mine is as big as a dozen ordinary mines. We have in our mine a dozen ordinary mines connected, and why should you connect more?

12. How many mines could be advantageously connected?—There is no saying.

13. And you might connect three and baffle the circulation?—It depends upon the arrangement of doors.

14. As to this ward system of signalling, have you found any difficulty with it?—I have not heard of any.

15. *Mr. Reed.*] You stated that your mines amount to many mines: how many shafts have you?—Six shafts, as a matter of fact, but they are not all in commission.

16. Your system is natural ventilation?—Barring forced ventilation in one or two headings.

17. Although a number of shafts may be of benefit with natural ventilation, are you aware that with mechanical ventilation a number of shafts is an advantage?—I do not know that it is so.

18. Would you be inclined to leave such an important matter as this to the Minister or Inspector of Mines?—No, I would not agree to anything but an open Court deciding it. I would

be content for the Warden to deal with it. We think that the Inspector of Mines would consider it his duty to interfere with a few men for the benefit of many.

19. Have you heard of any such suggestion?—No; but he would probably look at it in that way.

20. You do not mean to infer that the Inspector would harass the mining industry?—No; but it would be only natural for him to say that the larger number of men should get the good air.

21. And so you would be in favour of this matter being determined by the Warden?—Yes, I favour it being dealt with by the open Court, though I think certain restrictions ought to be placed upon what even the Warden could do. I do not think the Warden should be given the power to order the connection in case of fire. I drafted certain provisions which would not allow the Warden too much freedom. I would insert a protection clause for the objector.

22. As to stoping on the Rill principle, do you use that system?—I would not like to give expert evidence on that point.

23. Have you found it dangerous?—No, we are adopting it a little more lately. I am not going to give evidence on that subject.

24. As regards lighting, Mr. Gilmour stated that he believed there was forty miles of cross-cuts and levels in your mine and twenty miles open: do you think that would be exaggerated?—I should think there would be thirty miles open, but it is rather a lot to say offhand. I should say it is more than twenty, but whether it is thirty or forty I could not say. Twenty miles would certainly not be an exaggeration.

25. Twenty miles of travelling-roads open?—Yes.

26. Supposing that the law compelled that the travelling-roads in a mine should be permanently lighted, would you adopt lamps, kerosene, candles, or electricity?—I do not like grease lights of any sort.

27. If that became law would the lighting be likely to cause danger?—The idea is new to me. A definition of lighting is difficult to give. If you have no standard of illumination you would not see a truck coming.

28. Do you think the danger from permanent lighting would be greater than that under the present system?—Speaking on the moment, as I understand the matter, I think so.

29. Have you ever heard of such a proposal before in connection with travelling-roads in metal-mines?—No.

30. To light your travelling-roads in this manner would entail an enormous expenditure in electric plant?—Yes, it would be the expense of getting the wires in and maintaining them. We have a certain amount already wired, but the wires are knocked about a great deal. We have some thousands of feet lit with electric lights.

31. If such a scheme meant the safety of the employees would it not have been adopted long ago?—I do not think it would add to the safety of the employees; it might add to the convenience of working.

32. In regard to the gates to the cages, have you anything to suggest in the direction of amending the new regulations?—I have given a good deal of thought to the matter, and conferred with the engineers at the mine. We have had many conferences on the subject, and the safest thing we have been able to hit upon is a bar hung at the centre, which drops down to about 3 ft. 6 in. or 4 ft. from the bottom of the cage.

33. Would you recommend that the words "or approved barrier" be inserted in the regulation after the word "gate"?—Yes, it sounds right. I think that would be satisfactory.

34. Is there any other section in that regulation which you would like to speak about?—Yes, as to the rate of lowering men. I do not think you should have a fixed speed. I know of engines which it would not be safe to run at 500 ft. per minute; on the other hand, I have known many which it would have been perfectly safe to run at 1,250 ft. It should not be more than half the ordinary winding-speed.

35. Who decides the winding-speed?—The engine decides that.

36. *The Chairman.*] There has been a suggestion that a Board be formed, consisting of the mine-manager, the workmen's inspector, and the Inspector of Mines, to draw up rules and regulations for the working of each particular mine according to local conditions, such rules to be notified and posted up, and that a given time be allowed for interested persons to object to any or all of them; if passed they would become the working rules of that particular mine. Such rules would include the speed of winding, the method of ventilation, the height of stopes, and a number of other matters. Do you think that would be a workable scheme?—I am afraid it would lead to a perpetual state of dispute and trouble. The Mining Regulations are generally satisfactory; it is only in one or two small details that objection is taken to them.

37. There are a number of things which could be dealt with in the manner suggested, such as box rises?—I think that matter comes under the control of the Inspector of Mines; he could settle that. I think the general Mining Act is good, though I do consider that these last regulations have not been very well considered.

38. *Mr. Cochrane.*] You gave two reasons for connecting mines—to get fresh air and to get rid of foul air. That may be for your two mines, but take another district: do you not think it would be advisable to allow authority to the Inspector of Mines to order connections for the safe escape of men and to provide a second outlet?—I think it should come before the Warden; then the Inspector of Mines could be heard, and also the objector.

39. Then, in the case of mines that are connected, would you be favourable to the Inspector, with the approval in writing of the Chief Inspector, having power to close such connection?—No, I do not like the idea that the Inspector should be able to do such things as that. Of course, he would do what he thought was best, but I consider it would be better for the Court to deal with such matters.

40. Then, would you approve of power being given to the Court to close openings between mines if it were considered beneficial to do so?—Yes. I can quite understand a case where a mine with a single opening should be connected with another mine with a single opening for safety, but closed for ventilation.

41. *Mr. Parry.*] In regard to the speed-limit for winding, do you not think it advisable to have some restriction upon the speed?—I think the restriction suggested would meet the case—that is, half the ordinary winding-speed.

42. Is it not a fact that some men can stand being raised quicker than others?—Yes, that must be so. The ordinary lift in a warehouse affects some people.

43. Is it not also a fact that a man fainted in No. 2 cage at your mine a few days ago?—Yes, but I think he was ill underground; he had been complaining underground.

44. In regard to the gates I know that you have had some conferences on the subject: have you had gates on any of your cages?—I have never had a gate on them. We cannot design a satisfactory gate.

45. Do you not think a gate on a frame could be designed so as to go up over the cage?—You would find trouble with anything which slides up; it would be in the nature of a portcullis, and there is the danger that it may drop when you do not want it to do so. It might knock a man off the cage and down the shaft. The safest thing for the purpose is the bar.

46. But the bar does not do away with the chance of accident to a man fainting?—Well, it did stop the last man who fainted in the cage. The other men grabbed him and held him up by the bar. I do not think we can make provision for every man who faints.

47. *Mr. Reed.*] Are you aware of any country in the world which has insisted upon gates being provided on cages?—No.

ELECTRICAL APPLIANCES AND EXPLOSIVES IN MINES.

GRANITY (MARTIN'S HALL).—9TH OCTOBER, 1911.

FREDERICK HUBERT CHAMBERLAIN sworn and examined. (No. 1.)

1. *The Chairman.*] What are you?—I am an electrical engineer, and managing engineer of the Westport-Stockton Coal Company.

2. You are aware of the circumstances surrounding the accident at Waihi, as far as we know them?—Yes.

3. Can you give us any suggestion that would tend to prevent the recurrence of such an accident as that?—From the description of the accident I should say that it would be much safer, where electrical power is used for driving the gear, that the alternative brake-power be used under all conditions—that is, in these cases of winding-engines driven by electrical power and with an air-brake attachment, if the alternative brake-power (in these cases the air-brake) were used under regular conditions. In this case the increased speed of the drum was noticeable, and the engine-driver would have at once applied his air-brake. I take it that a certain time was lost when the driver was endeavouring to put on the electric power when it was off. I think they use electric power to reduce the speed of the cages, but I think in addition that it should be compulsory for them to have a tell-tale lamp installed. The driver naturally looks at the dial to see the position of his cage, and while he is looking at it several seconds would elapse while the current was off. If you had a tell-tale lamp over the top of the dial which was lit by the current supplying the motor he would be able to at once apply his air-brake. That is a very simple precaution.

4. This is a copy of the report by the Inspector of Mines on the accident, in which he states the precautions proposed to be taken: is that in accordance with your views?—Yes, it says that it is intended to arrange a device to cause the air-brake to act automatically in conjunction with the automatic brake in the event of a sudden cut-off of the electric power. I think that is what should be done.

5. And made compulsory in all cases?—Yes, where men are being raised or lowered. It is no hardship; but I still think you should insist upon the alternative power being used as the working-power. I think two things are essential: firstly, that the alternative power should be used under working conditions; and, secondly, in addition to that, a tell-tale lamp should be placed so that the operator on looking at the dial would at once see that his power was off. He would then not even have to look at the drum to see that his cage had got away.

6. *Mr. Reed.*] Can you suggest an efficient automatic brake other than the magnetic brake?—A very simple device could be arranged: you could have a magnetic trip which would at once apply the air-brake or other brake.

7. Something which would not leave it to the engineman at all?—Yes.

8. Would you be in favour of a broadly drawn regulation to that effect being incorporated in the Mining Regulations?—Yes, it should state that the driver operating an electrically driven cage in which human life is being transported should operate the alternative brake-power on that cage, because the best of electrical appliances get out of order at times. Then he is always working his emergency brake.

9. In connection with another matter—perhaps you are aware that in Great Britain it is the law that mining electricians must be qualified by examination. Would you be in favour of such a thing in this Dominion?—Yes, I think a mining electrician should be a certificated man. I cannot see any objection to that. Of course, you have the same thing in that line as you meet with in other lines. There are good practical men who are better qualified than men with a

theoretical knowledge. I think that the examination should be such that a man with practical experience should be able to gain a certificate. I do not think that you should have a technical examination which would bar a good average everyday man.

10. In regard to voltages, what is the highest voltage you have in the mine?—250; but I do not agree that that should be the highest.

11. What current would you admit into a mine?—I think 500 volts should be allowed in any mine where gas is not recognized. I cannot see any reason why 500 volts should not be allowed in a mine when it is allowed in every one of your cities. I think there should be restrictions in regard to the wires being exposed, so that a man with, say, a crowbar should not get against it. They could be raised on boards and brackets.

12. As regards the voltage permitted in a mine, are you aware that in Great Britain and New South Wales it is limited to 650?—Yes.

13. Would you consider that to be a fair thing for metal-mines—for pumping in metal-mines?—Yes, I cannot see any objection to that.

14. In the gold-mines here there is practically unlimited voltage permitted: what is your opinion as to that?—What is the power used for?

15. Pumping?—I do not see any reason at all why you should limit it.

16. Do you think 2,500 volts is safe in a timbered shaft?—Yes, properly installed, under British Board of Trade conditions it is safe.

17. In a metal-mine?—Yes, but not in every mine. I would draw the line at 650 volts in gaseous mines.

18. As to electrical firing, have you had much experience in the use of electrical batteries?—Only on ordinary contract work.

19. As to misfires, which do you consider the more prevalent—misfires with electricity or with the ordinary fuse?—Well, I could not answer that question, because I have not had enough experience.

20. Have you ever heard of electrical hangfires?—I have known cases in connection with railway-extension works where they have been blowing out a bank and where the battery has not put off the charge.

21. *The Chairman.*] But has the charge hung fire?—I do not know.

22. *Mr. Dowgray.*] Would you be in favour of electricity being kept out of all mines where there was gas?—Well, it depends upon what it is to be used for. If it is for ordinary lighting and power, and where you can house it, I do not think so. But I would not be in favour of its use for running locomotives, because your trolly-poles are always giving off sparks.

23. In connection with electric coal-cutting machines is there danger?—No; in that case it can be housed, and there would be no danger. It is worked on the same principle as in the magazine motors on a battleship.

24. Is there not danger to be feared from the wires fusing in connection with coal-cutting machines?—No, not if they are properly maintained.

WESTPORT COURTHOUSE.—13TH OCTOBER, 1911.

THOMAS STEPHENSON sworn and examined. (No. 2.)

1. *The Chairman.*] What are you?—A navvy, labouring on the line, and also president of the Westport General Labourers' Union.

2. What is it you wish to bring before the Commission?—Certain matters in regard to the use of explosives, with a view to the prevention of accidents. There are instantaneous fuses and slow fuses. In cases where instantaneous and slow fuses are to be used the last fuses should be attached together before the charge is laid, and after the charge is laid the whole of the fuses should be placed into the charges so as to fire all the charges together. Instantaneous fuse is used to fire two or more shots. In my opinion, if this had been the law, the last fatality we had would not have occurred. It was during the time of connecting these fuses that the accident occurred, but there has been no evidence to show what caused the accident.

3. Do you not think it a dangerous practice to use instantaneous fuse in any case?—No, it is not.

4. What is the value of instantaneous fuse if you have to use slow fuse to set it going?—The slow fuse is to give the lighter time. The whole of the instantaneous fuse is connected to the one slow fuse; or where a large shot has to be fired it should be fired with the electric battery, and not with the slow fuse at all.

5. Is there anything to distinguish the two fuses?—The slow fuses are red and the others white. You would know also by cutting them.

6. Is there sufficient indication of the danger of them?—That is what I wish to draw your attention to. The instantaneous fuse should be red and the slow fuse white.

7. *Mr. Parry.*] Would you tell the Commission what is the advantage of the instantaneous fuse?—To allow the shots to go off instantaneously. One hole would not do the work, and so you have to put in two and make them explode together. I also wish to speak as to the supervision of the explosives. At the present time there is no supervision except the man in charge of the Roads Department, and the scope of country he has to cover is too great for him to supervise explosives. I have been fourteen months on the railway-line, and I have never seen the Inspector there yet. There are gelignite caps, and fuses lying all over the place. An Inspector of Explosives should be appointed in this district where there are such large contracts going on.

8. Do you not think that the battery is the better in the event of a certain number of holes being required to be fired?—Yes.

9. And you could do away with the instantaneous fuse altogether?—Yes.

HOKITIKA COURTHOUSE.—28TH OCTOBER, 1911.

ANTON FALKENBACH sworn and examined. (No. 3.)

1. *The Chairman.*] What are you?—A mechanical and electrical engineer.

2. *Mr. Reed.*] I believe you have had considerable experience of electrical winding?—Yes.

3. In Victoria, at Charlotte Plains, and at the Ross Mine here?—Yes.

4. Can you suggest to the Commission a method of preventing accidents caused by the electric current being suddenly cut off? At the Waihi Grand Junction Mine recently a cage was precipitated to the bottom of the shaft as the result of that—the magnetic brake failed. What would you suggest to prevent such accidents as that?—Of course, it depends upon what sort of winding-engine you are using. In several instances at Charlotte Plains, when the current was cut off, the driver simply pulled the hand-brake and stopped the cage. As far as I know the engine they use at Waihi has magnetic brakes. These act at a certain point. When the engine-driver or winchman is winding the brake comes into action when the cage is a certain distance off the landing-platform, and then again before the cage is right up to the top of the shaft. Of course, the men become accustomed to using them, and they know the brakes work automatically; but I do not think the automatic brake should be used for lowering persons down a mine—the hand-brake alone should be used. If a man is winding men up and down, as long as he has one hand on the handle of the starter of the motor and the other on the brake nothing can happen.

5. But, in the event of the cage being only 20 ft. from the bottom of the shaft when the current is cut off, before the driver can realize that anything is wrong the cage may have struck the bottom?—I do not think so, because the cage should have at that point only a certain speed on.

6. But even when there is practically no speed on?—Of course, if they are using automatic brakes some apparatus could be devised to be fixed to the winch which would come into action as soon as the current is cut off. Some tell-tale should be devised to warn the driver that the current is cut off.

7. What sort of tell-tale?—A voltmeter or electric lamp.

8. Is it not necessary that the driver should know instantaneously?—Yes. When the driver is lowering men he generally shuts the current off before the cage reaches the bottom, if the winch is such that it depends upon the current being on or off. If he is winding there should be a tell-tale in front of him.

9. So that you are not in favour of using an automatic brake?—No.

10. You believe only in the hand-brake?—Yes. An automatic brake is good, but it is liable to get out of order.

11. Does not this accident seem to indicate that it failed?—It was apparently out of order.

12. Would not a tell-tale lamp be more easily seen that a voltmeter?—Yes.

13. There should be a powerful light in front of the driver?—Yes, it would be a good thing to have one of those opaque lamps.

14. As regards mining electricians, I suppose you are aware that a mining electrician comes under a mine-manager, who may not happen to know anything about electricity?—No, I am against that. The mine-manager ought not to be in charge of any electrical power-house. In Victoria the manager is not in charge. I myself had two instances of that sort of thing. In one case the manager had to come down twenty miles to inspect the power-house, and then he asked me which was the generator and which the Pelton wheel. I contend that the man who does not know that surely is not in a position to say if the power-house is in order or not.

15. Would you be in favour of mining electricians being certificated, as in Great Britain?—Yes, and he should be the man in sole charge of the power. The assistant would not require to be certificated.

16. By examination?—Yes, or by service, or by producing a certificate from a college, so long as the applicant can prove his competency.

17. Have you studied the electrical regulations under the New Zealand Mining Act?—Yes.

18. Have you any suggestions to make with a view to their improvement?—Yes, I have marked several of them. There is, in the first place, the matter of the mine-manager being in charge of the power-house, to which I have already referred. Under the regulations the mine-manager would be the man in charge, and, as I said, that is absurd, for he would probably know nothing at all about electricity. The Ross Goldfields, for example, has power in excess of their own requirements, and could supply power to other mines. Supposing that it supplied power to a number of mines, according to the Mining Act each mine-manager of these mines would be in charge of the power-house, and would have to inspect the power-house once a week and give his opinion as to whether the power-house and its apparatus are in good working-order or not. Then in section 11 (General), subsection (*i*), of the regulations it says, "That no repairs to the live parts of any electrical apparatus, except mere wiping or oiling, shall be done when the current is on, and that there shall be no departure from this regulation except when a stoppage of the current is, in the opinion of the manager, liable to involve danger. Such repairs shall be carried out subject to the manager's approval and such special instructions as he may issue." But you never cut the current off if it is not necessary. Another thing is that the manager does not know about the repairing of electrical apparatus. He cannot give instructions in regard to that matter. The man in charge should give the instructions as to what is to be done in the way of repairs. Supposing the transmission-line breaks down it is the electrician in charge of the power-house who has to effect the repairs.

19. But would it not be necessary for the electrical officer to give instructions to the manager? If the electrician required costly supplies to effect repairs he would have to procure them through the manager?—The matter of the cost and ordering of supplies is quite a different matter altogether. Of course, any company which employs a competent engineer asks him to make a list of what supplies he wants when repairs have to be effected. He would not consult the manager as to what he wanted. The manager may be a manager, but he would not be an electrician.

20. Would it not be better for the mining electrician to give these instructions by permission of the manager?—Well, that is a matter which concerns only the company which employs him. I do not think it would be necessary to get any permission from the mine-manager. As engineer in charge of the power-house I would give my own orders. Why should I ask the mine-manager? It would be the directors of the company, if anybody, whom I would ask.

21. But it is the practice throughout Australasia; all the men are under the manager's direction?—It may be so here, but not in Australia. I sent my reports direct to the company. If, for instance, I wanted material for installation, to take the manager away from his work and ask him to go through a list of supplies which he would not understand would be absurd.

22. At Charlotte Plains you had a mine-manager, but if you had a superintendent over you all the case would be different, would it not?—Well, if there is a superintendent over all he would be a sort of director, and then the electrical engineer would be independent of the mine-manager but responsible to the superintendent; but that would be provided for in the regulations of the company itself.

23. You refer to the certificated mine-manager?—Yes; but, still, the certificated mine-manager might have a general knowledge of machinery and electricity and yet not be competent to inspect electrical machinery—he is entirely concerned with his mining. Another point I wish to refer to is in regard to having an electrician on the surface. The regulation says, "A competent person shall be on duty at the mine when the electrical apparatus or machinery is in use; and at such time as the amount of electricity delivered down the mine exceeds 200 horse-power a competent person shall be on duty at the mine above ground and another below ground." I think 200 horse-power is below what should be fixed to require two men to be in attendance. It would mean that a company working full time would need six men—two on each shift. With a small mine that would involve an expense which is not necessary. It is not necessary to have a man standing on the surface, as the Ross Goldfields did. They had to employ a man for that purpose under the regulations. One of the winchmen would know enough to deal with anything which might be required; it would only mean perhaps the pushing-in of a switch. I think that should be extended to from 400 to 500 horse-power; then the company could afford to have another man.

24. Is it not necessary to have a man below in case a cable or wire is arcing?—No, because an arc is generally formed by a short circuit, and as soon as a short circuit forms the fuse or automatic cut-out will blow out.

25. But in the event of anything happening to the current below he may take charge. For instance, in case of fire or shocks to the men, an experienced electrician might be able to act more promptly than, say, a miner?—I do not object to having the man below, but I do object as to the necessity for the man on the surface; he is not necessary. Should anything happen below, if an engineer is there he could switch the current off at once, but on the surface the engine-drivers know enough to be able to pull out a switch. At Charlotte Plains these men did this work.

26. Did you allow inexperienced men around the switchboard there?—Yes, the winding-engine driver was properly instructed as to how to do these things.

27. As regards the voltage carried into a mine, we followed at first the British and New South Wales practice of allowing nothing higher than 650 volts, but there has since been an amendment increasing it: do you consider it safe to allow the higher voltages to be taken into a mine?—No, I do not think it is safe; I think 650 volts is quite high enough.

28. A company controlling a mine in the north—the Crown Mine—insisted upon its being increased to 2,000 volts: do you consider that dangerous?—Well, a high voltage to be used purely for pumping would not be dangerous, but if any man got a shock from a wire carrying 650 volts it would be sufficient for him.

29. In connection with fires, is not 2,000 volts dangerous?—No, I do not think so, because if anything burns through the installation burns away from the wires, and the automatic cut-out acts. But in any case, if the man on the surface saw smoke he would switch the current off at once himself, and down below in a pumping-shaft the engineer there could do so also. For pumping in a shaft it would not be dangerous.

30. But what about the voltage for traction purposes?—I think 500 volts would be quite enough for them—continuous current, not alternating.

31. *The Chairman.*] There is just one point I want cleared up: in connection with the accident at Waihi did I understand you to say that the current was cut off?—Well, not that the current was shut off, but that the current was taken off at the motor. They were starting the motors. The winch revolves as long as the motor revolves, and when the cage gets to a certain point underground the driver must shut off the current. In most of these mines they have tell-tales which show the different levels, and when the cage gets to a certain point the current is switched off so that the cage does not overrun the level.

32. According to that, if the current is cut off when the cage is 20 ft. from the bottom, the cage ought to be under the control of the brake?—Yes, it ought to be under the control of the brake. If the current is on it would wind right down.

33. And the automatic brake would stop it?—No, not taking the automatic brake into consideration. I think in this accident the brake did not stop it. Its use ought not to be allowed for lowering men.

34. *Mr. Reed.*] I think they have a magnetic brake there and compressed-air hand-brake, and they were lowering men 16 ft. from the bottom—that is, one revolution from the bottom?—It depends upon the diameter of the drum.

35. The diameter of the drum would be about 12 ft.?—It all depends upon the speed of winding. They should cut off the current a good distance from the bottom, so that the winding-drum is well in hand.

36. An accident such as that is not conceivable to you?—Not through cutting off the current. The only thing that might explain it is that when the driver cut the current off from the motor

he expected the magnetic brake to act, but it did not do so, and then the cage went down. In that case a man would have no time to use another brake. It does not take the cage long to travel 16 ft., whereas it takes a good deal of time to work any other brake.

37. As a matter of fact, the cage ought to be well under control?—Yes.

38. You believe in prohibiting these automatic brakes and having hand-brakes only?—Yes, for lowering men.

39. You favour an independent brake?—Yes, a powerful lever brake, the same as we have here at the Ross Goldfields.

40. There is a more powerful brake, called a "Post" brake, with more leverage below?—Yes, that is what I mean. A hand-brake is the most certain to act.

41. *Mr. Molineaux.*] In speaking of an automatic brake we applied the term to a brake which comes into action when the cage rises above a certain point on the surface, the object being to prevent an overwind. I take it that the automatic brake which you speak of would not be a similar appliance?—Yes, that is what I am speaking of; it prevents an overwind upwards or downwards.

42. No, not the brake which I speak of; it only comes into action when the cage is a certain distance above the surface?—Yes, that is the same brake, because when one cage is coming up the other is going down. When the one is down at the bottom the other is up at the plat. If it stops the one from going down it must stop the other from coming up.

43. But the brake I speak of only comes into operation when the cage has landed at the bottom; it prevents the cage at the top being overwound?—I see.

44. Is that the same style of appliance you have been speaking of?—Yes.

45. I understood you to say that when the cage comes within a certain distance of the surface the automatic brake comes into operation to stop the velocity of the cage?—Yes.

46. Then it appears to me that they are not the same appliances?—Yes, I think they are.

47. It is generally considered better, I think, to leave the question of the velocity of the cage to the engine-driver?—Yes, that is so; but even then, if he depends upon his magnetic brake and the current is cut off, the magnetic brake will not act—it is an automatic brake.

48. An automatic brake may be worked either by steam or compressed air?—Yes.

49. Take a winding-engine similar to that at the Grand Junction Mine, and supposing they are depending on the compressed-air brake, not upon the electric power, if the compressed-air brake had been used on all occasions when the power was shut off from the motor the driver could still have had the engine under his control with his compressed-air brake?—Yes, that is what I said before.

50. *Mr. Reed.*] How do you propose to cut off the electric power before you apply your hand-brake—automatically?—No, by hand; by the starter. The driver should have it well in hand.

51. By the resistance?—Yes. The winding-engine driver should never have his hand off his handle. It cuts the resistance out in notches or turns. It accelerates slowly until it reaches full speed, and then the driver must cut the current off and let the velocity carry it up.

52. So that you are in favour of the hand-brake, with the addition of a tell-tale light?—Yes, for lowering men, not for trucks. For lowering men I am against using any automatic brake.

JOHN ROWE LEGGO sworn and examined. (No. 4.)

1. *The Chairman.*] What are you?—I am travelling instructor for Nobel's Explosive Company, of Glasgow.

2. How long have you held that position?—I have been an instructor for eighteen years.

3. Our inquiry covers the question of accidents from the use and firing of explosives: if you have any general information to give us as to the minimizing of such accidents we shall be pleased to hear you?—Well, I am a believer in electric firing as absolutely the safest method.

4. And how is that method from an economical point of view?—I think it is just as cheap as firing with the ordinary safety fuse.

5. And, from a working point of view, as to manipulation?—It is just as simple.

6. Would you suggest that it should be used in all cases, or only for a given number of shots?—I would suggest that it should be used for a given number of shots, not so much for single holes.

7. How many shots?—Any number above one, and especially in outside workings such as cuttings. If you are firing four or five holes in a cutting, and the holes are 8 ft., 10 ft., or 12 ft. deep, the safety fuse, which has a travelling-rate of ninety seconds per yard, may not be satisfactory, because something may come on the scene before the charges explode, whereas with electricity the shot is fired as soon as the word is given. Not only that, but with the low-tension fuse it is possible to examine and test it to make sure of it by the aid of a galvanometer. With high-tension electric detonators you cannot test them by the aid of a galvanometer.

8. Have you any opinion to offer as to instantaneous fuse?—The instantaneous fuse was a very excellent article before the electric firing came into use, but there is now no advantage to be gained by using it for single holes.

9. You think it has had its day?—Yes.

10. And as to the danger from the use of it, do you consider that if it is used it ought to be distinctly marked in colour to prevent its being taken for ordinary slow fuse?—Yes, certainly. I have a sample of electric fuse here [produced] which can hardly be distinguished from our ordinary red sump fuse; it is the same colour and the same size. That fuse travels at the rate of 100 ft. per second, whereas the red sump travels at ninety seconds per yard.

11. There should be a definite colour for each of them?—Absolutely.

12. Now, as to the question of explosives which may be used in gaseous mines?—I would suggest the use of some flameless safety explosive, such as monobel, kynite, or ammonite; they are all effective explosives, and, what is more, they have less injurious fumes than ordinary powder.

13. Supposing you wanted to blow out timber in or near a gob in a fiery mine, is there any explosive that could safely be used?—Yes, the ordinary flameless explosive such as monobel—that is, with a fair amount of tamping, and provided it was not overcharged.

14. But there could not be much tamping at all in connection with timber?—Well, that is the safest explosive that could be used. The tamping would only be necessary to smother a small flame that is created by the detonator.

15. Could such shots be fired by electricity with safety?—Absolutely; that is, so far as science can possibly demonstrate to us.

16. Supposing it was tested immediately before firing, and that explosive was used immediately, do you think it could be done with reasonable safety?—I should say so. In the testing of all explosives—I speak of monobel with greater knowledge—we used what is known as a testing-chamber, which is a boiler with greater strength than an ordinary boiler. This boiler is charged with various gases which are found in fiery mines, and also with very fine coaldust, which is put in motion by means of a jet of compressed air. At the mouth of this chamber there is a gun charged with the explosive. The slightest flame would cause an explosion. Each batch is put to that test, and if it shows flame the whole batch is condemned.

17. And from that test you can recommend monobel?—Yes, or any of the permitted explosives; they are all under British Government supervision and tests.

18. *Mr. Cochrane.*] With regard to safety explosives in fiery mines, what would you designate a fiery mine? Do you know the definition?—Well, I am not an expert collier; my experience in colliery work is comparatively small.

19. Are you aware that mining engineers deem a mine to be fiery when there is 2½ per cent. of firedamp in the return? What would you say as to the safety of using these explosives in mines having a little gas?—I can only say that this explosive is used in large quantities in every mine in the British Isles, and I figure there will be some fiery mines there.

20. Then, in regard to blasting in a mine with only a little gas, what would you say as to the use of gelignite?—I think gelignite is a dangerous explosive to use in coal-mines under any conditions.

21. *Mr. Dowgray.*] Would you be able to get in sufficient monobel for blowing out timber?—Yes, monobel has a strength within 10 per cent. of No. 1 dynamite. You could have it put up in any size you liked. There is this about electric firing: you can divide the requisite quantity into a number of charges, if necessary, and fire simultaneously.

22. Is this monobel similar to roburite?—It is. It has 82 per cent. of nitrate of ammonium, 10 per cent. of glycerine, and the rest is made up of woodmeal and moisture.

23. In regard to the list of permitted explosives, is not a fiery mine in the Old Country one in which safety-lamps are used?—Yes.

24. It is not a matter as to whether an engineer considers it a fiery mine?—No. In any case it is a step in the right direction, because we never know when the conditions in a mine are going to change. It has less fumes and no flame. Mr. McEwan here has taken the step in this district.

25. *Mr. Parry.*] During your travels have you ever heard or seen a hole explode twice?—Yes, I have, but not with this compound.

26. But with dynamite?—Yes, I have.

27. What do you attribute that to?—A weak detonator in the first place, and perhaps the fuse igniting the top plug. That plug, being set fire to, generates sufficient heat to explode the remaining portion of the charge. Nitro-glycerine is supposed to withstand heat up to 600° Fahr. You can set fire to a plug, and it will burn, but if you took a similar plug and threw it into a strong fire it would probably blow the house up.

28. How do you account for two explosions?—One would be only a small explosion through imperfect detonation.

29. The one would be the detonator against the explosive?—Yes. Then, sometimes, through bad storage or climatic changes, one plug is less sensitive than another. They may be mixed, with the less sensitive one at the bottom, and the more sensitive plug on top goes off first, and by its heat and concussion it explodes the other, making a second explosion and report.

30. Is it possible to have two explosions with one detonator and one fuse?—Yes, but such an occurrence is very rare.

31. Knowing that, it is possible to take precautions against accidents from that cause?—That is so.

32. *The Chairman.*] The explosions would be almost instantaneous—not one explosion and then a hangfire?—No.

33. *Mr. Parry.*] One man told us that an explosion took place, and after waiting ten minutes they walked back and there was another explosion: how do you account for that?—A portion of the charge had exploded. Was the second explosion of any magnitude?

34. Yes?—Then you must remember that there is a tremendous heat generated in the hole, and fragments of burning paper, or fuse, or some feature in the rock must have become very hot and raised the remaining portion of the charge to exploding-point.

35. *The Chairman.*] We have had a suggestion made to us that all explosives should be stamped with the date of the month of their manufacture?—Yes, so ours are, but not each plug. It is my duty to inspect the magazines and see that our explosives go out in proper rotation.

36. *Mr. Parry.*] Seeing that you admit, as a man with a great deal of experience, that some dynamite is in better condition than others, do you not think it would minimize accidents to a

great extent if there were a man like yourself, who understood good dynamite from bad, to manipulate the supply?—I certainly think that in a big mine it would be a good thing to have a "powder-monkey" with a good knowledge of explosives.

37. To deal with the explosives?—Yes.

38. *The Chairman.*] But would that meet the case? For instance, could you tell by superficial examination of the charges whether one was stale or in good order?—Yes, I could, but I could not tell you whether the detonator was weak or strong.

39. You think that is a good suggestion?—Yes.

40. *Mr. Cochrane.*] What do you think of the practice of taking gelignite into mines in single tins like plan cases?—Well, if the temperature is satisfactory and the mine dry it is all right. It is like a magazine: if the temperature is high the stuff will deteriorate after a few days, and then again if it is very, very cold it would become sluggish. This monobel is a rather sensitive powder, and should be carried down in daily requirements.

41. Would it be preferable to use thawing tins?—But the best way is to avoid thawing altogether by carefully attending to the storage.

42. By keeping it at a uniform temperature?—Yes.

43. *Mr. Parry.*] In regard to men taking the wrappers off dynamite, do you think that should be stopped?—Absolutely; they should be fined.

44. As regards the bulling of holes—where men fire holes two or three times if the burden is not removed—is that practice detrimental to a man's health?—No, not unless the explosive has burned in the hole. If it is burned it gives off ten times the amount of injurious fumes which would come from an ordinary explosion.

45. But, in the event of dynamite not shifting its burden, does it not give off greater fumes than it would otherwise?—No.

46. But a man, in loading the hole the second time, would be more liable to suffer, would he not?—Yes, he should keep his nose away from the hole. He should also throw in a can of water and wait until the hole cools down. A number of accidents have occurred through this same bulling, because men do not know what is left in the hole, and neglect to take this precaution.

47. No doubt you have read and heard of a number of accidents resulting from dynamite being allowed to lie about the bottom of shafts?—Yes; but the trouble is that you may be an instructor, or whatever you like, but when you talk to a miner and tell him so-and-so he will tell you he has been "working at this game" for twenty-five years and has not been blown up yet.

INSPECTION OF BOILERS.—INSPECTORS' EVIDENCE.

DUNEDIN COURTHOUSE.—29TH SEPTEMBER, 1911.

ARCHIBALD WALKER sworn and examined. (No. 1.)

1. *The Chairman.*] You are Inspector of Machinery under the Government?—Yes, and surveyor of ships and boilers and machinery on land-work.

2. In regard to the inspection of boilers, you are aware of the provisions of the Mining Act as to the hydraulic test?—Yes.

3. Is that test carried out?—No, not as far as I am aware, because we do not test under the Mines Act: we issue a certificate from our own Department in conjunction with the Mines Department from year to year. I may say that there are five-thousand-odd boilers inspected in New Zealand, and eight hundred in Otago, for which we issue certificates annually. All steam boilers come under the Inspection of Machinery Act, and that includes mine boilers.

4. Subsection (37) of section 254 of the Mining Act requires that "once in every twelve months every such boiler shall be subjected to an hydraulic test"—that is, a test which is to be made by the owner or person in charge of the boiler?—If you read that section carefully you will see that it requires all boilers to be tested annually by an hydraulic test, but you will notice that it does not say to what pressure, and I therefore consider the provision is practically useless. In fact, we do not consider it necessary at all unless in conjunction with another inspection.

5. No, it is not to be tested by you?—No; but I may say we have instructions from the Chief Inspector of Machinery, dated, I think, in 1907, telling us that if we are in doubt we are to carry out this test in conjunction with the Inspector of Mines. If any doubt arises of any kind we are only too pleased to do so. But we consider that when that clause was framed the pressures being used were practically infinitesimal as compared with present pressure.

6. Do you test the boilers on dredges and about mines by hydraulic test?—If we think it necessary. I may point out that in this country new boilers are always tested to double the working-pressure for workmanship, but not to see whether the boiler is strong enough, because we know it is strong enough by calculation and by the design. To safeguard the owners and others that test is made; it is the test laid down by the British Board of Trade for new work.

7. Well, have you a regular system of testing—the Act here specially mentions the hydraulic test?—I may explain that we have a regular system of inspection. We examine the boilers internally and externally once a year to the best of our ability. We do not take down the brickwork every year, because we know the parts which are likely to deteriorate. We lay it down pretty fairly what the test is to be. The Mining Act and Coal-mines Act say nothing about the extent of the hydraulic test. The provision in those Acts is, I think, a copy of the English Act. That is only my opinion; I do not know the English Act.

8. *Mr. Reed.*] You suggest that this section is copied from an obsolete Act?—I do not know, but I think so.

9. Would you be surprised to hear that every British country has this regulation?—I do not know.

10. The New South Wales Act has it. It reads, "At least once in every six months every boiler shall be thoroughly cleansed, and once in every twelve months such boiler shall be subjected to an examination and hydrostatic test by a competent and thoroughly qualified person; the test of working-boilers shall be equal to one and a half times the pressure at which the safety-valve blows off, and that of new boilers double the intended working-pressure"?—Yes, that is more up to date.

11. Now I will read you the Victorian regulations: do you think this is obsolete? The Victorian current legislation states that "Once in every six months, or more frequently if an Inspector of Mines considers it necessary, every boiler shall be thoroughly cleansed, and once in every twelve months every such boiler shall first be subjected to examination, and afterwards shall be subjected to an hydraulic test." The States of Western Australia and Queensland have the same provisions?—I consider our inspection here more adequate than that.

12. In addition to your test do you think it would be detrimental to subject the boilers to the hydraulic test?—It would be unnecessary.

13. But as Parliament has determined upon this test is it for you to say what is necessary?—I do not determine the matter at all.

14. But you are an Inspector under this Act as far as machinery is concerned?—Yes, as to boilers.

15. Do you consider that these statutes I have quoted from, which necessitate an hydraulic test, are obsolete?—I would not like to say that.

16. Do you say that the advisers of these States in connection with machinery testing are obsolete in their ideas?—I say that our Act does not lay down the pressure.

17. But that is at the option of the Inspector?—No, sir, I do not think so.

18. Would you recommend that this clause be deleted from the Mining Act?—Well, if I were framing an Act I would not put it in, because I do not think it is necessary.

19. *The Chairman.*] Supposing the section were recast to provide a fair test with a fair pressure, would it be reasonable to require the owners to do it?—No, I should think that the annual inspection should be considered sufficient—it should be left to the discretion of the Inspector.

20. Is it not better to determine a matter by statute than to leave it to the option of an Inspector? You might carry out your inspections very well, but some Inspectors may not?—Well, Mr. Chairman, I would point out that for any boilers built in New Zealand a test of one and a half times the working-pressure is worth nothing, because they are built to stand a considerable amount over their working-pressure—a great deal more than one and a half times. There are standards laid down as to the strength of the material. In the New South Wales Act there is no provision for such an investigation as we have here with expert boiler inspectors; neither are there expert boiler inspectors under the Government in England to issue certificates as we do in New Zealand. These Acts which have been quoted are in force in countries where, if I may be permitted to say so, they do not run things in the same way as we do here. The boilers imported into New Zealand are under special supervision from the time of their birth. The smallest factor of safety for new work is 5.

21. *Mr. Reed.*] You say that the lowest factor of safety here is 5. Now, suppose the boiler were subjected to an hydraulic test of one and a half times the working-pressure, would it injure the boiler at all?—No, not in the slightest degree.

22. We have been told that the owners of the boilers on some of the dredges in Otago are afraid that the boilers would burst if they were subjected to that test. What do you think of that evidence?—It is all moonshine.

23. Do you consider a one and a half test is adequate?—I consider it is not a bit of use.

24. But it would not hurt the boiler in the slightest?—No, not in the slightest.

25. So that there is no harm in having this provision in the Act?—No.

26. *Mr. Molineaux.*] Do you consider it advisable that this test should remain in the Act?—Well, if you want my opinion, I say this test is not necessary.

27. It fulfils no good purpose?—That is so.

28. *Mr. Dowgray.*] Would this hydraulic test of one and a half times the working-pressure, referred to by Mr. Reed, not discover any defects in a boiler?—Well, I do not know, I am sure. I have not had sufficient experience in testing in that way for defects.

29. I thought I heard you say you were a boiler expert?—Yes.

30. Do boiler experts not test with the hydraulic test?—Not unless under special conditions.

31. Is the hydraulic test a good test?—Yes, under some conditions.

32. Under what conditions?—For testing, when repairs have been effected to boilers, as regards the workmanship.

33. If a boiler has been working for eight or ten years does it not deteriorate?—Sometimes. Would you be surprised to know that boilers have been running for fifty years, and are now running with the original pressure?

34. Do you place the inspection carried out in New Zealand above that of any other country, such as Australia or Great Britain?—Well, in proportion to the number of boilers in use, we have fewer explosions than they have in Australia, or Great Britain, or America.

35. Is that a matter of good luck?—No, it is owing to good inspection.

36. How long does it take you to make an inspection?—It depends on the size of the boiler. You cannot lay down any hard-and-fast rule as to time.

37. When you are appointed Inspector of Boilers are there not certain conditions laid down for the inspection of boilers?—Yes.

38. Do you carry them out?—Yes.

39. Did you ever see that report-book, referred to in the section in the Mining Act, in which the result of the hydraulic test is to be entered?—No, I have never seen those books in the mines.

40. Have you ever asked to see them?—No.

41. You remember a boiler accident at Kumara when three men were killed: your Department had tested that boiler, had it not?—I believe so.

42. With the hydraulic test?—No.

43. If the hydraulic test had been applied would those lives have been saved?—It depends upon the extent to which it was tested.

44. If it had been tested to one and a half times the working-pressure?—No, it would not have made the slightest difference.

45. Do you mean to infer that it was working beyond its working-pressure?—There is no evidence to show. Unfortunately, the man was killed who was driving the engine.

46. Where do we get our best boilers manufactured just now?—Well, I suppose we make as good boilers in New Zealand as are manufactured anywhere.

47. Are not most of them imported into New Zealand?—Some years more are imported than in others, but it depends upon the rush of work.

48. Do you not think that the men in the Old Country have made a deeper study of boiler-testing than they have here?—Well, we practically follow the British Board of Trade rules here.

49. Do those rules not lay it down that they shall be bored?—Yes, where required.

50. Is that not the test laid down by them?—With the hydraulic test also. I am talking of the annual inspection, and you are talking of the inspection of new work. Practically double the working-pressure is the test for workmanship; it is not a test of the strength of the boiler.

51. Is the hydraulic test not designed to see whether the boiler is capable of standing that pressure?—Yes. You are only testing with double the working-pressure, but not to one and a half times above the working-pressure.

52. Would the hydraulic test not be better than the other test?—No, I do not think so. If I were testing with the hydraulic test I would take all the brickwork off.

53. To effectively test with the hydraulic test would that be necessary?—Yes.

54. *Mr. Reed.*] Is it not necessary also to remove the brickwork to inspect for corrosion as well as for the hydraulic test?—Well, we run boilers at sea for considerable periods bagged all round, and you cannot get round them.

55. In regard to these dredge-boilers which have been run until the dredge itself is no longer required, do you not think "it is better to be sure than sorry" as far as testing them is concerned?—I would be just as sure with my present system of inspection as with any hydraulic test unless you put it up to bursting-pressure. Many of these dredge-boilers still work to the original pressure. They are sometimes taken out of the dredges and put into use elsewhere.

GREYMOUTH COURTHOUSE.—27TH OCTOBER, 1911.

PETER MCKENZIE sworn and examined. (No. 2.)

1. *The Chairman.*] You are Inspector of Machinery for this district?—Yes.

2. *Mr. Molineaux.*] Is it part of your duty to examine boilers in course of construction?—Yes.

