1896.
NEW ZEALAND.

BRUNNER COAL-MINE DISASTER

(REPORT OF ROYAL COMMISSION APPOINTED TO INQUIRE INTO, ON 26TH MARCH, 1896).

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

COMMISSION APPOINTING COMMISSIONERS TO INQUIRE INTO THE COAL-MINING DISASTER AT BRUNNERTON.

To all to whom these presents shall come, and to CHARLES DUDLEY ROBERT WARD, Esquire, of Christchurch, District Court Judge; Sir JAMES HECTOR, of Wellington, Knight Commander of the Most Distinguished Order of Saint Michael and Saint George; JOSEPH PROUD, Esquire, of Wanganui, a certificated Colliery-manager under the provisions of "The Coal-mines Act, 1886"; and THOMAS SKELLON, of Huntly, Coal-miner—Greeting:

WHEREAS a disaster occurred at the coal-mine at Brunnerton, known as the Brunner Mine, on the twenty-sixth day of March last, which caused the deaths of sixty-five persons working therein: And whereas it is expedient that a Commission should be issued for the purpose of inquiring into the cause of the said disaster, and for the other purposes hereinafter mentioned:

Now, therefore, know ye that I, David, Earl of Glasgow, the Governor of the Colony of New Zealand, reposing trust and confidence in your knowledge, integrity, and ability, and by the advice and with the consent of the Executive Council of the said colony, do hereby constitute and appoint you, the said

CHARLES DUDLEY ROBERT WARD,
Sir JAMES HECTOR,
JOSEPH PROUD, and
THOMAS SKELLON,

to be Commissioners for the purpose of making inquiry into the matters hereinbefore referred to, and into the several other matters mentioned in these presents, that is to say:—

1. To ascertain in what parts of the mine the disaster occurred, and the nature of the same.

2. To ascertain whether it was caused by an explosion; and, if so, whether by an explosion of firedamp, or of firedamp mixed with coal-dust, or coal-dust alone.

3. To ascertain what lights were used in the different parts of the mine at the time of the disaster or explosion.

4. To ascertain whether any inquiry into the cause of the disaster has taken place. If so, what was the nature of such inquiry? How was the tribunal constituted?

5. To ascertain to what extent the provisions of "The Coal-mines Act, 1891," and the general rules, the special rules, and additional rules made in accordance with the provisions of that Act were complied with in the mine; but more especially as regards (*a*) the storage and use of explosives, and the nature of the explosives; (*b*) the lighting and ventilation of the mine; and (*c*) the means of escape in case of accident.

6. To ascertain the nature and character of the working and general management of the mine, and whether the mine was well managed or not.

7. To determine the competency of the Inspector, and the efficiency of the inspection of the mine.

8. To determine the competency of the manager, mine officials, and servants, and the management and working of the mine.

9. To ascertain the number and efficiency of the stoppings, the materials of which they were composed, and the condition they were in immediately prior to the disaster.

10. To ascertain the nature and sufficiency of the machinery and appliances used in the working of the mine, and the condition the same were in at the time of the disaster.

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

12. And generally to make inquiry into any matter or thing arising out of or connected with the several subjects of inquiry hereinbefore mentioned, or which, in your opinion, may be of assistance in fully ascertaining, explaining, or assisting in arriving at a fair and just conclusion in respect to the subjects of inquiry or any of them, or any part thereof or in relation thereto.

And for the better enabling you to carry these presents into effect, you are hereby authorised and empowered to make and conduct any inquiry under these presents, at such place or places in the said colony as you may deem expedient, and to call before you and examine on oath, or otherwise, as may be allowed by law, such person or persons as you may think capable of affording you information in the premises; and you are also hereby empowered to call for and examine all such books, documents, papers, maps, plans, or records as you shall judge likely to afford you the fullest information on the subject of this Commission, and to inquire of and concerning the premises by all other lawful ways and means whatsoever, and also to use the evidence taken in the course of any previous inquiry touching the disaster.

And lastly, that, using all diligence, you do report to us, under your hands and seals, your opinion resulting from the said inquiry, in respect of the several matters and things inquired into by you under or by virtue of these presents, not later than the fifth day of June next ensuing, stating in such report what steps, if any, it would, in your opinion, be expedient to adopt under the circumstances which you find to exist, and in what manner effect should be given to such recommendation.

And it is hereby declared that this Commission shall continue in full force and virtue, although the inquiry be not regularly continued from time to time by adjournment, and that you or any two of you shall and may from time to time proceed in the execution hereof, and of every power, matter, and thing herein contained.

In witness whereof I, David Earl of Glasgow, the Governor of the Colony of New Zealand, acting by and with the advice of the Executive Council of the said Colony, have hereunto set my hand, and have caused these presents to be issued under the seal of the said colony, at Wellington, in the said colony, this twenty-fourth day of April, in the year of our Lord one thousand eight hundred and ninety-six.

GLASGOW, Governor.

Issued in Executive Council.

J. F. ANDREWS, Assistant-Clerk of the Executive Council.

GLASGOW, Governor.

To all to whom these presents shall come, and to CHARLES DUDLEY ROBERT WARD, Esquire of Christchurch, District Court Judge; Sir JAMES HECTOR, of Wellington, Knight Commander of the Most Distinguished Order of Saint Michael and Saint George; JOSEPH PROUD, Esquire, of Wanganui, a certificated Colliery-manager under the provisions of "The Coal Mines Act, 1886"; and THOMAS SKELLON, of Huntly, Coal-miner—Greeting:

WHEREAS by a Commission bearing date the twenty-fourth day of April last, you, the said

CHARLES DUDLEY ROBERT WARD,
Sir JAMES HECTOR,
JOSEPH PROUD, and
THOMAS SKELLON,

were appointed to be a Commission, for the purposes and with the powers in the said Commission more particularly mentioned: And whereas, by the said Commission, you were directed and required to report to me, on or before the fifth day of June then next ensuing, your proceedings and your opinion touching the matters mentioned therein: And whereas it is expedient that the said period should be extended as hereinafter provided:

Now, therefore, I, David, Earl of Glasgow, the Governor of the Colony of New Zealand, by and with the advice of the Executive Council thereof, and in exercise of every power and authority enabling me in that behalf, do hereby extend the period within which you shall (using all diligence) report to me as by the said Commission provided, to the twenty-second day of June instant. And with the like advice and consent, and in further pursuance and exercise of the said power and authority, I do hereby confirm the said Commission, except as altered by these presents.

In witness whereof, I, David, Earl of Glasgow, the Governor of the Colony of New Zealand, acting by and with the advice of the Executive Council of the said Colony, have hereunto set my hand and have caused these presents to be issued under the Seal of the said Colony, at Wellington, in the said colony, this second day of June, in the year of our Lord one thousand eight hundred and ninety-six.

GLASGOW, Governor.

Issued in Executive Council.

ALEX. WILLIS, Clerk of the Executive Council.

REPORT.

To His Excellency the Right Honourable David, Earl of Glasgow; Knight Grand Cross of the Most Distinguished Order of Saint Michael and Saint George; Governor and Commander-in-Chief in and over Her Majesty's Colony of New Zealand, and Vice-Admiral of the same:

MAY IT PLEASE YOUR EXCELLENCY,—

Your Excellency's Commission was received and opened at Greymouth on Thursday, the 7th May, 1896, and a preliminary meeting was held on the same day, at which the mode of procedure was discussed. The mine-manager, and the relatives of the deceased miners were represented by counsel, but the counsel for the Crown and for the owners of the mine did not arrive until the following day.

2. The Commissioners decided, after due consideration, that reporters for the press should be excluded, as it was not desirable that the evidence for the present should be fully published. This was done solely in the interests of the miners, as it was represented that there would be great difficulty in getting them to bring forward their evidence if it were immediately made public. This course was, however, found to be impracticable, as the public were not excluded, and consequently reports were furnished to the press from other sources. It was, therefore, decided after the preliminary inquiry on the first day, that the sittings of the Commissioners should be open to the press.

3. The Commissioners sat on nine days for the purpose of taking evidence, two of the sittings being held at Brunnerton, for the convenience of witnesses residing there, the other sittings being held in the Courthouse at Greymouth.

4. The Commissioners devoted one day to the inspection of the locality of the disaster in the Brunner Coal-mine. Your Commissioners regret that, owing to the pumping gear having been destroyed by the explosion, the water had risen to a considerable extent in the deeper part of the mine before the time of their visit, so that they were unable to inspect for themselves the exact place where the explosion appears to them to have originated, according to most of the evidence.

5. Some of the Commissioners also visited the Blackball and Westport Coal-mine, the two latter inspections being made for the purpose of investigating the working of certain changes in the systems of management which have been adopted since the Brunner disaster.

6. Your Commissioners append hereto the minutes of their proceedings and a list of the witnesses, whose evidence, duly sworn, was taken in full, and that evidence is also appended to this report.

7. The Commissioners also examined and perused the plans and documents which are referred to by the witnesses, and which are enumerated in the appendix hereto.

8. With regard to the questions submitted to us by your Excellency, we have the honour to report as follows:—

9. That the accident was caused by an explosion, which occurred suddenly in the sump side of the dip-working about 9.25 a.m. on the 26th March, 1896, and caused the death of sixty-five persons, not one of those who were in the mine at the time having escaped. The last men now alive who were in the mine before the accident were John Moseley and Frank Thomas, who left at 6 a.m., and the first to attempt to enter the mine after the accident was Mr. Bishop, the manager.

OWNERS.

10. The leasehold in which the Brunner Mine is situated has an area of 1,280 acres, and is part of the Grey District Coal Reserve.

The original lease was granted for a term of twenty-one years from the 1st January, 1874, but was twice transferred, in 1875 and in 1879; and was surrendered in December, 1886, by the then holder, Mr. Martin Kennedy, who, in January, 1887, obtained the new lease for a term of sixty-three years. This lease was transferred in 1888 to the Grey Valley Coal Company, and was by this company surrendered, in December, 1894, for a new lease under the conditions of "The Coal-mines Act, 1891." This lease was, on the 19th October, 1895, transferred by a deed of assignment, with the consent of the Minister, to the Greymouth-Point Elizabeth Railway and Coal Company (Limited); and this company was the responsible owner of the mine at the date of the accident.

The conditions of the lease under which the mine is now worked are as follow: The term of the lease is for twenty-one years, with the right of renewal. There is a dead rent of £1,000 per annum, and a royalty of 6d. per ton for all above 40,000 tons, the annual output to be maintained by covenant at 75,000 tons. The total area of the coal which has now been worked is about 230 acres, and the total amount of coal raised since the systematic working of the mine was commenced up to the 26th of March has been 1,307,942 tons. The amount of coal which has been left in the mine, as ribs for supporting the mine and the pillars, is about 1,000,000 tons, and of which one-half may probably be extracted. It is very certain, therefore, that, unless successful prospecting-works are pushed on in other parts of the leasehold, the mine will have to be closed long before the term of the lease expires. This prospect is not encouraging for the lessees to spend more than can be avoided in the management of the mine; but the evidence obtained during our inquiry has not disclosed any lapse of duty in this respect on the part of the company.

MANAGEMENT.

11. At the date of the accident the mine was under the administrative control of Mr. James Bishop, a duly qualified and certificated coal-mine manager, and who has been in continuous employment as such for twenty-five years, and for the last thirteen years has been manager of the Brunner Mine. Mr. Bishop's mining staff in the dip-workings when the accident took place comprised: One under-viewer, John Roberts; one fireman, John Morris; one deputy, Josiah Masters; two under-deputies on night shift, Robert Tennant and William Sheard. On any occasion when the manager required to be absent from his charge, the under-viewer was always given written instructions, making him responsible for the time being.

12. The number of hands employed in connection with the mine at the date of the disaster was as follows: In the dip-workings, 5 officers and 67 miners; in the rise-workings, 5 officers and 71 miners; and hands engaged on surface work, and in charge of machinery, 54: making a total of 202.

Since the work has been resumed after the disaster, the following numbers have been employed: In the dip-workings, 3 officers, 43 miners; in restoring damage, 20; rise-workings, 5 officers, 111 miners, 2 timber men, and 76 surface hands: making a total of 260. This shows an increase of 58 employés since the disaster.

DESCRIPTION OF MINE.

13. The Brunner Mine, which altogether has an area of about 200 acres, is situated on the north side of the Grey River, where it flows through a confined rocky gorge. The coal-seam as worked varies from 7ft. to 10ft. in thickness, and dips to the south-west at an average angle of 1 in 5. It intersects the river water-level near the point where the mine has been opened. For many years the coal was mined to the rise from a level tunnel, following the seam into the hill in a north-west direction, but after continuing this for 23½ chains, a down-throw fault was met with, which dropped the coal to the westward for 180ft. This fault was overcome by driving north-east along it, still on the level, for 12½ chains, until the coal was recovered. The main level was then again carried forward in coal for a distance of 32 chains, when the coal-seam was found to thin out and become unmarketable. From the main-level road, which extends more than half a mile into the hill, all the coal which could be worked to the rise in a north-east direction has been extracted, except a rib which has been left for access to future extension of the mine, and a detached area near the outcrop at 400ft. altitude, which is now being worked as a separate mine, known as the Coolgardie, and which fortunately has an entrance distinct from that of the Brunner Mine. Had it been otherwise, so that the two mines had underground communication, the miners at work in the Coolgardie district might have shared in the disaster.

The rise-workings from which the coal is worked most cheaply having been exhausted, the extraction of the coal below water-level and beyond the fault was proceeded with by what is termed a dip-working. Two incline drives about 1 chain apart were carried down in the coal and connected at intervals by cross-cuts or stentons to enable sufficient ventilation being carried forward, each succeeding stenton being closed by a stopping as the work advanced. These stoppings play an important part in the future security of the mine, for as the extraction of the coal by bords and pillars to right and left of the double incline is effected, these inclines have to act as the intake and return airways, by means of which fresh air is supplied to these dip-workings.

One of these incline drives, the east incline or the intake, has also to serve as the main road by which all traffic is carried on. By this all the coal has to be hauled up through to the main level, and so reach the surface along the engine-plane. The water which drains into the dip-workings is also hauled up and pumped along this roadway. The distance for which the main incline was used for these working purposes was 29 chains (1,914ft.) directed at an angle of 25° west of the full dip of the coal-seam, so that the vertical depth reached below the main level was 340ft. This represents the greatest depth below the outlet of the mine at which any of the miners worked, but to reach that outlet by the shortest route they would have to travel 638 yards up a steep incline and then 890 yards on level.

The dip-workings, which were alone affected by the disaster, were carried on in two areas, one lying to the west of the main incline, and from which all the solid or fast coal had been removed, and also more than half of the pillar coal. There was also a large area of goaf or waste place where the roof had been allowed to fall during the progress of the work as the pillars were removed, but as the miners in the western district were working at a lower level, and on the intake side of the goaf, no danger could arise even if any gas accumulated in that direction.

The workings on the east side of the incline were partly in pillars, and partly the solid coal, where headings were being pushed forward towards the fault in an easterly direction. There was no goaf in this area of the mine, but some of the pillar-workings to the rise had been abandoned for a time, and were not included in the ventilation circuit. Only three fast places, each with two miners, were being worked in the solid coal, but one of the others had been worked further to the dip. These working-places were situated almost in the deepest part of the mine, and were supposed to be at least 3 chains distant from the fault towards the direction of which the bords led, but the plans of the mine specially prepared for the guidance of the Commissioners do not, in our opinion, support this supposition, as the fault-plane is most probably nearer the "heading" than has been suspected.

The ventilation of the mine is effected by a powerful Schiele fan at the exit of the return air-course, which is arranged to draw from 16,000 to 18,000 cubic feet of air per minute, so that the air that entered along the main level was carried to all of the working-places in the mine. The air is distributed to the east and west districts of the mine by splitting the current at a point half way down the main incline, part being led by canvas brattice-screens through the east workings, and the rest through the west workings. Both of these ventilation currents, after doing their work, are led into the return airway which follows the west incline drive of the heading, and thence through a separate stone-drive along the line of the fault, 40ft. above the roadway, and so on to the fan at the outlet of the mine.

The drainage of the dip-workings is effected by a pump, worked by an electric motor placed in a chamber at the top of the main incline, and driven by a dynamo outside the mine. The water is raised by the pump 1,100ft. up the incline (or 220ft. vertically) from a dam, up to which it is drawn from the sump, 120ft. deeper vertically still than the dam, by baling-tanks or water-trucks hauled up by the same wire-rope gear used for hauling out the coal. The quantity of water which has to be baled out in this manner is very moderate, and it is done during the night when the mine is idle.

The removal of the hewn coal is effected, first, by jigging the skips or mine-wagons down the inclines to the level roadways, along which they are then drawn by horses to the main incline. On the east side of the main incline only the lowest, or sump-level, was being used for this purpose; and on the west side of the incline the mid-level only was in use as a hauling road at the time of the accident, the lower workings on that side having been for a time abandoned. These skips are drawn up the main incline by a wire rope, driven from outside the mine, to the level, and thence

along the engine-plane to the mouth of the mine by an endless-wire rope worked by a separate winding gear. The coal is delivered after it is drawn out of the mine through screens and shoots into railway-wagons, which are taken across the bridge over the Grey River, singly, by a horse to the Brunnerton Station, where the trains are made up for Greymouth.

The lamp-cabin, beyond which the miners are forbidden to pass on to their working-places each morning without the permission of the officer whose duty it is to see that every part of the mine is safe, is situated in one of the stentons about half-way down the main incline, and a short distance above the air-split.

Quality of Coal.

14. The coal in the Brunner Mine is highly bituminous, yielding from 12,000 to 15,000 cubic feet of volatile gases, when distilled at high temperatures. At ordinary temperatures, it does not give off gas when in bulk, nor is it liable to spontaneous combustion. When it is being mined in the solid a little firedamp has occasionally been met with, but never in such amount as to cause any serious accident. None of the witnesses considered that the Brunner Mine was a "fiery mine," although it was necessary at times to take precautionary measures by having thorough ventilation up to the working-faces, and by the use of safety-lamps. All the witnesses were agreed that it could not be considered a "fiery" mine, nor as one in which firedamp was likely to occur suddenly to a dangerous degree.

The texture of the coal is compact in the solid, but somewhat tender and friable when mined. It breaks into fine dross, but does not readily form a heavy deposit of light dust. The coal is moderately moist, especially in the deeper parts of the mine, and it was the opinion of the witnesses that the mine could not be classed as a dry and dusty mine.

Ventilation.

15. The ventilation of the mine prior to and at the time of the accident appears to have been ample, the amount of air passing in at the time being more than twice that required by the Coal-mines Act.

Machinery and Stores.

16. The machinery connected with the working of the mine on the 26th March, prior to the accident, was in perfect order and amply sufficient for all requirements. The supply of timber, brattice-cloth, and all other stores appeared to be sufficient in quantity, and good quality.

Site and the Extent of the Explosion.

17. All the evidence bearing upon this point has necessarily been obtained since the explosion took place. The examination was made by experts at the earliest possible date after the disaster, and occupied a considerable number of days. The experts comprised the mine-manager (Mr. Bishop), the Inspector of Mines for the district (Mr. Cochrane), and the following gentlemen who were specially appointed by the Government: Mr. Scott (manager, Blackball Mine), Mr. Brown and Mr. Lindop (managers of the Westport Colliery Company's mine), and Mr. Hayes (manager of the Hokonui Coal-mine). All are men of high standing in their profession as mine-managers. Four practical mining experts were also appointed by the miners to inspect the mine—their names being Messrs. Russell, Robinson, Ward, and Daw.

Your Commissioners are of opinion that the evidence clearly shows that the disaster commenced in the eastern part of the dip-workings, and extended into the western dip-workings, and also up the main incline, as far as the motor, all other districts of the mine appearing intact and uninjured.

The first evidence of the occurrence of the explosion, to those outside of the mine, was the outpouring of a large volume of smoke from the mouth. This smoke must have been driven out against the full force of the inward ventilating current, as the ventilating-fan was never stopped. On this cloud of smoke being noticed by the manager, the fan was at once put to full speed, and, after a few minutes, the air commenced to draw into the mine in its usual course. Mr. Bishop, the company's mine-manager, followed in immediately after the fresh air commenced to be drawn into the mine, but appears to have gone too fast and to have reached the after-damp, as he was overcome and rendered insensible about 4 or 5 chains along the main road level from the mouth of the mine. He was only rescued with difficulty. When the air current was restored it was found that the mine was wrecked up to the motor-cabin at the top of the main incline. Inside of this point there could have been no ventilation after the moment of the explosion, since, owing to all the stenton stoppings in the incline having been destroyed, the inward-air current was passing directly into the return airway at the top of the main incline without circulating through the dip-workings.

For three days rescuing parties performed the most laborious and dangerous work of restoring ventilation by means of temporary stopping of brattice-work, fighting their way, foot by foot, down the incline, and carrying fresh air forward, and dislodging the poisonous after-damp. Many of the rescuing party were overcome by the foul air. From the manner in which they suffered it would appear that this after-damp contained an unusual proportion of carbonic-oxide gas, or white-damp, which is by far the most pernicious and deadly product of a coal-mine explosion.

By Saturday night following the disaster the mine had been sufficiently cleared to enable the bodies of all the miners killed to be removed, with the exception of one, buried under a fall of stone from the roof, which was not found until the subsequent Monday. The exact locality where each body was found, and a nominal list of those who lost their lives in the accident, will be found embodied in the plan which accompanies this report.

Cause of Explosion.

18. Your Commissioners are of opinion, after full consideration of the evidence, that the primary cause of the explosion was a "blown-out shot" in the No. 4 bord of the east dip-workings,

fired by a person unknown, contrary to the rules of the mine, in a part of the mine where no work should have been in progress. Secondly, by the ignition of the coal-gas evolved from the surrounding coal, as the result of the shot and the spreading of the flame throughout the dry portions of the mine. Thirdly, by the explosion of the coal-dust raised by the concussion along the main road and working-places, which explosion might in some cases have been locally intensified by small quantities of firedamp, or by concussion in confined places and ignition thereby of inflammable gases in close levels. Fourthly, that no direct evidence was obtained that the explosion was commenced by an accumulation of firedamp, or that its extreme violence was due to the combustion of firedamp mixed with coal-dust.

It will be found by reference to the evidence that the opinions here expressed were those distinctly held by all the expert witnesses; but, on the other hand, the miners' representatives were inclined to attribute the explosion to an outburst of ordinary firedamp. They were unable, however, to give any reasonable grounds for this belief, nor could they indicate any part of the mine where a large escape of firedamp could occur suddenly and in sufficient quantity to produce the great force of the explosion. Nor was there any part of the mine suggested where gas could have accumulated in such a way as to produce these effects. Two theories were suggested by the miners. One was that the gas had issued from the working-faces in the eastern part of the mine, where undoubtedly there had been slight traces of gas found some days previously, but the fact that the men had been at work there for an hour and a half that morning clearly indicates that the mine was then considered to be in a safe condition. The other conjecture is that the gas came suddenly in large quantities from the deepest part of the mine; but all that could be urged in favour of this view was that certain lines of force were found to come up from the deepest levels. On the other hand, it was shown that these force-lines could be better explained by the blown-out shot theory. All witnesses, both professional experts and the miners, agreed in describing the intense burning which had occurred in the No. 4 bord as greatly exceeding that found in any other part of the mine. The position of the blown-out shot is shown in the plans Nos. 2 and 3, and detailed particulars in the enlarged plan No. 4 attached to this report.

By a blown-out shot is meant a blast which has failed to effect a rupture of the coal owing to the hole for it having been drilled in a wrong position, or owing to the coal not having been properly prepared by holeing or undercutting. In this particular case, there is some doubt as to when the hole was actually drilled; and there is some evidence that it was a portion of an old hole drilled about ten months previously, when the bord was being mined. This view is borne out by the circumstance that no tools were discovered in the vicinity of the shot-hole after the explosion. That a shot had been fired from this hole on the morning of the 26th there can be no reasonable doubt in face of the clear and explicit evidence of the experts, and from the inspection of the samples of freshly-charred coked coal taken from the roof, sides, and floor of the bord, and put in evidence.

The details of the blown-out shot, so far as it has been possible to infer them from the appearances presented by the mine, are very clearly described in the evidence. The effect of shots in igniting coal-dust has been the subject of many recent experimental investigations, and extracts from the reports of these are appended hereto in support of the importance which the Commissioners attach to the matter. The chief points to be noted are, that in this case the shot-hole was directed obliquely downwards, so that the force of the discharge struck the floor at a distance of 30ft. The temperature of the flame of such a shot would exceed 4,200° Fahr., which is amply sufficient to distill the coal, leaving a bright silvery coke, and to disengage a large volume of common coal gas. The estimates of the area and depth of the coal thus coked indicate that about a ton must have been more or less affected, and that from 12,000 to 15,000 cubic feet of gas had been set loose. For its perfect combustion, according to authorities, such gas requires about ten times its volume of air, thus producing an enormous volume of explosive gas in the mine. In addition, the shock of the explosion must have raised the coal-dust that lay along the roadways, and the combustion of coal-dust, when suspended in air, is now clearly proved to give rise to a progressive blast of terrific energy. The quantity of gas and dust produced was in all probability greatly in excess of the amount which the air in the mine was capable of consuming, so that the resultant after-damp, instead of being black-damp or carbonic acid, would be formed largely of white-damp or carbonic-oxide. This view received support from a feature already alluded to, that the members of the rescuing parties suffered from the symptoms of poisoning by this gas, 2 per cent. of which in the atmosphere, if breathed, causes severe effects. Another marked characteristic of this form of after-damp is that it supports combustion, so that the lamps burn brightly in it, while at the same time it is fatal to life. It seems to have been the general opinion that, while most of the men in the eastern part of the mine met their death from the effect of the sudden explosion and burning, most of those in the west workings were killed by this deadly form of after-damp.

It is quite obvious that the extreme burning of the coal in the neighbourhood of the blown-out shot, and which was so clearly described by competent witnesses, could not have occurred without giving rise to such tremendous force as could not have escaped observation; yet there is no evidence whatever of any severe explosion having taken place in the mine at any time previously to the 26th of March. On the other hand, the intense localisation of the coking cannot have been produced by any form of flash such as the flame from fire-damp, whereas a blown-out shot would fulfill all the requisite conditions.

Metereological Conditions.

18A. The self-registering barometers at six different stations in the colony show that the atmospheric pressure was remarkably steady for six days previous to the accident, although there had been a very heavy rainfall on Monday, Tuesday, and Wednesday, at some stations both on the east and west coasts: at Wellington, 4in.; at Hokitika, 6in.; at Lincoln, 3½in.; and at Greymouth on the 23rd and 24th, 6½in. The reading of the barometer at Greymouth on the 26th of March,

was 29·80, which is about the average reading for the year. There was a considerable fresh in the Grey River on the morning of the 26th March, and a moderate south-east gale was blowing. The weather was fine and the temperature about 60°.

Coroner's Inquest.

19. With respect to the fourth question referred to us, we find that a Coroner's inquest has been commenced, but has been adjourned for the unusually long period of two months. Touching the constitution of this tribunal, it appears from the statement of the Coroner (Mr. Stratford), that he first caused the Brunner constable to select twelve jurors, from whom he selected six, and then issued a precept to the constable at Brunnerton directing him to summon those particular individuals. "The Coal-mines Act, 1891," directs that when an inquest has been rendered necessary by an accident in a coal-mine, one half of the jury summoned shall be coal-miners. None of the jurors selected by Mr. Stratford were coal-miners; but he stated that none were accessible excepting miners employed in the Brunnerton Mine, and those who came to aid in rescuing the victims of the explosion there. On the other hand, Inspector McGovern and Constable Beattie, who was directed to summon the jurors, stated that there are a number of coal-miners, formerly employed in the Brunner Mine, now residing at or near Brunnerton, who might have been summoned as jurors. It is to be regretted that the Coroner did not, according to the usual practice, direct his precept to the constable and leave him to summon the jury, as in that case the above-cited proviso of the Coal-mines Act would probably have been complied with.

Explosives.

20. With reference to certain points to which our attention is specially directed, we have to report: That the only explosive used in the mine was blasting-powder, and that the usual precautions were being taken for its safe use within the mine at the time of the explosion; that each party of two men working in a place were allowed to take into the mine one cannister containing 4lb. of blasting-powder, which is the amount that may be required for one day's work; that the store of powder on the surface was kept by the company in a magazine, and sold only to miners in the above quantity.

Lighting.

21. That the lighting of the mine was sufficient, being effected by miners' oil-lamps, which they used at their work, except on a few occasions when safety-lamps were ordered to be used in certain parts of the mine. When not rendered absolutely necessary by the presence of gas to use these safety-lamps, it is much less dangerous to the miners to use the naked lights, as they are better able with their help to avoid dangerous portions of the roof, the fall of which is a frequent source of accident in coal-mines.

That with three exceptions, all the lights in use in the mine at the time of the accident were naked oil-lamps. The exceptions were in the third working-place on the fault-side of the eastern dip-working, where two locked Marsant safety-lamps were used by Brislane and Roberts, and the Davy safety-lamp which was used by the fireman, Morris, for the usual daily examination of the mine before the work begins. Morris was seen at half-past 5 in the morning, by the two men who were leaving the mine at that time, in the act of making his rounds. He was then passing into the western workings, which he was in the habit of examining first. His body was found in the eastern workings at the point indicated on the plan, but his Davy lamp, used for testing, was found at a distance of 66ft. in another working-place, from which it may be fairly inferred that Morris was not engaged at the time in making any tests for the presence of gas, but was engaged in the ordinary work of the mine.

Stoppings.

22. Owing to the soft nature of the floor of the mine and the hard nature of the roof, the ordinary wooden stoppings were not adopted, as the pressure caused the floor to rise and to disturb the efficiency of the stoppings. For some years past the permanent stoppings have been formed of what is termed "crib logging," consisting of two walls of heavy timber placed a certain distance apart and filled in with stones and dirt. The crib-log stoppings are thoroughly efficient under ordinary circumstances, but in the case of an explosion of the magnitude of that which occurred on the 26th March, no stoppings could be of much avail. The temporary stoppings used for distributing the air-currents throughout the mine are made of canvas and brattice-cloth.

Rules under the Coal-mines Act.

23. That the general and special rules under the provisions of "The Coal-mines Act, 1891," are shown by the evidence to have been complied with, with a few trifling exceptions, which have no bearing on this inquiry, and that no additional rules were in force in the mine.

Suggestions for the Better Working of Coal-mines.

24. The Commissioners regret that the time was not sufficient to enable them to go as fully as they would have liked into the question of making practical suggestions for the future working of this and other coal-mines, but, in view of further legislation on the subject, the following suggestions are respectfully submitted:—

Government Inspector.—No Inspector should be appointed who has not had practical experience in a coal-mine; and as mine-inspectors are a check upon, and in that sense superior to, mine-managers, we hold the opinion that no man should be appointed a Coal-mine Inspector who has not qualified by examination and practice as a colliery-manager. We would suggest that there should be three Coal-mine Inspectors—one for the North Island, one for Westland and Nelson, and one for Canterbury, Otago, and Southland. The Inspector should be authorised to introduce at each coal-mine special rules as to—

(*a.*) The nature and description of the lights or lamps to be used in the mine, and their custody, and the mode of using and trimming them;
(*b.*) The description of explosives to be used in the mine, the mode of using and of storing such explosives, of making and tamping holes, and the times and manner in which shots are to be fired in the mine;
(*c.*) The number and class of persons, if any, to be permitted to remain in the mine or any part thereof whilst shots are being fired;
(*d.*) The watering or efficient damping of the mine, or any ways or places therein;
(*e.*) Generally the precautions to be adopted for the prevention of accidents from inflammable gas and coal-dust;
(*f.*) And as to means of escape in case of accidents.

The Inspector's duties should be more definitely fixed by Act.

Every Inspector should have a safety-lamp to test for small quantities of gas—say, Inspector Stokes's Alcohol Flame Lamp, which will test as low as ½ per cent.

We are of opinion that prosecutions for breaches of the Coal-mines Act should be left solely to the discretion of the Inspector, and that he should be allowed legal assistance.

When an Inspector has visited a mine, he should place a copy of his report on the pit-head or other conspicuous place.

Testing Coal-dust.—We would recommend that the Government Analyst obtain samples of coal-dust from all the principal mines in the colony to determine the amount of inflammable gases they contain. Experiments in England prove that some coal-dust yields no inflammable gases, whilst other coal-dust is remarkable for the high proportions it contains.

Underviewers, Deputies, or Firemen.—These officers should be required to pass an examination before the Inspector of Mines for their district, and, if qualified, receive a certificate. To a great extent, the safety of the mine and the lives of the miners depend upon the proper qualification of these officers, as the mine is immediately under their control and management. The proportion of such officers should be fixed by the Inspector, according to the number of miners employed and the nature of the mine.

Other Officers.—Roadmen and other officials who may not require a certificate before they are appointed should satisfy the manager of their thorough knowledge of the duties they have to perform, and the manager should be held responsible for the due performance of such duties by his appointee.

Firing Shots.—In any mine in which there may be any danger, either from gas or coal-dust explosions, the underviewer, deputy, or fireman should alone fire shots; and in such mines the dust should be cleared out, and not allowed to accumulate.

Safety-lamps.—Every coal-mine manager should be provided with a lamp to test to ½ per cent. of gas, and the mine should be tried with the same at least once every week. Whenever it is considered essential by the mine officials to use safety-lamps in any working-place or places, the whole of the men working in that district should use safetys; for, it may be remarked that miners who are furnished with safety-lamps are naturally inclined to be sceptical as to their value if they know that, within a short distance of them, naked lights are permitted.

Tamping.—We are of opinion that tamping of fireclay or other approved material should be provided and sent into the working places by the mine-manager.

Main-haulage Roads.—No shots should be fired on main-haulage roads whilst the miners are in the mine.

Return Airways.—The size of the return airways should be specified by Act, and they should be kept clear and available as travelling-ways in case of need. All persons working in a mine should travel through the return airway at least once a month.

Reports.—When a miner reports gas or any other danger to an official, the official should at once enter such report in his report-book, with the date and time, and sign it. He should then read the written report to the miner who gave the information, who also should sign it.

Powder.—Where blasting-powder is used, no pair of men should be allowed to take in, or have in their working-place, more than 4lb. at one time.

Ventilation.—Section 33, subsection (1), of the Coal-mines Act, should read: "And for every horse, pony, donkey, or mule 600 cubic feet of pure air every minute."

Inspection by Miners' Representatives.—A periodical inspection of the mine by the representatives oppointed by the miners should be made compulsory, and the report should be written in a book kept for that purpose, and a copy of the report should be forwarded to the Inspector.

Conference.—The Commissioners recommend that the Government invite suggestions in writing from managers and miners in all coal-mines in the colony as to alterations required in the Coal-mines Act. Then a conferences of managers and miners working the different kinds of coal should be called together to go carefully through the Coal-mines Act and the suggestions received by the Government, and make such further suggestions for the amendment of the Act as they may think fit.

Summary.

25. In conclusion, your Commissioners have the honour to report the result of their investigations to be as follows:—

1. That the explosion originated in the south-eastern dip-workings of the Brunner Mine, and extended through the whole of the dip-workings, all the miners engaged in that portion of the mine at the time being killed.

2. That the balance of evidence goes to show it was caused by a "blown-out shot" fired by a person unknown, which distilled the coal and ignited the coal-dust lying on the main roadways.

3. That the lights in general use in the mine at the time of the accident were naked lights (oil lamps), two only of the miners being provided with locked safety-lamps. It was stated in evidence

that the latter were merely given as a matter of precaution. In the opinion of the Commissioners the use of naked lights had nothing to do with the cause of the explosion.

4. That a Coroner's inquest was commenced, and adjourned until the 15th June, and that the tribunal was not properly constituted.

5. *(a)* That the storage and use of explosives in the mine was in accordance with the requirements of the Act; *(b)* that the lighting and ventilation of the mine were carried out in accordance with the law, the quantity of air passing through the workings being more than double that required by the Act; and *(c)* that the means of escape were sufficient in the case of slight explosions and ordinary falls in the roof, but, in regard to the present disaster, your Commissioners fear that no provision could have been made by which the lives of the men in the dip-workings could have been saved.

6. That the management of the mine was under the skilled control of competent officers, who discharged their duties with care and reliability. The mine-manager, Mr. Bishop, is a duly-certificated mine-manager.

7. That the inspection of the mine was efficient; but, in the opinion of your Commissioners, it is desirable that the duties of Inspectors under the Mining Act and the Coal-mines Act should be performed by separate officers, as the inspection of the coal-mines on the West Coast is sufficient to occupy the whole time of one officer alone.

8. The Commissioners have satisfied themselves that there was no laxity of management or discipline in connection with the mine, excepting that in some cases the report-books appear not to have been kept with perfect regularity, as required by the Act.

9. That the system of crib-log stoppings, which is most generally employed in the mine, is thoroughly satisfactory on account of the nature of the floor and roof. It is the opinion of your Commissioners that no stopping that could have been devised would have been capable of resisting the enormous force which was exerted in this explosion.

10. That the machinery was sufficient, and in good working order.

11 and 12. The report contains a list of the suggestions your Commissioners have the honour to submit in connection with the working of coal-mines generally.

Given under our hands and seals at Wellington, this 15th day of June, 1896.

(L.S.) C. D. R. Ward.
(L.S.) James Hector.
(L.S.) Joseph Proud.
(L.S.) Thomas Skellon

MINUTES OF PROCEEDINGS.

Thursday, 7th May, 1896.

The first meeting of the Commission was held in the Courthouse, Greymouth, at 2 p.m.

Present: The Commissioners, his Honour District Judge Ward, Sir James Hector, Messrs. Joseph Proud and Thomas Skellon.

Mr. W. H. Russell, secretary and shorthand-writer to the Commission, was also present.

The Secretary read the Commission.

Judge Ward was elected Chairman of the Commission.

The question of making the inquiry an open or private one was discussed, and it was decided that it should be an open one, but to request the Press not to report the evidence given before the Commission. The Secretary was authorised to supply the Press with a brief summary of the evidence given from day to day.

Mr. Beare, of the firm of Guinness and Kitchingham, appeared as counsel for the Greymouth–Point Elizabeth Coal Company (Limited), and Mr. Joyce for relatives of the miners killed in the accident.

The question of the course of procedure was considered, and it was decided to call as first witness Mr. N. D. Cochrane, Government Inspector of Mines for the Westland District, and then Mr. A. B. Lindop, mining manager of the Westport Colliery Company.

The Secretary was ordered to call on the manager of the Brunner Mine to send into the Commission the following morning the reports of the underviewers of the mine for the twelve months prior to the 26th March, 1896.

The Chairman announced that on account of the absence of Mr. Hannan, Crown Solicitor, Greymouth, and Mr. Park, Crown Solicitor, Hokitika, one of whom would represent the Crown before the Commission, and in order to enable the necessary maps, plans, and papers to be procured, the Commission would adjourn until the following morning.

The Commission adjourned at a quarter to 4 p.m. to 10 a.m. next day.

Friday, 8th May, 1896.

The Commission met at 10 a.m.

Present: All the Commissioners.

Mr. Park, Crown Solicitor, Hokitika, appeared on behalf of the Crown.

The Chairman read a telegram received from the Premier with reference to the proposal to hold the sittings of the Commission at Greymouth instead of Brunnerton, and a suitable reply was approved. It was decided to inform counsel that the Commission would visit Brunnerton and take evidence there.

Mr. Beare, representing the Grey Valley Coal Company, put in ten books of underviewers' reports on the Brunnerton Mine.

Mr. Neil Dundonald Cochrane, Inspector of Mines for the Westland, Nelson, and Marlborough Districts, and Mr. Alfred Benjamin Lindop, mining manager of the Westport Colliery Company, were sworn and examined. Their evidence was taken down.

The Commission adjourned at 4 p.m. to the next day.

SATURDAY, 9TH MAY, 1896.

The Commission met at 9.45 a.m.

Present: All the Commissioners.

The Commissioners proceeded to Brunnerton by the 9.45 a.m. train by arrangement, and spent the morning in making an inspection of the Brunner Mine.

The Commissioners returned to Greymouth at 3.30 p.m., and adjourned until Monday, the 11th May, at 10 a.m.

MONDAY, 11TH MAY, 1896.

The Commission met at 10 a.m.

Present: All the Commissioners.

Mr. A. R. Guinness appeared for the Greymouth-Point Elizabeth Coal Company (Limited), and Mr. Beare for the manager of the Brunner Mine, Mr. Bishop.

The Chairman announced that the Commission had decided to allow the Press to be present at the proceedings, and to report the same, the necessity for the resolution formerly arrived at having passed away.

Mr. A. B. Lindop, mining manager of the Westport Colliery Company, was recalled, and gave further evidence.

Mr. H. W. Young, Authorised Surveyor, produced a plan of the Brunner Mine, and gave evidence.

Mr. Joseph Scott, mine-manager of the Black Ball Company, and Mr. John Hayes, mining engineer and manager of the Hokonui Railway and Coal Company, were also sworn and examined. The evidence of these witnesses was taken down.

The Commission adjourned at ten minutes past 4 o'clock until 10 the following morning.

TUESDAY, 12TH MAY, 1896.

The Commission met at 10 a.m.

Present: All the Commissioners.

Mr. Robert Russell, of Brunnerton, Mr. Henry Aldborough Stratford, Warden and Stipendiary Magistrate, Mr. Thomas Robinson, Taylorville, and Mr. James Bishop, mining manager of the Greymouth and Point Elizabeth Coal Company, were sworn and gave evidence, which was taken down.

The Commission adjourned at 4 o'clock until 10 the following morning.

WEDNESDAY, 13TH MAY, 1896.

The Commission met pursuant to the adjournment.

Present: All the Commissioners.

Mr. James Bishop resumed his evidence, which was taken down.

Mr. Thomas Brown, district manager of the Coalbrookdale and Granity Mines, Westport, and Henry Andrew Gordon, Inspecting Engineer of the Mines Department, and Inspector McGovern, Inspector of Police, were sworn and examined. Their evidence was taken down.

The Chairman announced that the next sitting would be held at Brunnerton, at 10 a.m. the following day.

The Commission adjourned at 9.30 p.m.

THURSDAY, 14TH May, 1896.

The Commission met at Brunnerton at 10 a.m.

Present: All the Commissioners.

Robert Tennent, Constable Beattie, William Dunn, and Robert Armstrong were sworn and examined, and the evidence was taken down.

The Commission adjourned at ten minutes to 5 o'clock, and returned to Greymouth.

FRIDAY, 15TH MAY, 1896.

The Commission met at Brunnerton at 10 a.m.

Present: All the Commissioners.

Robert Barnett, ganger on the Brunner Railway-line, James Ward, William Daw, William Sheard, James Rooney, Joseph Heard, Edward Moore, George Geoghegan, John Mosely, miners, John Thompson, Henry Bainbridge, engineers in charge of the machinery of the Brunner Mine, were sworn and examined.

James Bishop, mining manager, and Neil Dundonald Cochrane, Inspector of Mines, were recalled, and gave further evidence. The evidence of all these witnesses was taken down.

This concluded the evidence at Brunnerton.

The Commission adjourned at 3.30 p.m. to 10 o'clock the following morning.