3. And when constructed they are passed by you before leaving the yards?—Yes, if I am in the district at the time. At present, however, there are two boilers working under a permit because I was absent in the south when they were finished. They were tested in the foundry to twice the working-pressure before the owners.

4. In what manner do you inspect the boiler before it leaves the foundry?—The plans are first submitted to me to see that all the parts will carry the working-pressure required—the shell, the rivet section, the tube, and plates—and as to how it is to be stayed. The factor of safety ranges from 5·2 to 6·2.

5. For what purpose, in a new boiler of that description, is the hydraulic test applied?—It is always applied in a new boiler.

6. *The Chairman.*] By whom?—By the foundry-proprietors in the presence of the Inspector. It is applied for the purpose of finding the leaks. Sometimes a rivet may be put in slack and not filling the hole, and hammering up might break that rivet. When the hydraulic test is applied it immediately finds the weak spots.

7. That is, the hydraulic test is applied for detecting faulty construction?—Yes.

8. *Mr. Molineaux.*] Would you consider the hydraulic test a suitable one for finding the strength of the boiler?—No, certainly not. The hydraulic test is applied to a new boiler to find any bad workmanship.

9. Are boilers that are imported into New Zealand also examined by the Inspectors of Machinery?—Always; and if not up to the New Zealand standard, which is Traill's rule, they have to be strengthened to come up to our requirements. The New Zealand law on the subject is the strictest in the world.

10. Do you apply the hydraulic test for the same purpose—for workmanship—before permitting imported boilers to be used?—Yes.

11. What does your annual test consist of? How do you examine the boiler?—We examine it for corrosion or defects of any kind. I go inside and make my examination. Sometimes the plates get wasted away as the result of acids. Then an external examination is made to see if the seams are being burned with the fire. The examination is a general one to find any weak spots which may have developed.

12. In the case of a Cornish boiler, which is bricked in, what course do you take when examining?—We crawl through the flues to make our inspection. Sometimes we get the brickwork removed, but that is only done about once every two or three years. We use a candle on the end of a stick sometimes to enable us to see better. If there is any indication of scale forming we have the brickwork taken down.

13. Do you consider that the hydraulic test, if applied annually, would be any guide as to the safety of a boiler?—No, certainly not. I can give you a few proofs of that if you would like to hear them. These are extracts from Wannans': "Boiler exploded at Maldon, killing driver: Tested by hydraulic pressure only a month before, showing no defects. Boiler exploded at Castlemaine: Tested by hydraulic pressure to twice working-pressure only two months previous, showing no defects. Boiler exploded at South Melbourne: Tested two months before, hydraulic test, showing no defects. Boiler exploded at Richmond: Tested by hydraulic pressure to twice working-pressure three months previous, showing no defects." And then I have these extracts from Stromeyer: "Locomotive boiler, tested to 196 lb. hydraulic pressure, burst seven months later at 120 lb. Boiler-shell burst through manhole at 100 lb. after having been tested recently to 150 lb. Boiler-shell exploded at 83 lb.; it had recently been tested cold to 92 lb. Furnace collapsed at 50 lb.; it had been tested to 95 lb. only three days previously. A boiler burst at 30 lb. working-pressure after a cold-water test of 59 lb." Those are a few examples. I could give you another twenty if required.

14. Do you consider that the hydraulic test applied by an inexperienced man is likely to be dangerous?—Yes, it is likely to be dangerous to the boiler in as far as it creates strains on the boiler; cold water always creates a strain. If the boiler has been working the iron changes to a granular state. Cast iron cannot stand the test, and when the shell, after a certain number of years, gets into that granular state it is dangerous to test the boiler with cold water, and that test should not be carried out.

15. What do you consider is the most frequent cause of explosions?—Old age and the hydraulic test. The Board of Trade returns of boiler explosions in Great Britain for the year ended the 30th June, 1907, show seventy-seven explosions, causing the deaths of twenty-eight persons and the injury of sixty-five, and state that "nearly all the catastrophes seem to have been due to weakness, mostly the result of the age of the boilers."

16. Is the hydraulic test carried out annually in the Australian States?—I could not say. It was in general use up to a few years ago. I cannot say whether it is in vogue now. The Inspector used to put on the hydraulic test, but he did not go through the boilers like we do in New Zealand. If the test was satisfactory he was satisfied.

17. With regard to engine-drivers, will you inform the Commission how you consider an engine-driver should be trained?—He should be trained under a certificated engine-driver, who should be at all times alongside when the learner is practising. The learner should be for six months, at any rate, under a certificated man.

18. And during that six months should he be supposed to handle debris only?—The clause does not state whether it is material or men he is to wind. It is left to the discretion of the engine-driver whether he allows the learner to handle men. The certificated engine-driver is at all times responsible.

19. You are an examiner of engine-drivers?—Yes.

20. Would you consider a man competent who, when sitting for his examination, told you that he had never raised or lowered men?—Certainly not. He would not be competent; but that matter is not left to our discretion at all. All the papers are forwarded to the Head Office in Wellington, where they go before the Board of Examiners. All the names of men in the district who are coming up for examination are submitted to the local Inspector. We have no power to reject a man if he has been passed by the Board.

21. You consider a man would not be competent if he had not raised or lowered men, but the regulations say that he shall not raise or lower men until he has a certificate?—Is that so? I did not know.

22. *The Chairman.*] Under the latest mining regulations it is provided that no person other than a certificated driver shall raise or lower men, and no other persons shall be in the engine-room while he is raising or lowering men?—Well, that is going to prevent any one from going up for examination.

23. But the suggestion or inference is that he shall get his certificate without raising or lowering men?—Without any experience?

24. No, but with only the experience of raising dirt?—Yes. [Witness reads regulation.]

25. *Mr. Molineaux.*] As an examiner do you consider a man would be competent if he only had experience of raising debris, and then sat for his certificate under those regulations?—Certainly not; he must be allowed to handle the engine.

26. Those regulations do not debar him from handling the engine, but only from raising or lowering men?—Well, then, this means that whenever a signal is given that men are coming up he has to go out of the engine-room. Of course, he could become proficient in raising men equally as well as in raising debris.

27. *The Chairman.*] Except as to his own nerve?—That is so; but if a man is bothered with nerves he has no business to be there at all.

28. Supposing a man obtaining his certificate on raising dirt, under this regulation he would have to begin raising men without any one else in the engine-room?—Yes.

29. Do you think that is a safe practice?—No. It looks as if it would be necessary to make two classes of winding-engine drivers, a first and a second class, the second to only raise and lower men under a first-class certificated man.

30. But no other person is to be there?—Excepting the certificated driver. There must be two certificated drivers in the room when they are changing watches.

31. But not necessarily when they are raising men?—That is so; but they are generally changing at the same time.

32. *Mr. Reed.*] As regards your statement that the New Zealand law in regard to the inspection of boilers is the strictest in the world, do you understand the laws in other parts of the world on the subject?—Yes.

33. Tell me the law in Victoria?—I could not do so without looking up my books in the office.

34. Are you aware that the law in New South Wales requires boilers in use to undergo the hydraulic test?—Yes.

35. You stated that it injured the boilers to test them?—Yes, old boilers, not new ones.

36. Supposing a boiler were subjected to an hydraulic test of one and a half times its working-pressure would it be injured thereby?—I say Yes; that is, an old boiler, over twenty years of age.

37. But you did not state that before?—No.

38. So that it would be only boilers over twenty years of age which would be injured by the test?—Well, I would say from ten years, though the plate is not brittle at ten years like what it is at twenty years.

39. So that if anybody stated that a hydraulic test of one and a half times the working-pressure would not injure a boiler you would consider his opinion wrong?—Certainly.

40. Would you be surprised to hear that Mr. Walker, Inspector of Machinery at Dunedin, said so before this Commission?—It is not the rule of the Department, at any rate.

41. So that you boiler experts disagree?—Yes; in the explosions I quoted all the boilers had been hydraulically tested.

42. You stated that the majority of boiler-explosions were due to old age and the hydraulic test: what evidence have you to show that any one of those explosions was due to the hydraulic test?—I said that the hydraulic test had been applied immediately before the explosions took place. When the inquiries were held that was the conclusion they came to.

43. Will you quote us one case in which the report showed that was the conclusion arrived at?—I have none of my books here.

44. Is not the most frequent cause of boiler-explosions the water getting low?—I would not say that; it is a frequent cause.

45. Did a boiler burst in this district?—Yes.

46. Had it been hydraulically tested?—No.

47. How had it been examined?—By the hammer test.

48. How many people were killed?—Three.

49. Have you ever known a boiler to explode in New Zealand after the hydraulic test?—No.

50. But you have heard of one bursting which had not been subjected to that test?—Yes. In the first place, the boilers in New Zealand are not hydraulically tested, with the exception of a few mining boilers. None of the sawmill boilers are subjected to the hydraulic test.

51. If the hydraulic test is the cause of explosions and accidents can you explain why the States of Australia and New Zealand allow the hydraulic test to remain on their statute-books?—It is a matter of opinion.

52. It is an important matter of opinion, is it not?—Well, the Board of Trade is not upholding it. The Australian explosions are damning it.

53. If they do so why is it allowed to remain on their statute-books?—I do not know, but Cruickshanks and others condemn it.

54. Is it not a fact that the Inspectors of Boilers are good men?—Yes.

55. Is it not a fact that their recommendations are embodied in the statutes?—Yes; but the majority of them were made before the present Inspectors were in power.

56. But are not amendments to the mining statutes frequently passed, and yet this objectionable hydraulic test remains on the statute-books in these countries?—It is not enforced.

57. Where is it not enforced?—Here.

58. Are you greater than Parliament that you do not enforce what Parliament enacts?—But it is left to our discretion.

59. You are supposed to see that it is done?—Not the Inspector of Machinery. If you read the section carefully you will see that.

60. "And once in every twelve months every such boiler shall be subjected to an hydraulic test, and the date and full description of every such test and cleansing shall be entered in a book to be kept by the mine-manager or other person in charge of the mine, and the entries in such book shall on demand be open to the perusal of any Inspector under this Act or under the Inspection of Machinery Act, 1908"?—You see it says that the book shall be open for inspection, not that the test shall be made by the Inspector of Machinery.

61. That is where you get out of it. You are an Inspector under this Act?—Yes.

62. And you do not even examine or ask for these books to see if the tests have been made as required by the statute?—No, for the simple reason that if we tested every boiler we would lay the mines up for weeks at a time.

63. So that you use your discretion as to whether the will of Parliament is carried out or not?—But it is the mine-manager and not the Inspector of Machinery who has to see that the hydraulic test is applied. The Act does not say we must see it carried out. I know that tests are carried out.

64. The report-books show that the tests are not carried out every year?—They are carried out, so-many this year and so-many next year.

65. So that you do not see the law carried out?—I do not see the hydraulic tests carried out every year.

66. You allow the mine-managers to go on their way breaking the law?—Yes.

67. What authority have you for stating the hydraulic test does not test the strength of a boiler?—You have only to go to the Australian States for that. There is also the authority of Cruickshanks, the greatest boiler expert in Australia. They all condemn the hydraulic test.

68. They do not say that it does not test the strength of a boiler?—No.

69. But you stated to Mr. Molineaux that it does not?—It does not test the boiler where we want it tested.

70. So that you believe, then, that the hydraulic test does test the strength of a boiler?—Yes, any pressure that is applied will do that.

71. Now, you stated that the factor of safety for new boilers varies from 5·2 to 6·2?—Yes.

72. The law of New South Wales states that the factor of safety shall be from 1½ to 2?—Yes.

73. Supposing you have a boiler which has a working-pressure of 100 lb., and you test it to 200 lb.—that is, you double the working-pressure—is not that pressure equal in all directions?—Yes.

74. It is the pressure indicated on the pressure-gauge?—Yes.

75. Now, substitute steam for water, would that not be indicated on the pressure-gauge, too?—Yes.

76. In the event of a very weak boiler bursting at twice the working-pressure is it not better to burst it under the test where there are no people about?—But they very seldom burst during the hydraulic test. It would be better to burst them that way if possible.

77. You cannot prove that those instances which you quoted were due to the hydraulic test?—We do not test the boilers by hydraulic pressure. Those instances of explosions in Great Britain I quoted were two years ago, while I think you can go back twenty years without getting a case of an explosion after a hydraulic test in New Zealand.

78. If the hydraulic test is so dangerous why is it still on the statute-book?—It will go out in time.

79. Will you explain the theory of the thing?—With age a plate changes from a fibrous to a granular state. If you take an old boiler-plate you can break it, it is so brittle. A boiler-plate under steam is more pliable than a cold plate. You can break it when cold, but if you heat it up you will not be able to do so.

80. By your ocular test how can you ascertain whether the boiler is leaking or not?—You can see at once, because corrosion starts immediately. You can see where the joints are leaking.

81. Even where there is brickwork?—We take down the brickwork. You go round all the seams, and you are bound to see any defects. There are no seams, or very few, under the brickwork.

82. As regards the engine-drivers, are you in favour of a learner practising upon men?—I am not going to express an opinion on that at all.

83. You said, I think, that an engine-driver would be as proficient after raising rock as after raising men?—Yes.

84. And you also said that a man who has nerves had no right to be at an engine?—Yes.

85. So that you approve of the English system that the learner should practice at the engine winding mineral?—Yes.

86. The nerve would come to him?—Yes, with practice he will gain confidence.

87. So that the fact that he was raising his fellow-men would not make him nervous?—It would not give him nerve. It would be more the other way; it would take away his nerve, especially in a deep shaft.

88. Did you read about that Energetic Mine accident?—I was not on the Coast at the time.

89. A learner killed a man while a certificated driver was at his elbow?—Yes.

90. Would it not be better if men had a longer experience than six months?—Well, that would be a hard thing for me to say.

91. You are aware that in Great Britain there are no certificates?—Yes.

92. And yet winding accidents do not often occur?—Yes. That is because the drivers are not young men; they are middle-aged or elderly men.

93. What is your opinion as to the necessity for having two winding-engine drivers in case one took a fit?—No, it is not necessary at all.

94. Would two men distract one another's attention?—The tendency would be that way. Of course, where a certificated driver is teaching another man it is different: the certificated driver has his wits about him, because he is responsible if anything goes wrong. But with two certificated men there they are apt to be careless.

95. Would you be in favour of drivers submitting themselves to a medical examination frequently?—Yes, especially for heart trouble.

96. As regards practising, would you like a learner to practice on yourself or your friends?—No.

97. So that you do not approve of learners practising upon their fellow-men at all?—No.

98. *The Chairman.*] Do you approve of a learner getting his certificate before he has raised men at all?—I had better not submit an opinion on that point at all.

NELSON COURTHOUSE.—2ND NOVEMBER, 1911.

NEIL DICKSON HOOD sworn and examined. (No. 3.)

1. *The Chairman.*] You are the Inspector of Machinery for the Nelson District?—Yes.

2. A question has arisen in regard to the safety of boilers—as to the necessity for the hydraulic test as laid down in the Mining Act, both in respect to the safety of boilers and as to the injury likely to be caused to a boiler by that test—that is, injury in the nature of strain; further, as to whether all boilers should be tested annually by the hydraulic test. The Commission would be glad to have any opinion on the subject which you may care to offer?—There is no doubt that the hydraulic test does strain a boiler to a point, and if the boiler is dangerous it will show it. I do not think it is necessary to test a boiler above 100 per cent. of its working-pressure unless it shows the result of wear. I believe the hydraulic test from time to time is absolutely necessary for old boilers. I have had every boiler in every mine in the district under the hydraulic test.

3. At what pressure?—At 100 per cent. above the working-pressure—that is, twice the working-pressure.

4. There is no test pressure given in the Mining Act?—Well, the Department usually tests at 100 per cent. in excess of the working-pressure. I believe it is necessary, as all plates and rivets are different under heated conditions from what they are when cold.

5. Do you take into account the factor of safety of boilers when you are fixing the testing-pressure?—No, that is calculated in the first place.

6. I know; but is not the actual factor reduced by wear-and-tear?—Of course, we reduce it. If a boiler shows deterioration then we reduce the pressure according to the thickness of the metal; after it is calculated out the boiler is submitted to the hydraulic test.

7. Then the actual test is different for different boilers?—Yes, I think twice the working-pressure is a satisfactory test for an old boiler, but not for a new one. I believe that an Inspector should be allowed to use his own discretion as to when a test is necessary, and for an old boiler—say, twenty-five years old—I think it should be at least every second year.

8. The Act says the test shall be made by the owners?—I test them myself.

9. Under the Mining Act it is the owner who has to test the boiler; he has to keep a record of his test, which is to be open for your inspection?—Well, I supervise the test myself.

10. We wish to know whether you consider this annual hydraulic test referred to in the Act a necessary precaution, or is it a superfluous test?—Well, I think it should be left to the Inspector's discretion as to whether it is necessary, because there is no use unduly straining a boiler. Every boiler is tested before it leaves the foundry, and all plates and material for that boiler must be according to the Board of Trade requirements. The Department refuses a boiler-plate which is not made by recognized makers, or applies a higher factor of safety. Boilers are examined from time to time during construction, and all the holes are drilled with plates in position. After bending the plates are taken down, burrs removed, and then riveted finally. It is tested by hydraulic pressure. If it is to carry 150 lb. it is tested to 300 lb., and is kept under that test for perhaps half an hour. It is then examined with a straight-edge to see that there is no alteration in the shape of the boiler, and so on. I consider that it would be unwise or unnecessary to test that boiler again within the next year or within the next five years, and if it showed no signs of deterioration during the next five years it might be prudent to test it at one and a half times its working-pressure.

11. That would involve pulling down the brickwork?—Yes, in some cases.

12. What loss of time does that involve?—A considerable loss of time—not only the Inspector's time, but also that of the owner as well. Still, where there is an old boiler I consider it is quite necessary that the hydraulic test should be applied, say, once every two years, or according to condition.

13. Do you think it would be advisable to amend the Act if the clause is retained so as to fix a standard of test—say, 50 per cent. or 100 per cent. above the working-pressure—or should that be left to the discretion of the Inspector?—Well, at present I have a locomotive which fell through a bridge under repair, and have asked for a 50-per-cent. test in excess of the working-pressure; yet it is only about ten years old. I think that would be reasonable; but where it is an older boiler I would ask for a higher test.

14. Have you ever known boilers to burst under working-conditions after the hydraulic test?—No, not that I can remember. Of course, you will overstrain a boiler if you go beyond a certain point. But we have a factor of safety, and after calculation any boiler should resist a test of 100 per cent. in excess of the working-pressure arrived at, and that should not be an excessive strain on a boiler of average age or guaranteed material and workmanship. If a boiler is constructed to carry 150 lb., and you put a 500 lb. pressure on it, that would be excessive, but it should stand safely with 300 lb.

15. You consider a boiler's age?—Yes. I know if I were an owner I would be quite prepared to submit my boiler to a 100-per-cent. test. Every boiler of importance in every mine on the West Coast was tested in 1908 and 1909. I remember a boiler at the Golden Fleece which developed many weaknesses in the seams and stays, and another one at the A or B shaft at the Globe Mine. They are very old boilers—perhaps twenty or thirty years of age. A mild test might not have found out their defects.

16. What happened in those instances? Did you have the boilers removed?—They were repaired.

17. It does not necessarily mean putting the boiler out of commission, then?—No; they might work under reduced pressure. At the A shaft we reduced the boiler-pressure from 120 lb. to 90 lb., and continued until it was repaired; then the pressure was restored to 120 lb.

18. What do you think of the examination by hammering?—You can find a thin plate in that way.

19. Do you think that is as good a test for finding a weak place in a boiler as the hydraulic test?—No, there are plates in certain boilers which it is impossible to test satisfactorily with a hammer. If you find a weak place with the hammer there are perhaps others existing that you know nothing of. It is a good test if you can get well round the boiler, but it is a difficult matter to hammer a boiler all over. The hydraulic test, on the other hand, involves a great deal of time, and should only be applied to boilers of a good age and at the discretion of the Inspector. A boiler over fifteen years of age should be tested by the hydraulic test according to its age.

20. And the extent of the pressure should also be in the discretion of the Inspector? There is no mention of that in the Act, and a suggestion has been made that the section as it stands is inoperative?—Yes, we work on proper lines, and our rule is to test to 100 per cent. above the working-pressure.

21. Supposing the section were retained and made to read that a boiler shall be tested at a certain pressure, or such greater or less pressure as the Inspector deems necessary?—I would like you to thoroughly understand my reasons for suggesting this, as I believe the Inspector to be the most interested person as to the safety of a boiler, as he puts his name to the certificate. Therefore I think it should be left in the hands of the Inspector, who always feels that he is responsible for the safety of the boiler and to the public. I think it would be wise to leave it in his hands.

22. *Mr. Cochrane.*] You said, I think, that you would test new boilers to 50 per cent. and old boilers to 100 per cent.?—That is, a boiler which has been under working-pressure for, say, ten years.

23. And boilers over ten years—to what percentage would you test them?—I should test each according to its condition.

24. Do you not think there is an anomaly as between the testing of a new boiler and the testing of an old one?—No, I think not.

25. Why should they not be tested to the same extent?—There is less chance of a new boiler having deteriorated than an old one.

26. Why test the new boiler to a less extent?—Because it is not necessary to apply a severe test to a good boiler recently tested.

27. Then is there any necessity to test it at all?—Yes, it is more satisfactory to test it later on, and if there is a weakness developing it will find it. The test would reveal a weakness quicker than working-conditions.

28. I think you said the test should be at the discretion of the Inspector—that there was no use straining a boiler?—Unnecessarily. If there were a doubt about it withstanding the 100-per-cent. test I would strain it to destruction rather than risk anything.

29. I wish to ask you wherein would the strain consist?—Well, in an old boiler, if there were any wasting inside.

30. That would be deterioration, not straining. You said the test should be at the discretion of the Inspector—that there is no use straining a boiler unnecessarily. Wherein does the straining consist?—I have always applied the 100-per-cent. test with confidence.

31. You have been an Inspector of Machinery for a number of years?—About nine years.

32. Are you aware of the provision of the Mining Act on this subject?—Yes.

33. Has that been carried out?—Yes.

34. Every year?—I can testify to its being carried out in 1908 and 1909.

35. But all the years you have been an Inspector?—No, we were instructed in 1908 to apply the hydraulic test. Prior to that we had as much as we could do without this work. Now that is extra.

36. And prior to that was it carried out each year?—No, I do not think so.

37. Then some Inspectors seem not to have carried it out in late years either. You advocate the hydraulic test in all cases yearly?—No; the Chief Inspector of Machinery instructed me as regards the hydraulic test.

38. *Mr. Dowgray.*] Do I understand you to say that a boiler unable to stand a 100-per-cent. hydraulic test would be far better out of commission altogether?—Yes, I believe that. I think every boiler should be equal to that strain.

39. And for boilers which would be strained with a 50-per-cent. test above working-pressure would you consider that a safe pressure? Do you consider that would strain a boiler?—I reckon that if it did the boiler is not up to Board of Trade requirements. The Board of Trade will not have anything to do with a boiler which is strained with a 50-per-cent. test.

40. Is it possible to examine the whole of a boiler by using the hammer test inside?—No.

41. There are some sections of a boiler which you cannot get at from inside?—Yes.

42. And the only way to thoroughly test it is by the hydraulic test?—I would not go so far as to say that. If you get inside you can see almost every portion—there are special sight-holes for that purpose—but it is impossible to tap every part, and, what is more, you would not be satisfied with tapping, for sometimes bricks rest on the boiler and they change the sound altogether.

43. Some Cornish boilers are bricked up. Is it possible to test them as thoroughly when they are bricked up?—No. There is a boiler here in Dodson's brewery; it has been repaired; the defect could not have been found with the hammer test. I do not depend on a boiler if I have any doubt about it without the hydraulic test, and am in favour of the hydraulic test for old boilers, especially if they are, say, twenty years old.

44. *The Chairman.*] It has been suggested that after a certain number of years a change takes place in boilers—that the plates take on something in the nature of cast steel?—Yes, they crystallize. After, say, thirty years the plates become fragile, but these crystallized plates have been constructed before the Board of Trade rules were applied, and are generally of inferior

iron. In the Old Country there is no control over boiler-making as far as I know. There might be now, but there was not until recently, and any sort of material might be used. When the boilers come out here they must have the brand on them.

45. So that that change is minimized?—Yes.

46. What effect does the hydraulic pressure have upon material that crystallizes in that way?—None at all. Supposing there is a weak spot in a boiler which will stand the working-pressure, so long as that weak spot does not deteriorate any more there is no fear. If it does deteriorate and gets pretty nearly down to the safety-point, if you applied the hydraulic test the amount of metal that was held by the rivets would come away and the hydraulic pressure would force it out.

47. What effect would the hydraulic test have upon a crystallized plate?—The strain would not be there, but if you put it up to a fair percentage it would most likely fracture. If it crystallizes it might not be equal to more than one-third of its original strength. In one case I applied more than 100 per cent., and it went off like a shot. That convinced me that an old boiler requires a lower test; but I believe, if a boiler is a good one and fairly new, then the test is unnecessary. Such a boiler is good for years before the test is required.

48. That is why in such a case you advocate a low test?—Yes.

49. But after it goes a little further you would increase the pressure to test the safety of the boiler?—Yes.

50. *Mr. Dowgray.*] Do you consider a boiler which is crystallized should be subjected to a 100-per-cent. test?—Yes, if you suspect it is crystallized.

51. If such a boiler were kept working the metal would be elastic when it is hot?—Well, there is not much elasticity in crystallized metal.

52. When it is crystallized there will still be a danger?—Yes.

53. *The Chairman.*] It would fracture under heat just as it would under the cold test?—Perhaps it would not be quite as likely to do so; a cold plate and a hot plate are two different things. I believe that if the metal is crystallized under cold conditions it is also crystallized under heated conditions, but might be more ductile under heated conditions—that is allowed for—but the strength is gone in either case. The explosion of that boiler at Kumara was due, in my opinion, to inferior metal and the fatiguing of the stays; one gave out and threw additional weight on those adjoining. The management, in my opinion, was at fault, as those in charge should have noticed this before going too far.

54. Had that boiler been tested by the hydraulic test?—No, not to my knowledge.

55. If you had been in the habit of subjecting a crystallized boiler to the hydraulic test would you have found its weakness before?—Yes; but an Inspector would not be able to cover much ground if he had to apply the hydraulic test to every boiler. You would require an army of Inspectors.

56. *Mr. Parry.*] You have been an Inspector of Machinery for some time: have you anything to suggest in the way of inserting an amendment in the Mining Act with a view to minimizing accidents to men working the machinery, and so on?—Well, I feel that all the mechanism in connection with cages should have expert attention. I always inspect once a year to see that the grips are in good order. They are supposed to be tested by the mine-managers, but some of them have very little knowledge of metals and steel. I think the grips should be under the control of a qualified man.

57. *The Chairman.*] Of a machinery engineer?—Yes, such a man should certainly be responsible for them (the safety-grips) once a year. I think the Inspection of Machinery Department should be responsible for the mechanism of the cages.

58. *Mr. Parry.*] Have you any suggestions to make with a view to minimizing accidents in connection with machinery, batteries, and other plant outside mines?—I do not think so. I have looked through our Act, and it seems to provide for the efficiency and safeguarding of everything. The shafting must be equal to requirements and secure, the belts also, and gear on the poppet-heads must be in good order; and I always inspect them from time to time, also all grips.

59. Is there anything in the Machinery Act *re* the covering of set-screws?—Yes, anything that appears dangerous and is liable to cause an accident.

60. But do you not think it is necessary to have a provision in the Act that all set-screws and belts should be covered?—Yes, perhaps so; but it is included in "anything that is dangerous." I always refer in my reports to the set-screws and other things.

61. And you think it would be advisable to have that inserted plainly in the Act?—Yes.

62. What is your opinion of the danger to a man manipulating the belt by himself?—I believe there was a boy killed in that way in one of the engineering works in Dunedin, and some time back a man at Motueka was injured.

63. In regard to the fatal accident to Henesy at Waihi when putting a belt on by himself, do you think it is dangerous for one man to be allowed to put a belt on alone?—No, I do not think so, provided the belt is not too heavy.

64. Not for a man to do so in a lonely place?—Well, if he is negligent it is dangerous, but there is no danger if a man is reasonably careful. I have put on thousands myself, and I do not think there is any danger in it.

65. But in the case of a man going to work by himself, say, on Sunday evening, do you not think he should have some assistance?—It would depend on the weight of the belt; he should have assistance if it were heavy—say, over 5 in.

66. And, as regards a man looking after machinery by himself, do you not think that is dangerous?—No, I think not. When I am asking for machinery to be guarded I have often pointed out that a man might faint or stumble, and it would be well to have the machinery guarded so that if he fell against it he would not fall into danger. If everything is made reasonably secure there is no danger to a man if left in charge of machinery at night-time, provided he is in good health and sound.

67. In the event of his oiling different parts?—I realize all that.

68. The Commission has had an instance of a man attending machinery at night and looking after two or three compressors some distance away: do you think that is satisfactory?—Yes, if everything is safeguarded, and attendant in good health, there is no danger. Where there is any danger hand oiling should be disallowed, and automatic oiling insisted on.

69. In connection with the clause in the Machinery Act which says that no covering or fencing shall be removed while machinery is in motion, what do you think that means?—It means that the covering or fencing must not be taken off, because there is danger there.

70. And that even for repairs it should not be removed unless the machinery is first stopped?—Yes.

71. And you would consider, then, that if any person removed that covering while the machinery was in motion he would be committing a breach of the Act?—Yes.

72. You do not think that repairers have the right to remove the coverings while the machinery is in motion?—They would not be able to repair the machinery unless it was stationary.

73. There is nothing else you can suggest in regard to machinery?—I would suggest that where there is danger in oiling shafting automatic oil-feeders should be used, and I also think that safety-grips on mine-cages should be inspected every few weeks, perhaps, by a qualified mechanical man.

74. *The Chairman.*] Apart from the inspection by the mine-manager?—Yes, by a man who has some knowledge of steel springs and the action that is necessary to bring the grips into play. I do not like the spike grip. I believe the eccentric grip is the best, as it grips the guides on each side. I think a man should have mechanical knowledge; his decision then as to the efficiency of a brake would be satisfactory.

75. *Mr. Cochrane.*] Are there many spike grips on the cages in your district?—No.

76. Would you go as far as to say that they should not be used?—Yes, though it depends upon the nature of the timber they engage with. They might split the wood. Personally, I do not care for them at all.

77. As to the expert who you say should examine the safety-grips every few weeks, do you mean a Government expert or a man in the employ of the company?—I am not going to advise as to who should employ him, but he should be an expert—a man qualified to make the examination and put his name to the certificate.

78. *The Chairman.*] Is the mine-manager examined in that subject when he sits for his certificate?—I do not think so.

79. Do you think it should be a pass subject for a mine-manager?—Yes, all mine-managers should understand tensile and other strains on metals.

80. *Mr. Cochrane.*] Or the enginewright of the mine?—The man who puts his name to the paper.

81. *The Chairman.*] Will you peruse paragraph (5) (*j*) of the regulations recently issued by the Mines Department in regard to winding-engine drivers, which says, "No person shall interfere with the engine except the certificated winding-engine driver when men are being raised in or lowered down a shaft." Under that regulation a man is not allowed to raise or lower men until he gets his certificate. It has the effect of debarring a learner from winding men, and then when he has gained his certificate he has to commence winding men without any other driver being present in the engine-room. As an Inspector of Machinery have you any opinion to offer as to what practice a man should have in raising and lowering men either before or after he gets his certificate?—I examine candidates for winding certificates. They generally practice hauling material, or bale water from the mine, and gain confidence in that way. They wind material before they wind men.

82. Do you think they should have any experience of winding men before they get their certificates?—According to the Act they are prevented from doing so.

83. This is a recent regulation. We are inquiring into the whole question, and may recommend that this regulation be recast?—Yes, they should be working with an experienced driver before they get their certificates, and they do, I think. They always have a certain amount of practice at baling or hauling material; it is good practice, and they generally have a certain amount of that.

84. The question is whether they should get that practice before they gain their certificates or after?—They should get it before, as after getting their certificates they may take a position where there is no one but themselves. For instance, at the copper-mine here there was only the one driver. I generally question applicants as to whether they have had experience.

85. *Mr. Fletcher.*] You approve of them having that experience before they gain their certificates?—Certainly.

86. *Mr. Parry.*] A question has come before the Commission as to the risk run by men in being hauled and lowered with only one man at the engine: what is your opinion on that point?—You could not put more than one man in charge of an engine, as there would be a chance of working against each other. You must give one man absolute control.

87. Has it ever occurred to you that there is a great risk being run by the men?—Yes, I think the winding-engine driver's certificate is a most important one, for a driver has great responsibility, being intrusted with the safety of so many men.

88. *Mr. Dowgray.*] Seeing the importance of the winding-engine driver, are you in favour of a periodical medical examination of his eyesight and hearing?—Yes, and also as regards his heart. The eyesight is not so important a matter as the hearing. I believe it would be a step in the right direction, and it would instil confidence in the driver. In fact, I consider it is absolutely necessary, for a man deteriorates just like a machine.

MEDICAL AND EXPERT EVIDENCE.

THAMES COURTHOUSE.—17TH AUGUST, 1911.

GEORGE LAPRAIK sworn and examined. (No. 1.)

1. *The Chairman.*] You are a duly qualified medical practitioner, doctor?—I am, practising at the Thames.

2. Are you the hospital doctor?—No; I am in general practice.

3. What we wish to obtain from you, doctor, is your general opinion and experience in regard to the various forms of miners' disease, its causes, prevalence, and any matters in regard to it which have come under your notice. If you can suggest anything that would tend to minimize the extent of the disease, or to better the conditions of those who are likely to be exposed to the complaint, the Commission will be glad. How many years have you been practising at the Thames?—Twelve.

4. Prior to that had you any experience on coal or gold fields?—No. Miners' complaint, I may say, as it is generally known, is a wide term, which includes various forms or diseases of the lungs. When we come to true miners' complaint, as we call it, it has as a technical name "pneumoconiosis," which is due primarily to the inhalation of dust. Miners working are subject to various forms of lung-disease, not necessarily true miners' complaint. As I have already said, the complaint is caused primarily by the inhalation of dust, but superadded to that cause is the absence of sunshine to a certain extent, dampness, the variations of temperature, the presence of gas prevalent in the mines from explosions from gelignite-fumes, and also to a certain extent to gases given off from decaying timbers in older portions of the mine, together with the existence of insanitary surroundings. Then, briefly, as to the prevention of the disease—because, after all, prevention is better than cure—I would say that every means should be devised to have as little dust as possible in the workings. There is also the sanitary arrangements to be considered, and general cleanliness here should be practised as much as possible.

5. Can you tell us, doctor, without disclosing any professional confidence, to what extent is the disease prevalent?—Miners' complaint during the last six years has not been so prevalent as formerly, because there have been so many improvements made in the underground conditions, and also, I think, because the miner has himself been impressed with the risk he runs, and I believe the ventilation in the mines is better than it used to be. Most of the old hands who were suffering from the complaint nine or ten years ago have died off.

6. What is the duration of the disease from the time it begins to show marked symptoms until the end?—Well, once a man develops true miners' complaint and ceases work he simply leads an idle life, and he can live from ten to twenty years, taking a wide average, according to his age, of course.

7. That is, a man in the prime of life?—Yes, it very often shows in a man of forty years of age.

8. Have you any suggestion to offer to the Commission which a miner himself could adopt in order to minimize his risk?—Yes, I think so. The miner when he is working underground—several of them have admitted this to me—after working in warm air, goes to the face to get a breath of cold air, and certainly catches a chill. That gives them bronchitis, and makes them more susceptible to consumption and miners' complaint.

9. Have you any experience of, or do you know, whether miners' complaint develops into consumption proper?—By reason of the weak state of the lungs consumption is liable to follow on, but not necessarily miners' complaint.

10. Are these miners more susceptible if they come into contact with consumptive germs in others?—Yes. I might remark that a miner who is known to suffer from true miners' complaint or some form of consumption should be prevented from going underground.

11. Do you consider that miners' complaint is transmissible from a miner to a healthy person?—No; consumption is. In my opinion true miners' complaint, or pneumoconiosis, is not infectious.

12. *Mr. Cochrane.*] I would like to ask you one question, doctor: after a miner has become affected with tubercle superimposed upon miners' complaint what is the probable duration of the illness—how long will it last until death follows?—Well, within from five to ten years. The life is much shorter.

13. *Mr. Parry.*] Do you think it would be dangerous, doctor, for a man to leave his "face" in hot workings to come out into a cool place?—If he comes into a draught it is very risky.

14. *The Chairman.*] Do you consider the use of warm baths by miners, after coming out of the mines and before going home in their wet clothes, would tend to the improvement of their health or reduce their chance of catching a chill?—Yes, I think so: firstly, for the sake of cleanliness; and, secondly, because of the fact that a hot bath followed by a cool shower would be a safeguard. The sooner they change the better.

15. *Mr. Parry.*] Taking the average of the miners whom you have sounded and treated, how have you found their constitutions as compared with men of other occupations?—The average miner is a healthy man, otherwise he would never stand the work.

16. *The Chairman.*] Do you consider, generally, that the occupation of a miner is more wearing on his constitution than other occupations?—I look upon underground mining as being unhealthy even for a robust man.

17. And more apt to undermine a man's constitution than another occupation which requires the same expenditure of exertion?—Much more so.

18. *Mr. Reed.*] Do you think that the cases of miners' phthisis which have come under your notice have been contracted some time?—Yes.

19. Are you aware of any cases which have been contracted under modern conditions of mining—that is, of recent years?—Well, I might say that in Thames I have not seen during the last four years any fresh case of true miners' complaint.

20. Would the blowing of cold air on to the face of operations, rendering the temperature at that point cool, have the effect of giving the men a chill who were working intermittently between the face and the main roads trucking?—If there were a draught produced it would be liable to do so.

21. Would a draught be avoidable when carrying large volumes of air through pipes?—I should think that would be liable to cause a draught.

22. Would that draught give the men a chill who were intermittently waiting in that cool spot and then trucking in the warmer places?—Well, it would if they were in the draught for any length of time.

23. Do you approve the principle of spraying water into the dust?—Yes, I certainly do, for the reason that it lays the dust.

24. Have the men ever complained to you of the absence of bathing-appliances and sanitary accommodation at and in the mines?—I am sorry to say they have not.

25. Is it your opinion that the men take an active interest to secure for themselves the best conditions for the protection of their health?—I might say that I have a great respect for the *bona fide* miner, but I think he is rather careless about his health while mining. That is my personal experience.

26. You say miners' complaint is due in a measure to dampness also?—Yes.

27. Could dampness be avoided in these very deep mines where water issues from the rocks?—I should hardly think so.

28. Have you any knowledge of the miners contracting worm disease in this country at all?—I have had no experience of it.

29. Do you think it exists in New Zealand at all?—I have not seen it in the Thames.

30. *The Chairman.*] You are the lodge doctor in the town: I suppose these lodges are largely composed of miners?—Yes.

31. So that amongst the lodge members you would probably come into contact with most of the men who are suffering from this complaint?—Yes, that is so.

32. Do you find that the disease is diminishing?—Yes.

33. *Mr. Parry.*] In the course of your examination of miners have you found any of them suffering from indigestion?—Yes, they do suffer from indigestion.

34. On the average, a good deal?—To a considerable extent.

35. What effect do you think that the working of night shifts has on a miner's constitution?—I should say that it is not constitutionally a good thing; it would be better if they could work a regular shift. To work night shifts is not to their advantage.

36. *Mr. Reed.*] Is not indigestion very common to mankind?—It is very prevalent.

37. Would you think that the miner who does arduous work is more subject to it than a man who lives a sedentary life?—I have seen a good deal of indigestion amongst miners, and I think it is the result of their being somewhat careless about the crib they take.

38. *The Chairman.*] Do you think that is the cause?—I have not been able to make up my mind. They generally take a piece of bread-and-jam, and for a man working underground I do not think that is what they want.

39. *Mr. Parry.*] Would not the irregular hours have something to do with it?—Yes, I know a number of medical men suffer from indigestion. But with the miners I put it down a good deal to the crib.

DENIS WALSHE sworn and examined. (No. 2.)

1. *The Chairman.*] You are a duly qualified medical practitioner?—Yes, the medical officer in charge of the Thames Hospital.

2. How long have you been in charge there, doctor?—About four years and a half.

3. It comes within the scope of our Commission to inquire into the cause of miners' phthisis, and if you can give us any opinion as to the cause or extent to which miners are subject to it, the conditions which give rise to it, the precautions which should be taken to minimize it, we shall be pleased to hear from you. First, as to its prevalence?—Lung-disease amongst miners is very prevalent.

4. Is that miners' complaint?—Lung-disease when chronic would include miners' complaint—that is the disease which is produced by working continually in mines. It is very prevalent here. Some time ago I examined a number of men and found 16 per cent. had some chronic affection of the lungs resulting from working underground.

5. Has that percentage increased lately or decreased, or how is it affected?—I cannot say whether it is on the increase or not. That was two years ago, but I do not think the conditions have altered very much since then.

6. Have you anything to say as to the causes or contributing causes?—It is generally accepted that the principal cause of miners' complaint or fibroid phthisis is the inhalation of irritating particles of dust. That is the great predisposing cause of it.

7. Does the miners' disease result in tubercular disease or consumption, or does it render a person more liable to it?—Yes, it tends to render a man more liable to become the victim of tubercular disease, and the large majority of cases become tubercular.

8. Is it the necessary consequence following, or simply because of their greater liability to be inoculated?—The inhalation of fine irritating dust sets up a condition in the lungs which makes them very liable to become the seat of chronic disease.

9. Do you think that miners' complaint can be transmitted from one to another?—Until the case has become one of tuberculosis of the lungs I do not consider it transmissible.

10. Can you suggest any steps that can be taken to guard against the disease—any steps which the miners themselves might take in regard to their habits?—With regard to precautions which the men themselves might take, the careless expectoration about the mines should certainly receive attention. There is no doubt that a man suffering from tubercular disease spitting about the mines will spread the disease amongst others.

11. As a medical man have you any opinion to offer to the Commission as to whether persons suffering from tubercular disease should be allowed to work in mines at all?—Well, unless the person can be induced to take precautions as to spitting about, I think that in the interests of the health of the men generally such a person should be kept out of the mines.

12. *Mr. Reed.*] You stated that 16 per cent. of the men examined by you had chronic lung-complaint. How many men did you examine?—I examined from forty-five to fifty, but I do not mean that to be taken as typical.

13. And about eight men had chronic lung-complaint?—Yes.

14. Do you know from whence those miners came—were they all residents here?—They were old miners who had been living in the Thames for many years.

15. Was the complaint of long standing or only recently contracted?—Well, the disease has such a gradual onset that one can safely say that it had been coming on for some time.

16. Have you detected any cases of very recent origin during the last three years?—The disease has such a gradual onset that it is almost impossible to say when it did begin.

17. Have you conducted post-mortems of any men who have died of this tubercular disease?—Yes.

18. Many?—No.

19. Can you tell the Commission if it is indicated upon the lungs or any other organs affected that they have inhaled quantities of dust?—That has been demonstrated.

20. Have you observed it in all those cases?—I have observed it in cases of miners' complaint.

21. Can you tell the Commission about the number? I may say that the British Metalliferous Mines Commission are finding the results of post-mortems very valuable. How many post-mortems have you made, and what proportion have shown the presence of dust?—I could not give you any figures of importance.

22. In the interests of the men themselves would you consider it advisable that new-comers should be medically examined to see whether they have this tubercular disease in a transmissible form?—Yes; and I would go further: I would suggest periodical examinations of miners for this complaint.

23. Do you think that is the most practicable method of prevention—the exclusion of affected men from the mines?—No, I cannot say that is the most important step.

24. What would be the most important step?—To prevent as far as possible the inhalation of dust in the mines.

25. By the spraying of water, and so forth?—I suppose that is largely a question for mining engineers.

26. Would the presence of carbon-monoxide or carbon-dioxide be responsible alone for the production of this disease?—The presence of monoxide would produce a condition of low health which would make a man liable to contract it.