SATURDAY, 16TH MAY, 1896.

The members of the Commission spent the day in visiting the Black Ball Mine.

The Secretary was instructed to insert the following advertisement in the *Argus* and *Star* (Greymouth) and *Brunner News* (Brunnerton):—

"*Brunner Coal-mine Royal Commission.*—The Royal Commission appointed to inquire into the circumstances attending the recent accident in the Brunner Coal-mine will hold a further sitting, for taking evidence, at the Courthouse, Greymouth, on Monday, 18th May, at 9 o'clock. All persons who are desirous of giving evidence, and who have not yet been heard, are invited to come forward and tender the same at the above hour and place.—W. H. RUSSELL, Secretary."

MONDAY, 18TH MAY, 1896.

The Commission met at Greymouth at 9 a.m.

Present: All the Commissioners.

The Chairman said that, in accordance with the advertisement appearing in the daily papers, the Commission was prepared to receive, on oath, the evidence of any persons regarding the accident, and who had not already been heard, but no further witnesses came forward.

James Bishop, mining manager, and Neil Dundonald Cochrane, Inspector of Mines, were recalled, and further examined. Their evidence was taken down.

The Chairman announced that the Commission had concluded its sittings at Greymouth, and that the members of the Commission would probably remain a short time in Westport to make a few inquiries relative to the new system of firing shots, but no evidence would be taken there. There was, therefore, no need for counsel to travel to Westport.

The Commission adjourned at 9·45 a.m., and left Greymouth for Wellington at noon. On arrival at Westport, Messrs. Proud and Skellon remained to visit the Denniston mines, Judge Ward, Sir James Hector, and the Secretary continuing the journey to Wellington.

THURSDAY, 21ST MAY, 1896.

The Commission met at the Museum, Wellington, at 11 a.m.

Present: His Honour Judge Ward (Chairman) and Sir James Hector.

Consideration of the report was commenced, and the Commission adjourned at 1 p.m.

FRIDAY, 22ND MAY, 1896.

The Commission met at the Museum, at 10 a.m.

Present: His Honour Judge Ward (Chairman) and Sir James Hector.

The report was further considered.

The Secretary was authorised to engage assistance in transcribing the evidence.

The Chairman proceeded south in the afternoon.

THURSDAY, 28TH MAY, 1896.

The Commission sat at Wellington, at 10 a.m.

Present: Sir James Hector (Chairman), and Messrs Skellon and Proud.

Messrs. Skellon and Proud who had visited the Coalbrookdale, Cardiff, Granity Creek, and Mohikinui Coal-mines, brought up a report on their visits to those mines, which, together with part of the evidence taken at Greymouth, was considered. [For report see appendix.]

The Commission adjourned at 1 p.m.

TUESDAY, 9TH JUNE, 1896.

The Commission sat at Wellington, at 11 a.m.

Present: Sir James Hector (Chairman), and Messrs. Proud and Skellon.

Mr. Alexander Macdougall, managing director of the Greymouth and Point Elizabeth Railway and Coal Company, was sworn and gave evidence, which was taken down.

The Commission adjourned at 1 p.m.

FRIDAY, 29TH MAY TO SATURDAY, 13TH JUNE, 1896.

The Commissioners were engaged in considering the evidence taken during the inquiry, and drafting the report.

MONDAY, 15TH JUNE, 1896.

The Commission met at 10 a.m.

Present: His Honour Judge Ward (Chairman), Sir James Hector, Messrs. Proud and Skellon.

The report was considered and finally agreed to, and signed by all the Commissioners. It was then transmitted to His Excellency the Governor, and the Chairman declared the Commission closed.

LIST OF WITNESSES.

MINUTES OF EVIDENCE.

GREYMOUTH, FRIDAY, 8TH MAY, 1896.

NEIL DUNDONALD COCHRANE examined.

1. *The Chairman.*] What are you, Mr. Cochrane?—Inspector of Mines for Nelson, Westland, and Marlborough.

2. What was the last date of your inspection of the Brunner Mine?—18th February; when I inspected the Coolgardie section—"the rise section." I have a tracing of it.

3. Is that the rise opposite the dip-workings?—It is up an outside incline a long distance away from the other workings. I put in this tracing. [Exhibit 2, copy of Mr. Bishop's plan, put in. Witness explained the position of the rise-workings from the plan.] Perhaps I should explain why I only inspected one section last visit. At a former inspection I had found the mine idle—it was said to be for want of trucks. Mr. Bishop told me so. I had no reason to doubt him; but I went and saw Mr. McIntosh, and asked him if it was on account of trucks the mine was idle. He told me that they were really scarce of trucks, and I resolved that I would take one section only, and allow time for my inspection of the other side. If I had taken this section first it might have been thought that time was given to allow the management to put the place in order. And on the 16th January I took the dip-section.

4. *Sir J. Hector.*] That is where the explosion took place on the 26th March?—Yes.

5. From the 16th January to the 26th March you had not been in that part of the mine?—No.

6. Can you give an account of your inspection of the mine—of the dip-workings—on the 16th January?—I went in as far as the "cabin" down the dip-drive, and, as Mr. Bishop was away, I went round the works with Mr. Roberts, underviewer. We went round all the working-places. There were only four fast or solid places working. There were eight men engaged in the four fast places—I am speaking from memory. We had safety-lamps.

7. *The Chairman.*] What were the men working with?—With naked lights. I saw no safety-lamps excepting what Roberts and myself had ourselves. We examined for gas and there was none to be seen.

8. *Sir J. Hector.*] You mean your lamps gave no indication of the presence of gas?—No indication.

9. *Mr. Proud.*] What sort of safety-lamps did you examine with?—Marsaut. I examined carefully to see if there was any indication of a fault as the workings were approaching the fault, but there was no indication.

10. *Sir J. Hector.*] You examined the coal to see that it was not crushed?—To see if there was any indication of a fault. I did not expect to find such there. They were a considerable distance back from the fault. There was no indication of water running in on any face.

11. *Mr. Proud.*] The coal continued of the same character?—Yes.

12. *Mr. Proud.*] Did you measure the air then?—Not on that occasion. I did in my previous inspection in November.

12A. In testing for gas, what kind of a lamp did you use?—The Marsaut.

13. *Mr. Skellon.*]. Is it the general custom to measure the air at every inspection ?—Not every inspection.

14. Why not?—At times I might be in the district for another purpose and not have my anemometer with me.

15. Could you not have got Mr. Bishop's ?—It was not customary to measure every time. I did it on the 27th November, so that was comparatively recent.

16. Is it not the main thing in working mines to get good ventilation?—It was so strong when I measured it in November that it was quite clear that there was more than the quantity required. I can say that as an expert.

17. *Sir J. Hector.*] What was the coal like in that part of the mine they were stripping part of the pillars off? Was it hard coal or crumbling?—There was no sign of crushing. That is all I can say. There was nothing very striking.

18. Was any part of the dip-workings abandoned at the time?—Yes; the prospecting drive here [indicating on plan] had been abandoned.

19. Was the air kept driven to the end of the prospecting drive, or is there a stop there?—It was abandoned; I cannot swear it was blocked off. I understand it was being allowed to fill up with water.

20. How far was the water up ?—I cannot tell. Mr. Bishop will be able to speak about that. These places [above the bottom level on the west side] were not working.

21. When were you last in them?—It is a considerable time; they had not been working for a long time.

22. *Sir J. Hector.*]—What was the thickness of the seam there?—I did not measure it at that time; 7ft. had been cut out.

23. How were they taking it out—by blasting or holing?—They were working in the ordinary way—holing and blasting. I cannot from memory say that I saw any blasting going on that day.

24. What do they blast with?—Blasting-powder in cartridges.

25. How is that part of the mine ventilated? Did you test the air?—I should like to refer to my notes.

26. Yes. Were these written in the mine, or after you came out?—I think in the mine. I will read the note: "Brunner Mine, 16/1/96.—Dip-workings.—Came down dip, and in mid-level, 17 chains down from top of brow, banks 10, 7, 6, and 5 working, taking out pillars. Twelve places and twenty-six miners in all: only one shift. Mr. Roberts, acting-manager, appointed in writing. Some loose pieces on roof and sides, to which I drew attention, as well as to setting of some of the timber, are to be at once attended to. No gas seen in pillar-workings; air good. Only four fast places working, and these are about 28 chains from the top of the brow—east side; the lowest bord is in about 6 chains, and the face is so stony that it has been stopped for a fortnight. The bord above is further ahead without meeting any stone. Air sufficient. A second shift of two men working in No. 5 incline." These are all the things I have in regard to that inspection.

27. Which of the bords was it you found any stone in?—The bottom one farthest to the dip.

28. Were they blocked off or included in the circulation?—The return air was taken through them up the mid-level.

29. You observed all this?—Yes; the air was split, and one section was taken in at the mid-level. One split was taken round on the east side of the main incline, and it was brought round the west side up the bottom level and taken through an undercast—that is, the vitiated air from the east side was taken through the undercast, so that it should not meet the fresh air on the west side in returning. The other split came in on the west side, passing over the undercast and around the pillar-workings.

30. What size was the air-passages at the place they crossed?—They were simply driven underneath the level.

31. In the floor or further down?—No. It was silver-pine frames, strong enough for a horse to go over—wooden flooring—a simple wooden undercast put into the mid-level. It had stood the test of the explosion.

32. From there what became of it?—The two currents came up the back incline and out the return [indicated].

33. Is this part of the mine [indicated] above or below water-level?—All below.

34. Is this part—the goaf—ventilated ?—That was exhausted, the pillars were drawn.

35. Has the roof sunk completely down?—It has gone there [indicated].

36. Was that cut off from the rest of the mine ?—There is no occasion to cut it off.

37. Then that part of the mine is not visited by any one now?—All this part is not [indicated].

38. How long is it since that part of the mine was abandoned?—I cannot speak from memory.

37. Is it many years?—A year or two.

40. Has any provision been made for cutting off an abandoned part of the mine from the active live workings?—Not so far as I am aware; any gas coming from that part would not get near any working-part of the mine.

41. Supposing gas was going anywhere else would it accumulate ?—Not according to natural law; it would take the shortest way out.

42. *Mr. Proud.*] Did you examine the edges of the goaf?—I regularly examined the edges of the goaf.

42A. At the last inspection?—Yes.

43. *Mr. Skellon.*] On the 16th January you only examined the working-places on that side?—Yes; but there were pillar-workings there, and I examined the edges of the goaf or any suspicious place where I thought it was likely to be wrong. [Witness explained from the map how the air would carry out any deleterious gases without harming any of the men.]

44. *Sir J. Hector.*] What other plan have you?—The tracing that Mr. Bishop has to send to me half-yearly showing the progress of the works. [Exhibit No. 6, statutory tracing by mine-manager, showing progress of works up to September, 1895, put in.]

45. When was this given to you by Mr. Bishop?—I think I got it shortly after 3rd December, 1895. [Witness explained the plan and position of the dip-workings.]

46. How far had the roof settled and the mine closed?—You can hardly pick your way among these places, as I think the roof has come down every few feet, and it is not safe to go right in past the edges of the goaf.

47. Is there any place where the dust could accumulate in the goaf?—Any coal that would be left in the goaf would be crushed into pieces—into dust. There is dust more or less throughout every mine.

48. Have you been in workings that have been abandoned for a few months? Have you visited them without merely going into the goaf?—Where the men were working I would examine, and I would also go into suspicious places.

49. During your inspection you would have to visit the new works going on?—Sometimes.

50. Did you ever observe that they were dusty?—There was more or less small coal, and there was certainly some dust. I would not call it a dry and dusty mine.

51. Was the floor at all damp in those portions of the mine where any work was going on? Was there any water dripping?—At various places in the mine there was dripping water, but at that place there was none [indicated].

52. Did the floor rise, as well as the roof come down?—There was a tendency for the floor to rise in places.

53. Was it dry-crush or a wet, damp, sticky stuff?—I could only say that on account of the downward pressure the floor, being the weakest part, came up.

54. Was any stuff squeezed out between the timbers?—No.

55. Can you form any opinion how long it took the dust to settle in the bords after they ceased to work in them? Was it a matter of weeks or months?—That is a matter of opinion.

56. Have you ever made any observation?—Yes; I considered this question of coal-dust and took samples of it from off the main incline—off caps or bars.

57. That was the first time your attention was called to the dust?—My mind has always been alive to this question of dust ever since I have been an Inspector.

58. Have you made it part of your report on the mine to report as to how far it was a dry mine or otherwise?—I did not, as far as I am aware, send in a special report. I have spoken to the managers of all coal-mines warning them, and I have seen the question mentioned in the Home papers. I also went into it as far as I could with the means at my disposal, and took samples of the dust for examination by the microscope. I put in [Exhibit No. 4] samples of dust taken in the main incline off the cap or bar. I examined this specimen under a powerful microscope and could see nothing unusual as compared with other dusts.

59. Were the particles rounded or angled?—At the edge of the section they are fringed. I compared mine mentally with those I have seen in the Old Country as to whether it was a dry mine or not. I consider it is not a dry or dusty mine. Compared with Coal Pit Heath it was not even so dusty nor so dry, but still there was a moderate amount of dust, as there is in many mines, and small coal and rubbish.

60. Was there any part of the mine in the vicinity of the workings where such dust as you have referred to could have accumulated without being detected—I mean any part that was not visited by any fireman, inspectors, or yourself at any time?—No more than the ordinary workings a little way back from the face. At the faces dust does not accumulate so much. A little way back from the faces there is more or less dust.

61. *Mr. Skellon.*] After the explosion did you take samples of dust?—I did take samples; but owing to having to leave Westport suddenly, I had to leave them; but I could get them. When going through the mine with Mr. Bishop on the 17th November I drew his attention to the amount of stuff lying in one of these bords.

62. *Sir J. Hector.*] What do you mean by stuff?—Small-coal, rubbish, and stone. And his reply was, "But you will observe it is stone." I looked, and saw it was so, and not dry dust, and I considered his answer satisfactory.

63. You were about to explain the difference between these plans?—This is a tracing [Exhibit No. 3] first sent by Bishop, and I made a plan from it.

64. What was the date?—His workings are shown here up to the 4th November, 1894. [Exhibit No. 3, plan of workings, dated 4th November, 1894, put in.] I made a plan from this.

65. This is a plan [Exhibit No. 5, plan dated 2nd September, 1895] sent by Mr. Bishop before or after this one [Exhibit No. 6, plan dated 3rd December, 1895]?—Before.

66. I understand the latter [Exhibit No. 5] was something intermediate between this [Exhibit No. 6] and that [Exhibit No. 3]?—That was the first [Exhibit No. 3], that the second [Exhibit No. 5], and this [Exhibit No. 6] is the last. [Exhibit No. 6, plan up to 2nd December, 1895, put in.] When I got this tracing [Exhibit No. 5] from Mr. Bishop I found there was a difference in the line of the main incline from that shown in plan [Exhibit No. 3].

67. *The Chairman.*] Is it required by the Act that the plan should be sent?—Yes; forwarded to the Inspector.

68. *Sir J. Hector.*] You said something about a discrepancy. Were these plans sent in consequence of a discussion as to accuracy?—The third one [Exhibit No. 6] was sent because the other two did not agree [Exhibits Nos. 3 and 5]. It was an important thing, because the line of dip might throw the workings nearer the fault, and that might tap the water. Therefore, I wrote for a third tracing, and Mr. Bishop sent it along showing that this first one [Exhibit No. 3] was right. The third tracing agreed with the first, and the intermediate one was wrong, according to Mr. Bishop.

69. What was the amount of error in the plan?—It varied from a little here at top of dip to a chain down to the foot of the dip.

70. Would using that plan, in your opinion, have affected the stability of the workings? Which way was the error? Would it have made the incline appear to be farther from the fault?—Supposing the first plan is not correct, it would really make them farther away from the fault.

71. So that it would not have increased the danger, if they worked on the theory that the second plan was correct, if the wrong plan had been followed?—There would be no danger. I spoke to Mr. Bishop as to the question of the fault, and the third plan was sent, which was supposed to be very correct.

72. *Mr. Proud.*] Did you inspect the return airway?—Occasionally.

73. Not on the last occasion?—No. I will read my report: "27/11/95, Brunner Coal-mine.—Not working for want of trucks. Came in mid-level to west, and Nos. 10, 9, 8, 7, 6. [These are banks, although I have not said so.] Four places off No. 6, one off No. 7, one off No. 8, five off No. 10, one off No. 9. Air right; sufficient timbering. Some flakes and loose places, especially in level, which will be seen to. Fifty-six miners all told; twelve truckers and roadmen; nine fast places east of dip. A little gas has been seen here, but none to-day."

74. *Sir J. Hector.*] Where was that seen?—[Indicated on plan. Continuing reading notes:] "A few loose places in roof, which are to be seen to. Plenty of timber. Intake, 6ft. 6in. by 13ft.: This, worked out to an average of 127 and 137, gives 12,000 cubic feet per minute. Seventy men all told. Manager's report kept."

75. *Mr. Proud.*] Did you inspect the return-airway on that occasion?—No, I did not go through. The last time I came through that passage was in July. It was only occasionally I came through the return.

76. *Mr. Skellon.*] Is that return the only way the men can get out if the main roadway got blocked?—Yes, if the intake were blocked.

77. Do you not think it desirable for you to go through and see it is open at your inspections?—I proved clearly that the air was circulating through it freely.

78. *Sir J. Hector.*] How was the return-air circulated in the out-levels?—This return-air is in the natural strata. Of course, up the main dip it is separated by crib-stoppings filled with dirt.

79. *Mr. Proud.*] "Stopping" is not of brick?—No; this would stand better than brick.

80. *Sir J. Hector.*] Is it another distinct level?—The communication was made before this Act of 1891 was passed, so that it is in compliance with the Acts of 1891 and 1886, and, what is more, it has stood the test of explosion. I believe it runs from near the intake, in places, to 20ft. up a higher level—so I am told by Mr. Bishop.

81. Could you get through that?—It is small in places, but one can get through perfectly well.

82. Have you been through it?—Since the explosion, although there was timber blown right across, we could get through, and at the smallest place I had not to crawl. Lindop and Scott were there. At places it is low.

83. *Mr. Proud.*] Would it not conduce to the safety of the mine if you had two return-airways?—Certainly it would, but there is no provision under the Act for it. As long as there is a second outlet that is all the department can ask under the Act.

84. Would it not be well if signboards were put up to show the men where they could get out, and how?—Yes. Of course that would be an additional benefit to the men in the event of a disaster, but there is no provision for such under the Act. Miners know very well how the air goes, but there is nothing in the shape of direction-posts.

85. In England many miners have lost their lives through the men not being able to find their way out to the shaft after an accident. Would it not be well at convenient situations in the mine to place, for use in case of accident, plans or other indications of the easiest means of gaining access to the return-airways?—In this case, when these men started running from their faces in the west level, by that time the after-damp from the explosion would have been in the return-airway, and it would have been full of poisonous gas. Had they been in the return-airway itself, they would have been overcome all the same; it would have made no difference in this case.

86. *Sir J. Hector.*] When did you next visit the mine?—After the disaster, 27th March, at 2 a.m., 16½ hours after the explosion. I was in Westport when I heard of it. I heard of it at 6.15 p.m. on the 26th March; the wires were down.

87. Describe what you saw when you got to the mine?—I got to the mine and met Mr. Scott outside. I spoke to him as to whether he had reversed the fan, and I found it had not been reversed. After it had been running so long I thought there was no occasion for reversing it then. I think that course was the right one. I entered the engine-plane or level, and found there was no indication of violence until near the top of the main dip. On going along near the main dip there were props knocked out, and the boarding for the electric cable for transmission of power was down but the cable was not melted. On the caps there was dry dust sticking on the inside.

88. Did you take specimens of it?—I did not. I went to where the rescuers were and found they had taken the air down the old drive that was used for the pipe, and which had been part of the airway. I came right down the main dip, and noted that the stoppings were blown out.

89. These were the divisions between the descending and the ascending air?—Between the main dip and the back incline. I listened while coming down here in order to ascertain if I could hear any knocking of survivors going on in the mine, but I could hear nothing. I got down over falls to where the men were working. I noted that there was a good deal of water running down the dip, but there had always been a current of water running down this dip, keeping it more of less moist. I noticed the road was torn up in places; at other places there was dust heaped over the rails—a great quantity of dust.

90. That would be damp?—Oh, no. It was dry, covering the rails in places; and the rails were torn up in one place.

91. What lamp did you carry?—A safety-lamp. All the rescuers were working with saftey-lamps. I noticed there was an esccpe of air coming along this way to the back incline. When I

got down the men were leading forward the air by bratticing. I inquired why there was this escape of air. They said it was in case of any survivors, in order that they might get some air and not after-damp alone to breathe; so I thought it should not be interfered with, but I had no hope.

92. How did the lamp you carried burn?—The lamp burned brightly where the men were falling down.

93. By that you mean there was something in the air that was sufficient to sicken the men without its affecting the lamps?—Yes; I thought, probably, there was a trace of carbonic oxide in the after-damp.

94. If it were after-damp, would the lamps burn brightly?—With the incoming air, which was then coming forward, in certain proportion, the lamps will burn brightly with after-damp, but not with it alone.

95. Will they burn in the white-damp—carbonic oxide?—Yes.

96. Do you know, from your own experience, that they will burn brightly?—No; it is very well known that lamps will burn in white-damp.

97. How far did you proceed into the mine?—The work of extending the brattice was being continued in the drive to block off those places where the air might escape. I did not take note how far I went. I tried with the Davy lamp at the stopping, behind where the men were working. I also tried in advance of where they were at work, but there was no sign of a "cap" in the lamp.

98. Did you go any way near the old workings?—I went ahead of the brattice a number of yards, and there was no sign of firedamp, so far as we could judge from the lamp.

99. How is that tunnel drained?—By the pump below the mid-level.

100. Under what is called the "cabin?"—Below the cabin.

101. How is it worked? Where is the power?—By a pump from the top of the dip. The motor is at the top of the incline.

102. Had that pump been disabled?—It has been disabled by the explosion.

103. Was the water rising?—I did not get as far as the water. I inquired how long it would take before the water would reach the lowest position where a body was expected to be found. I was told about four ordinary shifts of eight hours each.

104. Where were some men expected to have been working?—In the lowest place down.

105. For four shifts was that kept dry?—It was allowed to rise. I cannot tell you the position of the water before the explosion, but it was four shifts below the level of what you call the sump-drive.

106. Did you see any of the bodies recovered?—Yes; but more particularly on the following day.

107. Did you observe the dust? Was it much scorched and singed?—In the main level it was comparatively dry. And when I returned about 6 o'clock at night on the 27th it was then wet and slimy.

108. That was twelve hours afterwards?—About sixteen hours. I entered at 2 a.m., and this was about 6 in the evening.

109. *Mr. Proud.*] Did you notice if the timber was charred?—There was no timber burnt into charcoal in any part of the mine. We found plenty of charred dust, and a thick heavy or coked dust on the props and caps.

110. *Sir J. Hector.*] You think that remained as the result of the explosion?—As one result of the explosion. The following morning I came in with the rescuers, then engaged in taking out the bodies from the mid-level.

111. What impression was produced on you as to what had been the immediate cause of death?—The faces were blackened with dust, and there was a sign of burning of the clothes. The arms of some were in front of them, as if they had fallen on their faces when running away.

112. What do you mean by signs of burning? Had they woollen clothes on?—Yes, and the clothes were burnt. In the mid-level there were signs of flame.

113. How does the air leave this level?—In a place near the middle-level face I found a coat with a parcel in the pocket, and I took this piece of burnt paper from it [produced.]

114. That was in the level. If the men had been running they would have been following the air?—This was in the right-hand side coming down the dip.

115. You presume, at the time of the explosion, there was a current of air passing in that direction?—Yes. The men had started to run, and the man found farthest away—I believe to be Masters—was lying face down. It was on the low side of the level. He had only his woollen under-shirt on and his trousers and boots. There was no sign of burning on him. It was just inside where this paper was found.

116. *The Chairman.*] And he was nearest the scene of the explosion?—He was farthest away.

117. *Sir J. Hector.*] Did you continue to visit the mine some time after that?—Yes.

118. What measures were taken in the way of assisting to restore the mine?—After the bodies were got out we entered the mine by the sump-side to try and find out the origin of the explosion. There were Mr. Brown, of Denniston, Messrs. Scott, Lindop, and Hayes. I am telling you who were present the first day. Mr. Gordon came on the Monday.

119. What did you find?—We found that there was strong coked dust on the props, and signs of burning. The coal was charred, and there were signs of violence—props and brattice knocked down.

120. Were you able to get right into the workings?—Yes; I only came into the sump-side when the last body was recovered. Going in on Monday we led the current round here [indicated], and we could get right round the faces. I could give you my general impression as to the direction of the force.

121. Did you make any official report at that time?—Not till some time afterwards, because our investigations occupied about a fortnight. The direction of the explosion varied in different places. It seemed to come up No. 2 incline, also up the main incline and across to the

bottom level. We saw trucks knocked into the end of that level. It had gone up slightly, this being a wet section with two dams up here [indicated]. It seemed to have died out in this section, and when it came up the main incline to have entered the mid-level. At the first stenton to the rise there would seem to have been a blast come down to meet it. We traced this, and saw it had come from the cabin down through the pillars, and then to have rushed up the pillar workings and right along the level.

122. You mean it perforated the pillars?—It went between the pillars, we could see that by the props being knocked down in every direction; for instance, in this place [indicated] we could see the props knocked down, and the same with the brattice.

123. Did you see any evidence of where the explosion might have originated?—Yes. At first it was a difficult matter to account for where it originated, but on going along the fourth bord from the sump-level we came on a place that was more charred than any other in the mine; the coal was coked and friable, and the small coal on the floor was like broken ice under our feet—crisp. And after noting that, we found a shot-hole put into where a strip had been in course of being taken off a pillar and up to which the rails were laid. This shot was evidently a blown-out one. There were cracks in the coal extending down that face, and there were "droppers" of the carbonaceous matter from the roof some 3in. long—that is, distilled bituminous matter. There was a slight corner behind this strip which was being taken off and a few feet ahead. There was no coking behind. The direction of the force seemed to have been away from this shot-hole—both ways in the bord, both in and out. In a fall near to No. 3 incline the cracks between the stones were filled up with heavy coked dust. These cracks would be a few inches in thickness, and were quite filled up with this coked dust. In the line of the shot-hole they projected downwards; there was a piece of "run" fuse—fuse that had been fired—found about seven yards away from the shot-hole. A prop in the line of the shot-hole had blistered coal sticking against the bottom of it, and a prop that had been lying down end on had small coal driven into the end of the wood. The place itself had not been holed or undercut. There was no holing done—practically none—nor had it been properly prepared. From the evidence I saw I had no doubt there had been a blown-out shot.

124. *Mr. Skellon.*] Do you know what they use for tamping?—Generally the fireclay.

125. *The Chairman.*] But there was no indication that a shot had blown out from the face?—Yes. Here is a plan I have had prepared showing the scene of the explosion [Exhibit No. 7].

126. *Sir J. Hector.*] Did you see the position of this shot-mark?—Yes [indicated].

127. That is to say on the lower side along the pillar that was being stripped?—Yes.

128. That is the working face from the incline?—Yes.

129. *Mr. Skellon.*] Did you find out who were working at that pillar?—There were no tools there, and nobody was found there, so far as is known. We will put in a full plan showing everything in regard to that, as soon as it is prepared.

130. Would the men not naturally carry their tools away before firing that shot?—Yes. I should imagine that any man who would fire such a shot would carry them away.

131. Who was the nearest man found to that place, "No. 4 bord"?—That I cannot tell you, but Mr. Bishop will speak as to the position of the bodies.

132. *The Chairman.*] Where would the men retreat to?—It depends upon where they are working. Supposing they were putting in a blast here [indicated] the men would have retreated to here [indicated].

133. *Sir J. Hector.*] Are you aware how long these pillars have been standing, and if this bord—No. 4—remained unvisited before they commenced operations for stripping this pillar?—I cannot tell you. We see the cracks running down, showing that it was a blown-out shot which had not done its work. I was satisfied from the direction of the forces as to the point of origin.

134. *Mr. Proud.*] Was there much coal-dust lying about the face?—There was more or less throughout the mine, but there was a lot of crisp coal under our feet which was gradually trampled into muck.

135. *Mr. Skellon.*] Was there any man found with his coat on?—Not that I saw. The only body I saw recovered was Worthley. I did not examine his body as I might have done, on account of being wanted to carry the stretcher.

136. *Mr. Proud.*] Was the mine very much damaged in that part?—I do not think the mine would be considered very much damaged, although there were signs of fire-coking of coal on pillars, knocked down brattice, trucks knocked about, and props down in places. Falls had taken place in the roof. In many mines the effect would have been greater; the roof would have been down so that we could not have got in for weeks. In this mine the roof appeared to have stood well. It is a good roof.

137. *Mr. Skellon.*] What is used for bratticing?—Brattice-cloth is used in leading the air round the faces.

138. Timber stoppings?—No; either the "crib-log" or brattice-cloth. I think these are just as efficient as the wood stoppings because the wood gets cracked.

139. Do you not use any stopping of timber filled in with slack?—You mean deal boards.

140. Yes?—No, I did not see any of that sort, the stoppings up the back incline are cribs filled in with rubbish. These were thrown right across the back incline.

141. Was there a barometer kept in the mine?—There was one at the outer office, which is a better place than at the mine.

142. Then the underviewer and fireman would have to go about 2 chains from the pit-head into the office to see it?—The outer office is open to any one wanting to go into it. The door is always standing open.

143. *Mr. Proud.*] Did you form any opinion as to how the explosion was caused?—The origin seemed to be from that pillar [indicated]. The flame would then rush down, start the dust, and the main force of the explosion would go on in succeeding throbs or explosions, as instanced by the authorities on coal-dust questions.

144. *Sir J. Hector.*] You mean the dust must have been exploded?—Must have been raised by the concussion, caught by the flame, and exploded, as coal-dust itself explodes; also, there are distilled all the gases that the coal-dust contains, and, if there was any gas about any place, possibly so small that it could not be detected, that would add to the explosion too.

145. And you attribute the explosion in some way to coal-dust?—Yes; for the reason that the coking shows that there has been coal-dust, and we know that coal-dust explosions vary in intensity; the force varying in intensity shows it was a coal-dust explosion. Gas would explode equally in all directions.

146. You say they vary in intensity in this case as a proof that it was due to coal-dust?—Yes; in some places the brattice would be knocked about, the props down, and a heavy coking would be on the props, while in other places there would be no sign of injury or damage.

147. *Mr. Proud.*] Was the mine dry in that particular part?—When we went through the mine after the explosion it was dry.

148. *Sir J. Hector.*] You said there was one part and in one direction that the mine was wet, and that the explosion did not seem to have affected it?—The force was strong here [indicated—bottom level, west side], but a few pillar-lengths away there was no sign of the explosion at all.

149. Were these old pillar-workings dry or damp?—This was the damp section of the mine. It had two dams on the top which would add to the dampness. Drips of water were seen coming from the pillars on this side, and this would create moisture.

150. Have you had any personal experience of coal-dust explosion?—No. I have seen small explosions of firedamp, but in such there was no coking on the props.

151. *Mr. Park.*] Can you account for the men running away?—I think the in-rush of air as well as the small flame, such as is indicated on this piece of burnt paper, would cause the men to run at once. They would meet the after-damp and were overcome by it. I do not think such burning as shown in that paper would be enough to kill the men. It must have been the after-damp they perished from in such places.

152. *Sir J. Hector.*] Could it be anything else than after-damp? Could it have been white-damp?—Yes, it could well be white-damp, because white-damp is the product of flame.

153. You know nothing about dust-explosions?—Nothing further than from reading authorities.

154. When you visited the mine, did you find the caps covered with dry dust?—Certainly, on this occasion.

155. So that the dry dust in this part [indicated] must have been affected?—By the explosion.

156. So that the whole of the dust in the mine would have been burned if it had been a dust-explosion?—No; because there was a great quantity of dust to be seen there after the explosion. I account for that simply through the want of oxygen. Had there been even a sufficient amount of oxygen there it would have burnt.

157. You mean the first explosion would have consumed only a portion of the dust, and the dust-explosion itself might have contributed to fan the amount of flame?—Yes, by tearing up the stuff between the sleepers and rails, which would be converted into dry-dust. Also the coal, on striking the pillars, would collect all the dust and the concussion would knock the dust off the sides and the explosion would be carried on until the dust came out at the mine mouth.

158. Was there any white-damp in the mine?—I think from the flame white-damp might arise. The only source of white-damp is from flame. To me it seems largely a matter of theory that there was white-damp there; there might have been a little firedamp present.

159. Unconsumed in the explosion?—I do not say so. It might have been given off after. I got a sample of the air taken by Mr. Aitken on the succeeding day.

160. *Mr. Park.*] Can you give me a reason why the dust was not consumed?—Because there was far more dust than the air in the mine at the time of the explosion could burn or consume.

161. Did you find much charred dust?—We found very much charred dust driven against the props; generally on one side, sometimes on two.

162. *Mr. Skellon.*] Is it not very strange that an explosion like this has never happened before? Is it a new thing to have blown-out shots in mines?—It needs a particular combination to cause an explosion of coal-dust. The dust requires to be very dry, very fine, in the air in suspension, and exposed to a large volume of flame. That flame requires to be of a high temperature: in fact, there are many conditions required.

163. You say the men were running away, and there might have been a small accumulation of gas. Could not the flame from the shot have first fired the gas, and thus gas have been the primary cause of the explosion?—That of course is possible, but at the same time when that shot went off it would also give off a flame. The flame would catch the dust and cause the main explosion afterwards. Either would be quite possible. The only thing is I cannot find any evidence to point to the ignition of gas. I heard the evidence at the inquest of Tennant, the roadman, that there was no place where there could be a large accumulation of gas.

The Chairman: We cannot take what you heard.

165. *Sir J. Hector.*] By what characteristics would you recognise an explosion of gas from an explosion of anything else?—I would not expect the gas to show coked dust on the props the same as a coal-dust explosion. I should expect that the force would be more or less equal in all directions. That is the effect of an explosion of gas. Taking it in this case, the explosion shows at different points a varying intensity, and the cloud of dust that came out of the mine is proof that it was a dust-explosion, and the varying intensity of the force is also proved by the brattice-cloth, props, trucks, and men being driven in all directions.

166. What subsequent action did you take as Inspector of Mines?—On the Monday I requested the mine should be made safe, because there was a great risk in the previous rescuing work. I am speaking of ventilation and securing of the roof.

167. Is the mine now being worked under your instructions?—In regard to working the mine, nothing has been done on the sump-side, but it has resumed work at the pillars on the western side. With a view to safety in the Brunner Mine, I requested Mr. Bishop to see that none but safety-lamps were used, and that there should be no shot-firing—only wedging the coal down, or scalloping. Mr. Bishop acknowledged the receipt of my letter, agreeing to it.

168. *Mr. Park.*] When you got into the mine on the first occasion you say you found the men working down the main incline?—I came later, and they had started taking up the brattice-cloth from here [indicated], so that the air would travel down its old course—that is, the back drive which conveyed the pipes discharging the water [indicated], so that it would flow out by the water-level, and no doubt, in clearing out the drain, the rubbish and dirt would be thrown into the back drive, which was partly filled, and presented a very small section. I recollect quite well, because I crawled out from here on the pipes when coming up. The air-current came down the main drive.

169. *Mr. Park.*] Why did they work down that back drive?—Because the men were strangers, and did not know any better, and the mine presented a different appearance after the explosion to what it did before.

170. Where did you find the greatest force of the explosion?—The greatest force seemed to be up the main dip; it blew out the stoppings there, which divided it from the return. At the top of main dip there was a brick-wall which closed off the dynamo. That was blown right down. There was a piece of brick-work a yard square blown a number of yards in from where the wall was, in one solid piece.

171. Then the other stoppings coming down the drive, were they all thoroughly staunch?—They were crib-stoppings, packed by dirt and filled.

172. What size was the return?—It was of varying size, of a good size, excepting at one point along the fault where it is small, but it is efficient for the purpose; a good current of air, more than double required by the Act, was circulated.

173. What quantity of air would be taken out at the return?—On the 27th November, I think I told you, I found 12,000ft.

174. Was that in the return or intake?—What goes in must go out, but there would always be a chance of some coming in from near the fan. I requested that this should be made airtight. I saw the stoppings in the old drive.

175. You say it was sufficient. There is also the fact that there was a man found further towards the same level who seemed to have no marks of injury or burning, is that so?—I recollect seeing no marks of violence on the body; he seems to have been overcome by the after-damp and to have run to the water, because there is such a thing as water being able to neutralise bad air to some extent. The man who thinks of that would make for running water.

176. He was running in the direction of getting out of the mine?—Yes; but before he could get anywhere near the return the gas from the explosion would be in the return, so that he would be only running into foul air.

177. Do you say this explosion would extend in both directions, both upwards and outwards?—I have described the directions of force already.

178. Were there any others?—I do not quite understand the question. If you ask me as to any particular road I should say it seemed to go up the main drive to the cabin. We found some falls right across. The force would then come down with the other current and come out in some of the pillar-workings into No. 6 and No. 5 inclines, in western workings.

179. Then did it extend upwards along the main drive, along the return?—There were no signs of violence in the return or near the engine-plane, only coal-dust on the caps, and excepting what I have already told you.

180. Had it spent itself before it got to the top?—It seemed to have spent itself along the main dip, and outside this there would be a considerable quantity of water where dust could not very well lie.

181. Did you notice the direction of the shot? Was it a level shot or an inclined one?—It rose towards the roof, but the explosion would strike the floor. I told you the dust on the floor was coked, and also at the bottom of the prop there was blistered coal, and there was coal driven into the end of a prop lying end on.

182. Would there be any reason why there were no tools found there?—I cannot say anything more in regard to that than I have already said.

183. I want your opinion as an expert as to whether there was any chance of a workman taking his tools away in case of their being covered up with coal?—The man who would fire such a shot would certainly remove the evidence of his work. I have asked Mr. Bishop to see that the men ran no risk, and I have his various letters acknowledging that should be done.

184. Have you any idea of how long the men had warning before they were overtaken?—I inquired the distance any man would run, and I believe it was 50 or 60 yards; the others would run only a very short distance—say, 20 yards.

185. Did you hear of any warning having been given?—I hear that the bell from the dynamo had rung outside the mine about the time of the explosion. It might be that the explosion had something to do with the ringing of the bell.

186. Did you find any clue?—It was the burnt fuse.

187. Was it preserved?—Four miners examined the mine on behalf of the men, and they examined the fuse, and took it away. I regret I cannot produce it. I got a piece of that fuse from one of the miners the succeeding day, and could show it if you wish. It was similar fuse to the other.

188. Were there any signs of any other blown-out shot?—I examined all the fast places, but there were no signs.

189. *Mr. Beare.*] When you made your last inspection of the mine, did you consider the Act had been fully and sufficiently complied with?—I consider the Act was reasonably well observed;

but there were always some things, not only in the Brunner, but in every mine, where I made requests for things to be done, and they were done.

190. I only ask whether on any occasion that you asked a certain thing should be done, it was done by Mr. Bishop as a result of your inspection?—I can tell you some of these things.

191. We wish to know whether your instructions as Inspector were always carried out by the mine-manager?—Yes. For instance, there was the removal of small coal from the workings. I requested that it should be removed from the main dip, and that has been done as I wanted it. I once asked him to stop the Coolgardie section, and he knocked off the men in order that the ventilation should be improved. When I found he was behind with the plans I would write him, and he would send on a tracing or letter saying a survey would be made. Sometimes there was a delay, and he was not up to time, but still he sent up the tracing.

192. Compared with other mines, how did the Brunner stand as regards your inspection?—I considered the Brunner was a safe mine.

193. Well managed and conducted?—I have answered that already. It was reasonably well managed. I look upon Mr. Bishop as a capable and strict mine-manager.

194. As to the ventilation of the mine, do you consider that was satisfactory in every respect?—It was more than double what was required by the Act. Sometimes I would want a little brattice put in, and it was attended to at once.

195. Have you examined personally the ventilation machinery?—Yes, the engines and steam boilers excepted. This is according to Act.

196. Did you find the brattice-work—the stoppings—all right?—There was no brattice between the return and intake, as far as the back of the dip. In the dip downwards there were stoppings between it and the back incline, which I have already described as cribs, filled between with dirt. I believe that is really a better system of stopping than brick in case of an explosion.

196A. Can you say, as an expert, if that is so?—Yes; I should say cribs filled up and well backed are thoroughly good stoppings. The tighter it is squeezed the better it will get. Brick-stoppings will crack with pressure.

197. As compared with other coal-mines, was the ventilation of the Brunner Mine adequate and good?—I have already said that the ventilation was good, and that there was more than the Act required. I consider it is quite sufficient, but compared with other mines I need to go into the question of figures. If I had asked anything more, Mr. Bishop could have said he had more than complied with the Act.

198. I think you have already told the Commission that in your opinion, after thoroughly examining the mine, it was not a dry or dusty mine?—I certainly would not call it a dry and dusty mine, as such term is understood at Home.

199. I asked this question because coal-dust is generally considered as likely to cause explosions. The question of coal-dust explosions has been greatly discussed, and that would probably make you more careful in your examination in regard to the dust in the mine?—I have given special attention to it, and have gone into the question of dust with the microscope. I also drew Mr. Bishop's attention to a lot of stuff and rubbish lying in the bottom level, on my November inspection. He said, "You will observe that it is stony." I did observe that it was black stone that was being met with in the faces, and I considered his answer satisfactory.

200. Notwithstanding, you can speak frankly, Mr. Cochrane, as to its not being a dry and dusty mine? There would be nothing dangerous in the way of dust?—I should say there was a moderate amount of dust.

201. Coming to the cause of the explosion, I think you have given it as your opinion that it was caused by a blown-out shot igniting the coal-dust?—I said so. The circumstantial evidence, as far as I could see, pointed to that.

202. I believe this coal-dust is very liable to ignite, in accordance with the quality of the coal—the better the coal the more liable that the dust is to ignite?—Generally I would say so, but I would not pledge myself to say that it was so in every case, because there are more direct conditions required in dust-explosions than in gas.

203. What would be the resultant gas from coal-dust—carbonic acid or carbonic oxide?—I should say both.

204. In going into the mine afterwards would the resultant gas enable you to come to a conclusion as to the cause of the explosion?—I do not think it definitely would. I am doubtful about that point. There are so many features to be taken into consideration. There is a large quantity of air coming in—12,000 cubic feet per minute—and there is the foul air, and any foul air that might arise would not be sufficient to show on the instrument.

205. Well, the gas did not help you to come to a conclusion that the explosion was caused by the ignition of coal-dust caused by a blown-out shot?—You mean from the mine atmosphere.

206. From the mine atmosphere?—I have mentioned that I thought there was carbonic oxide present, but I do not think that is a definite thing to go on. Even if it had been coal-dust the gas would be distilled out of the dust by the great heat.

207. When did you first come to the conclusion that a blown-out shot and the ignition of coal-dust were the cause of the explosion?—I did not mark it down. I did not go any further into the question of a possible cause for a considerable time after seeing that blown-out shot. I wanted to see everything, and to collect all the facts.