27. So that one remedy would be the presence of pure air?—Yes, I regard ventilation as a very important point to be considered.

28. And the gases are the least important?—Provided they are present in but small quantities.

29. What do you mean by small quantities—carbon-dioxide, for instance?—Anything below 1 per cent. has very little ill effect.

30. Anything above 1 per cent. is unfavourable?—Between 1 and 1½ per cent. may be regarded as almost the normal condition.

31. Have you read Dr. Haldane's work on the subject? He is an authority on the matter?—Yes, he is regarded as a very high authority.

32. As the highest authority in Great Britain?—Yes, as a very high authority in Great Britain.

33. Have you read of Dr. Cadman's researches?—No.

34. As regards oxygen, what would you regard to be the minimum percentage which mine-air should contain?—Not less than 18 or 19 per cent.

35. Dr. Haldane says 19 per cent.?—Does he?

36. Have you formed an idea of the minimum or maximum which you would regard as a standard for carbon-monoxide in the gases given off as the result of blasting in mines?—0·01 per cent. does very little harm.

37. Dr. Haldane has stated 0·02 per cent. as the point at which a man's blood is affected?—In giving my reply I was thinking of a man constantly working in an atmosphere which did not contain more than 0·01 per cent.

38. Would there be any harm in 0·02 per cent.?—Working temporarily, perhaps not.

39. As regards temperatures, would you consider the dry-bulb temperature or the wet-bulb temperature as the most important?—The wet bulb.

40. Would you consider the dry-bulb temperature of 100° unhealthy for a man to work in?—I would consider it excessive.

41. What would you regard as a temperature in which a man could reasonably be asked to work in, with the air not saturated?—I should regard anything above 90° as being very uncomfortable.

42. Would you consider 80° wet bulb or 85° reasonable?—I think 80° saturated air, both bulbs reading the same.

43. But if the hours were reduced?—I should think 80° wet bulb very severe even with six hours of labour.

44. *Mr. Parry.*] Do you think, doctor, that a man with low vitality, with his constitution run down with constant work, is liable to contract miners' complaint?—A man with lowered vitality will develop a disease more readily than one in normal health, whether he is underground or above ground.

45. With a man coming from a hot temperature down below to a cold one on the surface what would be the effect upon his constitution?—Of course, he would be more liable to take a chill.

46. In the course of your experience in examining miners have you found many miners suffering from rupture?—I do not think there is an excessive number of miners, as compared with other workers in the community, suffering from rupture.

47. *Mr. Dowgray.*] Do you consider hot baths when leaving the mine would be beneficial for the workmen?—They would be beneficial in this way: it would remove the irritating matter in the form of dust from the body, arms, and legs, which is the occasional cause of mild blood-poisoning.

48. *The Chairman.*] If baths were provided at the mines, where the men could change their clothes, would that have a beneficial effect and improve their health generally so that they would be able to resist injurious influences?—Yes.

49. *Mr. Parry.*] Can you tell us what effect working night shift has upon a man?—Provided he sleeps well in the daytime it does not affect him injuriously.

50. In the event of a man not being able to get his rest in the daytime?—Of course, that must prove injurious to his health.

WAIHI.—29TH AUGUST, 1911.

JOSEPH LIVINGSTONE FRAZER-HURST sworn and examined. (No. 3.)

1. *The Chairman.*] You are a duly qualified medical practitioner?—Yes.

2. Are you in private practice?—I am in charge of the hospital here, and in private practice as well.

3. How long have you been in practice?—About fourteen years.

4. The scope of this Commission, doctor, includes miners' disease, its prevalence, causes, remedies, and the surrounding circumstances; and if you can give us any information on the subject we shall be pleased to hear you, also as to any suggestions that you might be able to offer as to precautions which the miners could take for their own protection, and any information you can supply as to the number of deaths attributable to the disease which have come under your notice?—Well, sir, I have been in Waihi only seven months, and I have not seen a great many cases of the disease in that time.

5. Have you made a special study of the subject or read any authorities?—Not more than ordinary.

6. First of all, as to the cause of the complaint?—The causes are fairly well settled. It is the result of irritation by dust, and the gradual setting-up of slow inflammation of the fibrous tissue and loss of breathing-space in the lung, in consequence of which a man has a little less capacity in his lung than normal.

7. The cause is chiefly the dust?—Yes, the irritation caused by the dust. And there is very often also a tubercular infection.

8. Tubercular disease does not necessarily follow?—Not necessarily, but there is a weakened resistance of the lung itself, and in consequence of that a man is more than ordinarily liable to infection.

9. But miners' phthisis is not considered infectious?—No.

10. There would be no danger likely to result from having men suffering from miners' phthisis working down below?—Not so long as it is not tubercular. Until it really becomes a secondary infection there is nothing to show that a man has actually got it. The only thing that is manifest is that a man is rather short of breath; that is about the only symptom that shows itself. I have seen one or two cases of early stages of the complaint, and in each case where I found a miner suffering from shortness of breath I have advised him to cease mining.

11. Could you give us any idea of the number of men you have found suffering from it?—I have not kept any special record. I am only aware that I have seen three or four cases, and I considered it advisable in those cases that the men ought not to take further risk.

12. Will your hospital records show that?—No.

13. How many deaths have occurred—many?—Not in my time. In the early stages the men are not ill, and later they are not suitable cases for hospital treatment, so that the hospital books would not be any criterion as to the number of cases that there have been. The only cases that would come into the hospital would be where they had secondary infection.

14. Have you any suggestions to make as to remedies or precautions that miners themselves should take?—Of course, it is a question of avoiding the dust. The same disease affects men in other occupations, such as knife-grinders. Any such business is liable to give rise to pneumo-coniosis.

15. *Mr. Parry.*] Do you think that every care should be taken where dust arises from any form of work?—Yes, with dry crushing or anything of that nature.

16. No matter how slight the dust nuisance there should be some remedy provided?—Yes, as far as practicable.

17. During your practice in Waihi, in what state of health have you found the average miner whom you have examined?—Hardly so good as I would have expected from outward appearance, because the type of man who works in a mine has to be physically fairly strong, and one does not find them constitutionally so strong as one would think from outward appearances. In one or

two instances young well-set-up men have come to me for life examination, and I have found their chests defective, and, knowing their occupations, I have laid the cases aside. So that there is certainly an increased risk to life and a greater liability to lung troubles, and insurance companies would assess their lives below the average.

18. In other countries have you had experience of conducting examinations of men for insurance companies?—Yes, at Home.

19. How does the time taken by workers in Waihi to recover from accidents, such as cuts and bruises, compare with that in the Old Country?—Well, my first experience with regard to accidents in Waihi was this: that I found in almost every case I underestimated the duration of a man's incapacity as compared with what I had been accustomed to regard as sufficient in other places. That was for two reasons: firstly, because the men did not seem to have the recuperative power that one might reasonably have expected from that type of man; then, a man might be well enough to return to ordinary work, but he would not be fit to go back to a hazardous occupation such as mining, where other men's lives depend on his being well.

20. Do you think a man takes longer to recover here than in the Old Country?—Of course, my work in the Old Country brought me into touch with men in outdoor occupations such as shipyards and docks, and there my impression was that the duration of an injury is shorter than it is here.

21. Have you treated many men for boils, and poisoned hands, and so forth?—Yes, that is very common here.

22. What do you attribute that to?—It is usually a sign of lowered vitality.

23. *The Chairman.*] Can you assign a reason for that lowered vitality?—One thing which has struck me forcibly in regard to that is the nervousness that one meets with in able-bodied men. It has occurred to me that the broken rest that a man on the shift system has to content himself with has something to do with it. They do not seem to get accustomed to a set hour for sleeping before it is changed again, and they have another sleeping-time, and thus their rest is not always so complete. I think that also affects the women in the district. It has struck me while I have been in practice here how very neurotic they are, and I have put that down to the broken rest as well as to the anxiety in regard to accidents. That is the effect these things have upon their general health. Then, of course, the working at irregular hours causes digestive troubles, as does also the frequent alteration of the meal-times.

24. Do you think that working in hot places underground would have any effect on a man to cause the nervousness you speak of?—Living in hot climates certainly has that effect upon the nervous system. When you live in the tropics, especially where the heat is dry, one always finds a great deal of nervousness amongst the people. I have lived in the East and practised there, and I know that I made that observation with regard to life on the surface, and I know that the effect of a dry, hot atmosphere is always a nervous one.

25. Do you think that working on the 12 o'clock midnight shift has any ill effect on a man's health?—Of course, night-work is always more trying than day-work. One never really properly sleeps in the daytime unless by habit one has become accustomed to it. For instance, the hospital nurses are put on shorter periods of duty* at night-time than daytime; although the work is actually supposed to be less at night, it has always been found to be more severe on them.

26. It is not natural for them to be working at that hour?—No.

27. *Mr. Cochrane.*] You say that after a miner is infected with miners' phthisis tuberculosis does not necessarily follow?—No.

28. Is it liable to do so?—Yes.

29. Very liable?—Yes, particularly liable.

30. Then you told us that working in a dry, warm atmosphere conduces to nervousness: I would ask you what is the effect of working in a humid, warm atmosphere?—Well, the effect of living in a warm, humid atmosphere is to develop a lack of energy, lassitude, and general slackness.

31. And if a strenuous exercise is continued under such conditions what is the effect?—The result would probably be a collapse or general breakdown in health.

32. Would it affect the heart?—It would be apt to do so. A man would be working under a greater strain upon his heart.

33. Have you had any opportunity of judging such cases here?—No, not to ascribe them to that cause.

34. *Mr. Reed.*] As regards the health of the people of New Zealand, have you had any experience in other parts of New Zealand?—Only in the North Island.

35. Are you aware that the medical examination conducted by the officers of the "Challenger" showed poor physique?—I have examined a great many young fellows in the Volunteers under the old system. It was in a country district, and the general physique was good.

36. Did you read the report of the "Challenger" officers?—I am aware that it was so made, but I did not read it—*i.e.*, the report itself.

37. Do you agree with the finding of the recent West Australian Royal Commission to the effect that fibrosis in miners is produced by dust, and dust alone?—Yes, dust in the general acceptance of the term.

38. So that you do not think that carbon-monoxide or carbon-dioxide play any part in it?—I think it is due to a mechanical irritation.

39. Mr. Cochrane asked you as to the effect of a humid temperature: do you think, if men rested periodically when employed in a humid temperature of, say, 80° or 83° nearly saturated, that these temperatures would have a very injurious effect upon them?—My view of the effect of the humid atmosphere is that it increases the strain, and therefore, of course, rest would counteract that. A man would not be able to work the same length of time as in a more bracing atmosphere.

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* This might be misunderstood. The actual number of hours of consecutive duty is not less, but the period of night duty is a shorter one.—J.L.F.H.

40. What you say corroborates Dr. Haldane's view that men accommodate themselves to the heat by working less?—I mean that, taking the work on a time basis, men would be more exhausted working in a humid than in a dry atmosphere.

41. If a man were permitted to rest when he chose, would the effects of working in a humid atmosphere be serious?—Of course, that would depend upon the individual.

42. Supposing it were necessary to fix a standard temperature for the reduction of hours, would you suggest a wet-bulb or a dry-bulb standard?—I think a wet bulb. Of course, I have no practical knowledge of working-conditions underground, but I should judge the atmosphere by the humidity.

43. *Mr. Parry.*] You think that a temperature of 90° on the surface is more healthy to work in than a corresponding temperature below?—Yes, certainly, the fresh air alters the circumstances.

44. In the event of the air being as fresh underground as it is on the surface, is it more healthy on the surface?—I think the temperature then would make less difference. The temperature would not have the same effect.

45. Would it be more healthy to work on the surface?—Yes, I should imagine so. I know that in the operating-theatre I usually like the temperature to be about 70°. It is, of course, necessary to have it warm to prevent shock to the patients. I find that is fairly hot.

46. *The Chairman.*] What do you think would be hot enough for a man to work eight hours in?—I should think about 80°. Of course, the longer he was working the more he would become acclimatized.

47. *Mr. Reed.*] 80° dry or wet?—I was thinking of it under ordinary conditions—that is, partly saturated.

AUCKLAND (MAYOR'S ROOM, MUNICIPAL BUILDINGS).—4TH SEPTEMBER, 1911.

WYNDHAM GRATTAN GUINNESS sworn and examined. (No. 4.)

1. *The Chairman.*] You are a duly qualified medical practitioner?—Yes, M.D., D.P.H.

2. How many years have you been in practice?—Twelve.

3. You have had some experience in Waihi?—Yes, five years and a half.

4. You know something of the scope of our Commission. We are empowered to inquire into the various forms of miners' diseases, their cause, prevention, and cure. We will be pleased to hear any evidence you are able to tender on the subject. Will you tell the Commission in your own way your experience in regard to the complaint known as miners' complaint, and give us the benefit of any suggestions you can offer as to the means which might be taken either by the mine-owners or the miners themselves with a view to its prevention?—Well, as far as my experience in Waihi goes, while in practice there I had under my care a considerable number of cases of miners' complaint. I may say in the first place that I make a very definite distinction between miners' complaint and consumption. The word "consumption" might not be applied to miners' disease, and in this view I am backed up by the authorities on consumption, while I myself hold the position of bacteriologist. The first cause of miners' complaint is not the tubercle bacillus: it is not the factor that produces the disease, but it is merely the secondary result which generally comes in afterwards, and may bring about, but not necessarily, the death of a sufferer from miners' disease. There is another difference which I would like to point out which applies especially to the miners in Waihi, and that is that the term "pneumoconiosis" is applied to the various forms of miners' complaint; but there is another term called "chalicosis," which is definitely applied to the fibroid disease, which is produced by the inhalation of particles of quartz. This disease differs from anthracosis, which is truly applied to the inhalation of coaldust. The term "chalicosis" is applied to "Sheffield rot," which is really due to the inhalation of small quartz-particles, and is a very common disease in France, due to the inhalation of particles from mill-stones. Now, to apply this to the men at Waihi: When I went down there first of all there were a number of cases of this disease extant. Some of them in some measure had the tubercle bacillus, but in other cases it was only accidentally deposited there. The secondary cause of the disease was the deposit of the small particles of dust and quartz which had been inhaled into their lungs. During my residence in Waihi I had a number of cases of this form of miners' complaint. The term of duration of this disease is put down by the authorities at from four to five years. Those are the worst cases. I am referring to battery hands and workers in the dust. A case came under my notice where one family in particular suffered very severely from the disease. Three or four of the family died with it. They had all worked for some time in the dust, but were not then so employed. They had contracted this form of the disease while working there, and then had a tubercular tendency. There was tubercle in the house, and as a result they all died from tuberculosis. You may say that the tubercle was the last finishing-touch which killed them. On the other hand, there are a number of men at the present time in Waihi, whom I used to know, who at one time worked in the battery, but who on my advice had left the work there, and who are quite sound now. They had been "dusted," as they term it. I have had some of them consulting me recently. They had developed a chronic bronchitis due to irritation of the lungs by small particles of dust. These men were not tubercular; they had no signs of consumption at all. Let me quote a case in point: There was a man visited me last Tuesday who weighed something like 16 stone 10 lb., who is still working in Waihi. I recalled to his mind that he was once suffering from this disease. He consulted me for influenza this time. I said, "Eight years ago you were 'dusted'; how are you now?" and he replied, "I am quite right again." That man's lungs are now sound, though eight years ago he was "dusted." There was another man who was working in Waihi, and he too got out of the battery. I saw him the other day, and his chest and lungs are absolutely sound. The early stages produce a chronic bronchitis, and if you get them away from their work in the dust they are all right. Now, as to miners working in the mine itself.

We know from pathology that the disease contracted in the mine is totally different from that contracted by the battery hands; and here again let me state definitely that this disease is not due to the germ of consumption. In this connection I would quote from Bonney, who is the greatest authority on consumption and its germs, to back up that statement. He says (page 149): "The tubercle deposit is in no sense a casual factor in the production of pneumonokoniosis, but takes place merely as a terminal infection. The primary cause consists chiefly of an inhalation bronchitis through continuous exposure to 'palpable dust' incident to certain occupations." So that the disease is really a trade disease produced by the trade or occupation at which a man is employed. Now we go on to the other case—that of the man in the mine. I saw a number of these cases in Waihi, some of which were afterwards fatal, and others where the men had left their occupations and eventually recovered. The disease begins in a primary form as bronchitis, and affects the air-spaces of the lung, causing emphysema in the terminals of the bronchia and of the lung, and also ulceration. Now, in none of these stages will you find the tubercle germ. It comes, however, as an accidental inoculation of a suitable soil. To draw a simile: if the soil is suitable for the particular crop the seed will grow much more quickly. In certain cases miners' disease follows, and that is also termed "pneumoconiosis." It begins as bronchitis, and is induced by three or four factors. The first factor is the lack of oxygen. Of course, you will understand I am not making any statements against the Waihi Company as regards the ventilation of the Waihi Mine; I leave that to others who know more about it. These remarks do not refer at all necessarily to the Waihi Mine, but cases of this form of miners' complaint have been observed by me among the battery hands there. Well, the first cause we take is deficient ventilation and want of oxygen; the second is the carbon-dioxide produced by the combustion of candles; and the third cause is the inhalation of smoke due to the firing. Of course, there is also the fact that there is a certain amount of dust inhaled, but I want to point out specially that that has not the same effect as the battery dust. These four factors are undoubtedly the cause of the ordinary miners' complaint which is found in men working underground. You may superadd to that the fact that the miners' health is undermined by working in wet places and under insanitary conditions, which are casual factors, and which, while not acting directly on the lungs, do so indirectly by diminishing the individual's resisting-power. In summing up, then, I would say that the complaint has four causes—viz., the lack of sufficient oxygen, the inhalation of candle-smoke from combustion, the inhalation of dust, and the general factors such as living underground, continual wetting, and want of sanitation. These make for a chronic bronchitis, which goes on to emphysema and final ulceration, and death is thus caused very probably without the tubercle germ having been found in the man's lungs. The germs of tubercle are disseminated freely from one patient to another, and if a man in that state of health goes into a house where another miner is suffering from consumption the germ will find a suitable growing-place for propagation, and you will get tuberculosis superimposed on pneumoconiosis, and the resulting end will come much more quickly. There is another point in diagnosis between the true tuberculosis and pneumoconiosis, where the temperature is 101° or 102°: the patients's general external condition will coincide to a great extent with the condition of the lungs. If the lung is in a bad state he will look pretty bad, and then patients have morning and evening rise in temperature. In the case of miners' disease this rise in temperature is not present, but the patient looks rather flushed. He drags about his work and is able to do light work for a much longer time than a man suffering from tuberculosis would do, but the complaint is getting worse all the time. There is a shortness of breath with slight exercise, as the result of the lung being attacked and getting blocked up, so that every day there is less and less of the lung capable of being used. The growth of fibrous tissue blocks up the lung, and the man can do less and less work day by day, until eventually he can but walk very slowly, and the end will come quickly, while apparently to the inexperienced eye he has been able to get through his work up to within a short time of the end. Now, gentlemen, I have put before you the different forms of miners' complaint, and you ask me what suggestions I could offer to avoid it. As regards prevention, the first form of the disease, when it is due to the actual inoculation by particles of dust, has, I understand, been to a certain extent provided for by the use of the water system. The other means of prevention I would suggest are (1) improved ventilation, (2) improved sanitation, (3) the diminution of smoke as much as possible, (4) the prevention of the miners from going back into places where smoke is hanging, and diminution of the candle-smoke. Then there is a great point which the medical profession is fighting for—I refer to the segregation of tubercular patients. I pointed out that where death ensues it is caused by the superimposition of the tubercular bacillus on top of pneumoconiosis, and that is got only by contact with another patient; so that if we can secure the segregation of tubercular patients in the country we will not run the same risk of their communicating the true tuberculosis as at present exists when they come into contact with other patients who are rendered liable by the causes I have mentioned to contract the disease. That, gentlemen, is the case for prevention as far as I can give it.

5. *Mr. Cochrane.*] You told us that the duration of fibrosis was about four or five years?—Yes, that is so. I got those figures from Dr. Bonney.

6. What happens then?—Death. These are the causes which are due to caliosis from mineral-dust inhalation, and Bonney states (page 151): "In comparison with simple bronchitis and emphysema, or with ordinary cases of intestinal pneumonia, the cause of the disease is short, rarely lasting over four or five years."

7. And when can you say that the miner is actually infected with fibrosis from his commencing work in the dust? Can you say whether it is one year or two years, or does it take longer?—To answer your question I would put it like this: If a man comes to you with chronic bronchitis, and he shows signs of emphysema, you say to that man, "You must leave your occupation." Then he has an even-money chance as to whether he will eventually recover or whether his chronic bronchitis will run the tubercular course of four or five years. I am not prepared

to state how long he would require to have worked in the dust to make his complaint irradicable, because the resisting-power varies in different individuals. I could not say how long a man would need to work under those conditions to contract irradicable infection.

8. I think you told us that there was a decrease in the cases at the batteries. Have you noticed any decrease or increase in the cases at the mines?—Well, I have not been in practice there during the last five years, but I will say that during my residence there I had more cases of pneumoconiosis—that is, miners' complaint—from the batteries than from the mines, though there were also a number of cases from the mines.

9. Are you able to say if there was any increase in the number of cases from the mines during the period of five years when you were there?—You wish me to contrast, say, the first two years and a half with the last two years and a half. I could not do that. I think the disease was fairly evenly spread over the whole period.

10. Is there a greater tendency to tubercle if the sufferer has first contracted pneumoconiosis?—Yes, if the sufferer has first contracted pneumoconiosis, that prepares the lung to receive the tubercle. That is generally the last stage in a man's life.

11. Then you refer to candle-smoke. Is that actual carbon-dioxide?—Yes, CO_2.

12. Have you observed any ill effects on miners as the result of working in saturated air of high temperature?—That is put down as another predisposing cause of the complaint. It lowers the resisting-power, and is a predisposing cause of the bronchitis, which is the first stage of pneumoconiosis.

13. What effect on the heart has working under such conditions?—It tends to dilate the heart.

14. Does the heart not beat faster?—It does.

15. And what happens then?—There is a thickening of the heart-muscle. First there is distention, and then accommodation will break down.

16. And the effect upon the sufferer?—The usual trend of cardiac symptoms, which are due to overdilation of the heart, or what we call cardiac dyspnœa—that is, shortness of breath due to the heart's action. Then there would be incompetency of the valve, which would result in dropsy and swelling of the feet. Those are the symptoms following on overdilation of the heart. In connection with cases from the Waihi Mine, I have constantly met with loss of accommodation of the heart-muscle, due to working in these hot places. There is produced what is known as "bovine heart," or "ox heart," where the heart becomes overdilated. If you work in continued high temperature and a humid atmosphere the tendency of the heart would be to overdilate.

17. Then, coming back again to pneumoconiosis, I understood you to say that you are strongly of opinion that segregation is a remedy?—I am strongly of opinion that the remedy for tuberculosis would be segregation of the individuals affected with tubercle. There is another way of looking at it: put an individual affected with tubercle out in the country and he will meet with many people who are not liable to contract the disease. But what we term "segregation" has reference to a mining camp, for instance, where the population is thick, and that man must be got out of it. We must segregate him or take him out of that community. That is the opinion of the medical profession.

18. *The Chairman.*] Keep him out of the mine under all circumstances?—Yes, under all circumstances.

19. *Mr. Reed.*] Have you any opinion to offer regarding ankylostomiasis, or miners' hookworm disease?—I have not been able to detect any ankylostome there. We get it in other countries, but I have never got an ankylostome in New Zealand.

20. Are the conditions in New Zealand favourable?—No, I do not think they are. I do not think ankylostomiasis is prevalent in New Zealand.

21. Has it ever been detected here?—I have never heard of it being detected, nor have I detected it myself.

22. Have you ever heard of its being detected in Australia?—I believe it has been detected there. It is common in Cornwall, in the south of England.

23. I understand the conditions are not favourable?—I have examined bloody stools on more than one occasion, but I have never detected an ankylostome in Waihi.

24. Your experience of Waihi terminated four or five years ago?—That is, my practice there did, but I have had a number of Waihi patients come to consult me since.

25. Are you aware that the conditions there have improved recently?—I take your word for it.

26. You do not know of any recent cases of contraction of the disease?—No, my experience has been gained from patients who have suffered from the disease some years ago, by making examinations of the lungs to see whether there are any signs of a return of it, but during the last fifteen years I have never had any fresh case.

27. How many years ago do you think the disease was most recently contracted?—Well, I might say that I have read of cases of deaths in the Waihi Hospital in which the disease was contracted when I was there four or five years ago.

28. You know of fatal cases which contracted the disease five years ago?—Yes.

29. Many cases?—No, not many cases.

30. Regarding deficient ventilation, the Inspector of Mines has had numerous analyses made of the gases in the Waihi Mine, and I would like to ask you a few questions in respect to them. Under the most unfavourable conditions the percentage of carbon-dioxide obtained was 0·97 per cent. in volume. Would you consider that as injurious to man?—I can only say that, though it is underneath the maximum standard of 1 per cent., it approximates very close to it.

31. You referred to the carbon-dioxide by candles: do you consider the candles the principal cause for this gas?—They are one of the causes.

32. Is not the exudation from rocks a much greater cause?—The combustion of the candles has been laid down by Bonney and Osler as one of the causes of the vitiated atmosphere in mines.

33. You draw no distinction between the noxious carbon-dioxide from lights and that innoxious ground CO_2 from the rocks?—We take it merely as an indication of the impurity of the air. There are many other things more dangerous to man. We take CO_2 as an indication of impurity. I do not mean that CO_2 is the only gas in noxious air.

34. Are you aware that Dr. Haldane laid down the carbon-dioxide standard as 1¼ per cent., and the minimum of oxygen as 19 per cent.?—I take it as lower than that.

35. Do you regard 0·0025 per cent. as an extremely moderate proportion of carbon-monoxide?—I do not consider 0·0025 per cent. as injurious to man.

36. That is the highest proportion found in the Waihi and Thames mines under the most unfavourable conditions?—Is it? Then it is not injurious.

37. As regards oxygen, the lowest found in any of the Hauraki mines (which includes Waihi) is 20 per cent.: is that a healthy proportion?—Yes, that is above the minimum proportion allowed, which is 18 per cent.

38. If those proportions are correct would you regard the ventilation of those mines as adequate?—Yes, certainly; but still there is the other fact that miners' complaint does exist, and in making my preliminary statement I simply said that deficient ventilation is one of the factors. In those proportions, however, the air is not noxious.

39. To account for this improvement in the air I may say that mechanical ventilation has been installed since you were there?—I am glad to hear it.

40. In connection with the contraction of miners' phthisis, are you aware that in many countries they are proposing to medically examine new-comers to mines to see whether they have such disease in a transmissible form? Would you be in favour of that course being adopted here before men are permitted to work in the mines—that is, a similar examination to that conducted for life-insurance purposes?—As a bacteriologist I would state definitely that every man suffering from chronic bronchitis, if applying for admission into a mine, should have his sputum examined. I still adhere to my point that miners' disease is not due to tubercle, and therefore, in the early stage, cannot be disseminated from man to man, but that it is only where it has the tubercle superimposed on emphysema that it becomes contagious. It is impossible to use the stethescope where a man has emphysema plus the tubercle, and that is what is dangerous. If you eliminate every case of bronchitis you would eliminate every individual who would be naturally subject to infection.

41. Do you think it would be a reasonable precaution to conduct an examination of all miners?—I think so, and any miner who was rejected should have his sputum examined by a bacteriologist as to whether he was infectious or not.

42. As to the heat question and the conditions under which men work the matter of contract and day labour must be taken into consideration. The men get heated in humid places, and if they require a rest they descend by ladder or ascend a winze. Now, the highest temperature we have observed is about 83° saturated, and in two or three places it has been as high as 88°, say, in the bottom of a shaft. I will take 80° saturated, and would like to ask you whether that heat alone would be injurious to a man if the ventilation were adequate to remove the noxious gases and if he were permitted to rest occasionally during working-hours, and put in, say, seven hours actual working-time?—Under all those favourable conditions I think a man could work in 80° or 82° saturated, with adequate ventilation, and being allowed a spell; but, on the other hand, it is impossible for medical evidence to lay down hard-and-fast rules when you consider that the resisting-power of all individuals is not the same. Consequently, I am not prepared to lay down a standard of 82° saturated for all individuals.

43. Anything above 80° is not common, but at the same time such conditions do occur. Dr. Haldane says that heat, and heat alone, does not injure a man, providing he can take a rest. As a matter of fact, there is not a very great amount of work done in that temperature?—Of course, if you can get good ventilation and the temperature is 82° there are men who can stand it, but, again, there are others who cannot.

44. Would you recommend compulsory bathing by the men at the mine? It is compulsory in Belgium and Westphalia, but, of course, they have there the ankylostome?—But men suffering from bronchitis would further debilitate themselves by taking cold showers.

45. I meant warm showers?—Well, that would do them no harm.

46. *Mr. Parry.*] Would it require a man with a very strong constitution to work continually in a temperature of 80° saturated?—To a man of good constitution whose resisting-power was strong it would not be so trying, but a weak man would be very quickly knocked up.

47. Do you think it would require a strong man?—I do.

48. And do you think 80° would be excessive for a man of ordinary constitution?—I should put it down at 82° as a maximum for a strong man to do any sort of work in.

49. In your evidence you said that the dust was the cause of the disease, and that there was some difference in the result of the inhalation of the dust at the batteries and that at the mines underground?—No; I stated that the dust inhaled underground was, I think, one of the causal factors of miners' complaint, while the dust inhaled at the batteries is the one causal factor, and that the resulting conditions are different in the lungs.

50. You say that the prevention of the men going back after firing until such time as the smoke clears away is an important factor?—Yes, the smoke is one of the factors causing the bronchitis.

51. Would you recommend, then, that a stipulated time be made compulsory, and that no men be allowed to return before their time had expired?—I am not here to make a suggestion as to time; I only speak from the medical point of view, as to the necessity for preventing the men returning into the smoke. It is impossible for me to say that they should not return for five, or ten, or twenty-five minutes, or half an hour.

52. During your experience in Waihi how did you find the average constitution of the miner?—I found that there was a large proportion of bronchial catarrh compared with the rest of the community, certainly when compared with country workers, but the physique of the men generally was good.

53. As regards the vitality what did you find?—Taking a man as an ideal who is physically sound, who has a good strong muscular constitution, his heart normal, his lungs healthy, so that he is a good specimen of the human race, I would say that the men at Waihi are about the average; but, as I have already said, there was a preponderance of bronchial catarrh.

54. I would like to ascertain the state of the men's constitution as regards their energy and vitality. Could you compare their energy and vitality to those of men in any other place, say Auckland?—I would not like to say that, but they play a good game of football down there.

55. The fittest generally play football?—The only thing that would lower their vitality or decrease their energy would be this bronchial catarrh. I found that when they suffered cuts and their hands were poisoned they soon healed.

56. How long is it since you were in Waihi?—It is six years since I gave up my permanent practice there, but I returned for about two months, and I have been in practice in Auckland for about five years.

57. Are you aware that the heat of the mines is a great deal greater now than it was five years ago?—No.

58. What is your opinion of the effect of the different shifts of work on a man's constitution?—There is no doubt that the shift system has a considerable effect on them. I found that it used to upset their digestion, and the alteration of hours of sleep induced a good deal of dyspepsia and indigestion. They complained that the night shift made them unable to eat their food. I noticed that continually. The natural result is that a man's resisting-power would be lowered.

59. You said, in answer to Mr. Reed, that you thought the conditions here were not suitable for the disease known as ankylostomiasis?—Well, we have not had any ankylostomiasis here; at least I have never detected it, and I do not think we have it. Of course, the fact that our mines are fairly new tends to make the conditions unfavourable to the development of ankylostomiasis.

60. As regards the investigations respecting the disease in other countries, can you say if it has been found in low or high temperatures?—It is found in Cornwall, but that, I think, is the only place where it has appeared in England. Of course, in the Malay States ankylostomiasis is common, where the coolies get it very frequently.

61. In what temperatures is it more prevalent?—It is the most prevalent in the tin-mines in those States.

62. What was the temperature there: was it not from 70° to 75°?—I am not prepared to say, but I should think it would be much higher than that.

63. *The Chairman.*] What effect would the temperature have upon it, do you think?—It is not so much the temperature as the general conditions of the mines and the sanitation. You get the disease in Cornwall and the Malay States, and you have there the two extremes of temperature, so that I think, *per se*, it may be taken that the temperature in itself is not a determining factor in the development of ankylostomiasis.

64. *Mr. Parry.*] That is to say, that the worm would not develop unless the temperature were suitable for it?—Yes, that is a factor in the growth of disease.

65. In answer to Mr. Reed you dealt with the matter of men working in a temperature of 80° being permitted to take spells. Do you not think it would be better for the miner's health if he were to work for a stipulated number of hours and go home, rather than being permitted to take spells and work a longer shift?—Well, let us take an analogous case, as we have it in the stoke-holes on the big liners when in the tropics. Those men take a spell and go down again. I am not prepared to say that coming up and going down again is good for their health, but the fact remains that they do so.

66. Would he be more likely to take a chill if he were permitted to come up for a spell?—If you ask me, I think it is better for a man to take an occasional spell than to work his whole shift right through. The effect on the heart of working for any length of time in a high temperature is considerable. To take a simile, use a piece of elastic and stretch it out as far as it will go. If you hold it down any time its strength diminishes, but if you let it return soon and stretch it again the effect is not so noticeable. That applies also to the heart. If you work a man for a short time only, and allow his heart to contract down to normal, he will be able to do his work better. I would say, from a medical point of view, that it would be more healthy for a man working in a hot place to have periods of relaxation to enable him to cool down than for him to work some shorter time and work right through. It is a matter of short shifts *versus* spells, and I would favour the spells.

67. *Mr. Cochrane.*] I understand you said that ankylostomiasis had occurred in Cornwall: on that point I wish to ask you if you would favour the examination of miners at regular periods, say, every one or two years. It has been suggested that cases are in existence now in Ohinemuri. Do you think it would be advisable to have a periodical examination made to determine whether the disease exists in the mines of New Zealand?—It has been suggested, has it. There is only one way of seeing whether a man has it, and that is by looking through the microscope.

68. But do you think it would be advisable to have examinations?—I myself have made examinations of bloody stools merely out of interest, and I should certainly say that such a precaution would be a good thing. I would suggest that in cases which came into the local hospital, where the symptoms suggested the presence of the ankylostome, an examination should be made at once, and if the disease were detected it should be reported to the authorities.

ROBERT JOSEPH ENGLISH sworn and examined. (No. 5.)

1. *The Chairman.*] You are a duly qualified medical practitioner?—Yes.

2. You are familiar with the scope of our inquiries, which includes miners' phthisis, and if you have any information to offer on the subject of its causes, prevalence, or prevention of that disease we shall be pleased to hear you?—I am afraid I shall not be able to assist you very much, as I am not acquainted with mining conditions in New Zealand at all; I am only acting senior medical officer at the hospital at the present time pending the arrival shortly of the new senior medical officer. If, however, you have any questions to put I shall try and answer them.

3. Have you had any patients suffering from miners' phthisis at the hospital?—Since 1908 we have had two cases of miners' phthisis—that is, two patients gave their occupations as miners; about thirty-six others gave their occupations as labourers, and I have no means of knowing if some of them were also miners.

4. Were they all suffering from phthisis?—Yes.

5. Can you say how these cases terminated, or the majority of them?—Some of them died, some were discharged incurable, and some were sent to the Waikato Sanatorium.

6. None were discharged cured?—No.

7. You have had no first-hand experience of the disease yourself?—No, I have never practised in a mining district. The disease which affects the coal-miners is called "anthracosis," and that which affects the stonecutters is called "silicosis." Small particles of dust are aspirated into the lungs, which become fibrotic. The tubercle bacilli affects the unhealthy lung, and the condition them becomes one of fibroid phthisis, which may last for years.

REEFTON COURTHOUSE.—20TH OCTOBER, 1911.

EDWARD HENRY SCOTT sworn and examined. (No. 6.)

1. *The Chairman.*] You are a duly qualified medical practitioner?—Yes.

2. You are practising in Reefton?—Yes.

3. How long have you been in practice altogether?—Seventeen years.

4. How long have you been practising in a mining community, in touch with the disease known as miners' phthisis?—Since 1895, about sixteen years.

5. We are inquiring as to what steps should be taken to guard against this disease, and will be pleased to hear of anything which has come under your observation in regard to it, both as to the frequency of it and the number of persons suffering from it here, and also as to its cause?—Of course, it is a very big subject, and covers a lot of ground, and, though it is a matter which one cannot deal with in a few words, I will try to be as brief as possible. I understand that miners' phthisis is the subject of your inquiry, and, to begin with, we want a definition of the disease. Miners' phthisis is a term applied to a wasting disease supposed to be peculiar to miners—a wasting disease associated with lung trouble. It is a term applied very loosely by the public in general to any miners' disease. Of course, you have in pulmonary disease a chronic wasting disease of pulmonary origin. You may have phthisis pure and simple—that is, of a real tubercular nature. Then, in distinction to that, you have miners' phthisis, which may be either tubercular—that is, ordinary consumption—or what we call fibroid phthisis, due to the inhalation of dust. There are those two simple distinctions—namely, ordinary phthisis, and fibroid phthisis or pneumoconiosis. It is those two particular complaints that we have to deal with, and it is very difficult to separate them. In many cases indeed it is almost impossible to say where the one ends and the other begins. You may, in one case, have a pure infection of tuberculosis—that is, phthisis pure and simple—and in the other case you may have an intermixed infection of tuberculosis plus fibroid phthisis, or pure fibroid disease of the lungs. Under those three headings we have a classification which covers all the wasting diseases of a pulmonary nature in miners. Of course, we all know that the continued inhalation of dust produces certain effects on the fibroid tissue of the lungs, which causes fibrosis of the lung. This is not peculiar to quartz-miners. It is also common to workers in other occupations, more especially to stonemasons, who get fibrosis of the lung, even when working in stone in the open air, just as the miner does when working underground. Here in this district, owing to the migratory habits of the miners, it is very difficult to trace the sequence of events from a local standpoint, because the miner travels a great deal from one mining camp to another. Here I may say that a big supply of the miners is drawn from the Australian States. It is not necessary for me to go into the pathology of ordinary phthisis and miners' phthisis, which is a purely scientific subject which has been treated in many text-books, and there has been a good deal of discussion upon it also in medical papers and journals. What I came here for was to endeavour to see if we can do something to improve the general conditions of the miner. The one thing which stands staring us in the face is that the disease is partly caused by a tubercular element. Above all it is tuberculosis that we and the Government should endeavour to use all our efforts to combat, and there is no doubt that anything which injures the lung and the lung-tissue predisposes to tuberculosis. As regards particular instances in this district, the number of cases here is very small for scientific purposes, and broad conclusions drawn from individual cases are apt to be very misleading. We will take, for instance, the case of the young man going into a mine, and trace his history up. I think that is the best way to explain the disease. By the continual inhalation of dust, if he sticks to his trade all the time under conditions which are not favourable, his lung will be damaged to an extent largely proportionate to the dust and the quality of the material inhaled. That is, if he is working in very hard quartz country, the damage will be more serious than in soft rock. The injury will be largely proportionate to the dose of dust inhaled. Then he may have some

predisposition to disease. He may have a tubercular family history, and may thus have a weakness for tubercular infection, and as the result of such depressing influences he may become infected with tuberculosis. The course of that man's disease is pretty rapid. According to my experience I think we can say that the causes of miners' disease in young men are purely tubercular in origin. True pneumoconiosis, or fibrosis of the lung, is essentially a chronic disease, one which takes years in most cases to incapacitate a man, and, *per se*, to kill him. It is the chronicity of the disease which is its characteristic. If a miner, after getting pneumoconiosis, continues in the mine, and is careless in his habits, he is more likely to get tubercular infection than otherwise. He may, however, reach a good ripe age, and in this connection I may say that I have known instances of men who have been able to work on until they were seventy years of age. I am aware that this is in direct contradiction to statements which have been made on the point, but I know of these instances. If a man sticks to mining for fifty years, continually working underground, I think eventually he will die of fibrosis; but if he is careful the chances are that he will reach a good age—seventy, perhaps. A great deal of confusion has been caused here as the result of statements regarding miners' complaint, and the industry has received such a bad name that the majority of men now hesitate to go underground, because they think if they do so they are doomed. Well, I think that is wrong, and as the mining industry is a very important one we should endeavour to do all in our power to safeguard the men. If we can prove that it is not so dangerous, and that it is not a death-trap, then it is our duty to do so. Further, if it is a death-trap, the State should stop it to-morrow. As regards tuberculosis, much that has been written on pulmonary diseases in miners is of British origin, though they have no quartz-mining there. The nearest approach to that industry in Great Britain is the tin-mining in Cornwall, and that industry, I think, dates from the time of the Romans, or earlier. The tin-mines in Cornwall are taken as the basis for many of the conclusions found in medical articles on the subject. In Cornwall there has always been in the past great carelessness and indifference on the part of the authorities in regard to the conditions of the men working underground. Some fifty years ago it was a common thing for young boys to go into the tin-mines there and do labouring-work. Some I have known have told me that they have started work when eight years of age. They have followed that occupation in Cornwall continually for years, and have then migrated to other parts. A number of deaths from the disease here in Reefton have been those of Cornish miners, who have really been damaged in their constitutions and their lungs by working underground at too early an age. Further, in Cornwall the conditions of the miner were very much more arduous than they are here. They had no cages, they had to climb ladders, and their hours were long and their pay small. Everything was against the miner from the very start. The result was that tuberculosis was and is extremely rife amongst the Cornish miners, who were the real pioneers in gold-quartz mining. They migrated to all parts of the world, and, as I have said, I have known here Cornish miners who have worked in tin-mines and quartz-mines continually for forty and fifty years, and who have eventually died of tuberculosis superimposed upon fibrosis of the lung. It has been a tubercular infection, grafted on fibrosis of the lung. My experience here in Reefton goes to show that if a young man, say, under thirty contracts miners' complaint there need be no hesitation in saying that it is tubercular. Pure pneumoconiosis in an old man is a rare thing in a quartz-miner.

6. What precautions would you recommend should be taken to guard against it?—There is this phase of the question to be looked at if we are going into the matter broadly and scientifically: there are twenty-four hours in the day, and a miner is only eight hours in the mine and has sixteen hours out of it. As far as I can judge all the discussions have been in regard to the eight hours during which a man is underground, while nothing at all has been said about the sixteen hours that he is out of the mine. I think that has a big bearing on the question. There is no doubt at all that the better the conditions which the mine-owner makes for the miner the better it is for every one concerned. As regards the prevention of pneumoconiosis pure and simple in the mines, the important point is to keep down the dust as much as possible, and have as good ventilation with as good air as can be obtained. Then, again, as regards tuberculosis, there is no question at all in my mind that no man suffering from pulmonary tuberculosis, with expectoration, should be allowed in the workings underground. It is bad for the man himself, and it is bad for his mates. As regards prevention of tuberculosis or consumption, I think the State authorities are doing everything they can to stamp it out, but I think they have missed one point, and that is the expectoration of germs in and about a mine. Then, it should be known that the germ of tuberculosis is more dangerous in a dry atmosphere than in a wet one, and when the expectoration of a tubercular patient takes place dry spores are formed which are very dangerous. Hence we have the fact that has been noticed that in dry mines there are more cases of tuberculosis or phthisis than in wet mines. That, I think, is undoubtedly owing to the fact that the bacillus of tuberculosis is more fertile in a dry atmosphere than in a wet one. Then, again, as regards keeping the dust down, there is no question at all in my mind that where machines are used for boring a water spray should be provided. This should be made obligatory, both upon the miner and the mine-owner. If the owner fails to do his duty in providing the water spray he should be penalized; and, in the same way, if the miner refuses or neglects to use the water when it is provided he should be penalized similarly—he has his mates to consider as well as himself. Another thing is that in very dusty places, such as rises, respirators should be worn by the men. They should be provided by the employers, and the men should be compelled to use them. The same provision in regard to penalty should apply as in the case of the use of the water spray. Then, I want again to refer to the fact that the miner has sixteen hours out of the twenty-four to spend outside the mine. A great deal depends upon himself, and if he looks after his health and obeys the rules of hygiene I consider that the mining industry should not be an unhealthy one, provided the regulations regarding ventilation are enforced. Anything at all which tends to produce bronchitis is a source of danger to a man working in a dusty atmosphere, because

pneumoconiosis, in the first place, is simply a form of bronchitis. The miner, when outside the mine, should do everything he can to keep his body in good health, and avoid attacks of bronchitis or colds. A man has any amount of warning of miners' complaint as a rule, because it is essentially a chronic disease. If he gets symptoms and shortness of breath, as many of them do, he should take a spell or throw the work up altogether, in which case he would be all right, unless he contracts tubercular infection. What I wish to insist upon is that the danger a man has to think about is the tubercular trouble, which is the danger to life. Pneumoconiosis pure and simple is such a chronic and slow complaint that it takes years to mature. At first it is a bronchitis pure and simple—that is, a reaction of the lungs to throw off the dust—and if work under dusty conditions is continued you get the dust deposited in the lungs, which causes fibrosis, and eventually you will have a large portion of the lung tissue damaged and replaced by a fibrous tissue, which results in pure fibrosis. I consider that all quartz-mines should have a change-room and a drying-room for the men, and where you have a steam plant installed you should have hot and cold shower-baths. The shower-bath is more hygienic than the plunge-bath, and there should be facilities for the men to thoroughly cleanse themselves. Whether their use should be compulsory or not is not for me to say, though I think every man should be only too glad to avail himself of the opportunity, and no compulsion should be required. In regard to the care which should be taken by the miners when outside the mine, I do not wish to make any reflections upon any body of workers, but I want to say that alcoholic excess is one of the worst things for a miner, predisposing, as it does, to catarrh and indigestion, as well as to bronchitis and colds.

7. *Mr. Cochrane.*] You told us that respirators should be used: are you aware that there is considerable difficulty in getting the men to use them?—Yes, I have been told that they have been provided, but the men would not wear them. I think in that case the men should be penalized for their refusal.

8. Are you aware how oppressive it is to wear them under such circumstances?—Well, then, it is a question of getting more air or getting a more suitable respirator. I know of men who have worked with wet sponges over their mouths.

9. In mines?—Yes.

10. And do you know of a respirator you would specially recommend?—No, we have the ordinary respirator which is used for pulmonary complaints, but I have never studied the matter sufficiently to find a suitable one for mines, though I should think there are respirators to be obtained which would be suitable for that purpose.

11. Have you noticed any increase in fibrosis in the Reefton district since you came here?—No. We have had a number of cases of tuberculosis, but several of them are direct importations from Australia. Men come here simply to recuperate. I know of cases in which men have come and died here as the result of tuberculosis contracted in Australia. I do not think the men here now stop long enough at mining to contract pneumoconiosis.

12. Then, are you prepared to give evidence as to the effect of high temperatures upon miners?—That is a subject I have not gone into, but I can refer you to authorities on the subject. Of course, anything which lowers the vitality of a man will predispose him to pneumoconiosis. It depresses the resisting-power of the body to have a high temperature in the mine. I cannot say what the limit should be, because I have not gone into the subject.

13. *Mr. Dowgray.*] You told us that dust, and dust alone, causes pneumoconiosis: what causes chalicosis or Sheffield rot?—Chalicosis is caused by sharp-cutting dust of siliceous rock—the grinders' rot found in Sheffield steel-workers.

14. Sheffield rot is caused by cuttings of steel?—Yes. Chalicosis is also contracted by stonemasons.

15. Does the disease contracted by stonemasons come under the heading of chalicosis?—Yes.

16. I have been led to believe that pneumoconiosis is due to explosive-smoke and lack of oxygen?—I say dust, and dust alone, causes pneumoconiosis. The only thing in smoke to affect a man would be the solid particles of dust which would get into the lungs, but "pneumoconiosis" is the general term used for all dust diseases. Dust may take many forms; you may get it in cotton, flour, coal, steel, as well as rock-dust, the result of which is chalicosis.

17. You told us that the majority of persons who have died in Reefton from pneumoconiosis have been Cornishmen?—Emphatically no. What I said was, that the Cornish miner was the pioneer in quartz-mining.

18. *Mr. Parry.*] When did they become victims to the disease?—I have known cases of men suffering from pneumoconiosis who have come from Australia and died in Reefton, and I have known others to die here from tuberculosis and pneumoconiosis combined who have worked for thirty years in the Cornish mines. In old miners, as a rule, you never get a pure tubercular infection; the two things are always mixed up together.

19. Do you consider mining a healthy occupation?—If the mining regulations as they exist to-day are conformed with and enforced it is not an unhealthy occupation.

20. And yet you said that a man is almost certain to develop fibrosis if he works in a mine fifty years?—Yes; but how old would he be when he went into the mine?

21. Eight?—Well, he is not allowed into the mine here until he is sixteen, and that would make him sixty-six, which is more than the average duration of life.

22. You also said that a man cannot contract miners' phthisis under thirty years of age?—No, I did not say that. If a man, for instance, went into Waihi when they had dry crushing, and got saturated, it is possible for him to contract phthisis in a week.

23. So that it is possible to contract it under thirty?—Yes, it is possible for him to contract phthisis when he is twenty.

24. You said that the first step in prevention is for the men to keep themselves fit. Do I understand you to mean that they should take steps not to allow themselves to become run down or have their vitality lowered?—Yes, that is of the first importance. They should keep their health up at all costs and avoid any bronchial trouble.

25. And anything which tended to lower their vitality would be detrimental to the health of the miners?—Yes.

26. *Mr. Molineaux.*] Would you be in favour of a periodical medical examination of the men?—Well, of course, that has been a burning question here for some time. My own idea is that a man should be examined in his own interest, but whether it should be made compulsory or not is another matter. Certainly, compulsion is against the instincts of nature. The men consider themselves free agents, and it is simply a question for them to decide, but I consider they would be wise to be examined if they had pulmonary symptoms. We have a law that all cases of pulmonary tuberculosis must be notified. If a man wants to be cured of tuberculosis he has to be got in the early stages. The medical examination is the thing for the men themselves, and they would be wise if they decided to have it.

27. *Mr. Cochrane.*] I missed that question in regard to examination of miners. Did I understand that you would be in favour of their being examined for tuberculosis or not?—Well, it is a rather delicate question. I said a man in his own interest should be examined. I do not believe in the compulsory examination, though I think, from a medical point of view, the men should be examined.

28. Then you said the Government should use all efforts to combat the tubercular element: how are they to do that if the men are not to be examined?—It is for the Commission to decide that question.

29. But it is a medical question. How are you going to find out whether a man is tuberculous?—In early or doubtful cases by means of tuberculin.

30. Would you be in favour of engine-drivers being examined for cardiac troubles, say, once a year?—Yes, I certainly think that is necessary.

WILLIAM ALOYSIUS CONLON, B.A., M.B., Ch.M., sworn and examined. (No. 7.)

1. *The Chairman.*] What are you?—A duly qualified medical practitioner, and Medical Superintendent of the Reefton Hospital.

2. With how many years' practice?—Thirteen.

3. And during that time you have come into contact with the disease referred to as miners' phthisis?—Yes.

4. You have made a special study of it?—Yes, more or less, on account of the number of cases with which I have had to deal.

5. We are dealing more particularly with the precautions that require to be taken to guard against the contraction of the disease, both in regard to the conditions in the mines and also as to what precautions the men themselves can take. If you will give us the benefit of your experience and research we shall be pleased to hear you?—You have it as a definitely acknowledged fact that there is such a thing as miners' disease?

6. Yes, I think there is no getting away from that?—Have you also appreciated the fact that it is an accident? It is due to the cutting of the lungs by small particles of quartz, and in that sense it is an accident. I should like to make that aspect of the case clear, and if you wish me to give proof of the accuracy of my statement I will do so.

7. We will take your opinion?—Yes, very well.

8. Will you just tell us briefly your experience, directing your attention mainly to the causes that give rise to it, and the precautions that may be taken to minimize the danger?—Yes. A statement which should be made in regard to this matter is that in the Registrar-General's returns he gives the rate per thousand of deaths here from pulmonary diseases as twelve, and that for, say, Canterbury as three per thousand. There is a very large disproportion, as you will see.

9. Do you know the rate for other quartz-mining centres?—No. The rate I quoted for Canterbury is common to the rest of the South Island. I went to the trouble of taking out the number of men who have died here of the disease during the last twelve years and a half—first, during the ten years ending 31st December, 1909, and there were in all 524 deaths, and of that number fifty-five men died of miners' disease. That does not include the men, women, and children dying of ordinary tuberculosis. For the two years and a half ending 18th October, 1911, there were in all 136 deaths, and of these there died of miners' disease sixteen. I know at least three men suffering from the disease who left the district and have since died. That gives a total of 660 deaths, with seventy-one deaths from miners' disease; that is, about one-tenth of the total deaths in this district are due to miners' disease. That does not include those three cases whose deaths are registered in other places. I obtained this information through the courtesy of Mr. Smith, Clerk of the Court here. I also went to the trouble of taking out the number of quartz-miners working in New Zealand. According to the Mines Report for 1907 there were 3,740 quartz-miners in the Dominion; of these 2,594 were in the North Island and 1,146 in the South Island. These figures include truckers, chambermen, battery hands, and surfacemen, leaving in all probability 2,000 men breaking quartz. According to the statistics taken in Reefton twenty of these men should die every year—twenty of that 3,740. Well, the way to prevent the disease is to stop all mining; that is the logical conclusion. But to mitigate the evil is another question. To deal with this matter there are certain conditions which must be observed in all underground workings. These are, firstly, abundant ventilation; secondly, the ventilation to be as much as possible in the nature of natural ventilation; thirdly, the use of sprays to allay the irritant particles of dust; and, fourthly, the use of some disinfectant, such as formalin, in the water used for spraying, which will allay the dust and prevent the growth of the organism. The natural antiseptic is sunshine; in underground works you cannot get that, and therefore you must supply some antiseptic to in a measure take its place, though I do not say it will quite fulfil the sun's office. But to destroy noxious germs it is necessary, and it may be found practicable, to employ in the spraying-water some disinfectant, such as perhaps formalin.

10. Where mines are worked at different levels do you consider it injurious to use for spraying on one level water which has accumulated at a higher level? It passes through the ground, gathering up whatever filth it may come into contact with, and then it is taken on the shaft and sent down in pipes to be used for spraying in lower levels?—That is a very unwise thing to do, because these men get so many wounds underground which are due to the water, and every scratch seems to fester and gives the man a poisoned hand. In the South African mines they have a nebulizer—a thing on the idea of a scent-sprayer. That can be done, I believe, with a kerosene-tin full of water, and in that tin I think this antiseptic water could be used.

11. And you would advocate that water used in a spray should be pure surface-water?—Yes, it should come from outside the mine altogether. The water in the mine is loaded with filth.

12. You say spraying with some such disinfectant as you describe would have a beneficial effect?—Yes, because of the sun's absence, and the fact that the men spit out the tubercle bacillus, which must be there in abundance.

13. You made use of the term "natural ventilation." You were not speaking of natural as against artificial ventilation?—I mean that kind of ventilation which produces a current of air sufficient to enable men to work without producing a draught. I mean the leading-in of currents of air from the surface.

14. You do not mean natural ventilation as opposed to mechanical ventilation?—No, in my sense it would be mechanical ventilation—making use of mechanical means to induce as near as possible natural ventilation.

15. What is your opinion of miners suffering from the disease being allowed into the mines?—Well, I think a man who has a disease has as much right to earn his living as I have.

16. But from a health point of view?—That remains to be a matter for legislation. A man has a right to earn his living in his own way.

17. Irrespective of the health of the other men?—I do not see how you can debar him until you treat him as a leper or a lunatic.

18. Not necessarily. It might mean death to thousands if he is left in a mine. Why should he not be debarred from going below, and work provided for him on the surface?—You might just close up that particular avenue of employment for which he is fitted. I do not think you have the right to interfere with the liberty of a man.

19. What about the other men?—Well, they must put up with it until you can segregate him.

20. It may be particularly hard on one man to require him to leave his calling, but do you not think it would be harder on the others if he were kept there?—You could not do anything like that without legislation, and I do not think you would be able to legislate in that direction.

21. This is a question where in the interests of public health it may be advisable to take every care that such a man should not go into a mine?—Yes. Well, the mine-manager has the right to discharge a man, it is true. That would overcome your difficulty.

22. I am just asking you as a medical man whether a man suffering from that disease should be prevented from going down a mine?—Well, of course, I take up the position that a man is the master of his own destiny even if he is ill. I frequently tell men not to do certain things, but I take no steps to coerce them to do what I want them to do. If a man is known to be diseased it is an easy matter for him to be "sacked."

23. What is the difference between "sacking" him and asking him to remain on top?—That is a question for the mine-managers.

24. *Mr. Cochrane.*] The question of respirators has come up: have you any recommendation to make for or against their use?—I think it is quite impracticable to make men wear respirators, from my knowledge of men.

25. Can you tell us if pneumoconiosis is more prevalent now than formerly?—Well, that opens up a large question, because it is essentially a slow disease. The thing which is being reaped now was sown probably fourteen years ago. It takes fourteen to twenty years to run its course.

26. Have you read the report of the South African Commission?—Yes.

27. According to that it is usually quite pronounced in five years?—But that refers to a different country. The South African mine-owners offered a reward for the best method of spraying in mines, and I think it was won by some mining engineer in South Africa. In the Sydney sewers a man will not work for over twelve months before he is incapacitated. In Eaglehawk, Victoria, where the mines are 4,000 ft. deep, a man rarely lives beyond the age of forty-five. A medical friend of mine there has written a good deal on the subject of miners' phthisis, and from what I have read he says that men there do not last longer than forty-five years.

28. Before being incapacitated?—No, they die at that age.

29. Is their death due to tubercle superimposed on fibrosis?—Yes, always. The ages of the men whom I mentioned as dying here during the two years and a half ending October, 1911, were 49, 57, 55, 69, 61, 59, 59, 71, 54, 48, 73, 69, 62, 45, 77, and 65. The average for twelve years and a half will probably work out at 55.

30. If the compulsory medical examination of all miners were insisted on would it not greatly prevent the spread of miners' disease?—Well, no, I do not think it would, for this reason: miners' disease is an insidious, slow business, and might deceive the most capable doctor. By any examination he cannot detect the disease. I can bring into this room men who are looking as healthy as possible, and any doctor would give them first-class certificates for insurance, yet I know they have the disease.

31. Then, as to the natural ventilation you referred to: supposing there are two outlets, and one column of air is rarified, do you mean to advocate natural ventilation in that sense?—I do not know anything about the ventilation of mines, but what I meant to say is that you want to give a man as much ventilation as he would get in a quarry.

32. In cases of tubercle superimposed upon pneumoconiosis would you be in favour of the exclusion of all sufferers from the mines if they were suitably provided for by the Government?—

Yes, if they were suitably provided for. I might say that these men have always been provided for. I have nothing to find fault with in that way. In the early days, when the mines were owned by the storekeeper or other business men in the town, every one stood by the miners who contracted the disease. And then later, with the advent of foreign capital, the officials of the companies have treated the men most kindly; but what I convey to this Commission is that that acknowledgment should be made by the State, and not by individuals or companies.

33. But from a medical point of view, leaving that aspect out of the question, what is the danger both to the man himself and to the other men?—The danger to himself is past.

34. Is it not aggravated by his constantly going down into injurious conditions?—Of course, it does not benefit the man at all to go underground, and he is a menace to his fellow-workmen. What I have contended for is the fact that the disease is an accident. You have a Workers' Compensation Act which provides for payment being made to a man if his arms are cut off, but you have no clause to deal with a case where a man has his lungs cut off.

35. *The Chairman.*] Logically, do you not think a man who is a menace to others ought not to continue to be such a menace because there is no, at any rate, statutory provision for him? You have one man who has the disease, and because there is no provision for him you multiply the risk by sending him down below?—There is an abstract right and wrong in things, and I think that a man has a right to earn his living in his own particular way.

36. *Mr. Cochrane.*] What is your opinion of working continually in mines under high temperatures?—Well, the only way I can judge is from results. Those results are included in those figures I have quoted. As for the degrees of temperature that men work in I am not in a position to discuss them.

37. Can you say anything as to humidity?—That is very detrimental. It is found in the tropics, where white people cannot work. It is heat plus moisture.

38. If a man did continue working would it have a bad effect upon his heart?—I have no experience of that. The effect I have found has been mostly on the lungs.

39. *The Chairman.*] Is that produced by excessive temperatures?—Not wholly, but it would predispose a man to be ill.

40. *Mr. Cochrane.*] Would it not cause increased action of the heart?—Yes.

41. And what follows?—A man would get very fatigued; but I do not know that heart-disease would be contracted in that way.

42. Have you given the subject consideration in Reefton?—No.

43. And in regard to overdilation of the heart?—No, except in cases of overwork by good miners. I can only speak of my experience as gained in the consulting-room and in the houses where I have visited the men.

44. *Mr. Dowgray.*] What is the cause of bovine heart?—Overwork.

45. Has heat anything to do with it?—Well, I could not say as to that.

46. Is this miners' complaint very infectious in its earlier stages?—No, I would like to make it clear that there is a period when the disease is not at all infectious, and when it is about to become infectious is the time when a man is forced to cease work.

47. *The Chairman.*] It is the tubercle that makes it infectious?—Yes.

48. *Mr. Dowgray.*] He is practically injured by working in a mine?—Yes, as the result of having his lungs cut with the quartz.

49. So that a man may have had the disease for years and still not be infectious?—Yes, for ten or fifteen years. You might notice him a bit thick in the wind.

50. *Mr. Molineaux.*] At what stage is the expectoration dangerous?—That is difficult to tell. It is hard to say when miners' disease ends and tuberculosis begins. I have examined the expectoration of a man fifty-five years of age who had ceased work, and I have been unable to find any tubercle bacillus in his sputum, and yet he died of it eighteen months afterwards.

51. *Mr. Parry.*] Do you think the competitive system of work underground is detrimental to a man's health?—Yes, I do. Contractors are the men who suffer most. The good miners always go under quickest.

52. *The Chairman.*] What do you infer from that?—The more you exert yourself the more likely you are to get the disease. The men who work hard frequently go away from the district because their health is affected. A man cannot work underground and extend himself as he can on the surface. If you look through a list of the names of men who have suffered from the disease you will find they are the men who worked as contractors.

53. That is to say, it lowers his vitality?—Well, of course, the work uses a man up, and he runs into places without waiting for the dust to settle. He takes bigger risks.

DUNEDIN COURTHOUSE.—29TH SEPTEMBER, 1911.

JAMES PARK sworn and examined. (No. 8.)

1. *The Chairman.*] What is your position?—I am Professor of Mining in the University of Otago, and Teacher of Applied Geology.

2. I think you understand the scope of the Commission's inquiries. We would like you to deal with the matter of noxious mine gases and temperatures, and their effects upon miners. If you will give us your opinions on these questions it will be of assistance to the Commission?—Mine-atmospheres may be vitiated in three ways—firstly, by the presence of noxious gases; secondly, by the deficiency of oxygen; and, thirdly, by too high a temperature in connection with humidity. The gases principally met with in mines are carburetted hydrogen (the mixture of which with atmospheric air forms fire-damp), carbonic-acid gas, carbon-monoxide, sulphuretted hydrogen,

and, as the result of blasting, sometimes a little nitrous oxide. Now, in respect of carbonic-acid gas, commonly called "black-damp" or "choke-damp," it is a heavy gas, and consequently very difficult to displace from mine-workings, especially in low workings. It is incombustible, nor does it support combustion; it is colourless and odourless, but has a sweet taste. As it is incombustible it tends to limit the range of a fire-damp explosion. Black-damp occurs in all coals. It also results from the respiration of men and animals, and a certain proportion is given off by the air, by the burning of candles and of fuses, and in some mines there is present what is called "ground carbonic-acid gas," which is particularly plentiful in the Thames mines, more especially in the north end of the field. For a number of years—six or seven—I had the management of a group of these mines, and consequently gained some experience of the effects of carbonic-acid gas upon the workmen. The gas issues from the rocks as "blowers," often with great force. It issues in the bottom of the Big Pump through the water in the sump with such force as to give the appearance of boiling. In muggy weather with a low barometer it rises first into the low levels, then into the higher levels, and finally issues from the shafts and drives that are open to the surface. When that takes place, of course, the men have to be withdrawn from the mines. The atmosphere naturally contains 0·03 per cent. of carbonic-acid gas. When 3 to 4 per cent. of the gas is present there is a difficulty in breathing. Up to that point there is no inconvenience whatever. With 6 per cent. there is palpitation of the heart, with 11 per cent. unconsciousness, and with 25 per cent. death. When wading about in an atmosphere of CO_2 in the Thames mines it was our practice to leave the workings when the candle went out—that is to say, when the proportion of CO_2 amounted to between 3 and 4 per cent. Black-damp causes death by asphyxia or choking, by excluding oxygen from the lungs. In my opinion air containing more than, say, $1\frac{1}{4}$ per cent. of carbonic-acid gas should be considered below the standard, that opinion being based not only upon my own experience of the Thames mines, but also on the evidence given before the Transvaal and British Royal Commissions. Coming to carbon-monoxide, or white-damp, this gas is occluded in all coals, and is also produced by the imperfect combustion of waste matter in gobs, as well as being to a small extent produced by blasting. Further, it is formed in large quantities when the flame of a blast in a coal-mine is projected into an atmosphere containing coaldust. The flame acts on the dust and causes partial oxidation to CO_2—that is, carbon-monoxide. It may also be formed by the reduction of CO_2 by carbon into CO, that only taking place when it is passed over incandescent carbon. It unites with the blood as does oxygen, and hence excludes oxygen. It causes acute pains and loss of muscular effort, particularly in the legs. A small amount of CO in mine-air acts slowly on the blood, but after a time becomes culminative, and it is possible for a man to walk into a mine and be unable to return. A man who is working will breathe more carbon-monoxide than a man at rest in a mine. The effects of CO poisoning are the same as those due to deficiency of oxygen. Over 0·03 per cent. in mine-air is injurious, 0·1 per cent. causes headache, 0·15 per cent. is highly dangerous, and 0·2 per cent. might be fatal. Dr. Haldane states that noticeable symptoms, however, are never produced with less than 0·2 per cent., since absorption ceases when the blood becomes saturated. In view of Dr. Haldane's investigations I think that the maximum permissible amount of CO in mine-air should not exceed 0·01 per cent. Then, in respect of marsh-gas, or CH_4, this has a very low specific gravity—not more than one-half of air—and therefore possesses a rapid rate of diffusion. It is combustible, but singularly enough it does not support combustion—that is to say, a lighted lamp or candle plunged into an atmosphere of pure CH_4 is at once extinguished, but when mixed with certain proportions of air it forms explosive compounds. The lower limit is 1 of gas to 13 of air, and the higher limit is 1 of gas to $5\frac{1}{2}$ of air. The maximum explosive mixture is 1 of gas to 9·38 of air. It is detected in coal-mines by the small flame-cap that envelops and surrounds the flame in the lamp in a fire-damp mixture. A flame-cap $1\frac{3}{16}$ in. high very often indicates an explosive condition, but when fine coaldust is present even a less light might indicate danger. The ventilation in each district of a mine should be sufficient to keep the percentage of CH_4 in the return air under 1 per cent. as determined by analyses. This gas is met with frequently in coal-mines, and is occasionally met with in metalliferous mines. In the last copy of the *Mining Magazine*, which came to hand to-day, I found that an explosion of fire-damp took place in the Simmer Deep Mine at Johannesburg, where a number of Natives and the fire-boss were injured. The gas escaped as a blower in the lower levels emanating from the shales. In respect of sulphuretted hydrogen, this is a gas that occurs occluded in coal, mainly due to the decomposition of pyrite, and it is also found in metal-mines from the same cause. It is a colourless gas, with a characteristic evil odour. It is combustible, and when mixed with seven times its volume of air forms a very explosive mixture—in fact, one of the most explosive. When present to the extent of 0·07 per cent. it causes death in an hour. It acts as an irritant poison, causing vomiting. It is well known to be present in many sewer-gases, and many fatal accidents have happened to men rashly descending sewers containing this gas. In respect of nitrous fumes, these are evolved through the incomplete combustion of nitro-glycerine compounds, and are very highly dangerous even when in minute quantities; but nitrous oxide—that is, NO_2—is highly soluble in water, consequently it is rarely found in mine-gases an hour after blasting—that is to say, it is absorbed so rapidly by moisture that it disappears. In any case no determinable amount of this gas should be allowed in a mine, on account of its highly poisonous character. In respect of deficiency of oxygen causing the air to become unwholesome, I would say that 3·5 volumes of oxygen are dissolved in 100 volumes of water, so that it is much less soluble than carbonic acid, which is dissolved in water volume for volume—that is to say, that 1 cubic foot of water will dissolve 1 cubic foot of carbonic-acid gas; hence a water spray is used in mines to get rid of CO_2. A deficiency of oxygen in mine-air is a source of danger. Normal air contains 20·94 per cent. of oxygen by volume. According to the experiments of Dr. Haldane, carried on by him on himself, when oxygen falls below 12 per cent. there is a difficulty in breathing; at 10 per cent. the lips

become blue; with 6 per cent. he found palpitation of the heart. He almost killed himself in carrying out these experiments. He tested himself with atmospheres containing all these deficiencies of oxygen. On the other hand, pure oxygen may be breathed without injury to health at three times the normal pressure. According to the opinion expressed by Dr. Haldane, and confirmed by the British Mining Commission and the Transvaal Commission, air containing less than 19 per cent. of oxygen should be regarded as below the standard, but you will observe that from the experiments carried out by Dr. Haldane air may be breathed down to 12 per cent. without difficulty. If the quantity of oxygen or its pressure is diminished the results are injurious to the health of the man without being necessarily fatal. The air is said to be light when there is a deficiency of oxygen. It may be reduced to 15 per cent. without injuring man, but a candle will not burn in such air. Dr. Haldane in a recent lecture says that, roughly speaking, the light of a candle or lamp diminishes by 30 per cent. with a fall of 1 in the oxygen percentage. That in itself then becomes a valuable test for oxygen, because if a candlelight diminished so much as that it would be an indication of a deficiency of oxygen, or perhaps of an excess of CO_2. Now, in respect of moisture in mine-air, in still saturated air work is practically impossible over 80° or 85° Fahr., as shown by the wet bulb. Of course, it is the wet bulb that counts more than the actual dry heat, as man may work without great discomfort in a dry temperature up to 100°. Air in motion carries off the body-heat more rapidly than still air, and hence tends to reduce the injurious effects of the heat—that is, if moist air is in motion it is possible to work at a higher temperature than if it were still. I do not think it would be advisable to fix a limit of wet-bulb temperature for New Zealand mines, as this might seriously hamper mining operations in small struggling mines. Besides, atmospheric changes are so rapid in New Zealand that it might very well happen that the temperature might be high in one shaft and low in the next. Therefore, to fix a temperature standpoint might lead to a great deal of confusion so far as the working of the shifts is concerned. Further, it generally happens that where the humidity is greatest is in rises and dead-ends, or in stopes where the number of openings to the level above is insufficient. In rises the work, of course, is only of a temporary character, and to fix a limit of temperature might hamper the operations of the mine in temporary work. For these reasons I do not think it advisable to fix a standard in respect of humid temperatures. At the same time I think sufficient ventilation ought to be provided to ensure a moving current of air in the working-places as far as possible, and thereby keep the temperature within reasonable limits. Of course, it is well known that the total quantity of air passing into an intake of a mine might be sufficient for the men working in the mine, but it is quite possible that an insufficient quantity might be passing into certain faces through defective methods of ventilation or local obstructions preventing the air travelling in certain directions. Therefore, I do not think it would be advisable to fix a quantity standard; it would be a mistake to do so. I think a quality standard is better than a quantity one. I do not know that there is anything else I can say about these matters.

3. You say you do not agree with a standard temperature being fixed: can you make a practical suggestion as to how you could determine the injurious conditions by a working rule? Supposing a man is working in a place he considers too hot or otherwise injurious, how would you suggest a practical test with the air could be made to determine whether the conditions were injurious for that man to work in?—For my part, I should say that if a man complained of the place I should refer the matter to the Inspector of Mines.

4. There might be some difficulty if the Inspector were not available?—I have said that if the temperature goes over 80° it is very difficult for a man to work in still saturated air. Without saying that the temperature should be fixed, with which I disagree, I think that temperature would be a very safe guide to the Inspector of Mines—*i.e.*, if the wet bulb showed saturation at 80° with the air still he might say that the shift must be suspended or shortened.

5. Yes, but in the North objections have been raised to that method of dealing with the matter, on the ground that the Inspector is not always available when a complaint is made, and the work has either to go on or be stopped till he is available?—I think that some arrangement should be made with the management. It is to their interest, for a man works better in good air. It is a matter for mutual adjustment between the two parties.

6. But the men ask for a standard to be fixed?—I think it would be a difficult matter.

7. Have you any opinion to offer on Professor Malcolm's suggestion that the temperature of the individuals, if taken, would be a better guide than the temperature of the air?—I think that is open to this objection: at the time it was taken the men might show a high temperature, but with a rapid change in the wind there might be a correspondingly rapid change in the condition of the air and the temperature also. I think that to bind down the temperature of mines by legislation would be against the interests of the men themselves. For instance, if we have a north-east wind blowing, the humidity is always greater. But with the wind coming from the south-west the air does not carry the same amount of humidity, and the working-conditions would improve rapidly underground with a change of wind. I think it would be a fatal objection to fixing a standard of temperature for air.

8. And does it apply to the temperature of the body?—Yes, the one is dependent on the other. Therefore I do not think it would be practicable to use the body-temperature as a test.

9. *Mr. Cochrane.*] If a high temperature were maintained for one shift would you be prepared to reduce the next shift from, say, eight hours to six?—For what temperature—above 80°?

10. I am speaking generally?—The temperature and humidity are the main factors.

11. I mean with saturated air at 80°?—Yes, I believe that if the temperature rises above 80° with the air saturated it would be advisable to shorten the shifts.

12. And you do not think that would hamper mining very much?—Not more than working six-hour shifts in a wet shaft.

13. Are you aware that a fixed standard of temperatures is provided in Queensland, Victoria, and Western Australia?—Yes.

14. And that it has not been found impracticable?—I do not know what the results have been there.

15. Do you disapprove of the present quantity standard of 100 cubic feet of air per man per minute?—Yes, I do not think it advisable to fix a quantity standard. I should be in favour of following the English rule and say an "adequate" standard.

16. In what respect do you suggest that is an improvement?—I should substitute the word "adequate," and leave it to be maintained at the discretion of the Inspector of Mines.

17. You have been in charge of many mines?—Yes, a group of mines at the Thames.

18. Have you had any experience with electric blasting?—Yes

19. How do you compare that with blasting by means of the fuse?—I should say that electrical blasting is better in many respects than fuse blasting.

20. Would you specify the number of shots above which electricity should be used?—You can fire one shot or a number of them by electricity.

21. Yes, but with one or two the ordinary fuse is considered safe: is it with a good many?—Well, I do not know. Electricity is coming into common use. Its practical immunity from misfires is a strong recommendation. Misfires is the great source of danger with fuse firing.

22. We have heard that in some wet mines it is as subject to misfires as is fuse firing?—That must be due to defective manipulation.

23. Then, are you prepared to speak as to boilers?—Well, I have installed a few boilers.

24. And as to the hydraulic test provided by the Act?—Yes, they were tested by the hydraulic test.

25. Are you in favour of the hydraulic test?—Yes, I think it is reliable and a simple test.

26. *Mr. Reed.*] You quoted the British regulation as regards ventilation. That was established in 1872, and continued until this year. It is as follows: "An adequate amount of ventilation shall be constantly produced in every mine to dilute and render harmless inflammable and noxious gases to such an extent that all shafts, roads, levels, stables, and workings of the mine shall be in a fit state for working and passing . . . therein." Do you consider that a practical and adequate regulation for the ventilation of mines?—Yes, I do, most certainly.

27. And you would prefer that to the rule-of-thumb standard inserted in some of these colonial statutes?—Yes, most certainly.

28. This proposed addition to the English regulation is in the Bill now before the House of Commons: "For the purposes of this section a place shall not be deemed to be in a fit state for working or passing therein if the air contains either less than 19 per cent. of oxygen or more than 1¼ per cent. of carbon-dioxide." Would you approve of that addition to the regulations?—Yes, I think that is a very fair standard to fix.

29. That means that the Inspector of Mines, supported by this test, is in a position to adjudicate as to what is adequate or inadequate ventilation. Do you think that gives him sufficient power?—Yes.

30. Have you read the final report of the British Royal Commission on the temperature question?—Yes.

31. It states, "On the whole we do not think any good object would be served by prescribing a limit of wet-bulb temperature." Do you agree with that?—Yes, for the reasons I have given.

32. Our Inspectors have made tests of mine-air under the most unfavourable conditions in the metal-mines—for instance, there was recently obtained at Waihi upon analysis 0·0025 per cent. of CO, 0·97 per cent. of CO_2, and not less than 20 per cent. of oxygen. These proportions were found respectively in different samples. Would you consider that vitiated air?—No, there is nothing present to show that that air is anything but wholesome.

33. Would you regard a mine with that air as adequately ventilated?—Yes; in fact, the men are very lucky to get such good air.

34. If no worse air is found than that would you regard the mine as well ventilated?—Yes.

35. You spoke about the impracticability of establishing a temperature standard owing to daily variations. Now, we have taken temperatures during our inspection, and I may say that at the surface of the Grand Junction Mine at Waihi there was only 1° between the wet- and dry-bulb readings in the shade on one day, and the next there was a difference of 11°. That would support your contention?—Yes.

36. Under those conditions would not a standard temperature be difficult to adjust?—Yes, impracticable.

37. You have quoted Dr. Haldane: is he regarded as a high authority on the subject?—Yes, the highest authority.

38. As a test for CO_2 would you regard the candle as an adequate practical test?—Yes, it is a good practical test, because the candle shows the effect before it is dangerous to man.

39. So that the miners have in their candles a ready test?—Yes, and our practice at the Thames mines was to retreat when the candle went out.

40. It has been stated by some witnesses that accidents are more prevalent on the night shift than on the day shift: is there any logical reason for such an idea?—I do not know that my experience has pointed that way. We were just as immune from accident on the night shift as on the day shift.

41. Some witnesses have stated that falls of roof occur more frequently on the night shift than on the day shift; do you regard that idea as superstition?—Yes, purely.

42. As regards winding-engine drivers, it has been recommended to us that there should be two drivers in case one takes a fit: what do you think of that proposal?—I think it is utterly impracticable, and it would be a great handicap to small mines.

43. Do you think another man standing alongside would be inclined to distract the driver?—Yes, by talking to him. You might just as reasonably say that the man at the wheel on an ocean-going ship should have another beside him to see that he does not have a fit and fall down.

44. In some of the mines small slope drills are being introduced, and these drills are not worked with a spray as a rule, though the law requires it: can you suggest anything that could be arranged for allaying the dust when using slope drills?—No, it is a difficult thing, except you had a separate hose, as you have with the larger drills. I have used rock-drills in the Saxon stopes, and water was carried there through a line of pipes.

45. We find that pillar-extraction in high coal-seams sometimes considerably inclined is a source of accidents. To timber these places is practically impossible owing to their height. These seams are subject to "bumps," as the miners call them. Do you know of a safe method of working them?—No, it is a difficult matter. I found that in South Belgium, Westphalia, and North France they arrange for the men to work under the protection of timber frames supporting bars or girders of iron driven forward over the working-faces.

46. So that you do not think there has been a safe method yet adopted for the extraction of high pillars?—I cannot conceive of a safe method.

47. Would you recommend that coal be left behind, which would mean a loss of coal to the company and to the State?—The coal might be extracted by a slicing method, as they do in Westphalia. There they work the lower portion of the coal as a separate seam, and then extract the upper.

48. As regards engine-drivers, it has been proposed that they should be medically examined periodically for eyesight and liability to fits: would you consider that a reasonable proposal?—Yes, I cannot see any objection to that—say, a quarterly or half-yearly examination.

49. As regards the examination of mine-managers and officials, could you offer any suggestion to get more efficient men as regards the period they should be required to be practically employed in mines?—I should be inclined to adopt the German, American, and French method, which is to compel the men to work in different positions and on different classes of work underground so as to become thoroughly *au fait* with all the different operations in mining. A man might have five years' experience in getting coal, but that would not qualify him to manage a mine. It is a technical knowledge as well as a practical knowledge of mining that is required to fit him to manage a mine efficiently. I find that the great coal-mines in Europe and England require men of technological skill to manage them.

50. In preference to our present system would you recommend that men should have experience in all the departments of mining underground?—Yes, he should serve as a fire-boss, as a shift-boss, and so on.

51. Do you consider that the requirement of five years' experience underground is fair to the university student?—I think five years is too long to ask a man to put in. In Germany they only require three years, and the Germans are very thorough. In England also, according to the mining regulations, graduates of recognized mining schools are only required to work two years underground; they are exempt from one year's work. And I think it would be an encouragement to graduates in New Zealand to give them a similar concession, because, after all, the employer will take good care that he gets a qualified man. He will not employ a man simply because he is a university graduate. Our graduates leave New Zealand and get employment in charge of large coal and metal mines, and seem to be able to do very well, and I do not see why we should not give them some encouragement here.

52. As regards this standard of 150 cubic feet of air per minute per person employed in coal-mines, is there any logical reason why there should be 150 ft. per man in the working-place? Have you any idea how such a quantity has been arrived at?—No. Of course, the quantity that a man requires for respiration is known. The amount of air required will depend on the quantity of gas given off by the coal. Every ton of coal gives off hundreds and sometimes thousands of feet of gas, and that must always be taken into consideration.

53. So that you regard this fixed rule-of-thumb method as not being based on any scientific fact?—Yes, that is so.

54. Would you be in favour of having baths at the mine with warm water showers?—Yes, similar in equipment to those established by law in Westphalia, Belgium, and at the Courierres mines in France. The change-houses there are equipped with shower-baths.

55. And would you be in favour of latrine accommodation being provided?—Yes, some organized system should be adopted—the pan or any other system, so long as it is an organized system—rather than the happy-go-lucky method which obtains in our mines in New Zealand.

56. I think you said you were in favour of the hydraulic test for boilers?—Yes, it is adequate, and better than the tapping test.

57. You are aware if nearly all the British oversea dominions have this test at mines?—Yes.

58. Does this fact show that it is a satisfactory test?—Yes, most certainly, that would show that it is considered adequate.

59. *The Chairman.*] I want to draw your attention to the fact that in connection with the ventilation of the Deep Levels at the Thames the amount of CO_2 present was found to be 2·97 per cent.; that is below the standard. In the May Queen Mine the oxygen is above the standard, but the CO_2 is 0·13, which is far below the standard. In the Alburnia Mine the oxygen is below the standard, and the CO_2 is above the standard. In the Watchman Mine the oxygen was 20 per cent. and the CO_2 1·01 per cent., which is below the standard. When you gave it to Mr. Reed as your opinion that the mines were adequately ventilated you were basing your opinion on the data quoted to you by Mr. Reed?—Yes, it was on the data supplied by him.

60. *Mr. Reed.*] In regard to the Deep Levels, would you expect to get gas there?—Yes, I would expect to find CO_2 there.

61. When opening up ground do you not think the quantity quoted by me is a very small percentage of gas to get?—Yes, for Thames mines, where CO_2 is so prevalent.

62. And do you not think that those working-conditions are tolerably good?—Of course, it must be remembered that up to 2 per cent. it is not injurious, and it is only when the percentage reaches 3 or 4, at which the candle goes out, that you are expected to leave the mine. At the same time I think, if the standard is fixed at 1¼ per cent., steps should be taken to provide a sufficient current of air.

63. *The Chairman.*] I want to point out that the percentages quoted to you were not the worst which had been found?—I should say that some of the mine-gas was below the standard as shown by those analyses. I based my serious opinion on the supposititious case put by Mr. Reed.

64. *Mr. Cochrane.*] I think you said that the time required to work underground for university students should be reduced to three years?—Yes.

65. Which should entitle them to sit for the certificate as a mine-manager under the Mining Act?—Yes.

66. How about under the Coal-mines Act?—Well, I should insist upon their working four years underground for the coal-mines certificate, and three for the metal-mines certificate.

JOHN MALCOLM sworn and examined. (No. 9.)

1. *The Chairman.*] What is your position?—Professor of Physiology in the University of Otago.

2. I suppose you are aware of the scope of the Commission. We would like to have your opinion of the effects of mine-gases on miners, and the effect of temperatures on the constitution of men working underground?—The effect of a high temperature depends entirely upon the humidity of the surroundings.

3. I may say that a suggestion has been made to the Commission that there should be a standard temperature fixed—that is to say, when it reaches a certain height there should either be a reduction of hours or work in the place should be stopped altogether; and we are trying to arrive at a conclusion as to whether it is possible to fix a standard temperature, and whether heat or humidity alone is a sufficient reason for doing so, and, if so, what temperature should be fixed as the standard?—I think I understand the position. You have the same problem as was before the Commissions at Home and in the Transvaal.

4. Yes, but subject to New Zealand conditions?—Yes. Well, the condition of humidity is of first importance in this connection, because in a dry atmosphere one can stand a temperature which is sufficient to roast meat. Blagden and Fordyce in 1775 exposed themselves to a temperature where meat was being roasted. It was about 126 centigrade, and they were able to remain in it for about a quarter of an hour while meat was being roasted. But in air which is saturated one is unable to remain if the temperature is anything approaching the temperature of the body. If saturation is complete one would be unable to remain at a temperature much over 90° Fahr.; 98·4° is, of course, the average temperature of the body. I have read some of Dr. Haldane's works on this subject, and he says that work would be impossible above 90° Fahr. if the air were saturated. The humidity, of course, is determined by the difference between the readings of the wet- and dry-bulb thermometers. You keep the one thermometer wet, the evaporation cools the bulb, and therefore you get a difference between the two bulbs. The two thermometers are held side by side. The greater the dryness of the atmosphere the greater the difference between the wet- and dry-bulb readings, and by tables one is able to tell what is the amount of saturation. If saturation is complete the wet- and dry-bulb readings will be the same. Now, if the two readings are the same and both are high, it is obvious that a person cannot get rid of his own internal heat—the heat that he is producing cannot leave his body. In regard to the wet- and dry-bulb thermometers I would like to point out that the rate at which the air is moving is of very great importance also. If you have a rapid current of air you can secure your heat-loss—that is, you can continue to work even with a fairly high saturation. Even under those conditions, so long as the air is not completely saturated and is moving, then you can get rid of your heat and continue to work, whereas if the air is still a wet-bulb reading of perhaps 80° would be the maximum at which one could work. I should not like to give any opinion of my own in regard to what the wet-bulb reading should be. You can find that from Dr. Haldane's reports, to which the Commission has access. I think he suggests 80°, but I do not think he has made a fixed standard of it, so far as I know. In regard to the effects of working after the wet-bulb reading has risen so that the temperature is moist and high, the person's internal temperature rises; instead of being 98·4° it may rise to 101°, or even above that. Dr. Haldane, when examining some miners in one of the Cornwall mines in a warm temperature, found that their temperature had risen to 101·5°. They stopped work and came out to cool off, and I think Dr. Haldane expressed the opinion that men should not be allowed to work if the temperature rises about that point. I gather that general impression from his writings. But this rise in temperature is different in different individuals. For instance, Dr. Haldane, doing no work—just simply standing by—suffered a considerable rise in temperature, a much higher rise than the workmen. So the question of being accustomed to the work and conditions must also come into play, and Dr. Haldane expresses the opinion in his paper that men accustomed to the work and conditions seem to be able to regulate their temperature better than a man who has not been accustomed to such a high temperature. Dr. Haldane noticed no effect till his temperature rose between 101° and 102°—I mean he felt no distinct symptoms—but above that he felt throbbing of the head and palpitation, and this rise of temperature continued after he left the mine. It rose quite considerably, and took a long time to go down to normal again. Now, I would suggest to the Commission that the most practical test as to whether a place in a mine in which men were working was properly ventilated or had a sufficient dryness is to take the temperature of the men, but not to go by the wet-bulb readings

alone so much, because that must also be considered along with the amount of air passing. But if the temperature of the men were taken then the maximum figure could easily be arrived at with comparatively little research. I would not like to suggest a standard temperature, but if we could find the temperature which produces a certain pulse-rate that one would regard as too high, and then if the men were found to suffer to such an extent that their temperature and pulse rose above that standard, it may be taken that the place is being insufficiently ventilated. The taking of the men's temperature is quite simple; it can be done by the mine-manager or by the men themselves. The only point requiring care is that you leave the thermometer long enough in the mouth—say, three minutes—or rather longer if the temperature is taken in the armpit.