208. You cannot say when it was?—At the time of my first going into the mine I was inclined to think it was firedamp; I did not think of coal-dust then. I told you I examined the air in the stoppings behind where the rescuing party were, lest they should be attacked by an enemy in the rear. I thought if it was firedamp it might be expected to cause a further explosion, even if safety-lamps were used. It was necessary to test for gas, and I tested the stoppings and also at the brattice and could see no sign of gas in the flame.

209. You went with Mr. Lindop and others to examine the mine. When did you first come to the conclusion as to the cause of the disaster?—It was Mr. Thomas Brown that first discovered the shot-hole.

210. At any rate you say the shot-hole was discovered not by yourself but by Mr. Thomas Brown?—When I was present.

211. Was the place where the blown-out shot was different to others?—When they were shown the blown-out shot every one noted previously that the place was more crisp and burnt than other places in the mine, and it was apparent that there was something unusual, and there would have been certain conclusions come to in our minds. I did not recollect any conversations.

212. Have you seen anything to change your mind after a subsequent examination of the mine as to the origin or cause of the explosion?—I can see no other place where the ignition could have occurred; the circumstantial evidence points to that place only.

213. Can you tell what state the stores of the mine were in?—No.

214. Was there plenty of brattice-cloth in the mine?—I think so.

215. Was the mine a fiery one, in your opinion?—It was certainly not a fiery one, but gas was known to be seen in it at times. I have seen gas in the mine.

216. Speaking generally, I suppose in most coal mines there is a small percentage of gas?—Yes.

217. Speaking as an expert, you would not say this was a fiery mine?—No; I would not call the Brunner a fiery mine, but still there was enough firedamp to cause the men and officers to be well on their guard. There were two safety-lamps found lying in Brislome's bord after the explosion. I had spoken to Mr. Bishop about it, and he said it was only a matter of precaution, and that the safety-lamps would be withdrawn. I thought it better to let him retain the safety-lamps in that place, as in case the men were burnt he might say I had ordered the withdrawal of the safety-lamps.

218. Speaking generally, can you say that safety-lamps were used where gas was expected?—At any place where they thought there was a likelihood of gas.

219. You do not know what persons handled the safety-lamps?—No.

220. Do you think the mine was safe to work without safety-lamps?

221. It is not now worked with naked lights?—No.

222. And it is a common practice to work with naked lights in coal-mines?—Yes.

223. *Sir J. Hector.*] Is the inspection made in the morning with safety-lamps before the men are admitted to the mine?—The firemen are ordered to go with safety-lamps, and whenever I saw them in the execution of their duties they had safety-lamps, both Roberts and Morris.

224. You consider the examination of the working-places with safety-lamps, before the men are admitted, a sufficient test to allow them afterwards to go in and work with naked lights?—That is the test provided by the Act, and if it is carried out precisely it should be sufficient to allow the men to go in with safety.

225. *Mr. Skellon.*] Brislane and his mate you say had safeties?—I was told so.

226. Do you consider it safe for them to be working with safety-lamps in one bord, and the men in the next bord in-by with naked lights?—That would depend on circumstances. I think it is bad practice to have safety-lamps in one bord and naked lights in another, but it would depend on the amount of gas, and if the lamps were there simply for testing.

227. *The Chairman.*] If there were gas, of course naked lights would not be used?—It depends on the proportion of gas. Suppose there were a few cubic feet of gas there would be no danger if the ventilation was good.

228. *Mr. Skellon.*] If the fireman had been around Brislane's bord in the morning and found no gas there he would not have required them to take the safeties in?—Oh, he might quite well have asked them to take safeties in as a precaution if he was afraid of any little gas, and in order that he might test for it. But it does not follow that there was gas there because he required them to take safeties.

229. *Sir J. Hector.*] I suppose I am right in assuming that gas sometimes suddenly hisses out from coal, and renders it necessary to put out the naked lights?—It is a common occurrence in the mines at Home for gas to hiss out. I have seen that, but I have never heard of firedamp hissing out in the Brunner Mine. I think the grinding of the stone might be caused by water, but I have never heard of firedamp hissing out of that mine.

230. *Mr. Joyce.*] Did you think there was enough coal-dust in the Brunner Mine, when you made your last inspection, to cause you to take special precautions about it?—I was aware there was some small coal but not enough to make me take action, otherwise I should have done so.

231. Do you know that in England all the coal-mine owners are compelled to water the dust for a radius of 13 yards around a shot?—I have no personal knowledge other than there has been a provision put in a recent Act for watering in certain cases.

232. Do you think water would be a preventive of explosions, or salt, say, for a radius of 20 yards?—It would be a benefit, but not necessarily a preventive. It seems there is a great difficulty in saturating the dust thoroughly.

233. You say that salt would not be a preventive?—It has not been found effective in certain cases where it was tried, but I think it would be a benefit—it would absorb dust; but you would require plenty of salt.

234. Of course your opinion as to the cause of this explosion being coal-dust is simply theoretical?—It is formed from the evidences in the mine, and coal-dust is the only thing that would fall in with the circumstances I have seen there; and any case of assumed theory you will not find to fit in with the facts.

235. There might be a small proportion of firedamp?—Yes; but too small to be taken into consideration.

236. But might not there be a large proportion of firedamp present previous to this explosion?—I do not think it is reasonable to argue on that assumption.

237. Still, you would not like to say it was not firedamp?—There was the distinct evidence of the explosion.

238. From your own opinion, can you say there was no firedamp?—I saw firedamp after the explosion, but it was in such small quantities as not to be wondered at, considering that ventilation had been disarranged for several days.

239. From the appearance of the mine would you say there was not, in your opinion, any large quantity of firedamp? Would the appearance of the mine enable you to swear that?—We went through the various places and tested for firedamp, and found none of consequence.

240. I am not asking you about the firedamp you found afterwards. Can you swear, from the appearance of the mine after you made your inspection, that there was not any large amount of firedamp as the primary cause of the explosion?—I think I have answered that question already. In regard to sufficient evidence, I cannot say definitely what the circumstances were before the explosion from the appearances afterwards. The mine would be very different after the explosion from what it was before.

241. I take it that there may have been a large quantity of firedamp as the cause of the explosion?—I do not think it is at all likely.

242. Do you not know that the artificial explosions they have had of coal-dust have been produced under circumstances that are not very likely to occur in that mine?—Yes; that is quite true. There are very few coal-dust explosions in mines at all.

243. I think the majority of experts state that we can hardly expect these conditions to occur in mines without gas?—No; only on very rare occasions.

244. From your inspection of the Brunner Mine, would any of these conditions be likely to take place?—If you indicate the conditions, I can deal with them individually.

245. Did you notice if there was any very fine dry dust?—There was a moderate amount of fine dust.

246. Was it sufficient to create an explosion?—It is becoming clear that small amounts will cause disastrous explosions.

247. And you found a moderate amount of fine dust in the mine?—And very small coal.

248. It must be exposed to a body of flame to produce an explosion?—Yes.

249. And the temperature of that flame must be very high?—Yes.

250. Could not these conditions be very well produced in the Brunner Mine?—No; there are other conditions required to be fulfilled. The dust requires to be very fine and very dry—quite fine. There was a certain amount of small coal along with the dust, otherwise I should have taken steps to have it removed. I got the coal moved off the main incline.

251. In reference to this blown-out shot, might not the shot have been put in when the bord was being constructed?—Yes.

252. Because there is another shot-hole alongside, to mark where the explosion appeared, in the midst of the same line?—Yes; it is a frequent thing to see, immediately the shot falls, half a hole, the rest having been blown off.

253. In just the same line as the blown-out shot?—Yes.

254. You cannot say whether that shot was put in when the bord was being constructed or not?—I have said already that there was evidence of an explosion on that blown-out shot.

255. If it had been put in when the bord was being constructed—that was some time before the explosion—then the explosion could not possibly have occurred?—I think it was driven a long time before, possibly a year before the explosion.

256. You mean the bords; but I am talking of the blown-out shot. If the charge had been put in two or three days before, no explosion would have occurred in that particular portion of the bord?—If the blown-out shot had occurred two or three days before it would have caused an explosion two or three days before. Now you can see the blistered coal perfectly on the line of force, and small coal driven into the end of the wood—coal charred and dropping from the roof, and blistering all round.

257. Could not these evidences have been produced by an explosion elsewhere?—I do not think they could be the same at every point; they will not fit in with direction.

258. Will that shot fit in with the various directions?—Yes.

259. The explosion went right across the air-current?—That is the custom in every explosion, to keep the supply of oxygen from the air. This explosion went both sides from the blow-out shot, up and down.

260. Gathering intensity as it went along?—Yes; a gas-explosion would be otherwise.

261. A gas-explosion would lose its force as it proceeded?—Yes, unless it met further quantities of gas.

262. You have remarked that you saw Worthley's place, and you remarked that you thought at first that the explosion occurred in that portion of the mine?—I did not say so. I saw there was evidence of an out-flame, and props were scattered, and the top end was charred; but those evidences did not fit in with direction, and it was not to be expected that that would be the point of ignition.

263. You say that the mine was perfectly safe; but we have had evidence to the effect that the return-airdrive, in case of accident, would have been filled with poisonous gas. Is there no way of rendering a mine safe, in case of accident, in the way of keeping the air pure?—Supposing, instead of the return going out, it had gone right up to the goaf, the after-damp would have been sucked up all the same.

264. You think that as soon as the explosion appeared, both the main-drive and return-airway would be full of poisonous gas?—In this case it would, because the seat of the explosion has been near to the return. It is a question of relative distance and relative speed.

265. Could you not make that portion of the mine safe in case of accident? It was really a man-trap in case of accident, because you had no other airway for the poisonous gases?—The men could get along by the return. We came up there, but there is no other way of driving the impure air out.

266. Still, the mine was full of gas, and, according to your evidence, the moment the explosion occurred everybody in it must have perished?—I think that once the explosion occurred, even if there had been a second outlet, the poisonous gas would have risen, and the men would have had no chance.

267. If the Brunner mine had had 1,000 men engaged in it they would certainly have perished. Is that not so?—If such a large number had been employed, there would probably have been other arrangements, and the mine would have been divided into districts. The force would probably then have expended itself in one district. The number of men employed was not large for one district—say, sixty men.

268. There were sixty-five men killed. Say, for instance, that you took a shaft out at Coolgardie, do you not think that would have purified the air, in case of accident? Say you used fire instead of a fan?—The ventilation would have been less, and it would not have been so good. The poisonous gasses would still have filled the return, even up to Coolgardie, and would have travelled up the hill and destroyed the Coolgardie Mine itself.

269. Say you sank a shaft from the top of the hill, would that have been any better?—And worked with a fan into the mine?

270. Yes?—I fancy the bad air would still have risen.

271. But do you not think the shaft would get rid of the bad air much quicker?—You mean the poisonous gases resulting from the explosion.

272. Yes?—In such a case it would not do so.

273. And there would be a greater chance for the men?—It would depend altogether on where the shaft was placed.

274. You could not place it in such a position as to prevent the gas reaching the men?—I do not see that it would make much difference.

275. Supposing you had an air-shaft, would you not get rid of the poisonous gasses very quickly?—The only difference would be that the gas might be drawn up the shaft.

276. That would leave your air free to come through from either side in the ordinary current?—If it were a shaft instead of a roadway and if there was no blow-out of stoppings, it would depend altogether upon the resistance of the stoppings; but I think most of them would be knocked down when the explosion occurred.

277. Then it all depends upon how long the good air took to get through?—Precisely.

278. How long is it since you went along this return-airway?—I think it was in July last I went through it.

279. Could you go straight through, or did you have to climb up the shaft?—I had to climb up a shaft.

280. For what distance?—It is a small shaft about 30ft. high, but it was more than was required by the Act. Instead of the 6,500 cubic feet of air per minute required, it had 12,000ft. per minute.

281. You said something about a 30ft. shaft in the return-airway. If you were getting out of the mine, would you have to climb that shaft?—You would require to walk up an iron ladder.

282. An iron ladder was provided?—There was one.

283. What was the width of the shaft?—I cannot say from memory.

284. About 6ft. x 3ft.?—It was a round shaft, I think about 4ft. or 5ft. in diameter.

285. Would that assist the passage of the air, or did it not stop it?—It would tend to stop it, but the moderate volume of air it would catch would be very little. I could not insist on it being made larger, because there was more than the required quantity of air passing in through the airway.

286. But if this return-airway had been a good deal larger, facilities for the escape of the men would have been better?—Undoubtedly.

287. In your opinion, as an expert, is that return-airway sufficiently large for the mine?—I could not have compelled them to make it larger.

288. Leaving aside the question of what you could have compelled them to do, I am asking for your opinion as an expert, and outside of your duties as an inspector, would you consider that airway was sufficiently large for the mine?—I think for a mine like this, which was to be exhausted in a year or two, the return-airway was reasonably good. It is a small airway, there is no doubt about that, but a fair return. It is not as if they had to travel it every day. There was the second outlet, and a big current circulating through it, much more than I could have demanded.

289. Looking at it from a common-sense point of view, as an expert, your opinion is that it was large enough?—It would have been better larger, but still there was more air passing through than the Act demanded.

290. You are only basing your statement on the fact that the mine would have been exhausted in a year or two. Considering the number of lives in that mine, do you not think that the airway ought to have been larger?—It was not a question of lives at all. I would depend upon what the conditions were. The men would never have got out, as they never could have reached the airway. The greater portion of return is very large.

291. If an explosion occurred in some portion of the Brunner Mine to-morrow, and there were 100 men in it, I suppose the whole of them would be lost?—If you placed them in the position where these men were working the conditions would be just the same; even with a shaft as you suggest, the foul air would go instantly to the mouth of the intake, so that the men would be bound to be cut off.

292. If you had a very large current of air passing round the mine, would not that current tend to drive out the noxious gases quicker?—Quicker, but not quick enough in case of an explosion.

293. To prevent loss of life?—No. The explosive force was so strong that it forced the black smoke out at the mouth of the intake, where Mr. Bishop fell. That would be all sucked back, and it would return from the intake at the speed the fan would draw it, and go back through the return.

294. Then there is no possible way of preventing accidents like this occurring?—Yes; I think so—by using safety-lamps and having no blasting.

295. And I take it that is the only way to prevent accidents?—That is the only feasible way that has presented itself to me in the meantime.

296. You do not know any way by which you can make the mine safe to work except by using safety-lamps and without using powder?—I will not say that, but I am telling you the way I have arranged in the meantime.

297. Until you find some better way?—Yes.

298. With reference to the Coolgardie drive, how far would you have to drive to connect with the hill-workings?—That would depend upon the point from which you want to connect with Coolgardie. If a drive were put in from the dynamo on plan, it would be a matter of 24 chains. The men working in the dip-workings would have been killed all the same. One man was got out alive, near the mouth of the mine. He was said to be 14 chains in from the mine mouth.

299. Was he overcome?—Yes.

300. Could not you conduct the air down in this direction [indicated]?—Those were old workings and falls, and as far as I know it would not have made any difference; and to have had an air-lead up to Coolgardie would simply have been the means of introducing explosive matter into the Coolgardie workings.

301. Do you think a rise to Coolgardie then would be useless in case of an accident occurring?—Of course, the more outlets you have the better, but I do not see that it would have made any difference. It would simply have introduced the explosion into the Coolgardie workings.

302. Assuming the coal-dust lay along these workings?—I mean that.

303. Have you any way of cleaning up the large amount of coal-dust which accumulates in this mine?—I have already done so. There is a certain amount of coal-dust in every mine; but there is also small coal and rubbish that the force of the explosion would tear up and convert into dust. Then the pieces of coal flying through the air from the knocked-about trucks, together with the dust lodged in the crevices and pick-marks, would also add to the explosion. There is certainly a very great deal more dust about the mine since the explosion than there was before.

304. You would have to ballast the rails with something else than small coal?—It was sodden wet stuff before it was hardened with traffic, and I never for a moment thought it would have turned into coal-dust and assisted the explosion.

305. Still you find it has done so?—It has been burnt up.

306. In your opinion, you should ballast these lines with something else than small coal, in order to make them perfectly safe?—That is so.

307. And of course to use safety-lamps, and have no blasting?—That is a different matter altogether.

308. Is not gunpowder rather out of date? Do they not use flameless explosives as a rule now?—Are you talking of New Zealand?

309. I am talking of the Home collieries?—I came out in 1880, so that I can only refer to what was done then, and to what I have heard since. The so-called flameless explosives have been tested in Coalbrookdale, and I understand that some detonators got into the coal which was taken to Wellington, and exploded when the coal was used there.

310. You know, as a matter of fact, that the flame generated by these high explosives is not so great as that which comes from a blown-out gunpowder charge?—Not so great.

311. Therefore, the danger is much less?—Much less.

312. Did you examine all the stoppings in the mine as you went through?—All that came under my notice. Of course, you cannot get into every little crevice and cranny, but I made a thoroughly good and honest inspection of the mine. I neglected no part of my duty; I gave myself to my work, and carried it out thoroughly.

313. There are wood-stoppings here and there—deal-board stoppings [indicated.] What have you to say about them? Did you see them?—I do not recollect just now.

314. Did you ever see any permanent stoppings made of brattice?—There was the undercast, situated here [indicated on plan], but it is sufficiently strong for a horse to go over; and then, in this spot [indicated] there has been another, where we used to walk across, and a little further on there was a 9in. brick-stopping, which was blown away. [Witness fully described the position of the stoppings on the plan.]

315. What were the majority of the stoppings composed of?—Many were brattice-cloth.

316. Do you consider brattice-cloth stoppings sufficiently good stoppings? In case of accident they would be useless?—Yes, but the brick would have been the same.

317. Why did they have two brick-walls in the centre?—You might have had all of the stoppings solid, but then the mine could not have been worked.

318. Is it not the usual custom to have two brick-walls a certain distance apart, with dirt filled in between?—No. Of course, if you had two brick-walls, it would be better, but in going round places where the brattice was used you would not be expected to have brick-stoppings; and if they were insisted on by Act of Parliament it would mean that the mine could not be worked. It would be too expensive.

319. But still, brick would be preferable to brattice-cloth?—For taking the air round a face brattice is fairly sufficient.

320. But in case of an explosion it goes down quickly?—There is no doubt of that.

321. And the air then goes in all ways?—The circulation is, of course, destroyed.

322. When you have seen them bringing air up to the face you say you sometimes instructed the men to brattice low down, away from the face. Would you leave the brattice in?—

It all depends on the width of the spilt and the strength of the ground. It is difficult to say from memory what I may have required.

323. Did you lead it up to the face or some distance back from it?—Some distance from it; not right up to the face.

324. Some 20ft. or 30ft. away in some cases?—In some cases more.

325. Would not that have a tendency to allow the gas to generate?—Yes.

326. And if the mine were at all fiery or liable to produce gas, the effect of the brattice being so far away from the face would assist the gas to generate?—It was not a fiery mine, as you assume, and if there were any gas seen in the face the brattice would be put in at once.

327. That is, assuming it was seen?—Yes, by the mine people.

328. What lamp do you test with for gas?—The Davy lamp.

329. Do you think that is a sufficiently good test?—Sufficiently good for practical purposes.

330. Is not there a great tendency to explode when there is only a small quantity of gas?—With 2 per cent. it should not explode.

331. When you were going in with the rescue-party, did you find in any portion of the mine which had not been recently blocked up any foul air?—There were falls at different places where we got over, but there was no place completely blocked. It was the foul air resulting from the explosion that kept some of the rescuing men from getting out.

332. Was the ventilation blocked up by the falls?—Oh, no.

333. Were you always in the habit of measuring the amount of air coming into the mine?—I made my regular inspection twice a year; and the amount of air required in this mine was what was put down before I came here. Then there were other occasions when I dropped in at any time; and when I found the air clearing well there was no occasion for testing. I often tried it, and always found a strong current.

334. Did you give notice of your intention to inspect before you visited the mine?—My visits were always in the way of surprise. I never gave notice of my coming to any mine. I strove to conceal my coming, but when I had anything special to inspect, such as an inspection for the purposes of the prospecting drive for the Harbour Board, I might give notice then; but that is quite a different thing to inspection of the mine.

335. Your ordinary inspection was always in the nature of a surprise?—As near as possible. I endeavoured to take the management by surprise.

336. Did you ever notice that they had any difficulty with the powder-smoke when you made your inspections?—The reason for getting the undercast was that the powder-smoke was rather thick. That is why I spoke about it. I requested that the ventilation should be improved, and Mr. Bishop got the undercast in.

337. Did that effectually clear the powder-smoke? — You cannot completely clear away powder-smoke.

338. Was there not rather more than was necessary at times in the Brunner mine, which shows that there was not sufficient air passing through these bords?—The return was sufficient air for ventilation purposes.

339. What kind of doors did they have in the Brunner Mine?—There was a door on the mid-west level.

340. Was it well constructed?—I believe so. They seemed sufficiently strong for the purpose.

341. Have you made an inspection at that door since the explosion?—Anything done since the explosion has been more or less hurried. I have not given special attention to the doors since the explosion.

342. You could not say whether the door was blown about much?—No, not from memory.

343. I suppose there were some things you did look at, but which you did not take special note of?—That is so.

344. You were-asked about the difference between white-damp and black-damp. I suppose you could not tell the difference?—Yes, I can tell the difference in this way: if black-damp were present in any quantity it would put out the light. Carbonic oxide or white-damp would not put out the light. It would be more likely to be found in the roof.

345. Did you test for it?—There is no test you can make for carbonic oxide.

346. Can you say whether there was carbonic oxide or carbonic-acid gas there?—I have said already the lamps burned freely.

347. That showed that there was no carbonic-acid gas?—Not exactly.

348. It may have been something else?—After-damp is largely composed of nitrogen and a little carbonic acid.

349. The after-damp would remain as the result of the explosion?—Yes.

350. Therefore, white-damp and after-damp in most of their essentials are the same, so far as the light test is concerned?—No.