5. Can you give us any idea of what temperature should be regarded as being high enough to warrant action being taken?—Well, I have looked into that question. It is quite usual for the temperature to rise in myself during a walk to the extent of 1°—that is, temporarily; of course, it fell very soon when one cooled off. Zuntz and other observers state that the temperatures vary; instead of being 98·4° they vary to from 99·5° to 100°. There are also various other authorities who say that the temperature may rise to 100° in men doing work under ordinary conditions. I should be inclined to think that if it rose to over 101·5°—that is, allowing 1½°—the place requires better ventilation; but as I have had no experience in that temperature or in that degree of humidity I only put it forward as a suggestion based upon Dr. Haldane's work and experiments. I have been down in mines and seen men working where I was astonished to find they could work. I myself was panting with the heat, but they were able to work, though that is probably to be explained by what Dr. Haldane says as to the men being accustomed to the conditions.

6. Did you take the temperature?—No, I was taking mine-gases at the time, and I put down my panting as much to the increase of CO_2 as to the heat. Of course, either would cause the increased rate of respiration. There is one other thing in connection with the matter of individuality and training in a mine which is worth considering. A stout man would not be so suitable for that kind of work, because he has more difficulty in getting rid of his heat. He has a greater layer of fat for the heat to diffuse through. He would be less suitable for that kind of work, and also under those conditions should be extremely careful in regard to his diet. In hot climates men avoid fat, and miners should be just as careful. They should largely live on carbo-hydrates—that is, sugar, and starch, and proteins.

7. *Mr. Cochrane.*] I think you said that men readily adapt themselves to working in high temperatures?—I did not say "readily," did I?

8. Take it, then, that they do adapt themselves: would that apply if the air were completely saturated?—No, beyond a certain point of saturation it is impossible for the body to get rid of its heat. It is a purely physical condition.

9. So that they would not then adapt themselves?—Not with a high temperature saturated with moisture.

10. Then, what occurs if they persist in working in temperatures which are too high?—Their own temperature rises and their rate of respiration increases, and it is impossible for them to exert their muscles.

11. In cases not so great as that how does it affect the heart?—It increases the heart-rate. I do not think it would affect the heart, in the popular sense, to cause heart-disease.

12. Not if persisted in?—It would be very difficult to say that. If they persisted in working when the temperature was high it is possible that the heart would be damaged, but I would not like to offer a decided opinion on the matter because I am not in practice.

13. I infer that it would take some time?—Yes, a man might get a temporary disablement of the heart—dilatation of the heart. It would not be permanent, in my opinion.

14. Then, did you say that to get suitable ventilation it is necessary to find the temperature that produced a certain pulse-rate?—Well, you should take the temperature of the men and find that temperature which increases the pulse-rate and respiration up to a certain point. If they are increased to or beyond that point then it is dangerous to work there.

15. *The Chairman.*] Would that vary in different individuals?—Not very much. The temperature of individuals is practically uniform. The pulse-rate is also practically uniform—about seventy-two—and the respiratory rate is also uniform, though the rate of respiration is not a good guide, because it is more under voluntary control. The pulse-rate would be a very reliable guide to go on.

16. *Mr. Cochrane.*] Can you offer a suggestion as to what increased pulse-rate would indicate a dangerous condition?—Well, I have not thought of that point. I forget what Dr. Haldane stated. [Referring to notes.] His pulse-rate when standing, when his temperature was 106°, was 138. Of course, that was only one case. To settle this matter of a fixed temperature one must take an average of a number of cases, and I think that Dr. Haldane's pulse-rate might be taken into account in determining the figure, but, personally, I should not like to lay down any fixed law. I only throw out that suggestion of 101·5. It should be made a matter of research under the conditions in New Zealand.

17. Then, as to mine-atmospheres, are you prepared to answer a question as to them?—Yes.

18. Supposing that samples of air were taken from a mine, and on analysis were found to contain sufficient oxygen and no deleterious amounts of carbonic acid or oxide, but still miners complained of injurious effects from working in those atmospheres, how would you account for it?—Do you mean injurious effects from breathing the atmospheres? Did you say how much the oxygen was diminished?

19. Supposing there were 20 per cent. by volume of oxygen in the mine?—Well, I would be very puzzled to account for the injurious effects complained of. That reduction in volume of oxygen would probably be due to nitrogen or fire-damp. If there were no increase in the CO_2 I can hardly account for the air being the cause of the complaint.

20. I did not say no increase of CO_2—I said no injurious proportion of CO_2—say, 1 per cent.?—Well, if the 1 per cent. arose from the respiration of the men I can understand it being injurious. If the 1 per cent. arose wholly from the CO_2 produced in mines then I do not see how the effect can be accounted for. So long as your air contains 20 per cent. of oxygen and only 1 per cent. of CO_2 due to the mine-air and not to respiration, and contains no carbon-monoxide and no fumes, I think the air would be good.

21. Might it not be rendered injurious by the presence of a small quantity of sulphuretted hydrogen?—Produced in the mine?

22. In any way—or nitrous oxides?—Well, certainly, sulphuretted hydrogen in small amounts might give rise to symptoms. It is a gas soluble in water, and in a mine with any water there would be very little of it, I should say, hardly enough to produce symptoms.

23. I just wish to arrive at some explanation of such a state of things giving rise to a complaint from the men?—Well, it is difficult to answer a question like that—to imagine all the things that might occur. Sulphuretted hydrogen might be the cause of it.

24. *Mr. Reed.*] Have you read the report of the British Royal Commission on Mines?—I have read through a great part of it.

25. Dr. Haldane was one of the Commissioners, and they presented their report in 1909. If I read some of their conclusions will you please state if you approve of them. As regards temperatures in mines the report states, "The available information seems to indicate that where the heat in a mine is excessive miners readily adapt themselves to the adverse conditions by either doing less work or by only working intermittently, with periods of rest in cooler air." Is that a reasonable conclusion to draw?—Yes.

26. They were of opinion that it was the wet-bulb temperature which should be considered when working in mines. Do you consider that a reasonable deduction?—Well, I was rather astonished that Dr. Haldane did not fix either his wet-bulb reading or his wet bulb in conjunction with the rate of movement of the air. I have thought over it, and presume that he found it very difficult to estimate the rate of movement of air, and therefore did not care to fix the wet-bulb reading.

27. As regards the velocity of air, in a mine it is not possible to produce an excessive velocity. In colliery-workings it is quite unpleasant if it exceeds 3 ft. per second: would you regard that as sufficient to clear the heat in a mine like the Waihi?—I would not like to offer any opinion. I should go back to the temperature of the man.

28. Would that be very practicable, to regulate the matter to suit each man? It would be a matter of personal equation?—No, you would take an average of several men.

29. Our Inspectors of Mines have been in the habit of taking samples of air for analysis from what they consider the worst places in the different mines. The Inspector of Mines at Waihi took samples under the most unfavourable conditions—namely, when shovelling is begun after blasting with high explosives. In no case was there found more than 0·0025 per cent. of CO: would you consider that as noxious?—No.

30. Dr. Haldane states noticeable symptoms were never produced with less than 0·02 CO. The maximum that we have been able to detect at Waihi is 0·0025 per cent. Would you consider that air to be vitiated from a practical point of view?—No, I do not think so. I do not think that such a proportion of CO would produce damage to the individual.

31. Now, as regards CO_2, under the same unfavourable conditions the maximum found in the Waihi samples by the Dominion Analyst was 0·97 per cent.: would you regard that as noxious air?—Does the mine produce CO_2?

32. That amount of it is given off by the rocks, men, candles, and blasting, and also by the action of sulphuric acid on the calcite?—No, I should not regard it as high.

33. As regards oxygen, the Waihi Inspector has not been able to get less than 20 per cent. in any of his samples: would you regard that as adequate?—Yes.

34. So that if those proportions were put together in one sample—CO, 0·0025 per cent.; CO_2, 0·97 per cent.; and oxygen, 20 per cent.—would you regard that as vitiated air?—No; there is no evidence of vitiation there. Whether a trace of sulphuretted hydrogen was present is not stated.

35. In no sample that has been submitted have we been able to detect it?—Well, you have no evidence of vitiation in that air.

36. Would you regard it as adequate ventilation if the air is not more vitiated than that?—Yes.

37. You have quoted Dr. Haldane: is he regarded as a very high authority on the subject?—Yes, he is *the* physiologist in Great Britain who has paid most attention to this question.

38. As regards the ventilation of mines, it is debatable as to whether there should be a quality standard or a quantity standard of air provided; our quantity standard is fixed at 100 ft. per minute per person in gold-mines and 150 ft. per person in coal-mines: do you approve of this?—I should not like to express an opinion. It would vary according to the nature of the mines.

39. There is a Coal-mines Bill before the British House of Commons which proposes to fix a standard of quality and of quantity. It states, "A place shall not be deemed to be in a fit state for working or passing therein if the air contains either less than 19 per cent. of oxygen or more than 1¼ per cent. of carbon-dioxide"?—Yes, I know that.

40. Would you regard that as a practical standard for the Inspector to determine whether a mine is adequately ventilated or not?—That is put forward on Dr. Haldane's recommendation, and it should be a very good standard; it is extremely likely to be a suitable figure.

41. Are you aware that Dr. Haldane has made some research in connection with mine-gases?—Well, he has frequently published papers on the subject, which I have read.

42. As regards black-damp, I have a recent report of his which states that "black-damp, as ordinarily met with, is simply nitrogen mixed with about 5 to 20 per cent. of carbon-dioxide"?—Yes, he stated that before.

43. If black-damp contains more than 5·25 per cent. of CO_2, do you know what specific gravity it would have? Would it not be lighter than air?—That is a question of calculation. The more CO_2 the mixture contained the greater its specific gravity would be.

44. Dr. Cadman reports that 5·25 per cent. of CO_2 in black-damp makes it the same specific gravity as air?—Yes, that is merely a matter of mathematical demonstration.

45. The miners think all black-damp is heavier, and expect to find it on the ground?—I should agree with the mathematical demonstration.

46. You said the miners become accustomed to the heat, and therefore stand it better than the casual visitor in the mine?—Yes, that is possible.

47. Can you suggest a practical test for carbon-monoxide?—I think a mouse is the best test. It has been suggested by Dr. Haldane. It is an excellent test, and one that can be proved scientifically.

48. A mouse is affected in about one-fifteenth or one-twentieth of the time in which a man would be affected?—Yes, owing to the more rapid respiration in regard to its bulk.

49. Does not Dr. Haldane recommend a bird, because he found a mouse became accustomed to the vitiated air and gradually became less sensitive?—Yes, I could quite well believe that. I tell the students that it is a question of the size of the animal. I have no doubt, though, that a bird would also become accustomed to the gases, because a small proportion of carbon-monoxide breathed for a little time has the effect of increasing the number of red-blood corpuscles, and the same result would follow in a bird as in a mouse.

50. Are you aware of any chemical test that could be applied?—Not one that could be readily applied.

51. Are you aware of the Simonis carbon-monoxide detector? It is operated by certain chemicals and a strip of paper; it is a matter of discoloration of the prepared paper, according to the proportion of CO present?—No, I do not know it. Is the composition of it known?

52. No, it is a patent, and the character of the materials are not known to me?—Well, a test could easily be made with atmosphere containing a small amount of CO.

DANIEL BLACK WATERS sworn and examined. (No. 10.)

1. *The Chairman.*] What is your position?—I am a mining engineer.

2. With how many years' experience?—About twenty-two.

3. I think you know the general scope of our investigations; we will be pleased to hear you on any matters which you may desire to place before the Commission?—Well, I have really not formed any definite ideas in connection with the objects of the Commission, because in this part of New Zealand the quartz-mines with which I have had most to do are chiefly on a small scale. I would like to say, however, that the restrictions and conditions discussed to-day in connection with temperatures, shot-firing by electricity, and so on, would harass small mines very much. Under the Mining Act as it is at present we get on very well. There is no trouble in regard to the temperatures, because they are not high. It is mostly new work, and the ventilation is practically all natural, though there are one or two instances where small fans have been installed. I find, myself, that the Inspectors of Mines generally look after this matter fairly well. If they find a mine is not satisfactorily ventilated they try to help in the matter, especially if it is a small mine. It is in the small mines where these conditions, if brought in, would work very harshly. In connection with shot-firing by electricity, there is none of it down here, and to bring in a regulation that over a certain number of shots must be fired by electricity would be a hardship on these small mines. I do not know whether it means a certain number of shots in one working-place.

4. It means in any stope or working-face. If any man wants to fire more than the specified number of shots it must be done by electricity—that is to say, if there is any danger of the hole first lit going off before the fuses to the others can be lit then electricity should be used. Of course, with your conditions there may be no danger?—No, because there is more than one man firing. Well, I doubt very much whether it would be any safer than with the ordinary fuse. There would be as much danger through the wires as through the lighting. A man has plenty of time to light half a dozen holes and get a long way away before the explosion takes place.

5. It has been suggested that in winzes and shafts electricity should be used for firing, but in stopes and rises ordinary fuse should be used?—Yes, there is a certain amount of reason in that, but I think many of these cases should be left to the Inspector of Mines, because the mines are so varied in size: that is the difficulty. Some of these conditions would harass the small mines very heavily.

6. Would you be in favour of more extensive powers being placed in the hands of Inspectors?—Yes, I am prepared to trust the Inspectors with greater powers.

7. What do you think of the suggestion that the Inspector should have the power to prosecute summarily in regard to certain minor breaches of the Act if on his rounds of inspection he finds any matters unsatisfactory? At present he has to report to Wellington, and the matter filters through a number of channels before he finally gets instructions on the subject. Do you think it would be better to give the Inspector summary power to prosecute?—Provided that if he had not that power it is going to take such a long time to get the matter decided?

8. At present the Inspector has no power to prosecute at all except by authority from head-quarters?—Yes, it is a matter for the Department to deal with, but I think if the Inspector were given that power it would conduce to the carrying-out of the regulations.

9. *Mr. Cochrane.*] In regard to this electrical shot-firing question, do I understand you are not against it for such as work in winzes?—No, I am not aware of any objection to its use there.

10. Supposing you are firing, say, twelve shots in one face, would you prefer using electricity or fuse?—Well, I have had very little experience of electricity, but I have seen that number of shots fired by two men with fuse.

11. Do you think there would be a chance of misfires in that case?—I doubt it, because the number of misfires with fuse now is almost infinitesimal.

12. Have you any statistics on that point?—No.

13. You know the time which has to elapse before a man returns after a misfire?—Yes.

14. Would you be in favour of that being reduced in quartz-mines?—No.

15. Then, as to the hydraulic test for boilers, as provided in the Act, are you in favour of that or not?—I do not see the advantage of it. It is only a little over the steam test now being used. I consider an external and internal examination far more important, because boilers might be thin and still stand the test. The factor of safety is so great that the boiler will stand the pressure, but by examination internally you can find whether the plates are scaling badly by boring them.

16. *Mr. Fletcher.*] Will you give us your opinion as to the best way of getting rid of dry dust in boring holes?—The only way is to play water into the mouth of the hole. I know there is great difficulty in getting the men to do it, because it makes them so muddy.

17. There is no chance of using some means of air-suction?—No, I have not come across any such means.

LATHAM OSBORN BEAL sworn and examined. (No. 11.)

1. *The Chairman.*] You are a mining engineer?—Yes.

2. With how many years' experience?—I have been practising twenty-six years.

3. Your experience has been confined to this district, has it not?—Mostly in Otago and Southland, though I have been up as far as Waihi.

4. And it extends to both coal and gold mining?—Yes.

5. Will you tell us in your own way what it is you wish to place before the Commission?—As regards the subject of temperature, in coal-mines there is a good deal of spontaneous combustion, and at times it is necessary for the management to put men in on short shifts at the inception of a fire, and if a standard temperature were fixed it might make matters very awkward for the manager. The question of temperature should, I think, be left in the hands of the Inspector of Mines and the manager. A fire very quickly raises the temperature, and if it were fixed the manager might be unable to put men into the mine. I have seen places in the Kaitangata Mine where the temperature has been pretty high, and it has been necessary to put men in on very short shifts.

6. Is that the only objection that you can suggest to the fixing of a standard temperature?—Well, I think it might lead to trouble if put into force in the lignite-mines.

7. Supposing for ordinary working-places under average conditions a temperature were fixed, with an exception for such cases as you mention?—Yes, that would do.

8. Do you think a temperature could be fixed for average working-conditions with such an exception as that?—Yes, I think so.

9. And you think that would be better than fixing an average for working-conditions in every case?—Yes. And they should take all the coal down to the roof in large seams. I think it would be advisable to take the coal down to the roof, and it would then be safer than leaving a certain amount of coal overhead. By taking the coal down to the roof you know the extent of the danger. If a certain amount of head coal were left there would be danger to the miners. The coal would be more liable to fall than the roof.

10. And how would you take it down, in thick seams?—By the present system—by timbering it, reducing the pillars, and letting it fall. I do not know any better way than that. Of course, my experience has been that the managers as a rule are very anxious to have no accidents, and as far as I know, when pillaring, the supervision by the managers and Inspector of Mines is very good at present. I notice that the question of wide and narrow bords has been raised. Where the coal in a mine is of good quality I think the wide bord better than the narrow one. My experience has been that the narrow bords are inclined to crush a bit at the bottom and the sides come in, and if the bords are kept 12 ft., with a single prop in the centre, it enables the floor to swell. My experience is that a bord stands better wide than narrow. In dealing with the question of ventilation I think it would assist it a good deal if some regulations were made as to an exhaust fan. It is a good thing to lay in a pipe and take the impure air out of a coal-mine by an exhaust fan. I have found that method very satisfactory in improving the ventilation—much better than any other system. If a mine is a bit warm it is not much expense to lay in a galvanized-iron pipe to take cold air in and impure air out. 2,000 ft. of pipe and a small pipe and oil-engine would not cost more than £200, and the ventilation would be greatly improved. It is better to exhaust the air.

11. And better to use both exhaust and fan?—Yes, but I think the matter of ventilation should be left to the Inspector. If a standard were fixed it would not be as satisfactory as it is at present. As a rule, if a mine is not satisfactory the miners very soon commence to leave, and the management discovers what is the matter. I do not know that I have come across a single place where the proprietors and owners were not anxious to give the men as good ventilation as possible.

12. Do you think it would be an advantage if the Inspector were given certain powers in regard to ventilation in different localities?—Yes, I think so.

13. So that if he finds any system is not giving satisfaction he should have power to insist on its being improved?—Yes, I think he should have power to insist upon the ventilation being made good, but if he did so it might be a hardship upon a company. Still, it always pays to improve the ventilation.

14. In regard to opening up new districts in a mine, would you consider it reasonable that before doing so the management should be required to submit to the Inspector a plan of their proposed ventilating system?—Yes, it would be a good idea.

15. So that, before they go into the new workings at all, details of the proposed ventilating system should be submitted to the Inspector and approved by him before they incur any expenditure at all?—Yes, I think that would be satisfactory. I have always found that good ventilation pays—you get so much more work out of the men. I would also say that I believe in the use of electricity for blasting where it is intended to fire a number of shots; it is safer. Any blasting accidents which have occurred have been caused, as far as my experience goes, owing to the use of cheap or inferior gelignite, &c., or tamping too hard; it only requires very gentle pressing. I do not know of any case where Nobel's gelignite has been blamed for an accident. I think electrical firing is much better than firing with several fuses. I might also say, in regard to the Kaitangata Mine, the ventilation with the new shaft was rather a strong point some time ago, and I know it has made a great improvement. You want the air to go in and up the shaft by the fan by the shortest route.

16. In quartz-mines which are working on different levels, what is your opinion of a system of ventilation by means of which the return air from a lower level passes up through a higher level and so on up to the surface?—It is not a good system. The exhaust-fan system is the best.

17. No, but this is a question of vitiated air: do you think a system of ventilation should include the taking of all vitiated air right to the return airway?—Yes, it ought to be concentrated in a special airway.

18. *Mr. Cochrane.*] What do you mean by saying that the air should be taken by the shortest route to the fan?—The air going into the mine should be taken by routes as short as possible, or, if it is split up into a good many routes, then it should go as direct as possible to the exhaust fan.

19. Including the air from the working-faces?—Yes.

20. Then, as to the use of electricity for shot-firing, how many shots should be the limit to be fired with a fuse, or would you have all shots fired by electricity?—I should say not more than four should be fired with the fuse.

21. Then I think you said that if a standard were fixed it would not be so good as the present system of ventilation?—Well, the present system provides for so-much air per man and so-much per horse.

22. Do you approve of that?—Yes; that is, I approve of it subject to its being under the control of the Inspector of Mines.

23. Then, as to 12 ft. bords allowing the floor to rise, supposing it were a strong floor that would not rise, what then?—If it were a strong floor that would not rise I do not see that anything would be gained by keeping the bords narrow. It would be better to keep them 12 ft. then. One of the chief causes of danger is keeping the bords irregular—a narrow one and then a wide one—and so on, and not evenly distributing the pressure.

24. As to taking down head coal, do you recommend that it be taken down in all cases?—Yes, I think it is better to take it down in all cases than leave it up, because then you get a better idea of the nature of the roof. There are some parts of the Kaitangata Mine where there is a conglomerate roof which is safer than the clay roof. If the manager finds that the roof is soft he takes extra precautions to watch it.

25. Are you aware that in some mines they leave coal and bore up to see if there is sufficient coal left on?—No, I do not know of that being done.

26. *Mr. Molineaux.*] With regard to the inspection of boilers, do you consider that it would be an advantage for the boilers to be tested by the hydraulic test every twelve months?—Well, I think that the hydraulic test when the boilers are new is more a test of workmanship—of their tightness, as it were.

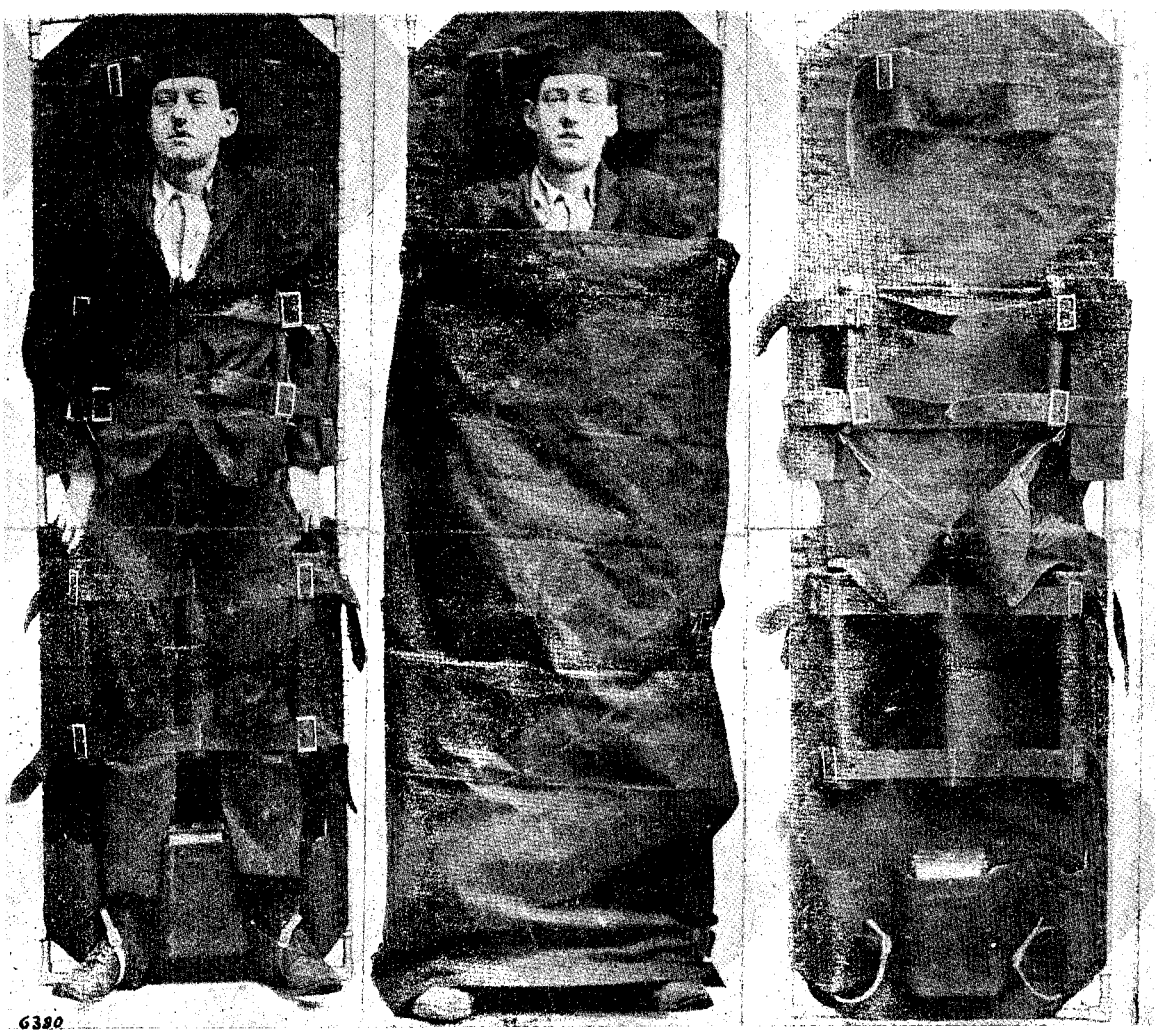
27. *The Chairman.*] But the Act requires an annual hydraulic test—that is, a test of wear-and-tear and not of workmanship: do you think that is necessary?—I would sooner leave it to the Inspector of Machinery.

BAYNE'S PATENT ADJUSTABLE MINE STRETCHER.

The Bayne's patent adjustable mine stretcher is designed for the purpose of moving the injured in cases of accident in mines. An accident occurring underground occasions relatively greater delay in the removal of the injured to the hospital than accidents on the surface, and it is to lessen this disability in underground accidents that the Bayne stretcher is provided. The saving of time in serious accidents in reaching the hospital means securing to the injured the chance of recovery denied when undue delay occurs, while in handling an injured person the risk of further injury resulting from the patient being carried any distance is to be avoided.

The special conditions claimed for Bayne's stretcher is that its service in moving the injured can be given and continued throughout from the place in the mine where the accident occurred till the hospital is reached. The stretcher is constructed of strong wire woven on a tubular frame to form the litter. In placing the disabled on the stretcher the head is held in a padded frame, the body in an adjustable splint, which, in cases of broken ribs or injured back, can be enlarged to prevent pressure. The thighs are held firmly on a canvas seat, which also supports the weight of the body. The legs are in splints, which protect and hold firmly any injured part, and the feet are held fast by being strapped to the frame. While being carried vertically each part is held in position by broad leather straps, which can be made to take their proportion of weight by adjustment. In the case of injury to the pelvis the canvas sling must be put out of use, and the straps and arm rests will carry the body. If the legs or feet are the affected parts the slings and straps are so arranged that the patient is not inconvenienced in any way by the weight. The whole is covered with strong canvas, under which a blanket is placed to keep the patient warm, and an apron is added which covers the figure and straps to the frame.

The necessity for first-aid requisites is met by having attached to the stretcher a sealed box containing bandages and lint.



BAYNE'S PATENT ADJUSTABLE MINE STRETCHER.

The following advantages are possessed by the stretcher :—

(1.) It can be easily carried, being only 50 lb. weight, and can be placed in the cage in any shaft, and lowered and conveyed quickly to the part of the mine where it is required.

(2.) When the patient is placed upon it the rough ground does not affect the back, as the wire is strong enough to prevent pointed stones being felt.

(3.) The limbs are in a natural position, and movement is prevented.

(4.) It can be taken up a winze by attaching a rope to the top, or passed down travelling-ways from the stopes.

(5.) It can be carried in a horizontal or vertical position, and, where necessary to pass obstacles or falling water, on the side.

(6.) It can be strapped in the cage or on a bucket to ascend the shaft, and when on the surface can be removed in a vehicle or in the ordinary horse ambulance. There is no necessity to disturb the patient until arrival at the hospital.

It is recognized that the arrangements in connection with the ambulance service on mining-fields is most inadequate, and men are put to much unnecessary pain in consequence. Doctors are of opinion that more damage is frequently caused by rough handling than by the actual casualty, and many lives have been lost in consequence of not having facilities for removal of cases of accident from the workings. Time is also a great factor, and, having everything necessary at hand, delay is avoided.

EXHIBITS.

HIKURANGI MINES.—THE TEMPERATURES AND AIR-MEASUREMENTS TAKEN BY COMMISSION.

The Commission inspected the undermentioned mines and found the following conditions :—

Hikurangi Coal-mine.

Temperature : Outside mine, in shade—wet bulb 49° Fahr., dry bulb 54° ; in mine at extreme end of main heading—wet bulb 67°, dry bulb 68°.

Air-measurements : Main intake, 7,020 cubic feet per minute ; returns, 2,714 cubic feet per minute.

Number of miners and others stated by manager to be fifty.

Air per man entering mine, 140 cubic feet per minute ; air per man leaving mine, 54 cubic feet per minute.

Northern Coal-mine.

Temperature : Outside mine, in shade—wet bulb 60° Fahr., dry bulb 63°. Pillar-extraction, No. 6 section, Steel's place—wet bulb 77°, dry bulb 77°. Air completely saturated. Sample of air taken for analysis from this place. Pillar-extraction, Section No. 5, Wallace's place—wet bulb 72°, dry bulb 73°.

Air-measurements taken in fan drift, 27,204 cubic feet per minute.

Manager stated number of men to be fifty, and horses three, representing 544 cubic feet of air per minute per person.

As regards temperature in Steel's place, no man had worked in that place for fourteen hours, or in Wallace's place for two hours previous to taking of above temperatures.

EXHIBIT No. 1.

Particulars of Quartz-mines situated in the Thames County and Borough.

Name of Mine.	Date of Inspection.	Where Measurement taken.	Quantity of Air per Minute.	Number of Men on Shift.	Number of Cubic Feet per Man.	Temperature.	System of Ventilation.	Remarks.
			Ft.					
Waiotahi	20/9/10	No. 6 level, main crosscut ..	3,544	5	708	..	Two shafts, natural ..	..
,, ...	21/4/10	Nos. 5 and 6 levels ..	No measurement	4	Adequate	..	Two shafts	Four men working below.
,, ...	25/7/10	No. 7 level	,,	2	..	..	Cutting chamber	..
Deep Levels (S.) ..	7/4/10	Main crosscut face ..	2,006	5	401	80° d.	22 in. pipes and fan ..	..
Deep Levels	8/5/10	1,000 ft. cut face	1,560	3	520	80° d.	,, ..	..
,, ...	1/6/10	Saxon main crosscut ..	1,851·8	3	617	82° d.	,, ..	..
,, ...	21/7/10	1,000 ft. Saxon main crosscut	2,051	4	512	..	,, ..	..
,, ...	21/7/10	1,000 ft. Saxon new reef ..	567	2	283	77° d.	9 in. pipes and fan ..	..
,, ...	29/11/10	No. 10 (1,000 ft.) face ..	2,398	2	1,199	84° d.	8 in. pipes and fan ..	Deep Levels crosscut.
,, ...	28/2/11	End 9 in. pipe at face of drive	528	2	264	..	9 in. pipes and fan ..	..
,, ...	27/3/11	1,000 ft. crosscut, main drive	2,235	3	745	..	22 in. pipes, blower, fan ..	Pipes being installed.
,, ...	27/3/11	,, ,,	441	3	147	78° d.	9 in. pipes, blower, fan ..	Air discharged into face.
Occidental	12/4/10	Low levels crosscut ..	90	3	30	..	6 in. and 3 in. pipes and fan	Still defective.
,, ...	24/7/10	Low level winze	No measurement	..	Air bad	..	..	Asked to make second outlet.
,, ...	20/12/10	Deepest level winze ..	10	5	2	..	3 in. pipes and fan ..	Ordered men out of mine.
Thames	24/4/10	Cambria crosscut	51·7	2	25·8	..	10 in. by 12 in. air-box ..	Manager fined £4 17s.
,, ...	9/2/11	Cambria reef, face drive ..	39	2	19	70° d.	,, ..	Main crosscut. Air passing, 1,310ft.
,, ...	17/2/11	,, driving ..	59	2	29·5	68° w.–70° d.	,, ..	Samples mine-air taken.
Alburnia	24/4/11	Sons of Freedom reef ..	51·7	2	25·8	..	..	Manager fined £4 17s.
,, ...	9/2/11	,, ..	No reading	2	..	80° d.	..	Manager warned.
,, ...	17/2/11	,, ..	,,	2	..	75° w.–76° d.	None	Samples mine-air taken.
New Sylvia	25/4/10	Low level	110	2	55	67° d.	9 in. pipes and fan ..	Manager fined £4 17s.
,, ...	27/7/10	,, at face	231	2	115·5	..	,, ..	..
,, ...	22/12/10	,, 7 in. pipe ..	21	2	10·5	..	7 in. pipes and fan ..	Improvement promised.
,, ...	18/2/11	,, ...	21·11	2	11	66° w.–68° d.	..	..
* Watchman	25/4/10	Charter level	61	4	15	..	8 in. pipes, natural ..	Manager fined £4 17s.
,, ...	27/7/11	,, ...	401 and 256	4	164	..	9 in. pipes	..
,, ...	22/12/10	,, end pipe ..	No reading	4	..	..	7 in. pipes	Manager warned.
,, ...	18/2/11	,, ...	61·6	6	10·19	66° w.–68° d.	8 in. pipes, furnace ..	..
Waitangi	25/4/10	Low level	426	3	142	..	10 in. pipes, fan	First-class conditions.
,, ...	22/7/10	,, ...	810	4	202	..	..	..
,, ...	22/2/11	,, ...	490	3	163·3	..	10 in. pipes, fan	First-class conditions.
May Queen	8/5/10	1,000 ft. Exchange crosscut ..	347	2	173·5	..	7 in. pipes, fan	,,
,, ...	8/5/10	1,000 ft. south drive ..	..	2	..	85° d.	9 in. pipe, blast	Air good and fresh.
,, ...	1/6/10	Nos. 5 and 6 levels ..	No measurement	3	..	..	..	,,
,, ...	1/6/10	1,000 ft. level (south) ..	1,695	4	423·75	82° d.	9 in. pipe, blast	,,
,, ...	1/6/10	Exchange drive	253·9	2	126·5	85° d.	,, ...	..
,, ...	21/7/10	1,000 ft. Exchange reef ..	316	2	158	84° d.	8 in. pipe, blast	..
,, ...	21/7/10	1,000 ft. south drive ..	313	2	156	88° d.	,, ...	..
,, ...	31/10/10	No. 10 (1,000 ft.) face pipe ..	936	3	312	86° d.	14 in. pipe, blast	Deep Levels crosscut.
,, ...	31/10/10	No. 10 N.W. drive ..	544	2	272	88° d.	8 in. pipe, blast	,,
,, S.W. crosscut	29/11/10	No. 10 (1,000 ft.) face pipe ..	626	2	313	84° d.	,, ...	,,
,, N.E. crosscut	29/11/10	,, ,, ..	596	2	298	..	9 in. pipe, blast	,,
,, ...	28/2/11	N.E. crosscut, 7 in. pipe ..	234	2	117	88° d.	.. ..	..
,, ...	27/3/11	1,000 ft. N. crosscut ..	226·8	2	113	88° d.	9 in. pipe, blast	Air discharged into face.
Victoria	10/2/11	No. 2 level	Conditions fair	4	..	..	2 shafts, natural	..
Moanataiari T. ..	17/2/11	Main tunnel at door ..	1,625	6	146 per man	..	2 openings, natural ..	..
				1 horse	600 horse			

Boyd Bennie, Inspector of Mines.

EXHIBIT No. 2.

ANALYSES OF AIR IN SOME OF THE MINES IN THE THAMES COUNTY AND BOROUGH.

Mine.	Date.	Locality in Mine.	Analyses.				Remarks.
			O.	N.	CO_2.	CO.	
Deep Levels ..	9/8/10	Main crosscut ..	20·26	..	2·97	..	Ordered men out of mine.
May Queen ..	9/8/10	1,000 ft. crosscut..	21·03	..	0·13	..	,, ,,
Thames ..	17/2/11	Cambria reef ..	18·65	..	1·79	..	Manager prosecuted.
Alburnia ..	18/2/11	Sons of Freedom..	18·17	..	1·95	..	,,
Watchman ..	17/2/11	Charter level ..	20·00	..	1·01	..	,,
New Sylvia ..	18/2/11	Low level ..	(Bottle broke)				,,

BOYD BENNIE, Inspector of Mines.

EXHIBIT No. 3.

AIR-MEASUREMENTS TAKEN AT THE THAMES GOLDFIELDS (THAMES DEEP LEVELS), BY FRANK REED.

Name of Mine.	Date.	Locality where Measurement taken.	Number of Men per Shift.	Quantity of Air circulating in Cubic Feet per Minute.		Temperature, Deg. Fahr.	
				Total.	Per Man underground.	Wet.	Dry.
May Queen ..	12/8/11	747 ft. level, return ..	6	8,140	1,356	..	..
,, ..	12/8/11	1,000 ft. face, south crosscut	2	339	169	83·5	84·5
,, ..	12/8/11	Exchange reef level ..	..	..	..	82·0	82·0
Saxon ..	12/8/11	1,000 ft. crosscut face, 730 ft. from shaft	..	..	..	80·0	80·0
,, ..	12/8/11	1,000 ft. crosscut, end of air-pipe	4	1,695	424	76·0 51·0*	76·0 51·0*

Name of Mine.	System of Ventilation.	Number of Samples taken.	Remarks.
May Queen ..	Roots blower, 3¾ in. W.G.	Nil	Eight-hour shift.
,, ..	Ditto	Three in crosscut, six at face of crosscut	Quantity measured from 9 in. air-pipe.
,, ..	,, ...	Nil	..
Saxon ..	,, ...	Four	..
,, ..	,, ...	Nil	Quantity measured from 22 in. air-pipe.

BOYD BENNIE, Inspector of Mines.

* Outside shade temperature.

EXHIBIT No. 4.

WAIHI GOLD-MINING COMPANY (LIMITED).—TEMPERATURE OF MINE-AIR OBSERVED BY COMMISSIONERS.

Date.	Level.	Place.	Temperature.	
			Wet Bulb.	Dry Bulb.
			°	°
18/8/11	..	Outside mine, in shade	56½	62½
,,	Plan level 9, 1,000 ft.	Martha, south drive from No. 2 shaft ..	74	75
,,	,,	Welcome, west of Richards's crosscut, 30 ft. in	73	74
,,	,,	Edward, east of Perch's crosscut, about 200 ft. in	73	73½
,,	,,	Edward, 570 ft. in from Perch's crosscut ..	82½	83
,,	,,	No. 4 shaft crosscut, 1,000 ft. in	59	61
,,	,,	Reptile crosscut, 800 ft. in, end of blower-pipe, 800 ft. in	82	82
,,	,,	Empire, east face, 617 ft. in	81½	81½
,,	,,	Royal face, 800 ft. in	78	78
,,	Plan level 10, 1,150 ft.	Face of crosscut	77	77
,,	Plan level 9, 1,000 ft.	Perry's stope, 24 ft. up, Empire	69	70
,,	,,	Brown's stope, Empire	70	72
,,	,,	Martha, south Robinson's stope	68	68½
,,	,,	Dutton's drive	81	82
19/8/11	..	Outside mine, in shade	54	62½
,,	Plan level 8, 850 ft.	Royal, east face, 900 ft. in from No. 4 shaft ..	76	77
,,	,,	Pearson's stope, 88 ft. up	78	79
,,	,,	,, other end	79	79
,,	,,	Napier's stope, 50 ft. up	74	75
,,	,,	Royal, Elsegood's stope, 40 ft. up	81	81
,,	,,	Scorpion crosscut face, 600 ft. in	80	82
,,	,,	Edward and Welcome, 80 ft. up	75	75½
21/8/11	..	Outside mine, in shade	45	54
,,	Plan level 7, 700 ft.	Edward level, under Bullock's pass	79	80
,,	,,	Bullock's stope, 90 ft., west end	82	83¾
,,	,,	,, ,, east end	81½	82
,,	,,	Empire, east (Williams's) stope, 70 ft. up ..	70	77
,,	,,	Furey's stope, 60 ft. up	77½	78½
,,	Plan level 6, 600 ft.	Regina Section, Martha, Prisk's place ..	69½	70
,,	,,	No. 1 shaft, north-west crosscut	59½	61
,,	,,	Martha, south Truscott's stope, 85 ft. up ..	70	70½
,,	,,	Martha, north Cameron's pass, near fallen ground	82	82½
,,	,,	Edward filling-shaft, first observation ..	82	83
,,	,,	,, second observation ..	80	81
,,	,,	Royal, Healey's place	77½	78

M. PAUL, Inspector of Mines.

EXHIBIT No. 5.

OHINEMURI MINES.—PARTICULARS REGARDING TEMPERATURES OF AIR IN QUARTZ-MINES, NORTHERN INSPECTION DISTRICT.

Waihi Mine.

Date.	Locality in Mine where Temperature was taken.	Temperature, in Degrees Fahrenheit.	
		Dry Bulb.	Wet Bulb.
1/12/09	No. 7 level, north-west No. 2 shaft	75	None taken.
,,	No. 1 shaft, north-west crosscut	65	,,
,,	No. 1 shaft, south of north-west crosscut	72	,,
,,	Richards's filling-pass	72	,,
,,	No. 6 shaft, crosscut	..	,,
,,	No. 4 shaft, south crosscut	..	,,
,,	Royal filling-pass	..	,,

EXHIBIT No. 5—*continued.*

OHINEMURI MINES.—PARTICULARS REGARDING TEMPERATURES OF AIR IN QUARTZ-MINES, NORTHERN INSPECTION DISTRICT—*continued.*

Waihi Mine—continued.

Date.	Locality in Mine where Temperature was taken.	Temperature, in Degrees Fahrenheit.	
		Dry Bulb.	Wet Bulb.
1/12/09	Main drive on Royal lode	..	None taken.
,,	No. 8 level, north section, Royal lode	..	,,
,,	No. 4 shaft, drive on Empire lode	..	,,
,,	No. 4 shaft, north-west crosscut	..	,,
2/12/09	Drive along Edward lode	75	,,
,,	Same drive, near its junction with Royal lode	77	,,
,,	Wheel filling-pass	77	,,
,,	Drive on No. 2 lode, 40 ft. west No. 1 filling-pass	..	,,
,,	Main crosscut to No. 6 shaft	65	,,
,,	South section Martha lode, west of Hawkins's stopes	..	,,
,,	No. 9 level crosscut to No. 6 shaft	..	,,
,,	North branch of Royal lode from No. 4 shaft	..	,,
3/12/09	Junction of Welcome and Edward lodes	70	,,
,,	North crosscut from No. 4 shaft	..	,,
,,	Empire lode, east of crosscut	82	,,
,,	Empire lode, west of crosscut	80	,,
,,	Main crosscut from No. 4 to No. 6 shaft	83	,,
,,	North branch of Royal lode, between Nos. 4 and 5 shafts	..	,,
,,	Royal lode, face of drive	82	,,
26/9/10	Main crosscut from No 4 shaft	69	68
,,	Face of drive from Empire to Edward lodes	84	83
,,	Drive east, Empire lode	70	69
,,	Stopes on this lode	75	73
,,	Martha lode, east of No. 9 level	73	71
,,	Face of crosscut, Regina section, No. 9 level	77	76
,,	Drive, south section of Martha	78	76
,,	Drive, north section of Martha	64	61
1 & 2/10/10	South crosscut, No. 6 shaft	58	55
,,	No. 2 lode, west drive	58	55
,,	Face of drive, east footwall section, Martha lode	67	64
,,	Hanging-wall, drive east Martha lode	64	61
,,	Hanging-wall, drive west Martha lode	63	59
,,	Main crosscut, north-east from No. 4 shaft	62	59
,,	South-west crosscut from No. 4 shaft	61	59
,,	Drive on Empire lode	73	71
,,	Drive east on Royal lode	64	61
,,	Stope on Royal lode, 1,000 ft. from crosscut	83	81
,,	Same line of stopes, 300 ft. east	80	78
,,	Temperature of stables for horses in use	71	70
5/10/10	Drive on Royal lode, west of crosscut	67	64
,,	Thomas and party's stopes, Royal lode	83	81
,,	Face of crosscut, west of Royal lode	79	76
,,	Waddel and party's stopes, Edward lode	79	77
,,	Steer and party's stopes, Edward lode	74	72
7/10/10	Charters and party's rise	84	81
,,	Brooking's stopes, Martha lode	67	64
,,	Stopes, footwall section, Martha lode	70	68
,,	Same stopes 160 ft. farther east	67	64
,,	Butler and party's stopes on Martha lode	68	67
,,	Richards and party's stopes on Martha lode	71	69
20/10/10	Main crosscut to No. 6 shaft	60	58
,,	East drive on footwall of Martha lode	69	67
,,	Drive on No. 2 lode	64	62
,,	Drive footwall of Martha lode west	69	68
,,	Rise footwall of Martha lode west	78	77
,,	Stopes on Martha lode above this level	72	71
,,	Main crosscut to No. 2 shaft	68	67
,,	Main crosscut to No. 6 shaft	58	56
,,	Matheson's stope, footwall section	72	70
15/2/11	Drive, No. 11 level	80	79

EXHIBIT No. 5—*continued.*

OHINEMURI MINES.—PARTICULARS REGARDING TEMPERATURES OF AIR IN QUARTZ-MINES, NORTHERN INSPECTION DISTRICT—*continued.*

Waihi Mine—continued.

Date.	Locality in Mine where Temperature was taken.	Temperature, in Degrees Fahrenheit.	
		Dry Bulb.	Wet Bulb.
15/2/11	Drive on Royal lode, No. 10 level	85	84
15/3/11	Drive on Royal lode, No. 10 level	85	84
,,	Reptile crosscut from Royal lode, No. 10 level	80	79
16/3/11	Temperature of air passing down No. 4 shaft	63	..
,,	Temperature of air passing down No. 6 shaft	63	..
20/3/11	Parry and party's stopes, Empire lode, above No. 10 level	76	75
,,	Murphy and party's drive, Edward lode, No. 10 level	83	82
,,	Face of drive, Royal lode, No. 10 level	80	79
,,	Face of drive, Martha lode, No. 10 level	71	70
,,	Face of crosscut through Martha lode, No. 10 level	77	76
,,	Rise on Martha lode, 80 ft. above this level	75	74
,,	Brooks and Down's stopes above this level	73	72
,,	Pearson and party's stope, Royal lode, above No. 9 level	83	82
,,	Fletcher and party's stope, Royal lode, above No. 9 level	84	83
23/3/11	Stopes on Empire lode east, No. 10 level	77	76
,,	No. 1 stope, Royal lode, No. 10 level	77	76
,,	No. 2 stope, Royal lode, No. 10 level	81	80
,,	No. 3 stope, Royal lode, No. 10 level	79	78
,,	No. 4 stope, Royal lode, No. 10 level	83	82
24/3/11	Horan and party's stope on Royal lode, above No. 9 level	87	86
,,	Adjoining stope on same lode farther east	79	78
,,	Cartman and party, same lode	80	79
8/5/11	Reptile crosscut, No. 10 level	82	80
,,	Drive on Empire lode east, No. 10 level	81	80
,,	Drive on Royal lode west, No. 10 level	78	77
,,	Drive on Empire lode west, No. 10 level	74	71
,,	Crosscut for Rex lode, No. 9 level	78	77
,,	Main airway on Empire lode	70	69
26/7/11	Face, No. 11 level	81	80
,,	Main crosscut, No. 11 level, between Nos. 4 and 5 shafts	78	76
,,	No. 10 level, Reptile crosscut	80	79
,,	Rise west face drive on Royal lode, same level	80	79
,,	Main crosscut between Nos. 4 and 6 shafts, same level	61	59
,,	Drive on Welcome lode west, No. 2 shaft, same level	73	71
,,	Dead-end, south face Edward lode, No. 10 level	80	78½
,,	Winze on Empire lode, 65 ft. below this level	73	69
,,	Face of drive east Empire lode, same level	85	80
27/7/11	Main crosscut west of No. 4 shaft to Royal lode, No. 9 level	62	60
,,	Drive, junction of Royal and Edward lodes, same level	80	76
,,	Stope on Scorpion lode, same level	85	84
,,	Scorpion crosscut	85	84
,,	Face of drive on small lode west of Scorpion crosscut	85	83
,,	Drive on Empire lode where horses are stabled	70	67
,,	Main aircourse between Nos. 4 and 6 shafts, near stables	68	66
29/8/10	No. 10 level, main crosscut, from No. 4 to No. 6 shaft	68	66
,,	Empire lode west, No. 10 level	69	68
,,	Face of drive from Empire to Edward lodes, same level	84	83
,,	Drive, east Empire lode, same level	70	69
,,	Stopes on Empire east, above No. 10 level	75	73
,,	Martha lode east, same level	73	71
,,	Face of crosscut, Regina lode	80	78
,,	Drive on south section Martha, same level	78	76
,,	Drive on north section Martha, same level	64	61

EXHIBIT No. 5—*continued.*

OHINEMURI MINES, HAURAKI MINING DISTRICT.—PARTICULARS REGARDING VENTILATION OF QUARTZ-MINES, NORTHERN INSPECTION DISTRICT.

Waihi Mine.

Date.	Where Measurement taken.	Volume of Air circulating.
		Cub. ft.
1/12/09	No. 7 level, north-west No. 2 shaft	2,071
,,	No. 1 shaft, north-west crosscut	6,272
,,	No. 1 shaft, south of north-west crosscut	5,088
,,	Richards's filling-pass	No reading.
,,	No. 6 shaft, crosscut	1,280
,,	No. 4 shaft, south crosscut	1,280
,,	Royal filling-shaft	No reading.
,,	Main drive on Royal lode	9,585
,,	No. 8 level, north section Royal lode	1,575
,,	No. 4 shaft, drive on Empire lode	2,376
,,	No. 4 shaft, north-west crosscut	5,120
2/12/09	Drive along Edward lode, same level	2,080
,,	Same drive near its junction with Royal lode	3,331
,,	Wheel filling-pass	1,472
,,	Drive on No. 2 lode, 40 ft. west No. 1 filling-pass	3,307
,,	Main crosscut to No. 6 shaft, No. 8 level	6,327
,,	South section of Martha lode, west of Hawkins's stopes	2,275
,,	No. 9 level crosscut to No. 6 shaft	18,560
,,	North branch Royal lode, No. 4 shaft	3,375
3/12/09	Junction of Welcome and Edward lodes	6,352
,,	No. 10 level, north crosscut, from No. 4 shaft	5,850
,,	Empire lode, east of crosscut	No reading.
,,	Empire lode, west of crosscut	,,
,,	Main crosscut from No. 4 to No. 6 shaft	,,
,,	North branch of Royal lode, between Nos. 4 and 5 shafts	1,400
,,	Royal lode, face of drive	No reading.
26/8/10	Main crosscut from No. 4 shaft, same level	12,726
,,	Face of drive from Empire to Edward lode	No reading.
,,	Drive, east Empire lode	10,416
,,	Martha lode, east	No reading.
,,	Face of crosscut, Regina section	,,
,,	Drive, south section, Martha	,,
,,	Drive, north section, Martha	2,352
1 & 2/10/10	South crosscut, No. 6 shaft	12,800
,,	No. 2 lode, drive west	2,940
,,	Face of drive, east footwall section, Martha	No reading.
,,	Hanging-wall, drive east Martha lode	,,
,,	Hanging-wall, drive west Martha lode	940
,,	Main crosscut, north-east from No. 4 shaft	1,438
,,	South-west crosscut from No. 4 shaft	7,910
,,	Drive on Empire lode	7,200
,,	Drive east on Royal lode	No reading.
,,	Stope on Royal lode, 1,000 ft. from crosscut	,,
,,	Same line of stopes, 300 ft. east	,,
,,	Temperature of stables for horses in use	,,
5/10/10	Drive on Royal lode west of crosscut	2,660
,,	Thomas and party's stopes, Royal lode	No reading.
,,	Face of crosscut, west Royal lode	,,
,,	Waddel and party's stopes, Edward lode	,,
,,	Steer and party's stopes, Edward lode	,,
7/10/10	Charters and party's rise	,,
,,	Brooking's stopes, Martha lode	,,
,,	Stopes, footwall section, Martha lode	,,
,,	Same stopes, 160 ft. farther east	,,
,,	Butler and party's stopes, Martha lode	,,
,,	Richards and party's stopes, Martha lode	,,
20/10/10	Main crosscut to No. 6 shaft	,,
,,	East drive on footwall of Martha lode	1,610
,,	Drive on No. 3 lode	2,380
,,	Drive footwall, Martha lode west	No reading.
,,	Rise footwall, Martha lode west	,,

EXHIBIT No. 5—*continued.*

OHINEMURI MINES, HAURAKI MINING DISTRICT.—PARTICULARS REGARDING VENTILATION OF QUARTZ-MINES, NORTHERN INSPECTION DISTRICT—*continued.*

Waihi Mine—continued.

Date.	Where Measurement taken.	Volume of Air circulating.
		Cub. ft.
20/10/10	Stopes on Martha lode	No reading.
,,	Main crosscut to No. 2 shaft	7,936
,,	Main crosscut to No. 6 shaft	7,688
,,	Matheson's stope, footwall section, Martha	No reading.
,,	Main crosscut, south No. 4 shaft	,,
,,	Drive on Royal lode east	6,846
16/6/11	No. 4 shaft	24,120
,,	No. 6 shaft	15,480
26/7/11	Main crosscut between Nos. 4 and 5 shafts	7,875
,,	Reptile crosscut	464
,,	Main crosscut between Nos. 4 and 5 shafts east on Empire lode	9,324
,,	Face of drive east on Empire lode	122
27/7/11	Main crosscut west of shaft to Royal lode	4,320
,,	Stope on Scorpion lode	1,930
,,	Scorpion crosscut	87
,,	Drive west on Royal lode	4,200

OHINEMURI MINES, HAURAKI MINING DISTRICT.—PARTICULARS REGARDING ANALYSIS OF AIR TAKEN IN QUARTZ-MINES, NORTHERN INSPECTION DISTRICT.

Date.	Locality where Sample taken.	Oxygen.	Carbon-dioxide.
	Waihi Mine.		
15/2/11	No. 11 level	20·83	0·280
,,	No. 10 level, Royal lode	20·30	0·370
26/7/11	No. 1, near face, No. 11 level	..	0·376
,,	No. 2, Reptile crosscut, No. 10 level	..	0·096
,,	No. 3, rise west face drive, Royal lode	..	..
,,	No. 4, south face on Edward lode	..	0·041
,,	No. 5, winze on Empire lode, 65 ft. below this level	..	..
,,	No. 6, face of drive east on Empire lode	..	..
27/7/11	No. 7, No. 9 level, Scorpion crosscut	..	0·298
,,	No. 8, face of drive on small lode west of Scorpion crosscut	..	0·150
,,	No. 9, main airway near stables	..	0·096
,,	No. 10, drive on Empire lode where there are eight stalls, four horses in when sample taken	..	0·056
,,	No. 11, drive west on Royal lode over Gable's stopes	..	0·037
,,	No. 12, same drive further west	..	0·110
	Waihi Grand Junction Mine.		
15/2/11	Empire lode, No. 5 level	20·96	0·100
,,	Mary lode, No. 4 level	20·40	0·170
28/7/11	No. 13, face of drive on George lode, No. 5 level	..	0·098
,,	No. 14, Adams's stopes, Royal lode, above No. 5 level	..	0·128
,,	No. 15, Mary lode, Anderson's stope, above this level	..	0·055
,,	No. 16, face of drive east on Mary lode, same level	..	..
,,	No. 17, stope west on Mary lode above this level	..	0·065
,,	No. 18, drive on Grace lode, 1,000 ft. from shaft	..	..
	Waihi Reefs Consolidated Mine.		
28/7/11	No. 19, taken from bottom of shaft	..	0·381

M. PAUL, Inspector of Mines.

EXHIBIT No. 6.

[Not printed.]

EXHIBIT No. 7.

AIR-MEASUREMENTS TAKEN AT WAIHI GRAND JUNCTION MINE, 28TH AUGUST, 1911.

Locality where Measurement taken.	Quantity of Air circulating, in Cubic Feet per Minute.	Total Number of Men on Day Shift.	Average Quantity of Air per Man, in Cubic Feet per Minute.
Intake Air.			
No. 5 level—			
South crosscut	16,293	8	2,036
North crosscut	14,492	18	805
No. 4 level—			
North crosscut	4,738	12	394
No. 3 level—			
North crosscut	9,332	50	186
Measured intake from fan	44,855		
From natural sources—balance	2,710		
Total intake	47,565	88	540
Return Air.			
Passing through into Extended Mine at No. 5 level	11,550		
Passing through fan	36,015		
Total measured return	47,565	88	540

NOTE.—The fan is of Sirocco type, double inlet, electrically driven. Estimated B.H.P., 34; observed W.G., 1·12 in. Temperature of outside air in shade, 51½° wet bulb, 54° dry bulb; temperature of mine-air discharged, 69° wet bulb, 69° dry bulb; temperature of mine, maximum observed, 83° wet bulb, 83½° dry bulb.

M. PAUL, Inspector of Mines.

EXHIBIT No. 8.

WAIHI EXTENDED AND WAIHI GRAND JUNCTION MINES.—TEMPERATURE OF MINE-AIR OBSERVED BY COMMISSIONERS.

Date.	Level.	Place.	Temperature.	
			Wet Bulb.	Dry Bulb.
		Waihi Extended Mine.	°	°
26/8/11	..	Outside mine, in shade (wet day) ..	49	50
,,	No. 5 (960 ft.) ..	Plat at winding-shaft	79½	83
,,	,, ..	West crosscut at timber stopping (no work being done here)	89	90
,,	Sump (1,100 ft.) ..	Shaft-bottom during sinking (ventilated by pipes from blower fan)	88	88
		Waihi Grand Junction Mine.		
28/8/11	..	Outside mine, in shade	52	55
,,	No. 5 (944 ft.) ..	Return air from mine at fan	69	69
,,	,, ..	Plat at shaft	60	63½
,,	,, ..	No. 1 winze, Grace lode, 40 ft. down ..	79	82
,,	,, ..	Ferguson's stope, Empire lode, 900 ft., east	73	76
,,	,, ..	On level under Ferguson's stope ..	64½	70½
,,	,, ..	Lindwall's stope, Royal, east	70½	73½
,,	,, ..	Adams's stope	83	84
,,	,, ..	Keen's stope, 40 ft. up, Mary lode ..	83	83½
,,	,, ..	Keen's stope, other end	70	75
,,	,, ..	On level under stope	67½	71
,,	,, ..	At connection with Extended	73	84½
,,	,, ..	Henderson's stope, 42 ft. up	78	79
,,	,, ..	Henderson's stope, another place ..	78	81
,,	,, ..	Under Henderson's stope, at level ..	71	74

M. PAUL, Inspector of Mines.

EXHIBIT No. 9.

OHINEMURI MINES, HAURAKI MINING DISTRICT.—PARTICULARS REGARDING TEMPERATURE OF AIR, QUARTZ-MINES, NORTHERN INSPECTION DISTRICT.

Waihi Grand Junction Mine.

Date.	Locality in Mine where Temperature taken.	Temperature, in Degrees Fahrenheit.	
		Dry Bulb.	Wet Bulb.
20/7/10	No. 5 level, face of drive, Royal lode west	80	..
,,	Face of drive, Royal lode east, same level	84	..
,,	Face of drive, Empire lode west, same level	74	..
,,	Stopes, Empire lode west, same level	74	..
,,	South-east crosscut, same level	65	..
,,	North-west crosscut, same level	65	..
,,	Drive, Empire lode west, same level	75	..
,,	Drive, Empire lode east, same level	75	..
,,	Face of drive, taken from air-pipe, same level	88	..
,,	Face of drive, Royal lode west	75	..
,,	New crosscut, same level	81	..
,,	Martha lode east, same level	75	..
,,	Martha lode east, same level	74	..
,,	Face of drive, Martha lode east, same level	87	..
,,	Temperature of air delivered at this face	86	..
,,	North crosscut, No. 4 level	65	..
,,	Winze on Royal lode east, No. 4 level	86	..
26/7/10	Winze on Royal lode, below No. 4 level	86	..
,,	Rise on Royal lode, above No. 5 level	88	..
,,	Rise on Martha lode, above No. 5 level	90	..
,,	Drive on Empire lode east, No. 5 level	85	..
15/2/11	Royal lode drive east, No. 5 level	87	81
,,	Drive on Mary lode, No. 4 level	83	82
28/7/11	No. 5 level, face of drive, on George lode	80½	79
,,	Adams's stope, Royal lode, above No. 5 level	83	80
,,	Main airway, Royal lode, No. 5 level	68	65
,,	Main crosscut south of shaft, No. 5 level	55	53½
,,	Drive on Grace lode, 1,000 ft. east of shaft, No. 5 level	85	81
,,	Mary lode, Anderson's stopes, above this level	85	81
,,	Face of drive east on Mary lode, same level	84	81
,,	Stope west on Mary lode, above this level	83	82
,,	Crosscut to Mary lode, same level	None taken.	
,,	Main crosscut north of shaft, No. 4 level	61	58

OHINEMURI MINES, HAURAKI MINING DISTRICT.—PARTICULARS REGARDING VENTILATION OF QUARTZ-MINES, NORTHERN INSPECTION DISTRICT.

Waihi Grand Junction Mine.

Date.	Where Measurement taken.	Volume of Air circulating.
		Cub. ft.
29/10/09	No. 1 lode, west crosscut	3,360
,,	Same lode, west No. 4 winze	3,780
,,	Main crosscut, north of shaft	3,780
,,	South-east crosscut, between shaft and No. 4 lode	9,100
,,	Empire lode, 10 ft., west of crosscut	6,300
,,	Same lode, at end timbers	2,900
,,	Empire lode, east crosscut	3,360
,,	Empire lode, further east between Nos. 7 and 8 winzes	1,470
,,	Main crosscut, north of shaft	19,320
,,	No. 2 lode, west No. 4 winze	6,300
,,	No. 1 lode, east crosscut	2,604
,,	South-east crosscut	5,512
,,	Empire lode east	5,880
,,	South-east crosscut, No. 5 level	9,088

EXHIBIT No. 9—*continued.*

OHINEMURI MINES, HAURAKI MINING DISTRICT. — PARTICULARS REGARDING VENTILATION OF QUARTZ-MINES, NORTHERN INSPECTION DISTRICT—*continued.*

Waihi Grand Junction Mine—continued.

Date.	Where Measurement taken.	Volume of Air circulating.
		Cub. ft.
20/7/10	North-west crosscut, same level	9,152
,,	Drive, Empire lode west, same level	2,002
,,	Drive, Empire lode east, same level	2,229
,,	Face of drive taken from air-pipe, same level	460
,,	Face of drive, Royal lode west, same level	900
,,	New crosscut, same level	No reading.
,,	Martha lode east	2,352
,,	Martha lode east	5,670
,,	North crosscut, same level	23,296
19/1/11	Main crosscut, No. 3 level	6,154
,,	Main crosscut, No. 4 level	7,995
,,	Main crosscut, No. 5 level	18,767
,,	Royal lode drive east, No. 5 level	No reading.
,,	Drive on Mary lode, No. 4 level	,,
28/7/11	Face of drive on George lode, No. 4 level	,,
,,	Adams's stope, Royal lode, above No. 5 level	,,
,,	Main airway, Royal lode, No. 5 level	7,315
,,	Main crosscut south of shaft, same level	21,315
,,	Drive on Grace lode, 1,000 ft. east of shaft, same level	876,928
,,	Mary lode, Anderson's stopes, above this level	798
,,	Face of drive east on Mary lode, same level	No reading.
,,	Stope west on Mary lode, above this level	,,
,,	Crosscut to Mary lode, same level	7,000
,,	Main crosscut north of shaft, No. 4 level	8,320

OHINEMURI MINES, HAURAKI MINING DISTRICT.—PARTICULARS REGARDING TEMPERATURE AND VENTILATION OF QUARTZ-MINES, NORTHERN INSPECTION DISTRICT.

Waihi Extended Mine.

Date.	Where Measurement taken.	Temperature, in Degrees Fahrenheit.		Anemometer Reading.
		Dry Bulb.	Wet Bulb.	
				Ft.
24/11/09	Crosscut, No. 4 level	83	..	6,300
,,	Face of crosscut, No. 4 level	96	..	..
,,	No. 2 crosscut, No. 5 level	..	..	2,450
,,	Face on No. 2 reef, No. 5 level	90	..	..
,,	Half-way in this drive, No. 5 level	83	..	..

M. PAUL, Inspector of Mines.

EXHIBIT No. 10.

FATAL ACCIDENTS WHICH HAVE OCCURRED DURING THE YEAR 1911.

A. C. Anderson, killed by a fall of quartz in stopes on Royal lode at No. 5 level, Waihi Grand Junction Mine, on the 16th January, 1911.

James Samson, killed by a fall of quartz in the stopes on the Martha lode at No. 8 level, Waihi Mine, on the 17th May, 1911.

SERIOUS ACCIDENTS WHICH HAVE OCCURRED DURING THE YEAR.

William Moran, lost eyesight by an explosion of gelignite in the Waihi Grand Junction Mine on the 19th January, 1911.

Thomas Franklin, lost left arm at elbow owing to blasting accident at No. 5 level, Waihi Grand Junction Mine, on the 15th April, 1911.

William Simpson, arm broken by being struck by handle of windlass in Komata Reefs Mine, Komata, on the 11th April, 1911.

George Faulder, received nasty cut on head and back, also left hand injured, by a fall of ground in the Waihi Mine, being unable to get away from a shot, on the 17th April, 1911.

D. Smeaton, small bone in leg broken in Waihi Mine on the 18th April, 1911.

Henry Colhurst, leg broken by a fall of stone, Old Hauraki Mine, Coromandel, on the 16th May, 1911.

William Hill, lost right eye, and left eye seriously impaired, by a blasting accident in the Waihi Mine on the 24th May, 1911.
P. Martin, broken leg, Waihi Grand Junction Mine, on the 30th May, 1911.
Samuel Thornally, severe cuts about head and face, also ribs broken, one of which penetrated the lung, in surface cutting, Waihi Mine, on the 24th June, 1911.
Hugh McKernon, fractured skull, Waihi Grand Junction Mine, on the 22nd July, 1911.
H. W. Jones, broken leg, Four-in-Hand Mine, Coromandel, on the 7th August, 1911.

TOTAL NUMBER OF ACCIDENTS IN THE WAIHI MINE SINCE 13TH APRIL, 1911.

April.

Robert Dick, strained himself using crowbar, Waihi Mine, 22nd April, 1911.
D. Smeaton, small bone of leg broken, Waihi Mine, 18th April, 1911.
G. Faulder, blasting accident, Waihi Mine, 17th April, 1911.
G. MacRae, injury to eye, Waihi Mine, 29th April, 1911.
R. Hawke, poisoned hand, Waihi Mine, 20th April, 1911.
R. J. Andrews, injury to eye, Waihi Mine, 13th April, 1911.
G. Warby, poisoned ankle, Waihi Mine, 17th April, 1911.
R. Hatfield, poisoned ankle, Waihi Mine, 28th April, 1911.
D. Strong, injury to back, Waihi Mine, 19th April, 1911.
E. Weston, injury to foot, Waihi Mine, 26th April, 1911.
S. McLeary, crushed fingers, Waihi Mine, 22nd April, 1911.
A. Williamson, injury to thumb, Waihi Company's Victoria Mill, 28th April, 1911.
T. Sharkey, injury to knee, Waihi Mine, 26th April, 1911.
John Rigby, strained back, Waihi Mine, 18th April, 1911.
H. Wallace, poisoned finger, Waihi Mine, 22nd April, 1911.

Total for month of April, 15.

May.

A. McLeary, Waihi Mine, 11th May, 1911.
John Owens, injury to hand, Waihi Mine, 12th May, 1911.
James Samson, killed by a fall of quartz, Waihi Mine, 17th May, 1911.
W. Huxtable, injury to arm, Waihi Mine, 22nd May, 1911.
John Cunliffe, Waihi Mine, 23rd May, 1911.
J. J. Casey, Waihi Mine, 24th May, 1911.
William Hill, blasting accident (will probably lose sight), Waihi Mine, 24th May, 1911.
T. Brydon, Waihi Mine, 25th May, 1911.
Robert Trembath, pneumoconiosis, Waihi Mine, 31st May, 1911.
J. Burt, injury to hand, Waihi Mine, 16th May, 1911.
C. Perry, injury to foot, Waihi Mine, 9th May, 1911.
T. Smith, injury to head, Waihi Mine, 2nd May, 1911.
C. Burley, injury to knee, Waihi Mine, 10th May, 1911.
A. Jones, injury to hand, Waihi Mine, 10th May, 1911.
A. Atkinson, injury to head, Waihi Mine, 17th May, 1911.
S. West, Waihi Company's Victoria Mill, Waikino, 3rd May, 1911.
James O'Connor, pneumoconiosis, Waihi Company's Battery, 12th May, 1911.

Total for month of May, 17.

June.

Percy Wigmore, injury to foot, Waihi Mine, 1st June, 1911.
W. H. Cardwell, crushed fingers, Waihi Mine, 2nd June, 1911.
R. Lockyer, injury to foot, Waihi Mine, 7th June, 1911.
Alex. Ross, strained muscles, Waihi Mine, 12th June, 1911.
Ernest Opie, injury to thumb, Waihi Mine, 8th June, 1911.
A. Lucas, injury to wrist, Waihi Mine, 10th June, 1911.
James Kellet, injury to hands, Waihi Company's Sawmill, 15th June, 1911.
R. McLoud, injury to leg, Waihi Battery, 13th June, 1911.
F. J. Williams, crushed finger, Waihi Mine, 22nd June, 1911.
Walter A. Abbott, pneumoconiosis, Victoria Mill, Waikino, 19th June, 1911.
G. T. White, severe hæmorrhage, Waihi Mine, 19th June, 1911.
H. Morton, Waihi Mine, 1st June, 1911.
S. Thornally, broken ribs, Waihi Mine, 24th June, 1911.
S. Proctor, injury to hand, Waihi Mine, 26th June, 1911.
N. Thomas, crushed finger, Waihi Mine, 19th June, 1911.
A. Quinlan, crushed foot, Waihi Mine, 21st June, 1911.

Total for month of June, 16.

July.

W. H. Forsland, contusion of foot, Waihi Mine, 8th July, 1911.
J. Cornthwaite, injury to finger, Waihi Battery, 12th July, 1911.
D. Fitzgerald, contused elbow, Waihi Mine, 13th July, 1911.
H. S. Bull, strained back, Waihi Mine, 10th July, 1911.
R. McLeary, injury to thumb, Waihi Mine, 10th July, 1911.

W. Holdsworth, broken finger, Waihi Mine, 15th July, 1911.
J. E. Williams, crushed finger, Waihi Mine, 17th July, 1911.
T. Cartman, injury to leg, Waihi Mine, 15th July, 1911.
M. Kuluz, injury to thumb, Waihi Mine, 27th July, 1911.
C. Parry, scalp wound, Waihi Mine, 25th July, 1911.
W. J. Thompson, injury to hand, Waihi Mine, 26th July, 1911.
M. Mahoney, crushed leg, Waihi Mine, 31st July, 1911.
— Hughes, crushed finger, Waihi Mine, 14th July, 1911.

Total for month of July, 13.

August.

E. King, scalp wound, Waihi Mine, 2nd August, 1911.
A. Burt, injured by a fall down a winze, Waihi Mine, 1st August, 1911.
J. R. Morrison, injury to leg, Waihi Mine, 1st August, 1911.
G. R. Thomas, injury to finger, Waihi Mine, 9th August, 1911.
W. F. Reynolds, injury to wrist, Waihi Mine, 6th August, 1911.
P. MacDonald, sprained ankle, Victoria Mill, Waikino, 8th August, 1911.
R. Arnscott, injury to groin, Waihi Mine, 12th August, 1911.
William Moore, injury to finger, Victoria Mill, Waikino, 15th August, 1911.
Roger Hartley, injury to hand, Waihi Mine, 12th August, 1911.
W. Collins, contused wound left hand, Waihi Mine, 15th August, 1911.
Jacob Beck, injured back and head, Waihi Mine, 2nd August, 1911.
Andrew Love, injury to hand, Waihi Mine, 15th August, 1911.
Sydney O'Dell, injury to head, Waihi Mine, 14th August, 1911.
Cecil Farrely, injury to finger, Waihi Mine, 18th August, 1911.
G. B. Cooper, injury to hand, Waihi Mine, 19th August, 1911.

Total for month of August, 15.

CORONERS' INQUESTS AT WAIHI, HAURAKI MINING DISTRICT.—VERDICTS AND RIDERS RETURNED FOR PERIOD JANUARY, 1909, TO JULY, 1911, INCLUSIVE.

(1.) 18th February, 1909.—*Verdict:* "That the deceased, Joseph Hearn, met his death on the 18th February, 1909, at the Waihi District Hospital, through the result of injuries received from an accident whilst working on the No. 8 level, No. 2 shaft, of the Waihi Company's Mine; no blame being attachable to any one." *Rider:* A rider was added to the effect that in future a temporary staging be erected in passes during cribbing operations, but was deleted on the recommendation of the Coroner and Mining Inspector, as the construction of stages in passes would only increase the chance of accident, as men would have to go into the pass to take the staging out. The company's representative also agreed to recommendation.

(2.) 12th July, 1909.—*Verdict:* "That the deceased, Stanley Foster, met his death by accidentally falling down the shaft at the Waihi Beach Company's Mine on 8th July, 1909; no blame being attachable to any one." *Rider:* We would suggest that in future the bearers be put under the tank instead of through the straps.

(3.) 27th August, 1909.—*Verdict:* "That the deceased, George H. Roycroft, met his death at Waihi on the 26th day of August, 1909, as the result of injuries received by accidentally slipping and falling from the scaffolding of one of the B. and M. agitating-tanks at the Waihi Grand Junction Gold-mining Company's Mine; no blame being attachable to any one." *Rider:* The jury recommend that all scaffolding on such tanks be protected by a plank not less than 6 in. high on the outer edge of the platform.

(4.) 27th October, 1909.—*Verdict:* "That the deceased, Edward J. Liddy, came to his death on the 26th day of October, 1909, at the Waihi Hospital, as the result of injuries received in the Waihi Company's Mine on the 16th day of October, 1909; no blame being attachable to any one." *Note:* The evidence showed that there was no definite place fixed for the leaders of the shifts to meet, so that the leader of the outgoing shift could report as to the nature of the workings to the leader of the ingoing shift. The Coroner and Mining Inspector suggested that the jury make a recommendation in the matter, but this was not acted upon.

(5.) 3rd December, 1909.—*Verdict:* "That the deceased, Robert G. Stone, came to his death through hæmorrhage of the brain caused by a piece of timber, 6 in. by 2 in. and 4 ft. 6 in. long, falling on him while pulling down some old fluming at the Waihi Company's Union Battery. We find that the cause of death was purely accidental, and that no blame is attachable to any one."

(6.) 11th March, 1910.—*Verdict:* "That the deceased, Frederick Whyte and John O'Malley, met their death by falling down the Waihi Gold-mining Company's No. 4 pumping-shaft, there being no evidence to show how or what caused them to fall; no blame being attachable to any one." *Rider:* That men working in shafts be compelled to place adequate and cleated stage-boards beneath them.

(7.) 16th August, 1910.—*Verdict:* "That the deceased, George Henesy, met his death from injuries received whilst in the employ of the Waihi Company at Waikino on the 14th day of August, 1910, through attempting single-handed to place a belt on a revolving pulley, which duty should not be undertaken by one man. The jury find there is no blame attachable to the Waihi Company nor to any of its officials." *Rider:* That it be a recommendation to the Waihi Company that, wherever practicable, a guard be placed over the studs and collars of revolving shafts.

(8.) 13th October, 1910.—*Verdict:* "That the deceased, Charles A. Cavanagh, died in the Waihi Hospital on the 3rd day of October, 1910, from the result of injuries received by accidentally falling down the Waihi Company's No. 6 shaft when engaged in timbering operations on the 5th day of October, 1909."

(9.) 19th October, 1910.—*Verdict:* "That the deceased, Matthew Berryman, met his death by accidentally falling out of the cage down the No. 2 shaft of the Waihi Company's Mine on the 14th day of October, 1910." *Rider:* That, in our opinion, something should be done to prevent a similar accident, and we recommend that a conference be held between the Mining Inspector, the Miners' Union Inspector, and the Waihi Company's representative, with a view of devising some scheme of safeguarding the lives of men travelling in shafts.

(10.) 14th November, 1910.—*Verdict:* "That the deceased, Joyce William Chapman, met his death accidentally while repairing machinery when in motion at the Waihi Company's Waihi Battery on the 11th day of November, 1910." *Rider:* The jury is of the opinion that work of that nature should not be attempted while the machinery is in motion.

(11.) 17th January, 1911.—*Verdict:* "That the deceased, Andrew Craig Anderson, met his death accidentally on the 16th day of January, 1911, in the Waihi Grand Junction Company's Mine at Waihi, by a fall of stone; no blame being attachable to any one."

(12.) 17th May, 1911.—*Verdict:* "That the deceased, James Samson, met his death accidentally in the Waihi Company's Mine on Wednesday, the 17th day of May, 1911, through a fall of stone; no blame being attachable to any one."

Summary.—Ten killed in Waihi Mine and batteries, two killed in the Waihi Grand Junction Mine, and one killed in the Waihi Beach Mine.

All the verdicts were unanimous, and three out of the six jurors were working-miners not engaged in the mine where fatality occurred. Scene of accident inspected in each case.

I would recommend that the workmen's inspector under the Mining Act have a legal right to attend inquests and to examine and cross-examine witnesses.

Waihi, 23rd August, 1911.

M. PAUL, Inspector of Mines, Waihi.

EXHIBIT No. 11.

OHINEMURI MINES, HAURAKI MINING DISTRICT.—PARTICULARS REGARDING TEMPERATURE AND VENTILATION OF QUARTZ-MINES, NORTHERN INSPECTION DISTRICT.

Talisman Mine.

Date.	Where Measurement taken.	Temperature, in Degrees Fahrenheit.		Anemometer Reading.
		Dry Bulb.	Wet Bulb.	
				Ft.
29/9/10	No. 11 level	70	..	9,610
,,	Bonanza stopes, above No. 12 level	78	..	1,600
,,	Main drive, junction east and west branch, south shaft, No. 12 level	77	..	4,536
,,	Drive on reef north of shaft, No. 12 level	69	..	3,615
,,	No. 13 level, No. 6 winze, driving north and south from bottom, temp. each face	81	..	..
,,	South drive on reef, No. 13 level	79	..	7,200
,,	No. 12 winze, 150 ft. below No. 13 level	73	..	..
,,	Leading stope south of No. 12 rise, No. 13 level	81	..	..
,,	Drive on reef south No. 12 winze, No. 12 level	81	..	2,310
,,	Mullock rise south of No. 12 rise, above No. 10 level	83	..	..
4/4/11	South face drive, No. 13 level	79	78	..
,,	Bonanza stopes south No. 15 rise, same level	79	78	..
,,	No. 13 winze, below No. 13 level	83	81	..
,,	Mullock rise between Nos. 12 and 15 rises, same level	82	81	..
,,	Bottom of No. 12 winze, south face, same level	80	79	..
,,	North face, bottom of same winze, same level	78	77	..
,,	Face of north drive, No. 12 level	69	68	..
,,	Face of drive, Shepherd's lode, same level	69	68	..
,,	Bonanza stopes, intermediate level	77	75	..
,,	Bonanza stopes, above No. 12 level	78	77	..
,,	Same stope north of No. 12 rise, same level	77	76	..
,,	Stopes on east branch, north No. 7 winze	76½	75½	..
,,	Main crosscut, river level	67	65	..
3/8/11	Main crosscut, 70 ft. above No. 13 level, leading to Woodstock shaft	60	56	4,950
,,	Main crosscut, south of shaft, No. 13 level	62	60	5,530
,,	Main drive on reef north of No. 12 winze	70	64	6,300
,,	Face of drive on main lode north, over 1,000 ft. from shaft	77	76	No reading.
,,	No. 16 rise, 20 ft. north of above face, height 106 ft.	74	72½	102·2
,,	Welcome winze, east crosscut, No. 13 level, depth 62 ft.	80	78	No reading.
,,	North face, bottom of No. 12 winze, 140 ft. below No. 13 level	76	73	1,081·7
,,	South face from bottom No. 12 winze	80	75	No reading.

EXHIBIT No. 11—*continued.*

OHINEMURI MINES, HAURAKI MINING DISTRICT.—PARTICULARS REGARDING TEMPERATURE OF AIR IN QUARTZ-MINES, NORTHERN INSPECTION DISTRICT.

New Zealand Crown Mines.

Date.	Locality in Mine where Temperature taken.	Temperature, in Degrees Fahrenheit.		Volume of Air circulating.
		Dry Bulb.	Wet Bulb.	
				Cub. ft.
7/8/11	Main crosscut, No. 4 level	55	54	6,489
,,	Edwards's stopes, above No. 4 level	59	56	No reading.
,,	Hodge's rise, 32 ft. above No. 4 level	62	59	,,
,,	Wall's rise, below No. 4 level, Welcome reef	64	62	,,
,,	Radcliffe's stope, 100 ft. above No. 4 level	69	65	,,
,,	Main crosscut, No. 3 level	54	52	2,835
,,	Robinson and party's drive south on Welcome reef	58	56	No reading.
,,	Rise on same lode, above this level 16 ft.	60	58	,,
,,	Main crosscut, No. 2 level	None taken		3,906
,,	Main crosscut, No. 5 level	58	56	7,889
,,	Main shaft	56	53	17,400
,,	Digby and party's rise and stope, above No. 2 level	60	56	No reading.
,,	Digby's rise, above No. 3 level	70	66	,,
,,	O'Mara and party's stope, midway between Nos. 2 and 3 levels	62	59	,,
5/11/09	Waitewheta level	..	..	7,030
,,	Main reef, No. 4 level, south of shaft	70		2,080
,,	Main shaft, which is 30 ft. in length by 9 ft. wide	78		16,740

MATTHEW PAUL, Inspector of Mines.

EXHIBIT No. 12.

COROMANDEL MINES.—PARTICULARS REGARDING TEMPERATURE OF QUARTZ-MINES, NORTHERN INSPECTION DISTRICT.

Date.	Locality in Mine where Temperature taken.	Temperature, in Degrees Fahrenheit.		Volume of Air circulating.
		Dry Bulb.	Wet Bulb.	
	Old Hauraki Mine.			Cub. ft.
14/9/10	220 ft. level, main drive	74	71	1,914
,,	220 ft. level, face of stope	74	71	No reading.
,,	300 ft. level, drive on reef	76	74	,,
,,	300 ft. level, crosscut	74	72	1,892
,,	400 ft. level, main crosscut	69	67	1,575
	Kapanga Mine.			
11/8/11	1,000 ft. level, drive west 500 ft. from chamber	83	83	No reading.
,,	1,000 ft. level, drive east 60 ft. from chamber	77	76	,,
,,	920 ft. level, drive north	76	75	,,
,,	940 ft. level, drive west	77	76	,,
,,	940 ft. level, rise 30 ft. above this level	77	76	,,
,,	900 ft. level, drive east 100 ft. from shaft	76	75	,,

MATTHEW PAUL, Inspector of Mines.

EXHIBIT No. 13.

PARTICULARS REGARDING VENTILATION AT TAUPIRI COAL-MINES (LIMITED).

(Taken by Mines Commission.)

Date.	Locality of Measurements.	Quantity of Air per Minute.	Number of Men per Shift.	Temperature.		Remarks.
				Wet Bulb.	Dry Bulb.	
	Ralph's Colliery.	Ft.		°	°	
5/9/11	No. 6 intake	12,750	122 men, 4 horses	60	61	
,,	Haulage-road intake	21,620		59	61	
,,	Taupiri, west drive, intake	16,016	48 men, 1 horse	58	59	Total air, 50,386 cubic feet per minute.
,,	North return	33,600	..	..	..	
,,	South return	20,000	..	..	..	Total return, 53,600 cubic feet per minute

EXHIBIT No. 13—*continued.*

PARTICULARS REGARDING VENTILATION AT TAUPIRI COAL-MINES (LIMITED)—*continued.*

Date.	Locality of Measurements.	Quantity of Air per Minute.	Number of Men per Shift.	Temperature.		Remarks.
				Wet Bulb.	Dry Bulb.	
		Extended Colliery.				
6/9/11	No. 4 dip	..	..	68	68½	Taken on top of bench.
,,	No. 5 east, Couch and Stone's place	..	..	69	70	
,,	Walker and Parkin's stenton	..	..	68	69	
,,	Intake, west heading, No. 5 flatsheet	21,085	..	..	..	236·8 ft. per man.
,,	West level, No. 2 flatsheet	17,234	..	..	..	200 ft. per man.
		38,319				
,,	Return, west heading ..	24,540	..	..	..	
,,	West level, return ..	18,148	..	..	..	
		42,688				
	Fan drift	56,625				

System of ventilation: 50 in. Sirocco fan, double inlet, W.G. 1·3.

PARTICULARS REGARDING VENTILATION AT TAUPIRI COAL-MINES (LIMITED).

(Taken by the Inspector of Mines.)

Date of Inspection.	Locality where Measurement taken.	Quantity of Air per Minute.		Number of Men per Shift.	Temperature.	
		Total.	Per Man. Per Horse.		Wet Bulb.	Dry Bulb.
		Ralph's Colliery.				
		Ft.	Ft.		°	°
7/9/10	Main dip intake	26,479	173 600	132 men 6 horses	63	64
8/12/10	Main dip, No. 7, north return ..	18,525	214·4 600	78 men 3 horses	..	71
,,	Main intake, No. 6 level	27,146	230·4 600	110 men 3 horses	..	..
11/5/11	Little dip intake	13,035	327·2 600	38 men 1 horse	..	68
15/5/11	Main dip return and Little dip ..	17,160	179·3 600	89 men 2 horses	..	..
6/7/11	Little dip, No. 5, south side ..	12,750	490·4	26 men	..	..
,,	North side main dip and Little dip	19,692	203·4 600	85 men 4 horses	..	..
		Extended Colliery.				
5/8/10	North dip intake	24,375	234·3	104	..	..
8/9/10	No. 2 section, west intake ..	6,900	246·4	28	64	65
,,	Main return	27,000	465·5	58	..	..
9/12/10	West side, No. 3 return	18,900	378	50	..	..
12/5/11	North-west dip, main return ..	24,080	240·8	100	..	..
,,	North-west No. 6, 14 in. pipe ..	1,272	424	3	..	68
,,	West dip, No. 3 intake	4,590	191·2	24	..	68
7/7/11	North-west No. 5, main return ..	19,821	283·1	70	..	..
,,	Kinston's bord	935	467·5	2	..	..
,,	Dunn and Wilson's bord	880	440	2	..	..
,,	North-west district, No. 5 intake ..	7,917	247·4	32	..	..
,,	Kirkham and Curley's bord ..	563	281·5	2	..	..