351. Has white-damp a more injurious effect than after-damp?—Very much more.

352. *Sir J. Hector.*] You said you found no trace of a fault, but you afterwards said that in one of the advanced workings the coal got very thin and stony?—I said stony, and that the other place was more advanced and did not meet with stone.

353. It was in the very lowest bord you got stone?—Yes.

354. You do not consider that that was any indication of approaching a fault?—Oh, no.

355. *Mr. Park.*] There is provision in the Coal-mines Act for the men making complaints to the Inspector. Did you get any complaints from any of the miners in that mine?—It is a customary thing to receive complaints from miners. I got some in Westport, but the only one I can recollect receiving from men working in the Brunner mine was a complaint as to Mr. Bishop employing favourites, a matter in which I could not interfere at all. I have also had complaints

from miners in the Brunner Mine as to firedamp, but not in the Brunner Mine. They referred to having met with firedamp in the Mokihinui Mine; and when I got this information I waited on the manager, and, ascertaining it was so, I requested him to take action against it.

356. *The Chairman.*] You received this information about the Mokihinui Mine?—Yes.

357. We are not dealing with that mine?—But it shows that we have received information about firedamp, not in the Brunner Mine, but in a different mine.

358. *Mr. Park.*] Do you mean to say that the men working in the Brunner Mine did not report the firedamp or make any complaint to you about the mine?—No. The man reported firedamp having been met with in the Mokihinui Mine as it was being opened. He had been there, and mentioned the matter to me.

359. Do you say positively that there were no complaints from any miners in the Brunner Mine about gas?—I say so positively. I received no complaints.

360. Was there sufficient opportunity during your inspection for the men to complain to you if they had anything to complain about?—I would not say that at all, because miners might be afraid to complain to me when their officers were there.

361. As far as you were concerned you were "get-at-able"?—I went round the mine, and there was an officer with me. If they had wanted to complain they could have found me at my hotel, or have sent a letter to me. I have always got all such information by letter.

362. You are compelled by Act not to disclose the name of the person who makes the complaint?—Yes.

363. *Mr. Beare.*] Do you know of the explosions which happened in the Blackwell and Albion Mines?—I have had no personal experiences of those places.

364. Have you read of those cases?—I cannot say I have read of the Blackwell case; I have read of the Albion Mine, but I cannot speak definitely about it.

365. *Mr. Park.*] In connection with fireman Morris, had he found gas in the mine, what would Roberts have been doing—the other fireman?—Roberts would have been there to assist him; he was found up in the pillar-workings.

366. And his not being found near Morris, would you take it that no gas had been found by Morris?—That is the inference.

367. *Mr. Proud.*] Have you sufficient authority to cause alteration to be made for the safe working of coal-mines in cases of danger not expressly provided against by the Coal-mines Regulation Act?—Yes.

ALFRED BENJAMIN LINDOP examined.

368. *Mr. Park.*] What are you, Mr. Lindop?—Mining manager of the Westport Coal Company.

369. Have you seen the Brunner Mine lately?—I was there shortly after the late explosion; at seven o'clock on the following morning—27th March.

370. What did you find going on?—Mr. Bishop was at home. He was not well, so I went over to see him, and he came back to the office with me. I saw Mr. Cochrane, and immediately went into the mine. The men were engaged in rescuing work—in the workings on the sump-side.

371. Did you know the condition of the inlet into the mine?—Yes.

372. Will you tell us what it was like?—Do you wish me to say what I was doing that morning?

373. What you or the other men were doing?—We were putting up temporary brattice, in order to get the fresh air in, so as to get the men out; and as we got them out—our duty being simply to find them—we turned them over to the ambulance men, who took them to the surface. Our efforts were then confined pretty well to the "dip," or bottom-level, because there the water was rising, and we wanted to get all the bodies out before it rose too high. We finished on the sump-side towards 12 o'clock at night. In the meantime, I had been in and out of the mine, and at 12 o'clock I left the rescue-party starting on the west side. When I returned next morning, the air had been so good on the west side that the rescuing-party were waiting for stretchers to take the bodies out, as they had been found very quickly. We continued throughout the day, and got up No. 6 incline and to the far end of the level, where we expected to find the only missing man—Kemp.

374. Did you see if there had been an explosion, and did you make an examination as to what was the cause of it?—Of course at that particular time I was sure that the explosion had taken place on the west side, after seeing how the explosion had exerted its force there; but before that time I was not able to take any particular notice.

375. Did you make any inspection of the mine afterwards?—I did, with Cochrane, Brown, Scott, Bishop, and four men picked by the workmen. Mr. Gordon was with us.

376. Please give us the result of your inspection, and what you found?—First of all we started round the bottom level on the sump-side, or as near the bottom level as we could get. Mr. Gordon was with us, and he wanted to take the whole of the bords, so that he might get away on Friday. We got rather ahead in the inspection of the lower bords, and Mr. Gordon then left us, after which we commenced to make a more systematic survey. We started in the third bord or place, from the main dip, went along the second bord, came back by the slit into the next bord, and along the fourth bord. In the fourth bord we found signs of something unusual: the ground was very crisp under our feet, and the roof had the appearance Mr. Cochrane described—namely, of droppers of coal-like icicles, hanging down two inches thick, like blisters, from the coal. We examined this place very carefully, and Brown said, "I believe this here is a blown-out shot." A stick was put down it, and we found this blown-out shot to extend a depth of 2ft. 1in. [Mr. Bishop here produced a plan of the blown-out shot bord, which was accepted as evidence.] The shot had been placed at such an angle that it had struck the floor about 30ft. from the hole. You could see

where the dust and small coal had been driven into the end of a lying-down prop. On both sides you could see that the force had clearly gone pretty well in all directions. The force seemed to have gone outward both ways, but the main force had developed itself upwards in No. 2 incline. [Witness indicated position of blown-out shot hole on plan produced by Mr. Bishop.]

377. Was that the first intimation you had of the likelihood of a blown-out shot in the mine?—At that time we were searching for information as to what was really the cause, and we wished to go over all these places systematically.

378. Did you go on with your survey afterwards?—Yes.

379. Did you find anything else that would lead you to suppose that the explosion was due to other causes?—No; I looked at the thing afterwards and did not see anything else that could by any chance have caused it.

380. Is it at all usual to put a shot into the solid?—No.

381. *Sir J. Hector.*] Is this a correct drawing of the shot [Mr. Bishop's plan, Exhibit 8, referred to]?—Yes; it is signed by Mr. Bishop, and he is a qualified man.

382. *Mr. Park.*] You recognise the general features from the plan?—I do.

382A. And it correctly represents the place?—Yes.

383. You say it was a hole put into the solid?—Yes; it was a blown-out shot.

384. And would that account for the shot being blown out?—Yes; it had no chance, and the shot followed the line of least resistence. The shot was not holed or undercut properly.

385. Did you find out what the "tamping" had been?—No; there was some fuse picked up—"spent" fuse.

386. Did the fuse seem to have been recently fired?—Yes; it was "run" fuse.

387. What was the length of it?—Some pieces were 5in., 6in., and 4in. long.

388. Having made an inspection of the mine, what do you consider was the cause of the explosion?—I consider it was a blown-out shot firing the coal-dust.

389. In your inspection of the mine, did you find that it had been worked fairly well according to the rules?—I was not down the mine previous to the explosion, but as far as I could judge, it was mined in the usual manner.

390. Did you go up the return-air outlet?—Yes, I went up the return.

391. How did you find that?—I thought it was in very fair order, considering the length of the airway.

392. Did you find any accumulation of gas?—No.

393. Did you see any quantity likely to be dangerous?—I do not say dangerous. I found gas in two places.

394. Whereabouts?—At the bottom of Worthley's bord, during the rescuing work, and when the ventilation was not restored. Where a fall had taken place I could just get a trace of it in my lamp.

396. If you had expected any gas, should you have found it in any quantity at the time you made your inspection of the mine?—I think so. I think I would have found it giving off if there had been any gas, as the ventilation was slack. I am surprised we did not find more. I also found gas on the tension-stand, inside the cutting.

397. Did you find any to indicate carelessness in the management of the mine?—Nothing at all, as far as I could see.

398. And the return-airway was sufficient for the number of men working?—Yes; I walked through it with two lamps in my hands, one in each hand. I suppose the lowest height would be about 4ft., and the width of the bottom from 2ft. to 4ft.

399. Where there many places where it was as narrow as 2ft.?—Just alongside the fault it seems to me to be narrow; but you would not have been been able to carry a naked light through the return, the velocity of the air was so great.

400. In what direction would you find the greatest force of the explosion?—In Nos. 2 and 3 inclines. In No. 2 incline, the force had been so strong that it had turned a loaded tub right round. There was no doubt of that, because the chain was on the other end of the truck.

401. How far was that from the blown-out shot?—It would be from 5 to 6 chains, and from that point the evidences as to force were more or less apparent all the way up the incline. The miner, Scott, who was supposed to be at work on the flat-sheet, in all probability was jigging the coal. He was blown just inside the stenton, nearly 3 chains, where he was supposed to be at work. His leg was blown off, showing that he must have gone some distance, and it was afterwards found a chain from the body, on this side [indicated]. The body of another man, named McMinn, was found blown a considerable distance away—upwards of 3 chains.

402. Was that on account of the force of the explosion?—Yes; of course there was something to stop him. McMinn had been thrown a distance of 3 chains, and the other man had hit the coal on the other side of the stenton.

403. Besides those indications, did you find anything else to indicate the force of the explosions?—In No. 3 incline we found the same thing. The tubs were blown away, and the props were slanting up the incline.

404. That would be in a different direction?—Yes; the main force was developed in No. 2 incline. It then went up No. 3, and then up to the top of the main incline. At the top of the incline we saw more coal on the roadway. I might explain that there was more work done here in lowering the loaded coal down than anywhere else. There was consequently a good deal of tramping done about this spot. In the bords we did not find so much force developed as there was in the No. 2 incline, because in some bords the tubs were standing on the rails and were not blown over.

405. You say that in this portion of the mine you found greater signs of the force of the explosion?—Yes, on the main incline. On this side there were three or four tubs jammed together by the force of the explosion; but on the main level on the west side the tub was standing

3 or 4 chains back, and no force was apparent there, and even the canvas brattice was undisturbed.

406. Did you find any deposit of dust?—Yes. I had a very good example indeed in the afternoon of how the dust was lying there. Mr. Scott and I restored the ventilation by taking it down the full width of the dip instead of through the narrow passage shown here [indicated]. We decided that we would put the brattice up in this spot [indicated], so that we could keep the full width of the drive for the air passage. The air had never been driven that way up to that time, so that I had a very good opportunity of observing how the dust lay. It had never been disturbed, and there was a deposit of coal and slack and dust—one inch coal, then one inch slack, and one inch of dust.

407. *Sir J. Hector.*] Was the bottom of the three layers the finest?—No; it was the coarsest. I started at the top of the three layers and went down.

408. *Mr. Park.*] Was that charred dust?—It was charred.

409. The nearer it extended to the top you found it more charred?—Yes.

410. And the farther away there was less charring?—Yes.

411. Did the indications of the explosion get less as it travelled away from that particular point?—Yes. I think it was the moist ground that stopped the explosion from extending up the incline.

412. Was there moist ground up the incline?—It was dry when we went down, but on returning we noticed that water had been running down.

413. Where was that running from?—I suppose it came from the upper workings. I did not see it on the first occasion, because it was kept in its proper course in the regular channel.

414. Did you see this piece of charred paper which Mr. Cochrane produced this morning?—I saw it produced in Court.

415. Did you see anything like that in the mine?—In lots of places the coats were burnt.

416. Did you find any men who were burnt?—On the east side there were a few cases. The boy, Hill, had not a vestige of clothing on, while to my idea he did not seem burnt at all. He was not even crinkled. Whether he had his first skin taken off, I do not know; but the boy was clean. He was reddish coloured and had no clothes on. I do not know whether they were burnt or had been blown off him.

417. But was not that where the explosion had spent itself?—It was expending itself in that direction, although it had sufficient energy to have blown down a brick-stopping at this place.

418. Were not the men in the sump-level (No. 1) very much blackened?—Yes, Scott and McMinn were very much burnt.

419. Were their clothes burnt?—They were so black that I could not observe closely, and I did not examine them for that purpose.

420. Did you notice whether they were far from where they were supposed to be working?—These men were blown 2 or 3 chains from their working-places.

421. And had not they been able to run at all?—Those I saw had been simply knocked down.

422. There was a man found near the mouth of the tunnel. Did you see him picked up?—No; I was not there when he was found.

423. Was he simply killed by the foul air?—I think all of them were so on that side.

424. From what you have told us, do you think there was any other reason than a blown-out shot to cause this explosion?—No. I do not see where there could be any accumulation of gas.

425. And the fireman having gone round in the morning would be an indication that no gas was present?—He would have to go round in the morning the first thing to try for gas, and to report whether it was safe or not for the men to go to work. If he found the place not safe, I suppose he would make it safe before admitting the men, by removing the bad air preventing the work going on.

426. You know that a fireman has to go through the mine in the morning and make a report before the men go to work?—Yes; all the firemen were killed.

427. Is there any ground for the assumption that there was an outburst of gas?—Not to my knowledge. I do not see where it could come from; and I think had there been, we would have seen something of it when we were exploring the bords after the explosion.

428. Was there anything to indicate that the explosion was caused by coal-dust?—Everything points to it. For instance, if it had not been a dust-explosion the moisture dropping from the roof would not have made any difference to it. We have indications of this in No. 4 bord, where the whole of the direct force has been expended, while more distant—that is, in the lower west level—you can see where the brattice has not even been knocked down.

429. Did you find the force indicated equally in all directions?—Theoretically in a gas-explosion the force is supposed to be in all directions. I have seen half a dozen men in a coal-mine after an explosion very little disfigured; but then the explosion was confined to one place, not extended to several places, and it was the carbonic acid after-damp that killed them in that case, not the firedamp. There was some difficulty in getting to them then, on account of the carbonic-acid gas; but in the Brunner case we had carbonic oxide to contend with.

430. You do not think that these men were killed by the carbonic acid?—I do not think so. We did not find the appearances of it, because carbonic acid puts your lights out.

431. Did you test for it?—Repeatedly. We were testing the whole time, and while we were doing so our lamps were burning brightly.

432. *Mr. Beare.*] As a mine-manager yourself, you can say that this mine was well managed?—I am not a mine-manager at the present time. I am the mining-manager for the Westport Colliery Company.

433. But you have been a mine-manager?—Yes.

434. Can you tell the Commission if you noticed anything unusual in the management of the mine?—Not from what came under my knowledge.

435. I think you have told us that you found everything in its place and under proper regulations?—There is one thing I must qualify in regard to my previous answer—that is, in respect to the safefy-lamps found in Brislane's bord, when they were using naked lights in the next. Mr. Cochrane explained it by saying that Mr. Bishop ordered the safety-lamps in Brislane's bord as a further precaution.

436. Then I suppose the safety-lamps were only used as a further precaution?—So I understood Mr. Cochrane. That is the only thing unusual I saw about the mine.

437. I think you have already stated that the return-airway was perfectly sufficient?—Having been through the airway I can say it was quite sufficient. Of course, it was simply a matter of engine-power to get a further quantity of air through.

438. Coming to the scene of the explosion, would it have been possible to have made the mine any safer?—I do not quite understand you.

439. Taking the position of the men when they were found, we find that some had travelled a good distance: would it have been possible, supposing there had been a gas-explosion, for those men to have had the time to travel to where they were found?—I do not think they would have had any time to travel the distance some of them did. Indeed, I think they must have had some warning of the advancing disaster.

440. You have heard Mr. Cochrane's evidence. Do you corroborate it?—Yes, so far as I have given evidence myself.

441. What should you say was the cause of that blown-out shot?—I should say it was a blown-out shot wrongly put into the solid, and which, on exploding, took the line of least resistance, hitting itself on the floor of the bord, and stirring up and igniting the dust. This bord would be a little dusty, as it had probably been standing twelve months.

442. Would you say, from the appearances, that there had been no undercutting, and that the shot had not been properly prepared? Looking at the position of that hole, would you say that it had been drilled and put in under proper management?—Certainly not; no good miner would put in a shot like that.

442A. With regard to the return-airway, you say that in only one place was there any difficulty in getting through?—Yes.

443. And in that place it was quite sufficient for a man to pass through with a lamp in each hand?—Yes; I had two lamps with me—both my hands were occupied.

444. And you can say, after examining the mine, that it was not a fiery mine?—I should say not.

445. Would you say that it was a dry or dusty mine?—No.

446. You think, from its appearance, that it had been reasonably well managed so far as the coal-dust was concerned?—Oh, yes. Of course, a few days after the explosion it was very dry and dusty. You could not look inside the mine without meeting a very fine dust. It percolated through your coat and drawers to the bare skin.

447. Was that fine dust raised or caused by the explosion?—It has been since the explosion. Before the explosion I could not speak to, as I was not in the mine.

448. You saw no dangerous accumulation of coal-dust, or nothing more than might usually be expected in mines of this description?—No. I am speaking of the bords on the west level.

449. Have you read of the Blackwell and Albion explosions?—No. I have read Hall's report and his experiments.

450. There was a question asked of Mr. Cochrane by Mr. Joyce with regard to the air-shaft and another return-airway. What is your opinion? Would you say if there had been more air that it would have been the means of saving life?—I do not see how it could. You see you have got the foul air coming in this direction [indicated], and even if you had two shafts I do not see how you could have prevented the men being killed. The foul air had to go to the mouth of the mine, and, consequently, had to return over the men.

451. Then your opinion as an expert is, that the mere fact of putting down another shaft or return-airway would not have been the means of preventing the loss of life?—I do not see how it could unless you had a separate intake and outlet for each individual section of the mine. At present, the foul air is drawn up to the mouth of the mine through the return by one fan.

452. *Mr. Joyce.*] What is the distance you generally put in the drill-holes for your shots?—About 4ft.

453. So that really there was 2ft., less 1in., of the hole blown away?—I am not going to say that, but that would be the inference.

454. I think it is a pretty straight face?—It is pretty well straight.

455. Do you think there is sufficient coal lying below the shot-hole to account for the blown-out shot?—I would not like to say that, because there are pieces of coal in other parts of the bord that may have come from the shot. The shot did not strike straight out when it was blown out, as you can see where there has been a fracture.

456. Would you be certain that the hole was not blown out at the time it was made?—I am certain it was not.

457. What are your reasons for saying that?—From everything pointing to the opposite.

458. The only points are the facts that the roof has been charred. That seems to be the commencement of the explosion?—That is everything, I think.

459. Could you not have had an explosion in Worthley's bord?—I do not think so; I paid a good deal of attention to that bord.

460. Say, for instance, you had an accumulation of gas there, would it not have been the commencing point of the explosion?—Yes; but it would have developed itself equally in all directions from Worthley's bord, if it had taken place there.

461. The fact of these two currents shows that the gas must have been there?—No, not necessarily. The flame seems to have been there only because the props were scorched. They were not charred, but only scorched.

462. Your theory is that there has been considerable fire there and considerable flame?—No; I do not say that. I believe that there has been a huge flame coming out of the blown-out shot, and that has caused a scattering of the particles of dust.

463. There were no tools found near the place where the explosion was?—No.

464. How do you account for that?—I think the man who had put in a shot like that would not keep his tools there.

465. Where would he take them to?—To his working-place.

466. But any ordinary workman would have a long distance to go back to his ordinary working-place?—I do not think so. There are two or three who would have only a reasonable distance to go.

467. Five or six chains?—Two of them would have 5 or 6 chains; another about 4 chains.

468. It would not take any considerable time for a man to go that distance with his tools, and by that time the shot would be blown out?—No; he would put his shot in when he liked. The question of distance would be arranged for by the length of the fuse.

469. You cannot tell us what the length of the fuse would be?—I would not like to hazard an opinion.

470. I suppose you have known for some considerable time past that coal-dust is a very important factor to be reckoned with in coal-mines?—Yes.

471. What are the general precautions taken for preventing coal-dust exploding?—If it is "a dry and dusty mine," by the English Act, the dust has to be removed or watered within a certain distance. If it is a fiery mine the use of gunpowder is prohibited. The Brunner Mine is a damp mine.

472. Theoretically, you cannot have an explosion unless you have a dry and dusty mine; all the authorities seem to be agreed on that?—It must be dry and dusty, and there must be exceptionally favourable circumstances for a blown-out shot. The position of the shot must also be considered.

473. So that the Brunner Mine must have been dry and dusty before the shot was blown out?—I will not say that. What I say is that the cause of the explosion was a blown-out shot when there were other conditions favourable to its causing an explosion.

474. Can you show me any authority which says that a coal-dust explosion will occur in a mine which is not dry and dusty?—Yes, I can. That is the conclusion the jury came to after hearing the evidence in the case of the Apdale colliery explosion.

475. In a mine which was not dry and dusty?—Yes; the jury said the explosion was caused by a blown-out shot, but the mine was not dry and dusty within the meaning of the Coal-mines Act.

476. Was that an explosion which occurred solely from coal-dust?—It was after using galenite, one of the high explosives. Since this explosion at Brunner, we ourselves at Westport have issued very stringent regulations with regard to "holing" and undercutting, and we have taken the shot-firing into our own hands entirely.

477. I presume there will always be gas in more or less quantity in the Brunner Mine?—I think there is always gas in the bituminous coals of the West Coast mines.

478. And you know a very small proportion of gas—say, 2 per cent.—is liable to cause a heavy explosion?—Yes, and even less.

479. There is no lamp used in the coal-mines in New Zealand for testing under 2 to 3 per cent.?—That is the best test so far.

480. What amount of gas would be wanted to put the lamp out?—From 15 to 20 per cent. will do it, but ten is the most explosive limit.

481. And a man would be in the habit of testing with a safety-lamp, and, so long as the lamp only flickered and kept alight, that would be a sufficient test?—If a workman gets any gas in his lamp at all, it is his duty to withdraw, and report it at once.

482. With reference to firing shots, does the fireman go round and see that the shot is properly fixed before it is fired?—That depends upon whether the mine-manager gives permission for each man to fire his own shot, or whether he takes that duty into his own hands.

483. Do you think it is a safe precaution to allow each man to fire his own shot?—No. Since this blown-out shot at Brunner we have taken steps to require our own deputies to fire the shots. We have put on additional men to assist them in their duties.

484. Have you read of the number of explosions in 1887–88–89 from blown-out shots at Home?—Yes; we have had such instances in the mines at Home.

485. Of explosions caused solely by blown-out shots?—No, but a good many were caused by blown-out shots.

486. I think the English Coal-mines Act of 1887 was brought in immediately after a coal-mine explosion, caused by shots and coal-dust?—I think that was in 1886.

487. At any rate, it was necessary that an Act should be passed to cause the watering of all ways and roads for a distance of 20 yards round a shot?—Only in a dry and dusty mine—not in all coal-mines.

488. You have been through the return-airway?—Yes.

489. If the return-airway had been larger, would it have taken out the noxious gases which collected after the explosion?—As I said before, it is just a question of engine-power. There is plenty of air travelling through the passage, and if it were wider the only difference it would make would be that the engine would have less work to do.

490. As a matter of fact, the foul air was taken along the air-current?—Yes, all the way.

491. And therefore the coal-dust explosion must have expended itself at the mouth?—I would not say that, because we do not find signs of charring in the level leading to the mouth of the mine.

492. Well, the fact remains that you have all the noxious vapours there?—The foul air must have been in that tunnel, because Mr. Bishop was knocked down a very few chains from the mouth.

493. The foul air could only have travelled from the place where the explosion occurred, and outside that you would not have any foul air?—Not until such time as the explosion reached further on. When the explosion took place it went west and east, and swept up all the small particles of coal; the flame fed on that, and went on until it met something to arrest its force.

494. But do you not think the foul air would take a different line to the explosion, which would go against the air-current?—Yes.

495. *Sir J. Hector.*] Mr Joyce wants to know if the smoke of the explosion came out of the mine as from a chimney?—In the first place it did.

496. *Mr. Joyce.*] How do you account for its appearing there when there was no sign of the explosion in any part of the main drive?—Because the explosion was expending itself, and had been arrested in its course by the moist state of the main tunnel.

497. Did the force of the explosion in the first case push the foul air to the mouth of the tunnel?—The expansion of the air pushed it to the top.

498. Do you think that was the case?—I think so, because I understand that Mr. Bishop was only in a few chains, and McDonald as well; therefore, this foul air was returning against the air-current.

499. In a case like that, is there no possible means of saving the lives of the men in the mine?—I understand from Mr. Cochrane that they have stopped blasting, and are using safety-lamps, so that they have taken precautions.

500. Those are precautions taken since the accident when they worked with naked lights. With naked lights is there no way by which mens' lives could be saved?—Do you mean by another outlet?

501. Yes, by another outlet or by any other means. It really amounts to this at present, that when you have naked lights in a mine, if an explosion occurs, all the men in the mine must be killed?—Not exactly. You have to take all known precautions.

502. All precautions certainly, but in the event of an explosion everybody is likely to be killed. Is there no way by which you can save them without their having to return by the air-return or shaft?—I do not think that in this case any return-airway would have saved them. If there had been another shaft, the explosion would have extended to both districts, and would not have been confined to one side only, as the stoppings were blown down, and the cabin-wall was also blown out.

503. Are not shots liable to be blown out at any time?—Yes, but there is something radically wrong if you have a blown-out shot.

504. Even if properly rammed?—Of course the shot must take the line of least resistance. The hole must be 4ft. deep, and the coal must be undercut and holed, and the shot must not be put into the solid.

505. And a great deal depends upon undercutting if you do not want to have a blown-out shot?—Yes, a great deal.

506. Do you not think it is necessary to take precautions in the way of damping the dust in case you have a blown-out shot?—If it were a dry and dusty mine you would take precautions against it, but the Brunner has never been considered dry and dusty. There is always a certain amount of moisture on the roads.

507. Then we have another fact. You say where the ground was moist the force of the explosion was hardly seen at all?—That is so, in the moist level here [indicated]. I think it died away, because it had not been affected by the blast.

508. So that if the other parts of the mine had been moist, the presumption is that there would have been no explosion?—If there had been no dry coal-dust there would have been no explosion.

509. Do you use powder in your mine?—Yes.

510. You do not use any high explosive?—No; the reason being that we have had two or three accidents through caps being sent away in the coal to private houses. I think Sir James Hector had an experience of that.

Sir J. Hector: I heard of one case where an explosion occurred in a locomotive.

512. *Mr. Joyce.*] (To Witness): You have seen the stoppings in the Brunner Mine. Do you consider them sufficiently good?—Yes, they are good stoppings. They are crib-stoppings, and there is a permanent stopping of timber. There are also the brattice-stoppings. The stoppings should be divided into permament, and temporary, and brattice.

513. What did you think of the permanent stoppings?—They were very good, principally crib-logging.

514. Backed with coal-dust or earth?—With stone dirt, I understand.

515. The crib-logging is in, because the mine cracks, and the roof falls in?—Yes, and the floor comes up at the same time.

516. Have you seen the doors in the mine?—I do not think so.

517. Have you seen the barometer?—Yes, it is in the outer office.

518. Do you think that a good place, or whether a better place could be found for this instrument?—It is in a good place where it is now. The office is not locked up, and it can be seen by anybody.

519. Is it open at all times?—Yes; everybody seemed to go in there. That is where the clerk sits.

520. *Mr. Beare.*] If you were informed that the mine had been worked for one and a half hours before the explosion, would that be an indication to you that the examination had been made, and that everything was found correct—that there was no gas in the mine?—I think so.

521. Had there been gas there, would it not have been an indication that the explosion would have taken place before?—If there had been any accumulation of gas.

522. *Sir J. Hector.*] When you went into the mine with the lamps on the first occasion, how many hours was it after the explosion?—About twenty-two hours afterwards.

523. Did you have any occasion to lower your lamps to the floor?—I tried for gas in all directions. Of course, I had some men under my charge, and I wished to find out everything.

524. Did you find any indication of the presence of white-damp anywhere?—I found carbonic oxide.

525. Any carbonic acid?—Our lamps burned brightly, although the men were overpowered. This showed that carbonic oxide was present.

526. Was there any sign of black after-damp?—I only noticed the carbonic oxide. The only time our lamps went out was when they were knocked out through not being handled properly. Our lamps would not have burned in after-damp.

527. And they will not burn in black-damp?—No.

528. But they did burn in this gas?—Yes.

529. And still some of the rescuing party were suffering?—The men were knocked down.

530. There was something present which made them insensible without at the same time affecting the burning lamps?—Yes.

531. What did you suspect it was?—I think carbonic oxide.

532. What proportion of carbonic oxide would produce insensibility?—It is a very small amount; I think about 2 per cent. I can read it to you from Hughes: "Carbonic oxide is variously known as carbon monoxide and white-damp. Its chemical symbol is CO, and specific gravity 0·97. Luckily its presence is much less frequent in mines than black-damp, as it is far more poisonous than that gas. As little as 1 per cent. produces giddiness and faintness, while over 2 per cent. may cause death. Indeed, ½ per cent. breathed for any length of time is fatal. Carbonic oxide is known by its sweet and delicate odour and deadly results. Candles burn well in this gas, if anything, a little brighter, although their flame is not elongated until 12½ per cent. is present. It is produced by imperfect combustion, and especially by spontaneous ignition." Atkinson also says: "This gas is perhaps never found in coal-mines except as the result of the explosion of gunpower, or the imperfect combustion of coal or wood. . . . Such a proportion of this gas may be mixed with air as to form a mixture in which candles or lamps would burn, while life would become extinct; and it is probable that many deaths in mines have resulted from the gas in situations where the lights have continued to burn." I was going to remark that with regard to three explosions in the north of England, that they had the same effects there. Their lamps continued to burn, while the men were overpowered, and this was traced to coal-dust explosions.

533. From what you have seen of this mine, do you think there was sufficient provision made for ventilation?—Yes; it had more than the required quantity of air.

534. You formed an opinion from using an anemometer?—I could tell it by feeling, without testing with that instrument.

535. *Mr. Proud.*] Could you not have worked this mine safely by using a flameless explosive and a self-contained electric lamp of moderate weight, and burning about ten hours?—The electric lamp does not give you any sign of the presence of gas. That is its great drawback.

536. You could test for firedamp in the ordinary way?—You mean, you would have an additional lamp?

537. Yes?—The electric lamp has not been sufficiently developed to come into practical use yet.

538. *Mr. Skellon.*] You think it was eighteen months since this shot-hole was drilled in the solid?—I gather it was that length of time from the accumulation of rubbish in the board.

539. Was this tramway there then [indicated on the map]?—Yes; but I do not think you could get at the top coal, as the tram seemed to be right against the face.

539A. Do you not think it is a rather curious way of laying a tramway—in the way you have mentioned?—It is very likely they were going to open the face.

540. On the side of the pillar?—I do not know when the tram was laid, but of course if you want to get at the top coal you must be close up to the face.

541. From the way it is shown here, is it not more likely that the pillar has been stripped all along?—I do not know. The bord is driven in rather an irregular fashion.

542. You think this tramway has been in eighteen months?—I do not know anything about the rails. I am speaking of the bord.

543. You would hardly leave a tramway in a worked-out bord for eighteen months?—No; I should imagine it has been brought in ready for starting new work. I do not think a tub of coal has gone out of that tramway. It has not been a regular working-place. To get at the top coal, the man working it would keep his rails as much as possible on the high side.

544. *The Chairman.*] Is there any evidence of a shot having been fired from that shot-hole?—Everything points to it. There is carbonaceous matter like curls or icicles hanging from the roof.

545. Does it seem to have been a recently-fired shot?—Everything points to such having taken place.

546. *Sir J. Hector.*] Within a short time?—Within a recent period, otherwise the signs would be obliterated. I have got an exhibit of coal from Mr. Brown, taken from this point.

547. *Mr. Proud.*] You could not get an explosion of coal-dust by a naked light or an ordinary flame, could you?—No; it would require a blown-out shot.

The Commission adjourned at 4 o'clock p.m.

GREYMOUTH, MONDAY, 11TH MAY, 1896.

HENRY W. YOUNG examined.

1. *The Chairman.*] You have prepared some plans of the Brunner Mine?—Yes.

2. Are they prepared from your own survey or from other plans?—By surveying and plotting. The parts shown by the dotted lines are inaccessible at present on account of water. [Exhibit 9, plan of the Brunner Mine produced]. The survey of the dip-workings is shown in full, and the air-course is from actual surveying and plotting. The information as to the old workings is reproduced from the old mine plans merely to show their position with regard to the present workings.

3. *Mr. Park.*] Mr. Bishop showed you where the parties were working?—We got the information as to the names of the men working in the bords from the workmen with us as we went on and noted it in the field-book. The places shown with dotted lines were under water. The water-line is shown by the blue lines. The blue arrows show the air-currents at the time.

4. You have one black arrow here. What does that represent?—That is the over-cast air crossing.

5. *Sir J. Hector.*] Has it been made good?—Not at present.

6. How does the air return?—[Witness indicated on the plan.]

7. *Mr. Park.*] Who pointed out to you the place were the blown-out shot was?—Mr. Cochrane.

8. One of the plans we had showed a tramway. Were there any signs of it when you were there?—Yes; the tram runs past the blown-out shot to a face.

9. When where you first in the mine?—On Easter Monday. [Witness also verified Exhibit No. 7, enlarged scale tracing of the immediate scene of a explosion.]

ALFRED BENJAMIN LINDOP recalled.

10. *Sir J. Hector.*] The Commissioners wish to get a little more information from you before you leave. You are in charge of the blasting in the mine with which you are connected?—Yes; general control.

11. Would you explain your system of blasting?—We have given special written instructions to the mine-manager, and also written instructions to the deputies, with regard to firing shots. Formerly, we allowed the men to fire their own shots; but after this explosion we went into the question thoroughly, and we decided to take it into our own hands, and the deputies now fire the shots.

12. How many deputies are there?—We have ten altogether in the different sections.

13. How many men would be working in the shift under these deputies?—Our rule has been for one deputy to twenty men. We have a very bad roof.

14. Could you describe exactly what has to be done when a shot has to be fired? Who indicates the manner and locality in which the shot has to be driven?—The miner who holes the coal is the judge of that, and he is also the judge of how to put the shot in; and if the deputy has not approved of the shot he will not allow it to be fired.

15. Does the deputy examine the depth of the hole?—Yes; I will put the written instructions in evidence.

16. Then, if there is any particular danger about the shot arising from the manner and place it is put in, the deputy stops it?—He does not allow it to be fired. It has to be properly holed and undercut.

17. Does he remain to see the fuse fired?—Yes, and lays the fuse.

18. And takes care of the safety of the men?—Yes; and they have to use clay-tamping.

19. With reference to the storage and use of explosives in the mine, what system do you follow?—The miners provide their own powder, so that we do not have to find a magazine for the purpose. The Act fully provides for the storage of gunpowder.

20. How much are they allowed to take into the mine?—By Act, not more than 5lb.

21. Where do the men keep the powder?—In tins. They keep their own private store at home, or get it from the shop as they want it.

22. *Mr. Proud.*] Do they not bring in more than one charge?—They take enough for a day's work.

23. Do you allow the men to go into the mine with 4lb. of powder on their back without any storage?—They only go to their working-place.

24. Quite true; but from the Act it would seem that it ought to be stored until required for immediate use?—It is stored in tin canisters.

25. But that is not storing?—I do not see how you could alter it.

26. *Sir J. Hector.*] As a matter of practice, where do they get their powder from, and how much at a time?—They get it from the store in 25lb. barrels.

27. What do they do with the barrel?—They take it to their homes. We have nothing to do with that.

28. I wish to bring out the point as to whether the keg of powder is properly stored?—I do not know that, as the men take it home.

29. How many men are there about the place who are hewers?—160 men.

30. Has each of them a keg of powder?—No, not exactly. The men buy it in small quantities, as some places do not require much powder, and therefore they would not require to buy much.

31. Then, if they bought the powder they would keep it in their living houses?—I am afraid they would, but the stores have magazines.

32. But the miners themselves would not have magazines?—No, I think they would take it home with them.

33. Do you think the present law is sufficient in that respect?—I think the Act is sufficient.

34. *Mr. Proud.*] Do you consider that the severe inclination of the seam at the Brunner Mine introduces danger from firedamp?—No, I do not think it would. If any firedamp was given off it would only rise, without accumulating.

35. There is no probability of the gas rising and igniting the men's open lights?—I do not think the inclination would have anything to do with it. In any case the practice is to take it to the return-airway as quickly as possible.

36. When a reduction in the pressure of the atmosphere takes place, would gas be likely to issue from the goaf in the right-hand side going in by?—It might come off, but, still, just on the return side; it would not go over any naked lights; the ventilation being good, it would get right away to the top end.

37. Is it not desirable, if practicable, to have the intake and outlet of the air at opposite extremities of the working?—No, I do not think that would be desirable. If we had to have a shaft at the extremity of the workings, I think it would close all the mines in New Zealand.

38. Might it not be the means of safety to have another outlet for the workmen in case of an explosion?—Of course another outlet would help a little, but I do not think it would have helped in the case under discussion.

39. Against sudden outbursts of gas, is there any other remedy but the use of safety-lamps?—Yes, plenty of ventilation. Of course, in some districts where they have very fiery mines, they adopt the system of using safety-lamps exclusively.

40. In working coal, would you recommend the abolition of gunpowder and the adoption of high explosives?—No, I would not altogether. I think in fiery mines the abolition of gunpowder might meet the difficulty, but if you make a drastic rule that it should not be used in any mine, I think we should have a good many of them closed. I think the great difficulty we have to guard against is the blown-out shots.

41. Would it be well to drain the goaf by gas drifts?—Yes, if you were leaving the gaol behind, but when the goaf is on the right side I think it would clear itself as soon as it went into the return.

42. If you had the Fleus apparatus, would it have assisted you in the exploration and recovery of the workmen?—Yes, it would have assisted us in getting the brattice up, but no more; it would not have done us any good so far as the saving of life was concerned, as the men were past that from the very commencement.

43. As regards the permanent stoppings, could you suggest some other mode of constructing them so that they would not be destroyed by an explosion?—No; I think the permanent stoppings of the Brunner Mine were as good as they could be put in, considering the floor. They were crib-stoppings, and, as the floor lifted, it really meant that they tightened. I do not think that any stoppings that could be put in would have stopped the force of that explosion.

44. You think it is impracticable?—I do.

45. Would it not be well if air-crossings—whether overcast or undercast—were constructed in the solid strata?—There is no doubt it would be better, but the mine would never stand the expense; it would have to close up on account of the falls in the roof. I think it would shut up one-half of the mines if we had to go and drive air-crossings in the solid.

46. The Commissioners would be glad if you would kindly give them any other information or suggestions for improvements in the working of coal-mines so as to reduce the risk of accidents or limit their disastrous consequences?—That is rather a large question, and I would like to have time to put the answer into writing; there are so many things to be considered, especially with regard to safety-lamps. If we were compelled to go in for safety-lamps at Denniston, the mine could not be worked. We have a bad roof, and we must work it with naked lights. If the safety-lamps were compulsory in all mines our death-rate would run up enormously.

47. You will give that further consideration?—Yes. There is also the question of flameless explosives. In England, a committee which sat on this matter, with a view to reducing the risk in mines, recommended a powder called carbonite, which has stood all the tests of coal-dust and gas; when mixed with dry coal-dust it did not explode.

48. Roburite has given some good results, has it not?—Yes; all these high explosives have given good results, but none have stood the test.

49. *Mr. Skellon.*] Does your deputy charge the shots?—Yes.

50. If a workman has got a shot ready, does he have to go and find the deputy?—The deputy is passing backwards and forwards all the time. They send word to him when they want him to pass the shot, and we try to arrange it so that the men shall not have to wait.

51. Have you any means of preventing the men taking into the mines more than the proper amount of powder that they require?—They are not allowed to take more than they want for the day.

52. Do you examine them to see that they have not more?—The deputies examine them, and you would see a man going in with two tins when he should have only one. But in the bords they really do not want more than one for a day's work, as they would not fire over two shots on an average.

53. Some men do not care about storing powder in their homes, and they might take a large quantity into the mine?—We examine the bords to see if anyone has stored it, but have never come across a case yet.

54. Would it not be better if the company provided a magazine?—There is a powder-store on the hill, and the men prefer to get their own powder. We do not care about keeping it. The men get it from the stores.

55. At the Huntly Mine they do not care about keeping 25lb. kegs in a boarding-house, and that is the reason why the company erected a magazine?—The Act says that a man shall not take in more than is sufficient for one day's purposes. I think it is set down at 5lb.

56. *Mr. Park.*] Would it be practicable to give the miners charge by charge of powder in the mines?—No.

57. Why?—At the present time the miner is paid so much for hewing, and they have to provide their own powder for it, like getting their own tools, and they can buy it as well from the store as

from us. They could not get it any cheaper from us than from the stores. They can get 4lb., 5lb., or 20lb., and I do not think by our taking it into our own hands we could do any good.

58. Would it be any good if the miners were to co-operate and have a magazine amongst themselves?—If they did that they would require to provide a storeman.

59. And that would not be practicable?—I do not think so. There would be trouble in getting the powder out.

60. *The Chairman.*] Could not a miner state at the close of each day what amount of powder would be required for the next day's work, and the Company not allow more than that to go into the mine?—The allowance for a day is a 4lb. tin.

61. But each ganger knows very well what shots would be put in each day?—Not always; on some days he would not put in one shot, and on the next day two or three.

62. *Sir J. Hector.*] Do they break the coal down?—They break down, but they first want to fall with a blast.

63. *Mr. Park.*] How long have you had your present system in vogue at Coalbrookdale? Was it instituted before or after the Brunner disaster?—We took steps, as soon as we saw the blown-out shot, to take the firing into our own hands.

64. You took the step directly after your examination of the Brunner Coal-mine?—Yes.

65. And seeing the blown-out shot was the reason for the present practice?—Yes.

66. *Sir J. Hector.*] What was the practice before?—We used to allow the miners to fire their own shots.

67. *Mr. Proud.*] Have you introduced new rules or instructions about shot-firing?—Yes; Mr. Brown will put them in evidence.

68. *Mr. Park.*] Do the deputies get the timber in?—Yes, and cut it in lengths for the miners. They also lay the rails.

69. Does the goaf clear itself of gas in the Brunner Mine?—It must do; it goes right into the return.

70. And the only occasion for any naked lights was where the miners were working?—At present naked lights are only used when travelling along the return-airway.

71. Therefore, the workings are practically as good as before?—I think so.

72. *Mr. Beare.*] Does the fireman see the shot before it is charged?—He fires it as part of his duty.

73. And the general practice before was that the miners themselves did it?—Yes; they were the judges.

74. With regard to your previous evidence, I think you told the Commission that the mine was not a dry and dusty one. From your knowledge of the Brunner Mine, supposing the law of New Zealand had made it compulsory to water dry or dusty mines, would you, as an expert, have watered the Brunner Mine?—I do not think so.

75. Supposing the New Zealand law had been the same as the English law, which compels the watering of dry and dusty mines, would you, as an expert, have watered the Brunner Mine?—From what I have seen of it I should not have considered it a dry and dusty mine, and therefore it would not have been required to be watered by the English Act.