System of ventilation: Fan. Sanitary arrangements at mine: Pans.

BOYD BENNIE, Inspector of Mines.

EXHIBIT No. 14.

PARTICULARS REGARDING VENTILATION AND SANITATION AT THE HIKURANGI AND KIRIPAKA COAL-MINES.

(Taken by the Inspector of Mines.)

Date of Inspection.	Locality where Measurement taken.	Quantity of Air per Minute.		Number of Men on Shift.	Temperature.		System of Ventilation.	Remarks.
		Total.	Per Man. Per Horse.		Wet Bulb.	Dry Bulb.		
				Northern Colliery.				
		Ft.	Ft.		°	°		
12/11/10	No. 1 split intake	2,813	562·6	5	..	..	Natural ..	Outside shade 80°.
,,	Nos. 3 and 4 split intake ..	6,355	706·1	9	..	..	,, ..	
,,	No. 5 split intake	2,640	377·1	7	74	75	,, ..	
21/1/11	,, ...	No measurement		..	..	..	,, ..	Air fresh.
19/6/11	,, ...	2,600	520	5	..	..	,, ..	
,,	Nos. 5 and 6 split intake ..	6,000	461·5	13	..	..	,, ..	
,,	Main return fan inlet	38,500	1,036·1, 600	36 men, 2 horses	..	..	Fan	Nos. 5 and 6 districts not included.
				Hikurangi Colliery.				
14/11/10	No. 2 western area intake ..	5,142	504·6, 600	9 men, 1 horse	..	..	Natural ..	Change-room, no bath.
,,	No. 3 new dip intake	No measurement		6 men	..	78	,, ..	Second shaft will be completed soon.
17/1/11	,, ...	4,008	222·6	18	..	..	,, ..	
18/6/11	,, ...	5,980	119·5, 600	45 men, 1 horse	..	..	,, ..	Another outlet shaft since provided.
				Kiripaka Colliery.				
10/11/10	Main return	12,103	268	45	..	..	Fan	Change-room, no bath.
23/1/11	,, ...	No measurement		(?)	..	..	,, ...	Conditions good.
20/6/11	,, ...	,,		(?)	..	..	,, ...	,,

BOYD BENNIE, Inspector of Mines.

EXHIBIT No. 15.

Fatalities at Nightcaps Colliery, Nightcaps.

Date.	Name of Person fatally injured.	Age.	Occupation.	Shift.	Cause.	Verdict.
		Years.				
25/10/00	Francis Winter ..	45	Labourer ..	Afternoon ..	Fall of coal at face ..	"Accidental death."
1/10/01	James Quested ..	26	Miner ..	Day ..	Fall of timber and coal from roof	,,
1902	Nil.					
18/6/03	Henry Currie ..	24	,, ..	,, ..	Fall of coal from roof ..	,,
1904–6	Nil.					
21/6/07	William Duncan ..	49	Fireman and deputy	Day ..	Poisoned by white-damp from underground fire	"That deceased died on the 21st June, 1907; that the cause of their respective deaths, according to medical testimony and other evidence, was due to the effect of white-damp." *Rider*: The jury considers that due care was not exercised prior to the three deceased entering the mine, and recommends that safety-lamps be used for inspection, and that the Inspector of Mines insist upon the management complying with all the provisions of the Coal-mines Act in future.
	Patrick Welsh ..	52	Roadsman and repairer			
	William Carson ..	36	Ditto			
1908–11	Nil.					

Non-fatal Accidents, Nightcaps Colliery, Years 1906 to 1911 inclusive.

7th June, 1907.—Donald McMillan: Burns of face, breast, and arms by accidental ignition of blasting-powder in canister. 109 days off work.
13th December, 1910.—Matthew Spowart: Injury to right eye, with subsequent loss of sight; struck by piece of coal flying from pick-point. 134 days off work.

Minor Accidents, Nightcaps Colliery.

Year.	Due to Use of and Firing of Explosives.	Due to Falls from Roof and Sides.	In Shafts and from Machinery.	Eye Accidents.	Strains, Sprains, &c.	Totals.
1906	..	..	..	1	7	8
1907	1	1	..	1	6	9
1908	..	1	..	..	3	4
1909	..	..	1	..	5	6
1910	..	1	..	1	2	4
1911	..	1	..	..	1	2
Totals	1	4	1	3	24	33

EXHIBIT No. 15—*continued.*

BAROMETRICAL AND THERMOMETRICAL READINGS, MEASUREMENTS, AND ANALYSES OF AIR TAKEN BY E. R. GREEN, INSPECTOR OF MINES, AT NIGHTCAPS COLLIERY.

Date.	Place of Observation.	Barometer.	Thermometer.		Degree of Humidity.	Quantity of Air per Minute.	Number of Men on Shift.	Analysis.			
			Dry Bulb.	Wet Bulb.				O.	CO_2.	CO.	CH_4.
		Inches.			Per Cent.	Cubic ft.					
5/2/08	No. 1 district: No. 1 split	..	..	..	..	10,000	..	..	..	..	..
,,	,, No. 2 split	..	..	..	..	4,500	..	..	..	..	..
3/4/08	,, Fan	..	..	..	..	16,700	..	..	..	..	..
,,	,, Intake	..	..	..	..	14,400	..	..	..	..	..
,,	No. 2 district: Fan	..	..	..	..	9,600	..	..	..	..	..
,,	,, Intake	..	..	..	..	14,000	..	..	..	..	..
,,	,, Return	..	..	..	..	10,000	..	..	..	..	..
,,	,, Two shafts, open upcasting	..	..	..	..	4,000	..	..	..	..	..
,,	Ordinary workings	..	70	..	..	..	..	..	..	..	..
,,	Warmest place off air near stoppings	..	80	..	..	..	..	..	..	..	..
,,	At mine-mouth	..	53	..	..	..	..	..	..	..	..
27/8/08	No. 1 district: At door	..	..	..	..	12,500	..	..	..	..	..
,,	,, Return air-course, at door main horse level intake	..	..	..	..	7,500	..	..	..	..	..
,,	,, At old dip intake	..	..	..	..	5,000	..	..	..	..	..
,,	,, Main return air-course to fan shaft (taken from relief-pipe in stopping next to gob where 1907 fire blocked off)	..	62	..	..	..	..	..	0·18	Nil	Nil.
,,	Middle lay-by near top of Carson's heading (outside stopping)	..	70	..	..	..	..	..	12·10	0·06	0·74
,,	,, ,, (in pipe)	..	110	..	..	..	..	..	0·13	Nil	Nil.
,,	No. 2 district: Main return air-course to fan shaft	..	58	..	..	..	..	..	..	..	..
23/10/08	No. 1 district: Above ground	29·59	44	..	..	..	..	..	..	..	..
,,	,, Underground	..	65	..	..	..	..	..	..	..	..
18/12/08	,, At intake	..	..	..	..	18,000	..	..	..	..	..
1/7/09	,, ,, old workings	..	77	..	..	..	..	..	..	..	..
,,	No. 2 district: ,,	..	..	..	..	18,000	..	..	..	..	..
16/12/10	No. 1 district: Underground behind middle lay-by	..	58	..	..	..	..	..	..	..	..
,,	,, Outside mine (in shade)	..	70	..	..	..	..	..	..	..	..
,,	No. 2 district: Underground	..	54	..	..	..	..	..	..	..	..
13/3/11	No. 1 district: At intake	..	..	..	..	25,000	..	..	..	..	..
,,	,, Return air from working-miners to exhaust shaft fan direct	..	56	..	..	..	..	20·4	0·45	Nil	Nil.
,,	,, ,, ,, ,,	..	..	..	..	..	..	20·5	0·39	,,	,,
,,	No. 2 district: At intake	..	..	..	..	16,000	..	..	..	..	..
,,	,, At entrance to exhaust fan drift underground	..	52	..	..	..	..	20·8	0·36	Nil	Nil.
,,	,, ,, ,,	..	..	..	..	..	..	20·7	0·34	,,	,,
25/8/11	No. 1 district: Mine-mouth, 9·45 a.m.	30·20	42·8	42·3	97	..	..	..	..	..	..
,,	,, Return airway from No. 1 dip	..	59·5	58·5	93	8,000	15	19·84	0·17	..	Nil.
,,	,, Return air from No. 2 dip	..	57	56	93	13,650	20	20·25	0·20	..	,,
,,	,, Main return airway to upcast fan shaft	..	59·25	58·33	93	24,300	..	20·02	0·05	..	,,
,,	,, ,, ,,	..	..	..	..	..	..	20·37	0·05	..	,,
,,	,, At bottom fan upcast air-shaft	..	60	59	93	..	..	..	..	..	..
,,	No. 2 district: At return airway on horse-road	..	58	56·5	90	..	..	..	..	..	..
,,	,, Main return airway to upcast fan shaft	..	54	52	86	11,655	25	20·47	0·14	..	0·02
,,	,, ,, ,,	..	..	..	..	..	..	20·31	0·12	..	Nil.
,,	,, Mine-mouth, noon	..	51	46	68	..	..	..	..	..	..

E. R. GREEN, Inspector of Mines.

EXHIBIT No. 16.

Dredging Fatalities, Southern Mining District, 1909–11.

Date.	Name of Person.	Occupation.	Shift.	Dredge.	Cause.	Verdict.
3/6/09	James B. Patterson ..	Winchman ..	Afternoon ..	Pringle and party's	Head crushed between crown-wheel and spur-wheel while oiling machinery in motion	Accidental.
16/1/10	Patrick Gallagher ..	Fireman ..	Night ..	Enterprise ..	Caught in belting (unwitnessed)	,,
9/2/10	Charles Smith ..	,, ..	..	Lowburn	Precipitated into river through breaking of ladder-hangers, on which he was leaning when bucket-belt was being righted on bottom tumbler	,,
15/11/10	John Kelly ..	Dredgeman..	Night ..	Earnscleugh No. 3 ..	Precipitated into water by electric shock when repairing cables with power on	,,
19/1/11	George Todd ..	Diver ..	Day ..	Rise and Shine No. 2 (sunken)	Died from heart-disease while engaged in diving operations ..	..

Non-fatal Accidents on Dredges, Southern Mining District, 1909–11.

Date.	Name of Person injured.	Occupation.	Dredge.	Nature and Cause.
9/11/09	— Neilson	Fireman ..	Golden Bed	Crushed hand (subsequently amputated); caught between elevator-buckets and top tumbler in attempting to remove a stone while machinery in motion.
15/11/09	Andrew Baird ..	Winchman ..	Charlton Creek	Fractured rib through clothes catching in machinery.
14/1/10	W. Weir and J Hand ..	Dredgemen ..	New Roxburgh Jubilee ..	Bruised legs; Pinned by ladder-line to deck of dredge through stopper slipping.
	Alexander Ross ..	Dredgemaster ..	,, ..	Sprained ankle;
18/1/10	David Smith	Blacksmith ..	Karaunui	Broken bones of leg at ankle-joint; crushed between piece of machinery being hoisted on to dredge and hatchway of dredge.
31/1/10	..	,, ..	Golden Beach No. 1 ..	Loss of eye, by piece of steel off cold set.
2/2/10	L. Hall	Winchman ..	New Golden Run ..	End of thumb taken off; caught in twist of ladder-line when shearing.
7/5/10	E. Reid	Engineer ..	Riley's Revival	End of thumb taken off by elevator-roller falling on it.
28/7/10	Albert Stuart.. ..	Dredgeman ..	Sailor's Bend	Injured knee while stepping out of coal-boat on to a rock.
15/11/10	William Lainchbury ..	,, ..	Earnscleugh No. 3 ..	Four fingers burned off by electric shock while repairing cables when power on.
,,	John Love	Winchman ..	Olrig	Broken index finger of left hand; when screwing down brake-bolts of brake, strap gave way and crushed the finger.
17/5/11	William McAra ..	Dredgeman ..	1911	Wound of hand by piece of wire while working at boiler.
23/5/11	Frank Kitto	Dredgemaster ..	Golden Sun	Fractured ribs by falling down hold of dredge.

EXHIBIT No. 16—*continued.*

FATAL AND NON-FATAL ACCIDENTS IN ALLUVIAL MINES, SOUTHERN MINING DISTRICT, 1909–11.

Date.	Name of Person.	Occupation.	Claim.	Nature and Cause.
23/4/09	Thomas Kitto ..	Miner	Kitto and party's ..	Fracture of leg; struck by piece of cement rolling from face.
1910	Nil.			
1/3/11	Martin Trainor ..	,, ...	Arrow Falls	Fracture of leg; struck by loose stone following him after walking down face of paddock 6 ft. high.
17/4/11	Joseph Bates and Frank G. Smith	Miners ..	Round Hill	Fatal. Drowned in paddock by being caught in suction-pipe. *Verdict*: "Accidental death." *Rider:* That no sinking of second lifts be done at night.
23/5/11	W. H. Fortune ..	Miner	Fortune and Sons ..	Fracture of leg by fall of earth in claim while inserting a charge of gelignite.
8/6/11	James Morrin ..	,, ...	Roxburgh Amalgamated ..	Bruised and inflamed cartilage of knee; twisted when getting out of sticky clay in jet-hole.

ACCIDENTS AT QUARTZ-MINES, SOUTHERN MINING DISTRICT, 1909–11.

Date.	Name of Person injured.	Occupation.	Mine.	Nature and Cause.
1/3/11	Frank Jefferys ..	Miner	Carrick	Crushed fingers.
20/4/11	W. J. Stevenson ..	Engine-driver ..	Golden Point	Injured knee; struck by rim of fly-wheel of gas-engine when stopping wheel after engine had been stopped.
19/6/11	George Carson ..	Miner	,, ...	Injured thumb; ran a splinter of wood into it when putting up a set of timber.
8/7/11	J. Mann	,, ...	Cromwell	Fracture of fibula; was firing fourteen holes in face, and one prematurely exploded when he had got back about 50 ft. from face.
,,	James Ferguson ..	,, ...	Mount Highlay	Injuries to head and arms; fell over cliff alongside tram-line.
8/8/11	Andrew Reid ..	,, ...	Cromwell	Loss of forefinger of right hand by premature explosion of gelignite when charging a shot.
,,	Sydney Waide ..	Trucker ..	,, ...	Cut fingers; struck by flying material from premature explosion of gelignite.

E. R. GREEN, Inspector of Mines.

EXHIBIT No. 17.

Fatalities in Kaitangata Mines.

Date.	Name of Person fatally injured.	Age.	Occupation.	Shift.	Cause.	Verdict.
			Castle Hill Colliery.			
1900–02	Nil.	Years.				
3/7/03	George Hill	23	Miner ..	Day ..	Fall of coal from roof	"Accidental death."
1904	Nil.					
22/2/05	Robert S. Jordan ..	..	Mine-manager ..	,, ..	Suffocated while investigating underground fire at foot of upcast air-shaft	,,
15/8/05	Robert Donaldson ..	20	Trucker ..	,, ..	Concussion of brain; struck by runaway box on heading; died 16/8/08	"Accidental death." *Rider:* The jury recommend that the company should keep a stretcher and a supply of bandages and blankets below in each mine.
1906–11	Nil.					
			Kaitangata Colliery.			
1900–03	Nil.					
25/10/04	Adam Thomson ..	60	Miner ..	Afternoon	Fall of coal from roof	"Accidental death."
2/2/05	Allan McKinnie ..	26	,, ..	,,	Fall of coal from roof and side (on a fault)	,,
5/2/06	Alexander Bennie ..	51	,, ..	Day ..	Fall of coal at face while brushing roof	"Accidental death." *Rider:* The jury recommends that in future a stretcher and surgical appliances be kept in some suitable place underground.
8/11/06	Frederick Anderson ..	47	Underviewer ..	,, ..	Suffocated by foul gases in return airway while prospecting	"Accidental death."
,,	William Lee	24	Colliery engineer	,, ..		
1907–10	Nil.					
15/5/11	John McGhee ..	49	Miner ..	Afternoon	Fall of coal from roof (a smooth vertical parting and rough parting in roof)	"That deceased was killed by a fall of coal in Kaitangata Mine." *Rider:* That, in our opinion, three or more men working together increases the danger.
17/8/11	Joseph Carson ..	25	Repairer and certificated second-class mine-manager	Day ..	Fall of stone from roof	"That deceased was killed by a fall of stone in Kaitangata Mine." *Rider:* That Deputy Statham had erred in not reporting the dangerous nature of the stone to the mine-manager, and we are also of the opinion that a deputy's duties should be more clearly defined. (The verdict was "Accidental death.")

EXHIBIT No. 17—*continued.*

SERIOUS (NON-FATAL) ACCIDENTS AT KAITANGATA COLLIERY, 1899–1911.

Date.	Name of Person injured.	Age.	Occupation.	Number of Days off work.	Nature of Accident and Cause.
		Years.			
16/10/99	William McCormack..	..	Certificated mine-manager and acting machine coal-cutting expert	30	Burns of arms by slight ignition of gas in new section, Telford's heading.
1900	Nil.				
7/8/01	Edward Mackie ..	..	Miner	..	Fractured thigh by fall of coal from roof.
1902	Nil.				
6/3/03	J. Beardsmore ..	..	,, ...	..	Bruised back, resulting in rotation of two vertebrae, by fall of stone from roof.
6/10/03	J. Alexander ..	..	Deputy	..	Fracture of right humerus by fall of stone from roof in low place.
10/2/04	Charles Penman ..	50	Miner	108	Injury to eye, necessitating removal of same, by dirt flying from face of hammer while drifting a prop.
11/3/04	John Burns ..	17	Horsedriver	121	Fracture of leg, by fall of roof and side by boxes getting off road and bringing down three sets of timber.
4/5/04	William Cairns ..	50	Miner	322	Fracture of leg below knee by fall of coal while robbing a pillar.
1905	Nil.				
25/7/06	N. McAllister ..	45	Assistant manager ..	224	Severe burns about face, hands, and body, by small fall of heated sand and live coal from brickwall fire stopping at foot of engine plane.
,,	Charles Milne ..	28	Repairer	143	
10/10/06	John McCaughern ..	51	Deputy	61	Burns of face and arms by ignition of fire-damp at No. 8 crossing.
,,	William Proctor ..	32	Underviewer	61	
17/12/06	James Hill	33	Miner	261	Severe burns of face, arms, and body, by ignition of fire-damp at surface while sinking air-shaft (occurrence due to lighting a cigarette).
,,	David Coulter ..	35	,, ...	49	Burns of face, neck, and arms, by ignition of fire-damp at surface while sinking air-shaft (occurrence due to lighting a cigarette).
1/7/07	James Fibbes ..	31	,, ...	305	Injury to spine; jammed by runaway rake of boxes.
16/1/08	William Forrester ..	25	Trucker	314	Burns of face and arms by an ignition of gas at spontaneous fire in No. 3 bord, No. 19 dip section.
9/6/08	Robert Ferguson ..	60	Repairer	626	Fracture of both legs; run down by a rake of full boxes on horse-road (permanent disablement).
27/1/09	Charles King ..	35	Miner	87	Fracture of left arm by fall of head coal.
2/3/09	Samuel Newburn ..	36	Deputy and Shot-firer ..	28	Burns of face and arms by slight explosion of fire-damp while shot-firing in winch-heading section.
,,	William Oliver ..	33	Miner	40	
28/5/09	Thomas Dixon ..	55	,, ...	191	Wound and subsequent loss of right eye; struck by flying coal from working-face.
8/12/09	John Heard ..	58	,, ...	155	Fracture of arm and loss of fore and little fingers; struck by sliding fall of coal from roof and side in low pillar-workings.
7/11/10	Charles H. Stubbs ..	50	,, ...	..	Slight wound of scalp and sprain of knee; struck by a piece of coal falling from roof.
17/1/11	Joseph Gilmour ..	28	Trucker	46	Fractured collarbone; jammed by rake of boxes.
7/7/11	John Hale	36	Miner	..	Fractured right leg; jammed between box and prop by sprag coming out when pushing full box of coal out of his place.
21/7/11	William Christian ..	58	Repairer	..	Fractured ribs; crushed against prop by stone falling from roof while repairing on Barclay's stone drive.

EXHIBIT No. 17—*continued.*

SERIOUS (NON-FATAL) ACCIDENTS AT OTHER COLLIERIES, SOUTHERN MINING DISTRICT.

Date.	Name of Person injured.	Age.	Occupation.	Number of Days off work.	Name of Mine.	Nature of Accident and Cause.
		Years.				
27/4/09	J. C. Campbell	29	Miner	215	Homebush	Hernia, due to lifting full box of coal on to roadway.
2/11/09	William Nolan	50	,, ...	80	Clarke's	Compound fracture of bridge of nose and injuries to eyes and hand, by explosion of gunpowder while tamping a shot in opencast lignite-pit.
18/1/10	William Long	36	,, ...	87	Mount Somers ..	Strain of heart, due to lifting full box of coal on to roadway.
9/4/10	John Stevenson.. ..	49	,, ...	114	Allandale	Bruised back; struck by piece of coal falling from roof.

NUMBER OF MINOR ACCIDENTS IN COAL-MINES, SOUTHERN MINING DISTRICT.

Year.	Kaitangata Mine.	Other Mines.	Total.
1909	49	41	90
1910	38	28	66
1911	35	33	68
Totals	122	102	224

EXHIBIT No. 17—*continued.*

BAROMETER AND THERMOMETER READINGS AND MEASUREMENTS AND ANALYSES OF AIR, KAITANGATA COLLIERY.

(Readings taken by E. R. Green, Inspector of Mines; mine-air analysed by the Dominion Analyst, Wellington.)

Date.	Place of Observation.	Barometer.	Thermometer.		Degree of Humidity.	Quantity of Air per Minute.	Number of Men on Shift.	Analysis.				
			Dry Bulb.	Wet Bulb.				O.	N.	CO_2.	CO.	CH_4.
		Inches.			Per Cent.	Cub. ft.						
8/5/07	No. 6 stopping	..	..	..	..	..	..	..	..	1·11	..	0·27
,,	Main return near bottom of upcast shaft	..	..	..	..	..	..	..	..	0·43	..	0·66
22/5/07	Intake at split of air	..	..	..	..	..	..	..	..	0·17	..	0·06
,,	Return near foot of upcast air-shaft	..	..	..	..	..	..	..	..	0·27	..	0·85
,,	Near roof in Hird's bord	..	..	..	..	..	..	..	..	0·43	..	2·03
,,	Working-face, Hird's bord, breast-high	..	..	..	..	..	..	..	..	0·49	..	1·58
,,	Near floor, Hird's bord	..	..	..	..	..	..	..	..	..	..	1·48
,,	McGhee's bord—face	..	..	..	..	..	..	..	..	0·34	..	1·15
,,	North side return	..	..	..	..	..	..	..	..	0·31	..	1·02
,,	No. 8 bord south (Stubb's)	..	..	..	..	..	..	..	..	0·25	..	0·49
,,	No. 2 tunnel, opposite old workings	..	..	..	..	..	..	..	..	..	..	0·06
17/8/08	Barometer fallen 0·55″ in twenty-four hours.											
,,	At mine-mouth (pit instrument)	..	43 + 6 correction)		..	..	..	..	..	..	..	..
,,	,, (my instrument)	..	49		..	..	..	..	..	..	..	..
,,	Barclay's drive at foot No. 2 heading	..	63		..	..	..	..	..	..	..	..
,,	At No. 3 heading	..	67		..	..	..	..	..	..	..	..
,,	No. 4 flatsheet	..	71		..	..	..	..	..	..	..	..
,,	No. 5 flatsheet, return air-course	..	75		..	4,000	..	..	..	0·55	0·015	1·27
,,	No. 5 level intake air-course	..	70		..	5,000	..	..	..	0·41	0·015	1·40
,,	No. 7 flatsheet	..	76		..	..	..	..	..	..	..	..
,,	Main return air-course to fan shaft	..	69		..	30,000	..	..	..	0·43	0·015	1·71
29/9/08	At intake	30·30	..		..	30,240	100	..	..	..	..	..
28/10/08	,,	..	62		..	30,240	..	..	..	..	..	..
,,	South level extension main seam	..	72		..	..	..	..	..	..	..	..
,,	No. 3 dip east	..	67		..	..	..	..	..	..	..	..
,,	No. 3 dip off No. 3 heading	..	66		..	..	..	..	..	..	..	..
,,	Main return from No. 20 dip and No. 3 heading	..	72 (air here combined)			..	..	..	..	..	..	..
4/3/09	At split, Barclay's	..	..	..	..	15,000	..	..	..	..	..	..
,,	Main extension	..	..	..	..	15,000	..	..	..	..	..	..
24/4/09	At intake	..	..	..	..	30,000	..	..	..	..	..	..
22/6/09	,,	..	..	..	..	30,240	..	..	..	..	..	..
18/8/09	,,	..	..	..	..	30,000	..	..	..	..	..	..
9/3/10	,,	..	..	..	..	32,500	..	..	..	..	..	..
18/5/10	,,	..	..	..	..	32,500	..	..	..	..	..	..
10/6/10	During inspection by workers' inspectors a stopping was found leaking in No. 1 heading district; the miners working there were withdrawn and the stopping restored same evening	29·07	..	..	..	..	10	..	..	..	..	..

EXHIBIT No. 17—*continued.*

BAROMETER AND THERMOMETER READINGS, ETC.—*continued.*

Date.	Place of Observation.	Barometer.	Thermometer.		Degree of Humidity.	Quantity of Air per Minute.	Number of Men on Shift.	Analysis.				
			Dry Bulb.	Wet Bulb.				O.	N.	CO_2.	CO.	CH_4.
		Inches.			Per Cent.	Cub. ft.						
24/6/10	At intake	..	..	..	..	31,850	..	..	..	..	..	..
10/8/10	No. 1 main split, south side	..	..	..	..	15,000	..	..	..	0·22	..	0·54
,,	No. 2 main split, north side	..	..	..	..	15,000	..	..	..	0·11	..	0·36
,,	Main return air at bottom of upcast	..	..	..	..	30,900	..	..	..	0·46	..	1·10
4/10/10	Return air-course from No. 1 pillaring section, Oliver's dip	..	..	..	..	10,000	8	20·71	77·22	0·55	..	1·52
,,	,, ,, ,,	..	..	..	..	..	..	20·62	77·32	0·49	..	1·57
,,	At bottom of upcast air-shaft	..	..	..	..	..	..	..	..	0·34	..	0·85
,,	,, ,,	..	..	..	..	..	..	..	..	0·29	..	0·80
6/10/10	No. 3 heading at intake to No. 1 section, Oliver's level	..	59·80	58·50	91½	..	..	..	..	..	..	..
,,	At intake No. 1 bord, No. 1 section	..	73·0	69·50	82	..	..	..	..	..	..	..
,,	Return air from McGhee's level, being intake for No. 4 bord, No. 1 section	..	75·0	73·50	91½	10,000	8	21·00	77·82	0·27	0·02	0·89
,,	Taken from ladder 10 ft. from floor in No. 1 bord, Rogers's place	..	73·0	72·25	96	..	..	..	..	0·29	0·02	0·88
6/4/11	At intake	30	52	..	..	29,250	..	..	..	..	..	..
,,	Barclay's drive split	..	..	..	..	16,000	..	..	..	..	..	..
,,	Extension and winch-heading split	..	..	..	..	14,000	..	..	..	..	..	..
,,	Rise pillars, McGhee's section	..	75	..	..	..	6	19·31	..	0·62	..	1·36
,,	Entrance to McGhee's level, being return air from workmen in south extension split	..	..	..	..	..	..	19·88	..	0·43	..	1·18
,,	Ditto	..	..	..	..	..	..	19·85	..	0·44	..	1·14
,,	Outlet, McGhee's level to upcast	..	..	..	..	..	..	19.24	..	0·68	..	1·73
,,	Oliver's dip, being return air from Barclay's drive split after ventilating No. 21 dip and Oliver's dip	..	..	..	..	..	..	20·21	..	0·35	..	0·61
,,	Bottom of main upcast air-shaft, being return air from whole of underground workings	..	..	..	..	..	..	19·65	..	0·63	..	1·03
27/7/11	Office at mine, 8 a.m.	..	56	48	56	..	..	..	..	..	..	..
,,	Cabin	..	56	52	75	..	..	..	..	..	..	..
	South main extension, air-split to north side—											
,,	Return from winch heading at top of No. 1 heading	..	70	66	78	..	..	..	..	..	..	..
,,	Mundy's dip, with a blower of compressed air	..	66	64	88	..	..	..	..	..	..	..
,,	McGhee's level, rise pillars (1)	..	75	73	89	..	..	..	..	..	..	..
,,	,, ,, (2)	..	78	76½	92	..	..	..	..	..	..	..
,,	,, ,, (3)	..	77½	76	92	..	..	..	..	..	..	..
	At return airway from Barclay's drive split—											
,,	At No. 3, or bottom lift	..	67	66	94	..	..	..	..	..	..	..
,,	At main return to upcast air-shaft, where all return air gathered	..	72	70	89	..	..	..	..	..	..	..
		..	71¾	69¾	89	..	..	..	..	..	..	..

EXHIBIT No. 17—*continued.*

BAROMETER AND THERMOMETER READINGS, ETC.—*continued.*

Date.	Place of Observation.	Barometer.	Thermometer.		Degree of Humidity.	Quantity of Air per Minute.	Number of Men on Shift.	Analysis.				
			Dry Bulb.	Wet Bulb.				O.	N.	CO_2.	CO.	CH_4.
	At return airway from Barclay's drive split—*continued.*	Inches.			Per Cent.	Cub. ft.						
27/7/11	Top lift, No. 21 dip	..	64	62	82	..	..	..	..	..	..	..
,,	Return from No. 21 dip	..	64	62	88	..	..	..	..	..	..	..
,,	Pillars, McAllister's level (1)	..	69	67	89	..	..	..	..	..	..	..
,,	,, ,, (2)	..	67	65	89	..	..	..	..	..	..	..
,,	,, ,, (3)	..	64	62	88	..	..	..	..	..	..	..
	At intake Nos. 21 and 19—											
,,	At cabin again (1)	..	57	55	85	..	..	..	..	..	..	..
,,	,, (2)	..	57	54	82	..	..	..	..	..	..	..
,,	Surface lamp-cabin	..	52	47	69	..	..	..	..	..	..	..
,,	Office again, 3 p.m.	..	65	60	72	..	..	..	..	..	..	..
23/8/11	Mine-mouth, 8·30 a.m.	..	47	41	56	30,550	..	..	..	..	..	..
,,	Cabin underground at just outside two main splits	..	55	52	81	..	..	..	..	..	..	..
,,	At return airway from winch heading down No. 1 heading	..	71	69	89	2,000	5	20·17	..	0·27	..	1·42
,,	Main extension air-return (supplies extension Mundy's and No. 5 dip sections at return from No. 5 dip to McGhee's level)	..	70	68	89	15,000	..	20·27	..	0·28	..	0·21
,,	McGhee's level at intake to rise pillar places	..	71	69	89	2,000	..	20·10	..	0·26	..	0·81
,,	Rise pillar places off McGhee's level	..	78½	76½	89	8,000	..	20·08	..	0·41	..	0·82
,,	No. 21 dip, return air	..	64½	62	85	8,750	..	20·59	..	0·27	..	0·64
,,	No. 2 lift, pillars off Oliver's dip	..	68	66	89	..	8	20·20	..	0·30	..	1·02
,,	Main return airway to upcast air-shaft	..	70½	68½	89	31,510	..	20·00	..	0·33	..	0·76
,,	,, ,,	..	..	..	..	..	..	20·17	..	0·38	..	0·74
,,	On return to cabin at main air-split—inside	..	58½	55½	82	..	..	..	..	..	..	..
,,	,, ,, outside	..	55	52	81	..	..	..	..	..	..	..
,,	In cabin below	30·45	..	..	..	..	..	..	..	..	..	..
,,	At mine-mouth	..	46	41	66	..	..	..	..	..	..	..

E. R. GREEN, Inspector of Mines.

EXHIBIT No. 17A.

FATALITIES AT OTHER COAL-MINES IN SOUTHERN MINING DISTRICT.

Date.	Name of Person fatally injured.	Age.	Occupation.	Colliery.	Shift.	Cause.	Verdict.
1900	Nil.	Years.					
4/9/01	Walter Guttery ..	..	Miner	H. B. ..	Day ..	Suffocated by fall of dirt at mine-mouth	"Accidental death."
1902–3	Nil.						
28/3/04	Frank Wilson ..	..	Runaway sailor..	Taratu ..	,, ..	Struck on head by broken steam-pipe in prospecting-shaft	"That deceased met his death in Taratu Coal Company's shaft through the bucket in its ascent breaking a pipe which fell on him. The evidence before the jury leads them to conclude that deceased had exercised carelessness in not steadying the bucket away from shaft-bottom, and also that the management had been negligent in not having the steam-pipes raised or the midwall brought down below the pipes."
10/10/04	Thomas Foster ..	17	Trucker ..	Allandale ..	Afternoon ..	Slipped on rail while trucking, causing inflammation of sheath of tendon of left knee; blood-poisoning supervened, proving fatal on 1/11/04. (Tuberculous)	"Accidental death."
1/2/05	William Williams ..	..	Miner	McPherson's..	,, ..	Fall of coal in opencast ..	,,
1906–8	Nil.						
18/11/09	Edward Matthews ..	..	Miner	Green's ..	Day ..	Fall of coal at face ..	,,
5/2/10	Charles E. Riddle ..	..	Owner ..	Albury ..	Before starting work	Suffocated by black-damp ..	"Suffocation from misadventure."
20/7/10	Hugh Patterson ..	63	Winding-engine driver	Springfield ..	Day ..	Absent-mindedly fell down winding-shaft	"Accidental death."
4/3/11	Alexander McLuckie ..	39	Miner	McGilp's ..	,, ..	Fall of coal from rough parting in roof	,,
20/7/11	James R. Walker ..	32	,, ...	Freeman's ..	Afternoon ..	Fall from roof caused by an unseen lipe (or slip) in a fault	"Accidental death." *Rider:* The jury considered that it would be to the safety of miners when extracting pillars if two men were employed together.
7/9/11	Thomas Patterson ..	48	,, ...	Homebush ..	Day ..	Fall of stone from a greasy back in roof	"Accidental death."

E. R. GREEN, Inspector of Mines.

EXHIBIT No. 17A—*continued.*

SUMMARY OF FATAL ACCIDENTS AT ALL COAL-MINES, SOUTHERN MINING DISTRICT.

Year.	Causes.				Totals.	Number of Men killed.
	Due to Use and Firing of Explosives.	Due to Falls from Roof and Side.	In Shafts and from Machinery.	Other Causes.		
1899 (from October) ..	..	..	..	..	..	..
1900	..	1	..	..	1	1
1901	..	2	..	..	2	2
1902	..	..	..	..	..	..
1903	..	2	..	..	2	2
1904	..	1	1	1	3	3
1905	..	2	..	2	4	4
1906	..	1	..	1 (2 men killed)	2	3
1907	..	..	..	1 (3 men killed)	1	3
1908	..	..	..	..	..	..
1909	..	1	..	..	1	1
1910	..	..	1	1	2	2
1911	..	5	..	..	5	5
Totals	..	15	2	6	23	26

E. R. GREEN, Inspector of Mines.

EXHIBIT No. 17A.—*continued.*

THERMOMETRICAL READINGS AND MEASUREMENTS AND ANALYSES OF AIR.

Date.	Place of Observation.	Thermometer.		Degree of Humidity.	Quantity of Air per Minute.	Number of Men on Shift.	Analysis.			
		Dry Bulb.	Wet Bulb.				O.	CO.	CO_2.	CH_4.
		Freeman's Colliery, Abbotsford.								
		°	°	Per Cent.	Cub. ft.					
3/6/08	At intake No. 2	..	..	..	14,000	..	..	..	..	..
,,	No. 1 mine, entrance	..	..	..	6,036	..	..	..	..	..
4/9/08	At intake	..	..	..	12,000	..	..	..	..	..
,,	Return airway	..	..	..	7,500	..	..	..	..	..
,,	Dip intake, after leakage	..	..	..	2,625	..	..	..	..	..
,,	Surface	60	..	..	..	..	..	..	..	..
,,	No. 6 dip return	62	..	..	..	..	..	..	..	..
,,	No. 5 dip pillars	64	..	..	..	..	..	..	..	..
,,	No. 3 pillars	62	..	..	..	..	..	..	..	..
,,	No. 1 mine, intake	54	..	..	..	..	..	..	..	..
29/12/08	,, ,,	..	..	..	11,000	..	..	..	..	..
,,	At entrance	56	..	..	..	..	..	..	..	..
,,	Working-places	65	..	..	..	..	..	..	..	..
,,	No. 2 mine, intake	..	..	..	12,250	..	..	..	..	..
,,	Bottom No. 4 dip	68	..	..	..	..	..	..	..	..
,,	No. 5 dip	70	..	..	..	..	..	..	..	..
18/5/09	At intake	..	..	..	15,000	..	..	..	..	..
31/8/09	No. 1 mine, mine-mouth	56	..	..	5,000	..	..	..	..	..
,,	No. 5 dip	..	..	..	8,000	..	..	..	..	..
,,	Lower dip workings, vicinity of fire area	64	..	..	..	..	..	..	..	..
,,	No. 6 dip	..	..	..	10,000	..	..	..	..	..
28/10/09	Mine-mouth	69	..	..	..	..	..	..	..	..
,,	No. 2 intake	56	..	..	..	..	..	..	..	..
,,	Working-places	64	..	..	..	..	..	..	..	..
5/1/10	Mine-mouth	56	..	..	..	..	..	..	..	..
,,	Working-places	60	..	..	..	..	..	..	..	..
,,	At intake	..	..	..	10,000	..	..	..	..	..
29/12/10	,,	..	..	..	20,000	..	..	..	..	..
21/3/11	,,	..	..	..	20,000	..	..	..	..	..
7/9/11	Surface, 8.30 a.m. (in shade)	44	42	84	..	..	..	..	..	..
,,	Travelling-way	$54\frac{1}{4}$	$51\frac{3}{4}$	83	..	..	..	..	..	..
,,	Near haulage entrance	52	50	86	..	..	..	..	..	..
,,	Intake airway at No. 8 dip split	51	49	86	8,250	..	..	..	..	..
,,	Intake No. 7 dip split (No. 8 airway only)	$53\frac{1}{2}$	52	90	9,000	..	..	..	..	..

7/9/11	No. 7 dip, Knox's place	65	64	94	..	..	..	..	..	..	
,,	Matchett and Brockie's place	71	70	94	..	..	..	..	..	..	
,,	Lay-by, bottom No. 7 dip (left side)	69½	69	97	5,950	13	20·13	..	0·32	..	
,,	No. 7 dip (right side) Knox and another	71	70½	97	5,950	5	..	..	..	..	
,,	,, ,, Westfield and another	69½	69	97	..	..	..	..	..	..	
,,	No. 6 dip, intake	69¼	68¼	94	..	..	..	..	..	..	
,,	,, Jackson's pillar face, at bottom	74½	74	97	..	..	..	..	..	..	
,,	,, ,, at stenton, 13 yards back	73	72½	97	..	..	..	..	..	..	
,,	D. Smith's place	72½	71½	94	..	..	..	..	..	..	
,,	Return airway from No. 6 dip	71	70¼	96½	..	6	20·05	..	0·17	..	
,,	At undercast to fan upcast air-shaft, where all return air is gathered together	69¼	69	96½	19,800	..	20·64	..	0·19	..	
,,	Ditto	71¼	71	96½	..	..	..	..	..	..	
,,	Surface, 1.30 p.m. (in shade)	63	50	63½	..	..	..	..	..	..	
,,	,, ,, (in sun)	67½	53½	40	..	..	..	..	..	..	
	Saddle Hill No. 1 Colliery, Saddle Hill.										
30/10/07	Working-places	..	..	..	..	..	..	..	0·38	..	
2/9/08	McIntyre's section	68	..	..	..	..	..	..	..	..	
,,	Mine-mouth	66	..	..	..	..	..	..	..	..	
30/12/08	At entrance	58	..	..	..	..	..	..	..	..	
,,	Working-places	64	..	..	..	..	..	..	..	..	
6/8/09	,,	56–67	..	..	..	..	..	..	..	..	
26/10/09	Mine-mouth	52	..	..	..	..	..	..	..	..	
,,	Working-faces, vicinity of waste	66	..	..	..	..	..	..	..	..	
,,	Return air to furnace	70	..	..	..	..	..	..	..	..	
30/12/09	Stopping outside waste	70	..	..	..	..	..	..	..	..	
3/2/10	Mine-mouth	66	..	..	..	..	..	..	..	..	
,,	Working-places	56	..	..	..	..	..	..	..	..	
6/9/11	Outside mine-mouth, 9.30 a.m.	49	44	68	..	..	..	..	..	..	
,,	At cabin, being return airway	62	60½	90½	7,700	..	20·07	..	0·18	..	
,,	At top Bryce's heading, in pillars	64	63	94	..	..	20·42	..	0·12	..	
,,	At further-in pillar (Mitchell's)	64	62½	90½	..	..	..	..	..	..	
,,	Outside (in shade), 11.30 a.m.	52	46½	65½	..	..	..	..	..	..	
	Saddle Hill No. 2 Colliery, Saddle Hill.										
30/10/07	Return air-course	..	..	..	Furnace ventilation	..	..	..	0·91	0·03	
15/5/08	At intake	..	..	..	5,200	..	..	..	..	..	
2/9/08	,,	..	..	..	7,200	..	..	..	..	..	
,,	Working-places	56	..	..	..	..	..	..	..	..	
30/12/08	Outside	58	..	..	..	..	..	..	..	..	

EXHIBIT No. 17A—*continued.*

THERMOMETER READINGS, ETC.—*continued.*

Date.	Place of Observation.	Thermometer.		Degree of Humidity.	Quantity of Air per Minute.	Number of Men on Shift.	Analysis.			
		Dry Bulb.	Wet Bulb.				O.	CO.	CO_2.	CH_4.
	Saddle Hill No. 2 Colliery, Saddle Hill—continued.									
		°	°	Per Cent.	Cub. ft.					
30/12/08	Working-places	60	..	..	9,100	..	..	..	..	..
19/5/09	At intake	..	..	..	8,000	..	..	..	..	..
6/9/11	Outside, noon (in shade)	54½	47½	59	..	..	..	..	..	..
,,	In pillar workings, Manderson's place	64	62	88	..	..	..	..	..	..
,,	At McEwan's heading, Miller's place, where trying to get roof down to smother incipient fire	67	65	88½	..	..	19·27	..	0·64	..
,,	Riley's heading, where W. Hollows working; maximum at face, air from McEwan's heading	64	62	88	..	..	19·78	..	0·24	..
,,	Minimum in air-course on roadway 4 yards back from face	61	59	88	..	..	..	..	..	..
,,	Main return airway to upcast fan shaft	61¼	59¼	88	..	25	20·25	..	0·25	..
,,	At intake	..	..	..	15,000 (fan ventilation)	..	..	..	..	..
	Jubilee Colliery, Saddle Hill.									
30/10/07	Return air-course	..	..	..	..	..	..	..	0·49	0·02
3/8/09	Air return at furnace	64	..	..	5,250	..	..	..	..	..
,,	Pillar-workings	68	..	..	..	..	..	..	..	..
30/12/08	Intake	..	..	..	12,500	..	..	..	..	..
,,	Working-places	58	..	..	..	..	..	..	..	..
27/10/09	Mine-mouth	62	..	..	..	..	..	..	..	..
,,	Working-places	64	..	..	..	..	..	..	..	..
6/9/11	Mine-mouth (in shade), 2 p.m.	52	47	69	..	..	..	..	..	..
,,	At return airway to upcast furnace shaft	58½	57	89½	..	..	20·50	..	0·19	..
,,	At pillar working-places on Christie's boundary	60	58	88	..	..	..	..	..	..
,,	Other pillar places	56	54	87	..	..	..	..	..	..
,,	Surface again	53	48½	71½	..	..	..	..	..	..
	Homebush Colliery, Glentunnel.									
9/12/08	No. 1 mine, at intake	..	..	..	6,000	..	..	..	..	..
,,	No. 2 mine, dip section	..	..	..	6,000	..	..	..	..	..
,,	Engine seam	..	..	..	4,500	..	..	..	..	..
11/9/11	Surface (in shade)	68	55	43	..	..	..	..	..	..
,,	In dip pillar places, air return	66	63	83	..	..	20·45	0·005	0·16	..
,,	Return airway	62	60	88	..	..	20·12	..	0·30	..
,,	Surface again	66½	53	41	..	..	..	..	..	..

E. R. GREEN, Inspector of Mines.

EXHIBIT No. 18.

WEST COAST INSPECTION DISTRICT.—LIST OF FATAL AND SERIOUS ACCIDENTS, MILLERTON MINE.

Name.	Date.	Cause of Accident.	Verdict.
		1905–1907.	
		FATAL.	
J. Leece	7/6/07	Truck knocking out prop, causing roof to fall ..	Accidental.
		SERIOUS.	
C. Lewis	5/7/06	Fall of coal at face.	
C. Gray	3/7/06	Severe sprain through slipping on flatsheet.	
J. Young	10/7/06	Full tub running over him, slipped on rail.	
F. Smith	16/8/06	Fall of coal in face.	
D. McKenzie ..	17/12/06	Hanging shot coming away and crushing him.	
J. Tiplady.. ..	8/1/07	Kicked by a horse.	
		1901 to September, 1911.	
		FATAL.	
J. Maloney ..	24/9/08	Fall of stone from edge of goaf	Accidental.
C. Forrest.. ..	2/2/09	Fall of coal at face	,,
T. Maloney ..	9/3/10	,, ,, ...	,,
E. J. Quinlan ..	23/11/10	,, ,, ...	,,
J. H. E. Campbell ..	7/3/10	Runaway truck	,,
W. Young ..	17/3/11	Fall of coal back on the road..	,,
		SERIOUS.	
R. Arbuckle ..	4/6/08	Fall of coal at face.	
P. O'Neill	,,	,, ,,	
J. Pfeffer	9/1/09	,, ,,	

WEST COAST INSPECTION DISTRICT.—PARTICULARS REGARDING VENTILATION.

Locality.	Height in Feet.	Width in Feet.	Area.	Velocity per Minute.	Quantity.	Number of Men.	Number of Horses.	Cubic Feet per Man.	Remarks.
					Westport Stockton Mine, Westport Stockton Coal Company (Limited).				
B tunnel—			Ft.	Ft.	Cub. ft.				
Circulating around brattice and first working-place	11	4	44	140	6,160	9	1	474	There is an abundance of air circulating through this section, the return readings showing 80,200 cubic feet in fan drift.
Leaving last working-place for return	11	8	88	70	6,160	..	..	..	
C tunnel—									
Intake	8	12	96	315	30,240	..	..	..	
East split in fan drift	5½	9	49½	155	7,700	..	..	..	The capacity of the fan is about 20,000 cubic feet per minute, the powerful natural ventilation accounting for the extra quantity circulating.
West split, return ..	8	12	96	75	7,200	58	6	368	
					Millerton Mine, Westport Coal Company (Limited).				
Lonely section—									
Intake, Lonely dip..	10	10	100	110	11,000	110	4	162	22,862 cubic feet entering Lonely section.
Intake, overcast ..	5	6½	32½	365	11,862				Air afterwards goes to Lonely district.
Return fan drift ..	5½	7	38½	680	26,180	..	..		
Intake, second west	6	5½	33	250	8,250	11	1		
Mangatina west heading—									This intake reading must have been taken just at the time the south heading door was standing open for the purpose of running trucks through, thus short-circuiting the air to the return, or else the quantity would have read very near the return quantity, the stoppings along the road being in excellent condition.
Intake, first working-place	8	9½	76	115	8,740	46	1	395*	
Fan drift, return ..	..	..	..	..	19,760				
No. 10 pillars ..	2	2	4	1,080	4,320	16	1	216	The intake for this section is through the gob.
Main return, big fan, Mine Creek	7	12	84	1,416	119,025	..	..		Section not working.
					Seddonville State Mine (New Zealand Government).				
West section, return	..	..	..	..	11,550	24	1	402	Entering return after leaving last working-place.
Cave district ..	..	..	..	..	32,400	32	3	736	

J. NEWTON, Inspector of Mines.

* Calculated on return quantity.

EXHIBIT No. 18—*continued.*

WEST COAST INSPECTION DISTRICT.—ANALYSES OF MINE-AIR SAMPLES TAKEN BY INSPECTOR NEWTON.

Mine.	Locality.	Analysis of Mine-air.			
		CO_2.	O.	N.	CH_4.
Blackball	Return	0·50	20·00	79·50	..
Paparoa	Main return	0·63	19·70	79·67	..
Brunner	Return airway	0·50	19·92	79·58	..
Point Elizabeth, State ..	Main return	0·44	20·10	79·46	..
,, ..	Dip, No. 1 section, return ..	0·50	19·85	79·65	..
,, ..	Goaf, No. 2 section	0·65	19·44	79·51	0·40
,, ..	Return airway, No. 2 section ..	1·03	19·10	79·87	..
Stockton	C tunnel west, return	0·24	20·10	79·66	..
Millerton	Lonely fan drift	0·25	19·98	79·77	..
Ironbridge	Return airway	0·64	19·84	79·52	..
Coalbrookdale	Halton's place	0·48	20·25	79·27	..
Seddonville	No. 10 bank, west section ..	0·25	20·24	79·51	..
Gibson and Harris's mine..	..	0·82	19·45	79·73	..

J. NEWTON, Inspector of Mines.

EXHIBIT No. 19.

WEST COAST INSPECTION DISTRICT.—LIST OF FATAL AND SERIOUS ACCIDENTS, 1905–1907.

Name.	Date.	Cause of Accident.	Verdict.
		Point Elizabeth State Mine.	
		FATAL.	
S. W. Whitesmith ..	23/5/07	Caught in travelling-belt	Accidental.
		SERIOUS.	
J. Connolly ..	16/5/05	Fall of coal at face.	
J. Kyle ..	17/10/06	Falling between trucks.	
R. Wilson ..	30/10/06	Fall of coal at face.	
J. Kershaw ..	5/11/06	Jig prop carrying away.	
T. Jackson ..	1/7/07	Fall of coal at face.	
		Tyneside Mine.	
		FATAL.	
W. J. Morris ..	27/9/06	Killed by falling prop at face	Accidental.
		Blackball Mine.	
		FATAL.	
W. Meadowcroft ..	11/3/05	Strained back; died three months after ..	Accidental.
		Paparoa Mine.	
		FATAL.	
W. Hairobin ..	7/11/07	Fall of coal at face	Accidental.
		Puponga Mine.	
		FATAL.	
J. Muirhead ..	26/1/05	Runaway trucks	Accidental.
		SERIOUS.	
F. Lomas	12/6/05	Run over by truck; jig-chain breaking.	
		Seddonville State Mine.	
		Nil.	
		Westport Stockton Mine.	
		Nil.	

EXHIBIT No. 19—*continued.*

WEST COAST INSPECTION DISTRICT.—LIST OF FATAL AND SERIOUS ACCIDENTS, 1908 TO SEPTEMBER, 1911.

Name.	Date.	Cause of Accident.	Verdict.
		Point Elizabeth State Mine.	
		FATAL.	
R. Lumsden ..	26/5/08	Fall of stone in face	Accidental.
J. McIntyre ..	25/1/10	Runaway truck	,,
A. J. Davis ..	17/4/09	Run over by truck	,,
F. Fletcher ..	12/10/09	Fall of stone from roof	,,
G. Downs ..	7/2/10	Fall of stone and coal at face	,,
J. H. Johnston ..	3/10/10	Fall of coal at face	,,
J. Dunn ..	9/1/11	Explosion of fire-damp	,,
T. Whyte ..	3/3/11	Fall of roof at face	,,
T. McGahan ..	3/8/11	Fall of coal from corner of pillar	,,
G. Fullick ..	2/9/11	Fall of stone drawing timber	,,
		SERIOUS.	
J. Tyson	27/7/09	Runaway truck.	
J. Birch	12/10/09		
P. Rodgers ..	,,		
C. Rodgers (slight) ..	,,	Same accident, caused by a fall of stone.	
E. Clouson (slight) ..	,,		
J. Harrison (slight) ..	,,		
T. Braithwaite ..	8/10/10	Fall of stone.	
		Seddonville State Mine.	
		SERIOUS.	
G. Fleming ..	28/8/08	Caught by rope on curve wheel.	
		Westport Stockton Mine.	
		FATAL.	
J. Marx	13/3/10	Crushed leg between trucks; died thirty days after	Accidental.
		SERIOUS.	
J. W. Marshall ..	3/9/09	Fall from bins.	
E. Hartwick ..	17/12/09	Crushed with electric-brake car.	
D. Roberts ..	17/10/10	Fall of coal at face.	
		Paparoa Mine.	
		SERIOUS.	
T. Wilcox ..	4/5/09	Same accident. Explosion of fire-damp.	
R. Dall ..	..		
F. Hamilton ..	15/9/10	Collapse of timber at face.	
		North Brunner Mine.	
		FATAL.	
T. Compton ..	13/8/10	Runaway truck	Accidental.
		Tyneside Mine.	
		SERIOUS.	
D. Gainey ..	9/1/08	Fall of stone at face.	

WEST COAST INSPECTION DISTRICT.—FATAL AND SERIOUS ACCIDENTS AT WEST COAST MINES FROM JANUARY, 1905, TO SEPTEMBER, 1911.

Name of Mine.	Number of Fatal Accidents.	Number of Men killed.	Number of Serious Accidents.	Number of Men injured.
Point Elizabeth	12	12	8	12
Tyneside	1	1	1	1
North Brunner	1	1	..	..
Blackball	5	5	1	1
Paparoa	1	1	2	3
Denniston	9	10	12	12
Millerton	7	7	8	9
Westport Stockton	1	1	3	3
Seddonville	..	..	1	1
Puponga	1	1	1	1
Brunner	..	..	..	..
Total	38	39	37	43

EXHIBIT No. 19—*continued.*

WEST COAST INSPECTION DISTRICT.—NUMBER OF MEN EMPLOYED.

Mine.	Above Ground.	Below Ground.	Total.
Point Elizabeth—			
No. 1 section	35	130	165
No. 2 section	52	216	268
Tyneside Proprietary	41	42	83
North Brunner	46	85	131
Blackball	46	192	238
Paparoa	30	43	73
Denniston—			
Ironbridge	155	221	611
Coalbrookdale		235	
Millerton	113	436	549
Westport Stockton	54	120	174
Seddonville	23	70	93
Puponga	20	42	62
Smaller mines	..	..	50 (approx.)
Total	..	..	2,497

J. NEWTON, Inspector of Mines.

EXHIBIT No. 20.

PARTICULARS REGARDING VENTILATION OF WEST COAST MINES.

(Taken by James Newton, Inspector of Mines).

Locality.	Height in Feet.	Width in Feet.	Area.	Velocity per Minute.	Quantity.	Number of Men.	Number of Horses.	Cubic Feet per Man.	Remarks.
Point Elizabeth State Mine (N.Z. Government).									
(Taken on 5th September, 1911.)									
			Ft.	Ft.	Cub. ft.				
Intake, No. 1 section	7	9½	66½	790	52,535	..	..	..	
Intake, No. 3 west district	6	9½	57	250	14,250	11	1	290	This air passes through the west flat section, in which there are no men working, down to the workings in the extended dip, and is joined by a supply of fresh air from the intake.
Entering extended dip section	8	10	80	280	22,400	40	..		This quantity travels round the working, then through the east flat section up through the east level into the main return.
Third level east return	5	7¾	38¾	760	29,450	18	1		
No. 2 east level	4	5½	22	1,010	22,220	..	..	1,010	This air is split from the main intake and ventilates the second and first east levels, thence into the return.
Main return	7	7	49	1,150	56,350	18	1		
(Taken on 6th September, 1911.)									
Section No. 2, intake	7	10¼	71¾	660	47,355	..	..	213	This is a continuous current, but is split at levels to ventilate both top and bottom seams.
Section No. 2, return	5¾	7	40¾	1,250	50,312	190	8		
Brunner Mine, Tyneside Proprietary (Limited).									
(Taken on 7th September, 1911.)									
Main intake	5½	10½	57¾	150	8,662	7	1	247	The whole of this quantity goes to the lower level workings, where seven men and one horse are employed, then circulates to the top section of the workings, where it is joined by another body of fresh air that finds its way through the brattice stoppings in the main intake.
Top section	4¼	4¼	18	495	8,910	21	1	..	
Main return	..	..	..	..	11,340	..	..	..	

EXHIBIT No. 20—*continued.*

PARTICULARS REGARDING VENTILATION OF WEST COAST MINES—*continued.*

Locality.	Height in Feet.	Width in Feet.	Area.	Velocity per Minute.	Quantity.	Number of Men.	Number of Horses.	Cubic Feet per Man.	Remarks.
Paparoa Mine, Paparoa Coal Company (Limited).									
(Taken on 12th September, 1911.)									
No. 1 seam—Intake ..	7	12	84	120	10,280	2	..		Ventilates No. 1 seam and east section of No. 2 seam.
„ Return ..	4½	8½	38¼	270	10,328	..	..	868	This quantity, plus the quantity from No. 1, circulates through No. 2 seam.
No. 2 seam—Intake ..	6½	7	45½	690	31,395	42	1		
„ Return ..	6	8½	51	830	42,340	..	..	..	
No. 3 seam—Intake ..	5½	10	55	130	7,150	..	..	..	Leakage from intake doors accounts for the variation. No men working.
„ Return	6	9	54	140	7,560	..	..	..	After traversing each split and uniting in fan drift.
Main return.. ..	6¾	8	54	1,050	56,700	..	..	..	Variable speed in fan—some readings a good deal higher.
Denniston Mine, Westport Coal Company (Limited).									
(Taken on 19th and 20th September, 1908.)									
Ironbridge Section.									
Return, Kruger's Section	5	5	25	470	11,750	34	2	280	No reading taken at intakes—too large.
Intake, bottom drive, No. 4 pillars	4	10	40	210	8,400	10	1	600	
Intake No. 2 ..	5¼	5¼	27½	380	10,450	20	1	435	This is a split.
Intake, old mine ..	6	9	54	480	25,920	14	3	996	Natural ventilation.
Shaft return ..	..	..	3½	875	3,062	13	..	235	
Deep Creek return ..	3	5	15	490	7,350	19	..	386	
Main fan drift ..	8	12½	100	827	82,700	..	..	..	There are so many intakes to this section that it is practically impossible to get the intake quantities.
(Taken on 21st and 22nd September, 1908.)									
Coalbrookdale.									
Hodget's section, intake	7	9	49	190	9,310	13	..	716	
Entering return after ventilating west side of dip	7	11	77	610	46,970	118	8	251	This quantity, less 9,310, gives quantity ventilating No. 8 and No. 9 sections calculated on return quantity.

JAMES NEWTON, Inspector of Mines.

EXHIBIT No. 21.

LOCAL SALES OF BRIQUETTES AND EGGETTES AT WESTPORT, 1ST APRIL, 1910, TO 30TH SEPTEMBER, 1911.

——	Sold to General Public.	Sold to Government Departments.
	Tons cwt.	Tons cwt.
1st April, 1910, to 31st March, 1911	25 16	4 6
1st April, 1911, to 30th September, 1911	7 8	..
	33 4	4 6

BRIQUETTE-WORKS.

	Tons	cwt.	£	s.	d.	s.	d.
Coal used in manufacture	7,736	19	2,127	12	7	5	0
Pitch used in manufacture	798	15	4,225	3	3	10	1
Briquettes	8,535	14					
Less waste, &c.	116	7					
Output	8,419	7					
Stores			52	10	1	0	2
Wages			996	10	10	2	4
Coal used at boilers (579 tons 9 cwt.)			159	6	11	0	4
Total cost at works of 8,419 tons 7 cwt. briquettes and eggettes ..			£7,561	3	8	17	11

EXHIBIT No. 22.

PARTICULARS REGARDING VENTILATION OF QUARTZ-MINES, WEST COAST INSPECTION DISTRICT.

(Measurements taken by Inspector of Mines, Reefton.)

Name of Mine.	Date.	Locality where Measurement taken.	Number of Men per Shift.	Quantity of Air in Cubic Feet per Minute.	Quantity of Air per Man per Minute.	Temperature.		System of Ventilation.	Analysis.		General Remarks.
						Wet Bulb.	Dry Bulb.		CO_2.	O.	
Big River ..	20/6/11	No. 10 crosscut intake	20	2,119	105	67	68	Natural	..	..	Compartment shaft is upcast and downcast.
Progress ..	12/7/11	No. 11 main intake ..	82	4,114							Mine is worked two shifts, and on the third shift the workings are cleared by an exhaust fan.
,, ..	,,	Pioneer stope ..	..	..	89	75	75·1	,,	0·29	20·05	
,, ..	,,	No. 10 intake ..	..	3,156	..	..	..	,,	..	..	Total intake measurable.
,, ..	,,	No. 6 return.. ..	82	7,840	98	68·3	69	,,	0·27	19·65	Total return volume.
,, ..	12/9/11	No. 4 return.. ..	..	980	..	75·2	76·8	,,	..	..	
,, ..	,,	No. 5 return.. ..	12	3,445	287	68	69	,,	..	..	Total return volume, 7,554 cubic feet.
,, ..	,,	No. 6 return.. ..	14	3,129	223	68	69	,,	..	..	Return from No. 10 stopes.
,, ..	,,	No. 9 level	23	5,103	222	73	74	,,	..	..	Return from No. 11 or Pioneer stopes.
,, ..	,,	No. 10 level.. ..	34	3,537	104	75–78	77–79	,,	..	..	Intake near downcast shaft.
,, ..	,,	No. 11 level	..	4,410	..	..	..	,,	..	..	Practically all passes through workings.
Energetic ..	13/9/11	No. 4 intake.. ..	69	8,576	124	..	..	..	..	..	Only No. 7 level now working.
Keep-it-Dark ..	15/9/11	No. 7 intake.. ..	14	2,400	170	68	69	..	..	..	Several other connections to surface.
Blackwater ..	19/9/11	No. 2 intake.. ..	90	5,499	..	..	..	..	..	..	
,, ..	,,	Low level	..	5,061	..	..	60	..	..	..	

EXHIBIT No. 22—*continued.*

ANALYSES OF MINE-AIR, REEFTON MINES, WEST COAST INSPECTION DISTRICT.

Name of Mine and Section.	Temperatures.		Analysis.			Remarks.
	Wet Bulb.	Dry Bulb.	CO_2.	CO.	O.	
	°	°				
Progress Mine.						
No. 2 east intermediate ..	70	71	0·54	..	20·65	Dead-end : compressed air.
No. 10 level, 27 east ..	..	..	0·94	..	19·32	Rock-drill place ; shovelling.
No. 9 level	..	..	0·46	..	20·13	Air from No. 10 stopes.
No. 11 or Pioneer stopes ..	78	79	0·53	..	20·00	No current.
,, ..	75·3	77	..	..	..	In the current.
No. 2 east intermediate ..	71	72	0·45	..	20·39	Opposite end from No. 1 sample.
Pioneer stopes	74	75	0·41	..	20·44	Lower level than sample No. 4.
Energetic Mine.						
No. 10 stopes north ..	73·5	74·5	0·25	..	20·64	..
No. 11 level	73	74	0·36	..	20·58	Dead-end.
No. 8 stopes	73	74	0·28	..	20·62	Close of uprise to No. 7.
No. 10 stopes south ..	72	73	0·23	..	20·70	50 ft. from pass.
No. 6 level, footwall drive north	..	..	0·30	..	20·61	Dead-end.
No. 9 north stopes ..	74·5	75·5	0·33	..	20·57	No current.
Keep it-Dark Mine.						
No. 7 stopes	70·5	71·5	0·15	..	20·90	Appreciable current.
Blackwater Mine.						
No. 1 level	..	..	..	0·005	..	After firing in stopes.
No. 2 north stopes ..	60	60	0·42	..	20·63	..
No. 3 level crosscut ..	..	..	..	0·005	..	In face, 30 minutes after firing.
,, ..	..	..	..	0.008	..	50 ft. back, 30 minutes after firing.
Big River Mine.						
West intermediate stopes ..	70	71	0·33	..	20·68	..
No. 10 leading stope north	71	72	0·35	..	20·61	28 ft. wide.
South-west level stopes ..	..	..	0·53	..	20·36	..
New east intermediate ..	..	..	0·34	..	20·55	..
Progress Mine.						
No. 10 Progress drive ..	..	..	0·04	..	20·88	Dead-end.
No. 11 south crosscut ..	..	..	Lost in transit.			
,, ..	..	..	0·69	..	20·45	..
Crosscut from south rise ..	..	..	0·25	0·001	20·58	50 minutes after firing.

ANALYSES OF SAMPLES OF AIR FROM REEFTON MINES.

(Recorded by A. Whitley.)

No.	Name of Mine and Section.	Depth in Feet.	Air-measurements.			Analysis.			Temperature in Degrees Fahrenheit, Dry Bulb.
			Area in Square Feet.	Velocity in Feet per Minute.	Quantity in Cubic Feet per Minute.	CO_2.	O.	N.	
	Wealth of Nations.								
*1	No. 11 level, main return from upper workings	1,875	..	..	..	0·38	19·44	80·18	74·5
2	No. 6 level, main intake through incline shaft	1,234	37·37	120	4,485	0·10	20·82	79·08	63·5
3	No. 11 level, main return from upper workings by south rise pass	1,875	9	240	2,160	0·18	20·68	79·14	72
	Keep-it-Dark Mine.								
*1	No. 5 level, main return from lower workings	773	..	..	..	0·75	18·8	80·45	71·5
2	No. 7 level, 520 ft. from main shaft	1,073	29·25	62	1,813	0·20	20·67	79·13	66·5

* These analyses were made by Dr. Henderson, Reefton School of Mines ; the others by Dr. Maclaurin, Dominion Analyst, Wellington.

EXHIBIT No 22—*continued.*

ANALYSES OF SAMPLES OF AIR FROM REEFTON MINES—*continued.*

No.	Name of Mine and Section.	Depth in Feet.	Air-measurements.			Analysis.			Temperature in Degrees Fahrenheit, Dry Bulb.
			Area in Square Feet.	Velocity in Feet per Minute.	Quantity in Cubic Feet per Minute.	CO_2.	O.	N.	
	Progress Mine.								
*1	No. 3 level (old level undergoing repairs)	367	..	..	..	0·16	19·28	80·56	..
2	No. 11 level, north end of Pioneer section	1,416	..	..	..	0·52	20·29	79·19	82
3	No. 6 level, main return from lower workings	816	29·25	143	4,182	0·64	20·12	79·24	70
	Golden Fleece Mine.								
*1	No. 15 level, return from upper workings	1,797	..	..	..	0·76	18·99	80·25	72
	New Big River Mine.								
1	No. 9 level, top of new eastern winze, main return from No. 10 level	1,375	..	..	..	0·37	20·60	79·03	..

* These analyses were made by Dr. Henderson, Reefton School of Mines; the others by Dr. Maclaurin, Dominion Analyst, Wellington.

TEMPERATURES AND AIR-MEASUREMENTS, REEFTON DISTRICT.

Progress Mine.

Sept. 6, 1909.—Temperatures taken in stopes over No. 11 level at three faces; the dry-bulb readings were 75°, 76°, and 78° Fahr.

Sept. 7, 1909.—Temperatures taken in stopes over No. 10 level at two faces, dry bulb 74·5°, wet bulb 73·5°, Fahr.; about 95 per cent. saturation.

,, Quantity of air passing through main outlet, rise from No. 10 close to stopes, 4,080 cubic feet per minute.

,, Quantity of air passing through main crosscut, intake from B shaft at No. 11 level, 4,350 cubic feet per minute.

Sept. 8, 1909.—Quantity of air passing through No. 6 level, main return airway, 4,725 cubic feet per minute, at a temperature of 67° Fahr. by dry bulb.

,, Quantity of air passing into No. 8 level, near chamber at B shaft, 1,491 cubic feet per minute, at a temperature of 58° Fahr. by dry bulb.

Feb. 15, 1910.—Ventilation very bad. Manager to take men out of mine until it improved.

Feb. 22, 1910.—Quantity of air passing through No. 5 level, main return airway, 3,012 cubic feet per minute.

April 11, 1910.—Temperatures taken: Pioneer section, No. 11 level, 80° Fahr. by dry bulb; drive off rise at No. 10 level, 80° Fahr. by dry bulb.

Wealth of Nations Mine.

Nov. 3, 1909.—Quantity of air passing through No. 6 level, main intake, 6,000 cubic feet per minute, at a temperature of 59° dry bulb, 57° wet bulb, Fahr.; 86 per cent. saturation.

,, Temperatures taken: No. 8 level, stopes on main reef, 70° dry bulb, 68·5° wet bulb, Fahr.; No. 10 level, winze on main reef, 20 ft. below level, 74° dry bulb, 73° wet bulb, Fahr.; No. 11 crosscut, 60 ft. from main shaft, 75° dry bulb, 74° wet bulb, Fahr.; 95 per cent. saturation.

Golden Fleece Mine.

Dec. 8, 1909.—Quantity of air passing through No. 6 level, intake from surface *via* Ajax shaft and Royal workings, 2,082 cubic feet per minute.

,, Temperatures taken: No. 15 level, stopes over level, 71° dry bulb, 70° wet bulb, Fahr.; face of level, 70° dry bulb, 69° wet bulb, Fahr.; 94 per cent. saturation.

Progress Mine.

Oct. 4, 1910.—Temperatures taken: Provist's stopes, No. 10 level, in air-current, dry bulb 75°, wet bulb 74°, Fahr.; hanging-wall stope in this section, dry bulb 80°, wet bulb 79°, Fahr.

,, Pioneer stopes at No. 11 level, No. 6 bord, dry bulb 80°, wet bulb 79°, Fahr.; No. 5 bord, this section, dry bulb 78°, wet bulb 77°, Fahr.; 95 per cent. saturation.

A. WHITLEY, Inspector of Mines.

EXHIBIT No. 23.

SHAFT WINDING-SIGNALS.

Stop or hold cage (while in motion)	1 bell.
Lower	2 bells.
Haul up (when cage is stopped)	1 ,,
Haul up, men on	3–1 ,,
Turn off air	5 ,,
Turn on air	6 ,,
Accident	7 ,,

In addition to the ordinary signals for winding the section system must be used when ringing the cage from a level to another level.

No. of Section.	No. of Level.	No. of Level in No. 1 Section.	Bell. Bell.
1	1	1	1 pause 1
	2	2	1 ,, 2
	3	3	1 ,, 3
	4	4	1 ,, 4
	5	5	1 ,, 5
		No. of Level in No. 2 Section.	
2	6	1	2 pause 1
	7	2	2 ,, 2
	8	3	2 ,, 3
	9	4	2 ,, 4
	10	5	2 ,, 5
		No. of Level in No. 3 Section.	
2	12	2	3 pause 2
	13	3	3 ,, 3

When ringing the cage from a level to another level the number of the section must be rung first, and then the number of the level in that section.

It must always be understood that there are men on the cage in the inter-level signals.

T. O. BISHOP, Inspector of Mines.

EXHIBIT No. 24.

WEST COAST INSPECTION DISTRICT.—VERDICTS ON FATAL ACCIDENTS, POINT ELIZABETH STATE MINE.

R. Lumsden: Accidental death, no blame being attachable to any one.

J. McIntyre: We consider the cause of death was purely accidental, no blame being attachable to any one.

A. J. Davis: Deceased was accidentally killed, no blame being attachable to any one.

F. Fletcher: That deceased came by his death from shock and fracture of the skull caused by a fall of debris in No. 1 State Mine, Dunollie, adding that no blame was attachable to any one.

G. Downs: The jury returned a verdict of accidental death, no blame being attachable to any one.

J. Baker: The deceased died from injuries sustained while working in No. 2 section, No. 1, Point Elizabeth State Mine, no blame being attachable to any one.

J. H. Johnston: Deceased met his death by injuries received by a fall of coal, and that no blame is attachable to any one.

J. Dunn: That deceased met his death from injuries received through an explosion of fire-damp, no blame being attachable to any one.

T. McGahan: That deceased met his death by being struck with a piece of coal, and that no blame is attachable to any one.

G. Fullick: That the deceased met his death by a fall of stone, no blame being attachable to any one.

J. NEWTON, Inspector of Mines, Westport.

WEST COAST INSPECTION DISTRICT.—LIST OF FATAL AND SERIOUS ACCIDENTS, 1908 TO SEPTEMBER, 1911.
(See Exhibit No. 19.)

WEST COAST INSPECTION DISTRICT.—FATAL AND SERIOUS ACCIDENTS AT WEST COAST MINES FROM JANUARY, 1905, to SEPTEMBER, 1911.
(See Exhibit No. 19.)

PUPONGA COLLIERY.—READINGS TAKEN ON THE 7TH NOVEMBER, 1911, BY JAMES NEWTON, INSPECTOR OF MINES.

Intake, 39,550 cubic feet; return, 42,840 cubic feet. Ventilation good in working-places.

EXHIBIT No. 25.

ACCIDENTS AT POINT ELIZABETH STATE COLLIERY.

(Handed in by John Arbuckle, Secretary to the Point Elizabeth Sick and Accident Fund, at Runanga, 27th October, 1911.)

Fatal Accidents.

..	..	..	Smith: Fall of stone, solid place.
..	..	..	R. Lumsden: Fall of stone, solid place.
28 January,	1909	..	C. McIntyre: Empty truck.
17 April,	,,	..	J. Davis: Race of trucks on main dip.
12 October,	,,	..	F. Fletcher: Fall of stone on flatsheet up incline.
7 February,	1910	..	G. Downs: Fall of coal and stone (pillar).
..	..	..	J. Baker: Fall of stone in pillar.
..	..	..	J. H. Johnson: Fall of coal, solid place.
11 January,	1911	..	J. Dunn: Explosion of fire-damp, No. 2 section.
3 March,	,,	..	T. Whyte: Fall of stone (pillar).
3 August,	,,	..	T. McGhan: Fall of coal (pillar).
2 July,	,,	..	F. Devine: Accident to leg (died through blood-poisoning).
2 September,	,,	..	G. Fullick: Falling stone (pillar-workings, drawing timber).

Accidents through being struck with Timber.

31 May,	1910	..	W. Neen: Struck with falling cap-piece (external injuries).
6 July,	,,	..	T. Mossop: By prop falling on his foot.
9 ,,	,,	..	J. Kyle: Bar falling on his leg (sprained ankle).
20 September,	,,	..	W. Wilson: Bar falling on his leg.
1 March,	1911	..	W. Griffiths: Prop falling on his arm.
16 ,,	,,	..	D. Tweed: Finger jammed between prop and bar.
16 ,,	,,	..	M. Bell: Fractured leg (prop fell on leg).
24 ,,	,,	..	G. Ward: Piece of timber fell on hand.
7 April,	,,	..	J. B. Douglas: Piece of wood striking eye (cut on eyeball).
29 ,,	,,	..	T. Johns: Prop falling on leg (injury to foot).
9 May,	,,	..	J. Neilson: Prop falling on arm (muscular strain).
6 June,	,,	..	T. Pilling: Bar falling on him (bruised leg).
16 ,,	,,	..	A. Keowan: Jammed finger between timber.
19 ,,	,,	..	R. Pickup: Prop falling on toe.

Accidents through Slipping on Flatsheets.

4 April,	1910	..	E. Rutherford: Injury to knee.
16 June,	,,	..	O. Beckman: Injury to side.
12 August,	,,	..	B. Cartwright: Injury to knee.
31 ,,	,,	..	F. Renfrey: Broken rib.
6 June,	1911	..	F. Macharus: Strained back.
13 ,,	,,	..	J. Henderson: Strained back.
21 September,	,,	..	W. McNeil: Crushed hand.
30 ,,	,,	..	B. Bansgrove: Falling on flatsheet (injury to leg).

Accidents through Jig-chains and Jig-sticks.

29 February,	1910	..	J. Lyes: Struck by jig-stick on side.
28 June,	,,	..	J. Lithgow: Caught between roller on jig and chain.
9 October,	1911	..	J. Maloney: Blow from jig-chain (injury to arm).

Accidents through Falling Coal.

2 February,	1910	..	F. Marshall: Injury to back.
23 ,,	,,	..	J. Straghan: Broken leg.
5 ,,	,,	..	J. Rimmer: Injury to head and body.
24 ,,	,,	..	J. Higson: Injury to back.
11 May,	,,	..	R. Leach: Injuries to back and leg.
23 ,,	,,	..	A. Woodhouse: Injury to head.
4 August,	,,	..	J. Nicholson: Injury to back and head.
5 ,,	,,	..	C. Thomas: Injury to spine.
31 ,,	,,	..	A. Asquith: Cut and bruises on arm.
3 September,	,,	..	J. Lowe: Injury to head.
8 ,,	,,	..	G. Piner: Injury to leg.
8 November,	,,	..	M. Lacey: Injury to ankle.
26 ,,	,,	..	T. Delaney: Injury to foot.
29 ,,	,,	..	A. Mitchell: Injury to hand.
3 January,	1911	..	H. Houghton: Crushed finger.
5 May,	,,	..	D. McGhee: Crushed finger.
22 ,,	,,	..	J. Price: Injury to kneecap.
22 ,,	,,	..	W. Walker: Bruised back.
23 ,,	,,	..	F. Renfrey: Injury to back.
20 June,	,,	..	T. Satterthwaite: Injury to leg.

EXHIBIT No. 25—*continued.*

ACCIDENTS AT POINT ELIZABETH STATE COLLIERY—*continued.*

Accidents through Falling Stone.

3	March,	1910	A. Gibbs: Injury to back.
30	May,	,,	E. Scott: Cut on hand.
10	June,	,,	F. Tomlinson: Injury to shoulder.
17	,,	,,	J. Roberts: Sprained ankle and fractured leg.
22	,,	,,	T. Ellis: Injuries to head and shoulder.
27	,,	,,	J. Hall: Crushed finger.
24	October,	,,	J. Arbuckle: Broken muscle of leg.
29	,,	,,	J. Reynolds: Injury to spine.
8	December,	,,	T. Braithwaite: Fractured leg.
8	,,	,,	W. Shore: Bruised and poisoned hand.
12	,,	,,	J. Banks: Crushed finger.
12	,,	,,	R. Ward: Crushed finger.
16	,,	,,	W. Rowe: Fractured leg and dislocation of leg.
3	March,	1911	J. Law: Injury to back.
15	April,	,,	H. Knight: Injury to shoulder.
31	May,	,,	W. Shore: Crushed foot.
19	June,	,,	J. McPhee: Crushed finger.
7	July,	,,	G. Curran: Crushed finger.
20	,,	,,	R. Braithwaite: Cut fingers.
21	,,	,,	C. Russell: Crushed finger.

Accidents through other Causes.

6	January,	1910	W. Glynn.
11	,,	,,	P. Manderson: Injury to back.
24	,,	,,	P. Cruickshanks: Injury to finger.
24	,,	,,	A. Grant: Hand caught between truck and prop.
24	,,	,,	A. Gray.
31	,,	,,	A. McDonald: Blow in eye from piece of coal.
31	,,	,,	J. Cook: Injury to toe.
1	February,	,,	J. H. Johnston: Hand jammed with truck.
1	,,	,,	W. Cauldwell: Hand jammed between two trucks.
1	,,	,,	J. Settleton: Hand jammed between two props.
7	,,	,,	S. Keys: Cut on hand.
19	,,	,,	W. Shore: Knock on leg and poison.
26	,,	,,	J. Perring: Jar with pick handle.
28	,,	,,	G. Robison: Wire off rope sticking into hand.
5	March,	,,	W. Robson: Blow on eye.
5	,,	,,	F. Brooks: Blow on face.
5	,,	,,	J. Edwards: Sprained ankle.
7	,,	,,	J. O'Donnell: Sprained wrist.
15	,,	,,	F. Tomlinson: Sprained ankle.
16	,,	,,	F. Short: Blow on face from flying coal; injury to eye.
19	April,	,,	J. W. Sheard: Crushed finger.
20	,,	,,	E. Piner: Slipping on rail; injury to knee.
16	May,	,,	A. Kyle: Truck running over foot.
18	,,	,,	D. Young: Fractured collar-bone.
19	,,	,,	W. Muir: Hand jammed between truck and prop.
19	,,	,,	W. Muncaster: Strain to side.
30	,,	,,	A. Brooks: Strained wrist.
1	June,	,,	S. Moore: Hand caught between two trucks.
9	,,	,,	H. Vernon: Ruptured lifting truck.
9	,,	,,	S. Keys: Bar falling upon him.
21	,,	,,	A. Grant: Hand caught between truck and roof.
24	,,	,,	G. Elliot: Hand caught between truck and roof.
25	,,	,,	H. Arlow: Injury to knee.
5	July,	,,	C. Hunt: Hand caught between prop and jig.
6	,,	,,	F. Jackson: Injuries.
6	,,	,,	W. Eddy: Stone rolling on ankle.
12	,,	,,	J. Griffen: Injury to back.
19	,,	,,	H. Guthardt: Arm caught between two trucks.
30	,,	,,	J. Reynolds: Injuries to knee.
20	,,	,,	J. King: Foot caught between two trucks.
15	,,	,,	J. Price: Cut on arm and poisoned.
11	August,	,,	J. H. Johnston: Injuries to back.
11	,,	,,	J. Twist: External injuries.
17	,,	,,	J. McGuinness: Kick from horse; injuries to knee.
1	September,	,,	H. Houghton: Injuries to eye.
5	,,	,,	J. Rae: Strained back lifting truck.
8	,,	,,	C. W. Brown: Slipping while timbering.

EXHIBIT No. 25—*continued.*

ACCIDENTS AT POINT ELIZABETH STATE COLLIERY—*continued.*

10	September,	1910	W. Vipond: Hand caught between truck and coal.
13	,,	,,	R. Hannah: Fractured arm.
3	October,	,,	W. Partington: Poisoned hand from nail.
7	,,	,,	A. Smith: Jammed between two trucks (rope boy).
11	,,	,,	W. Fisher: Truck run over foot.
17	,,	,,	W. Missen: Slipping on rail; injury to back.
23	,,	,,	J. Armstrong: Hand caught on truck; crushed fingers.
24	,,	,,	F. Irvine: Hand jammed between truck and prop.
27	,,	,,	W. Dixon: Slipping on rail; injury to leg.
30	,,	,,	F. Macharus: Slipping on floor; injury to back.
1	November,	,,	J. Kyle: Hand caught with trailer while unhooking.
15	,,	,,	J. Bigrig: Slipping on floor; injury to back.
21	,,	,,	M. Fitzgibbons: Slipping on floor; injury to knee.
23	,,	,,	J. Fitzgibbons: Hand crushed between two trucks (rope boy).
24	,,	,,	F. Devine: Leg caught between two trucks.
24	,,	,,	F. Simpson: Strain to back.
25	,,	,,	A. Brooks: Struck on eye with coal; loss of eye.
28	,,	,,	P. Stewart: Pick through hand.
8	December,	,,	A. Forsyth: Hand jammed between prop and truck.
12	,,	,,	A. Waugh: Lifting truck; strain to back.
12	,,	,,	J. Pickup: Injured.
18	January,	1911	T. Allen: Truck falling on foot.
11	February,	,,	E. Burger: Truck run on to leg.
13	,,	,,	F. Jackson: Falling on rail; injury to back.
14	,,	,,	R. Moorfield: Knock on head.
15	,,	,,	J. Nuttal: Hand crushed between two trucks.
17	,,	,,	J. Rimmer: Pick stuck in leg.
27	,,	,,	A. Tither: Wrist jammed with truck.
3	March,	,,	G. Fullicks: Runaway truck; injuries to side.
9	,,	,,	W. Gleave: Injury and poisoned leg.
9	,,	,,	T. Price: Finger cut and poisoned with coal.
29	,,	,,	E. Burger: Injured back shifting stone.
30	,,	,,	H. Ceswell: Falling through viaduct.
31	,,	,,	R. Hogg: Arm crushed between two trucks (rope boy).
31	,,	,,	J. McDermott: Strained back lifting on a truck.
1	April,	,,	J. Smith: Finger crushed with sprag.
4	,,	,,	O. Davis: Slipped on rope; cut and poisoned arm.
8	,,	,,	C. Rogers: Pick stuck in finger.
10	,,	,,	J. O'Donnell: Arm cut with nail and poisoned.
18	,,	,,	T. Callanan: Hand crushed between two trucks.
18	,,	,,	J. Adams: Strained back lifting flatsheet.
28	,,	,,	R. Southward: Finger crushed between two trucks.
5	May,	,,	H. Routledge: Back strained lifting truck.
7	,,	,,	R. Lumsden: Hand crushed between two trucks (rope boy).
15	,,	,,	F. Jackson: Cut on hand with axe.
17	,,	,,	S. Gage: Strained shoulder on flatsheet.
22	,,	,,	B. Palmer: Jarred hand with pick.
23	,,	,,	T. Gollins: Strained back lifting truck.
6	June,	,,	V. Armstrong: Struck by runaway truck.
7	,,	,,	J. Coulthardt: Piece of iron run into hand (blacksmith).
12	,,	,,	J. Mears: Strained back lifting truck on.
15	,,	,,	R. Arbuckle: Cut on hand with axe.
19	,,	,,	S. Unwin: Falling on road; injury to knee.
19	,,	,,	T. Haliday: Hand jammed with truck.
23	,,	,,	C. Tanner: Kicked with horse (blacksmith shop).
24	,,	,,	A. Tither: Hand crushed between coal and truck.
26	,,	,,	F. Devine: Cut and poisoned leg.
21	,,	,,	E. McGuinness: Sticking pick in toe.
20	July,	,,	J. Hopkins: Pick stuck in arm.
26	,,	,,	T. James: Run over by truck.
26	,,	,,	J. Garvey: Slipping on rail; injury to knee.
28	,,	,,	F. Devine: Slipping down; injury to leg.
29	,,	,,	I. Mossop: Twisted ankle.
4	August,	,,	G. Burger: Arm jammed between two trucks.
13	,,	,,	J. Higson: Falling on main road; strained knee.
15	,,	,,	M. Lauder: Crushed finger between truck and coal.
25	September,	,,	R. Leach: Axe breaking and cutting finger.
2	October,	,,	J. Head: Hand crushed between truck and road.
2	,,	,,	J. Wilde: Injured by winch-rope, No. 2 section.
6	,,	,,	J. Coulthardt: Hand cut with iron (blacksmith shop).
10	,,	,,	J. Nash: Cut with axe.
9	,,	,,	T. Devaney: Runaway truck; bruised leg.

EXHIBIT No. 26.

PARTICULARS OF ACCIDENTS IN THE WESTLAND MINING DISTRICT FROM THE 16TH SEPTEMBER, 1909, TO THE 24TH OCTOBER, 1911.

Sept. 16, 1909.—John McGlone, married, aged 31 years, native of Ireland: Killed by a stone falling from hydraulic-sluicing face at Kumara.

Nov. 1, 1909.—Alfred Steadman, married, aged 32 years: Killed in the Ross shaft by a piece of timber falling.

Sept. 24, 1910.—John Kulsen, single: Slightly injured by a fall of clay in his claim at Tucker Flat, Kanieri.

June 15, 1911.—Charles Heil, married, aged 35 years: Killed by a break in the elevator-chain at Wheel of Fortune Claim, Stafford.

June 1, 1911.—Florence O'Brien: Wrenched his back while trucking in the King Gold-mining Company's Claim; idle twenty-four days.

July, 10, 1911.—Enoch Growcott, Rimu: Whilst lifting a stone received a jar; two weeks off work.

Aug. 29, 1911.—John Holley: Had his hip dislocated by a fall of debris; two months off work.

Sept. 6, 1911.—Albert William Upjohn: Injured his side and chest by the breaking of a plank in the sluicing-paddock; twenty-one days away from labour.

Sept. 25, 1911.—Alfred Richards: Injured by a stone rolling out of the face whilst picking up tools prior to knocking off work.

A. H. RICHARDS, Inspector of Mines.

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