76. *Mr. Joyce.*] As a matter of fact, you never saw the Brunner Mine before the Brunner disaster?—I did not see the rise-workings.

77. You could not say from your previous knowledge whether it was a dry or dusty mine?—No. From what I have seen on this side of the dip-workings I could not consider it dry or dusty.

78. There is one suggestion you made with regard to deputies. Have not they several other duties to perform besides visiting the men—namely, to make roads and put up brattice?—You mean our deputies at Westport mines?

79. Yes?—Their duties are now to fire the shots, put in timber, look after the safety of the men, put up brattice, and lay roads.

80. Do you think a deputy can lay roads and look after all these other things, as well as look after the safety of the men?—It is only a question of having enough deputies in proportion to the number employed.

81. How many do you employ?—I told you—one for every twenty men. Since we have taken to shot-firing ourselves, we have reduced the number of men to each deputy by putting on two additional men to assist the deputies in their extra duties.

82. Do you not think it would be better to have the deputies spending their whole time in attending to the safety of the workmen?—We have a good mine-manager attending to that. He is in the mine every day.

83. You do not know what the arrangement is at Brunner?—I did not know their arrangements previous to the explosion.

84. In answer to Mr. Proud, you stated it was a question of expense—if these mines were liable to be worked longer, and had more coal in them, you could have given greater facilities to the men by expending a certain amount more of money?—I think that was in regard to the air-crossing.

85. Is that correct?—It might be desirable, I think, in our limited coal-fields. I would not say you should not do it, but you would shut up your fields if you went in for making roads in the solid. Besides, the undercast in the mid-level stood the force of the explosion.

86. As a matter of fact your answer really amounts to this: In order to work some of these coal-mines properly you have to do away with some of the precautions you ought to take?—I would not put it that way. I would say that in the limited coal-fields we have, I do not think that you are warranted in going to the expense. It would not pay, and you could shut up the mine.

87. Do you not think it would be better to close up a mine rather than work one you could not expend the proper amount of money on?—You have to take all reasonable precautions, and when you have done that it seems to me it would not be proper management to lay out an air-crossing in the solid strata, because you would have to go a long way to make a good job of it.

88. Would not that be a most desirable thing to have your air-crossing in the solid?—Yes, if you had coal seams like they are in England. There you can project your workings after you sink your shafts and work accordingly. You can afford to go to every expense.

89. You say that your firemen fire the shots now. Do you know that that has been the case for a long time in a large number of mines in England?—No; I do not know what the custom has been for the last few years in England. It is in fiery mines that the distinction is drawn.

Mr. Joyce produced a copy of the English rules. Rule 1 states that the firemen are to fire the shots.

90. *Sir J. Hector.*] It is not necessarily a deputy, but also a miner of sufficient experience who might be authorised to fire a shot?—Yes.

91. I understand from your evidence that you attributed a good deal of the serious results of that blown-out shot to the fact that it was directed downwards at a certain angle, so that it hit the floor of the drive?—Yes.

92. Would it be expedient in your opinion to make provision for controlling the angle at which the shots should be put in, or is it sufficient to leave that to the judgment of the deputy?—I think that, with proper supervision with regard to holing and cutting, to have a blown-out shot would be very rare indeed.

93. Are the deputies you employ sufficiently aware of the extreme danger there is in the shot striking the floor when one blows out?—Yes, that has been pointed out. We have told them of the risk of coal-dust explosions, and we have taken the steps I have mentioned.

94. I understood you to say that if it had been a horizontal shot striking the coal on the opposite side of the bord, probably there would have been no fatal result?—That is my opinion; it was the angle that caused it.

95. *Mr. Joyce.*] Do you think the shot struck the floor?—Yes.

96. Then the angle was pointing to the floor?—Yes.

97. Some of the miners who examined the shot are not of that opinion; that is why I asked you?—Yes.

98. *Mr. Skellon.*] It is not always necessary to hole the coal?—No. If there is a parting on the floor, that is as good as holing. The men use their discretion.

99. *Mr. Park.*] Did you see the tramway in No. 4 bord?—There was a tram laid down.

100. Was it past that point [indicated on plan]?—Yes.

101. Do you verify this plan of the blown-out shot [Exhibit No. 8 produced]?—Yes.

102. Did that tram appear to be a relaid one?—I would not say that.

103. *Sir J. Hector.*] The tramway must have been right through the middle of the level, and this particular part must have been a relaid one?—Yes.

104. I mean it does not occupy the position of the original tramway used in making that bord?—Of course it would not, because the men would not take coal from that point [indicated.] It has been laid in evidently to strip that pillar [indicated.]

105. *Mr. Park.*] That is your opinion?—Yes.

106. *Mr. Beare.*] How many men could have the power of taking powder into the mine?—Only those working in the bords—two miners in each bord. They would take sufficient for one day's work—a tinfull between them.

107. From your examination of the Brunner Mine, would you say that a miner of experience would have any difficulty in finding the return-airway in case of accident?—No miner of average intelligence would have any difficulty; he would follow the wind.

108. *Mr. Skellon.*] Does the air follow the return straight through?—Yes; the air comes in the intake in the main level. The west level portion goes down this place here [indicated] and runs up the back incline and through an undercast and away to the east [indicated.] I should say that it divides at this point [indicated.] The other portion runs along the bottom level, and comes back up this incline [indicated] runs along the face, and joins at the same place again [indicated.] And then the combined body goes away to the outlet.

109. *Mr. Beare.*] Have you been through the return yourself?—Yes.

110. *Mr. Skellon.*] From the mid-level?—Yes, when I say that a miner of average intelligence could follow it; but if you knew the mine you could take a short cut and get into the return, but only those could do this who are familiar with the place.

111. It was a straight course from the mid-level right through to the extremity of the workings?—Yes, right through to the extreme end. [Witness further explained from the plan the course of the air.]

112. Supposing that there was an explosion, and the lights went out: you say that a miner could find his way out in the dark. What about the turnings?—[Witness explained from the plan the course a man would probably take, the position of the airway, and the course of the air over the dam.]

113. I think there would be trouble in following it in the dark. If there are any turnings in a mine, a man in the dark is not likely to get out, but to be lost. Is not that so?—I would not get lost; I would follow the air.

114. *Sir J. Hector.*] Is there any particular reason for leading this airway [indicated on the plan] through each of the pillars?—Mr. Bishop wanted to ventilate the bottom level, and that is why he ran it down there.

115. *Mr. Skellon.*] Would it not be better as a means of egress for men to get out of the mine if the airway was straight, especially if it happened that the men were in the dark?—I suppose so.

116. I suppose you do not know why it has not been made straight?—No.

117. *Mr. Beare.*] In your opinion, as an expert, it would not have made a material difference in the men getting out?—It would not make any difference, except that it might shorten the distance. That is the only thing I can see.

JOSEPH SCOTT examined.

118. *Mr. Park.*] What are you, Mr. Scott?—Mine-manager for the Blackball Coal Company.

119. Do you recollect the time of the Brunner accident?—Yes, it occurred on the 26th of March.

120. Did you make an examination of the mine afterwards?—Yes, four or five days afterwards. It took us three or four days to make the examination.

121. What part of the mine did you particularly examine?—The sump side.

122. That is, where most of the men had been working?—No, the majority of the men had been working on the opposite side.

123. Will you tell us why you particularly examined the sump side?—From what I saw during the time of the rescue work, I saw that this was the scene of the explosion.

124. And can you locate the place where you think the greatest force of the explosion was?—The greatest force occurred in No. 2 incline, and in No. 3, and No. 1; but the most damage was done in No. 2.

125. What were the evidences which made you come to that conclusion?—By the timber being knocked down, and blown up the hill. This led me to believe that the actual explosion had come up the incline.

126. Did you notice any particular place where the explosion, in your opinion, had started?—There is strong presumptive evidence that it occurred in No. 4 bord.

127. Is there any particular mark there?—Yes, there is evidence of a blown-out shot.

128. How long prior to your examination had that blown-out shot taken place?—I think it must be the cause of the explosion.

129. What were the marks you refer to?—The excessive charring which took place at this particular spot, and the coking of the coal-dust.

130. Did you see anything to lead you to believe that any one had been working there?—There were no tools in this bord; but that could be accounted for by the man firing that shot having taken them away after he got his shot ready.

131. Did you see any signs of a tramway?—Yes, there is one leading to this particular spot, within a few feet.

132. Is it laid as if ready for work?—Yes.

133. Where it would only be ready to work that bord?—Yes. I do not think a tub had ever been on that tramline, because there are one or two pieces of coal projecting out, which would have prevented a tub going in. It is evident that a tub had not been tried in it.

134. Would you suppose that it was ready for the purpose of working?—No; it was probably laid after that bord had been driven.

135. For the purpose of stripping?—Yes; there were two or three big blocks of coal that had fallen down from the shot, lying at the end of this road.

136. Did you notice the angle of the shot?—It was inclined towards the ground.

137. Then the inclination was to about 30ft.—the incline would reach the ground about 30ft. from the shot-hole?—That is about correct.

138. Did you see any marks of powder on the floor or sides of the bord?—Not of powder. When the shot was fired it would strike the ground at this particular point [indicated], that would raise a heavy cloud of dust which the flame following would ignite. Then, of course, it travelled down No. 3 or No. 2, and split at No. 3, and started up each of these inclines. The greatest force is shown in the incline; because you can understand that in jigging the coal down dust would be bound to be stirred up, and lodged in the timber. I have noticed in going through the mine that the greatest force is always shown on this incline. There is always a certain quantity of coal-dust there.

139. Have you been in mines where accidents have occurred?—Never a large explosion; only two or three small ones.

140. At any rate, you know the manner of jigging coal down an incline, which causes coal-dust to be blown off?—It must be blown off.

141. That is a fairly steep incline?—Yes; 1 in 8.

142. And the trucks would travel down fairly well?—Yes.

143. Therefore you think the greatest quantity of coal-dust would be in this incline?—Yes.

144. Did the trucks appear to have been in use?—Yes.

145. Did you see the tubs?—The tubs were there.

146. Are there not in that incline some tubs with the chains attached to them, showing that they were at work when the explosion took place?—Some tubs had been running there when the explosion took place.

147. And the force was great enough to turn them end for end?—Yes; some of them are blown right up to the other end of the bord.

148. And the posts in many cases are blown out and broken like matches in all these particular inclines?—Yes.

149. Why did this shot blow out?—Simply because they wanted to put more work on it than it was fit to do. Of course, it flew to the weakest part.

150. Why was it not able to do its work?—Because the coal was not prepared.

151. It was not under-cut?—No.

152. Did you measure the depth of the coal?—Yes; I found 2ft. 1in. left on.

153. And that was into the solid?—Yes.

154. And the shot had partially done its work?—It had blown a small piece off the throat of the hole.

155. Had it made any cracks into the solid?—I did not notice any, or no more than would naturally be there.

156. You say the greatest force was in this incline. In the further away places what did you find?—In inclines 5 and 6 I found indications of a strong blast. Then, it appeared to have found its way past No. 6 into No. 7, because six bodies were found there. The last man found had evidently run about thirty or forty yards from the middle level.

157. You think they had then some slight warning, and were able to run some little distance?—My idea is that they heard this shot when it blew out, because there were none of those men in No. 5 and No. 6 inclines, who were in the working-places when we got them. They were all out in the incline.

158. Was there any reason that they should have left their work?—No.

159. They would have been at work an hour and a-half?—Yes.

160. They would not be resting?—No; the attitudes showed that they were running out of the places, and had had some warning, and might have heard the explosion of the blown-out shot. That would blow the lights out.

161. Did you find any of their lights near where the men were?—I do not remember picking any lamps up.

162. Did you notice if the lights were where they had been working?—Some of them were.

163. Do you know what kind of lights were used at the time of the explosion? We were told they were naked lights?—Yes.

164. What kind of lights do you use in your mine?—Naked lights.

165. Did you ever have an explosion of fire-damp?—No; we have found no gas at all in our mine so far.

166. And you think it quite safe to use naked lights?—Yes.

167. Have you much dry coal-dust in your mine?—No; it is fairly damp. There is always a certain amount of water, which keeps it damp.

168. Have you examined the ventilation of the Brunner Mine since the explosion?—I only know what we did while inspecting the bords after the explosion.

169. Do you know whether it was sufficient for the adequate and safe working of the mine?—Yes, all that is required.

170. Do you know in any way that it could be improved?—No.

171. It has been suggested that there might be an outlet at each end of the mine, or another intake, and an outlet at each end. How would that do with a mine which was progressing inwardly?—The Brunner Mine, as far as I can see, is not progressing inwardly. They have gone as far as they intend to go, as far as I can see.

172. Do you think it would add to the safety of the miners if they had another outlet?—I do not think so in this particular case. If you had had half a dozen shafts you could not have saved a man. I could imagine that a man who could run only thirty yards has not much chance of getting out.

173. He would not find any place where the explosion would have less affect than in another place?—No; in fact, in one place we found the shovels standing on the rib-side where the wind could have blown them over.

174. So that the explosion had no force there, but the men were simply killed by the after-damp?—Yes.

175. Did you examine the stoppings?—There were none left when I went in; all had been blown out.

176. Do you know what crib stoppings are?—Yes, crib-log stoppings.

177. Seven feet I think, between the cribs?—Yes.

178. Do you think that adequate for stoppings?—Yes, quite of the best for that particular mine, or for any mine on the West Coast, on account of the roof dropping, and the floor rising and squeezing the crib-stopping, and making them air-tight.

779. If you had bricks would not they crush and cause a leakage?—Yes.

180. And boards would do likewise?—Yes.

181. Did you notice the machinery of the mine for ordinary working?—Yes, it is an ordinarily equipped mine.

182. All the appliances being of the usual kind?—Yes; and the best, as far as I could see.

183. Can you give us, shortly, the result of your examination of the mine, and what in your opinion led to the explosion?—I have already said that there was strong evidence that it occurred through this blown-out shot in No. 4 bord, which would raise a heavy cloud of dust where it struck the ground, then, of course, the heavy cloud of dust would be immediately followed by the flame, which would cause inflammation in the next bord [indicated]. This is evident by the excessive coking which has taken place in that particular place. Then there are indications that it has travelled that way and this way [indicated], and in no other place in the mine did I see the same evidence. Then, the blast has evidently come down to No. 3, and up the workings along the bottom level to No. 2, and No. 1, and then across here [indicated], because we find tubs of coal jammed up on that side. The force has spent itself at the sump, because we find no evidence of any flame in that portion of the mine. The road being wet has killed the flame.

184. I understand you to say that the damp parts of the mine were the least affected by the flame?—Yes, because there was always a certain amount of water trickling down the main dip. We found a great quantity of fine dust lying on the floor where the flame, as a general rule, never appeared to have consumed it. No fire had reached the top of the main incline, as we found in the motor-house a boy who had not been touched by fire at all. The boy did not appear to have been burnt, although every stitch of his clothes was blown off. On the top of the main incline a young fellow was found with his clothes blown off, and not at all burnt. All these indications lead one to suppose that the flame had only gone up a certain distance.

185. There was some question raised as to watering the mine?—Do you mean to damp the coal-dust?

186. Yes?—That might be very necessary where there is much coal-dust. Independent of that, in the West Coast mines I think the danger could be done away with by the appointment of a man to see that every shot is made properly ready before it is fired.

187. Do you think it would do any good to water the place around where the shot is fired?—It might be a good thing if it was very dusty.

188. In respect to blasting, what is the practice in your mine?—Prior to the explosion occurring in our mine all the men fired their own shots, but since the accident at Brunner the deputies fire them. There is a notice posted up informing the men what the Company intend to do, and also calling attention to clause 50 of the special rules with regard to tamping with clay instead of with coal-dust.

189. How do the men get their powder from you?—They buy it from the local storekeepers.

190. What quantities do they take in?—An ordinary quantity, in a tin, sufficient for a day's work—a 4lb. tin.

191. Do you know where they store that powder, or if they store it all?—Outside?

192. Yes?—I could not say definitely. I think that on going out at night they leave their can with the local storekeeper, who goes to the magazine and fills the tin; but whether he leaves the tin where they can take it for themselves I do not know.

193. You only know they take that quantity into the mine?—Yes; we have nothing to do with that portion of the work so long as they take the tin in.

194. I suppose you have read something about the late Commission which sat in England. Previous to this coming out, was it generally known that coal-dust is highly explosive?—It has been known for a considerable time that it was inflammable; but a few seemed to have an idea until recently that it must be mixed with a certain amount of firedamp before it would explode. It has been proved now that it is unnecessary, as pure coal-dust will explode by itself.

195. The men having been at work for an hour and a half before the explosion, would not that appear as though the air had been good when they went in?—I believe if there had been any gas in the mine in any face some workman would have touched it long before.

196. So that you would have supposed that the mine would be all right up to the time of the explosion?—I should say so.

197. And that any flame would have been reported to the fireman?—I imagine he would examine every face as usual.

198. And had allowed the men to go in to work?—That was sufficient evidence that the places had been examined and found free from gas.

199. Does the fireman usually observe the rule, that he has to examine all the places before the men enter?—Yes; and meets the men before they go in to the places. That is the rule in our mine.

200. Do they observe it?—Yes, it is always observed so far as I myself am concerned.

201. *Mr. Beare.*] As a manager yourself, after having thoroughly examined the Brunner Mine, in your opinion was the mine well managed in every way?—Yes.

202. Did you have any fault to find?—None that I could see. It is simply following out the usual style of coal-mining which is adopted throughout.

203. You were quite satisfied with the ventilation?—With that which was examined.

204. Did you know anything about the working stores kept in the mine?—No.

205. There was plenty of brattice-cloth and timber?—Yes. We proved that by the amount we used in getting down the main dip.

206. You saw nothing in your examination that you could find fault with as a manager of experience?—No fault whatever.

207. Supposing the law in New Zealand had been to compel the watering of dry and dusty mines, would you, as a manager, have watered the Brunner Mine?—I do not think so, on account of the appearance of the dip where water seemed to be thoroughly plentiful.

208. Your opinion is that the Brunner Mine is not a dry and dusty mine?—No, and not a fiery mine. I could not see any gas.

209. Is it of similar character to your mine?—It is worked pretty much the same, only we worked out to the rise, which is going towards the top. The principle is just the same.

210. When you say you have given instructions to your deputy or fireman to fire the shots, I take it there is some danger of explosion in your mine?—We take it as a precaution.

211. In case of a blown-out shot?—Yes.

212. You do not water your mine now?—No.

213. Coming to the scene of the explosion, who was present when this blown-out shot theory was first discovered?—I do not know. I was not in that day. I went in the next day.

214. You saw the locality and examined it thoroughly?—Yes.

215. I think the theory is that the shot was blown out through the action of some miner who was anxious to get coal readily?—Yes.

216. You would agree with that theory?—Yes.

217. It has been stated before the Commission that the probability was that the shot must have been put in by a miner who was anxious to get the coal easily?—I would agree to that.

218. Would you, as an expert, say that the shot had been put in under proper management and supervision?—In that particular place?

219. Yes?—No, I should not.

220. Would you say it is quite the contrary?—Equivalent to that.

221. There is no under-cutting, and everything about the shot is contrary to scientific principles?—Yes.

222. Did you notice particularly the effects with reference to the resultant gas produced by the explosion?—Yes; when I got into the mine, and got to the top of the dip, as soon as I saw the fumes coming up the dip, I made up my mind that coal-dust was the chief factor in it.

223. You were one of the rescuing party, were you not?—Yes.
224. What gas did you find in making your entry into the mine?—It was a resultant gas from a coal-dust explosion.
225. That is, carbonic oxide?—Yes, it was one of the chief elements in it.
226. How did the lamp burn?—All right.
227. What was the effect on yourself?—It produced sickness and fainting.
228. Is that the general effect?—Not with fire-damp explosions, which would produce sleepiness.
229. What would be the resultant gas of a fire-damp explosion?—About 9 per cent. of carbonic acid, 19 per cent. of steam and water-vapour, and the rest nitrogen.
230. Would the lamps burn in that?—No.
231. Which would prove positively that it was a coal-dust explosion?—Yes, that is the analysis which has been taken from the chief explosions that have taken place in the North of England during recent years. When they analysed the after-damp, they found in a coal-dust explosion that they always got a great quantity of carbonic-oxide.
232. I think it has been also stated that some of the men seem to have travelled a good distance, which they would not have been able to do in a gas explosion?—No, a fire-damp explosion would be instantaneous all over the mine.
233. That is to say, the men would have no time to travel any distance at all?—No, I do not think they would.
234. And coal-dust explosions take time to travel?—Yes, because in a coal-dust explosion the gas is distilled from the coal itself, and would take time in doing so.
235. Speaking as an expert, would you use any of these high explosives?—No, I do not think I would go in for them. They would not abolish the danger. They might minimise it, but I do not thing they would eliminate it.
236. Have you ever tried them?—I have seen roburite and two or three others used.
237. Can you say it would be practicable to use them in the mine?—I think it would be practicable; but still I do not think they would do away with the danger of what has occurred here.
238. *Mr. Joyce.*] Are you sure that the shot-hole was not put in when the bord was being constructed?—The shot-hole might have been put in, but I believe it was only fired that morning.
239. Still you would not like to swear that it had been fired that morning?—No; but there is every evidence that it had.
240. Does the explosion seem to have taken two directions?—Yes; to have spread both ways, towards Nos. 2 and 3 inclines.
241. I think you stated that one portion of the mine seemed to have felt the force of the explosion more than another?—It seemed to have partially died away at the point the mine was wet.
242. The conclusion you would come to would be that, if the coal-dust was kept damp there could be no explosion?—Throughout the mine?
243. Or in the vicinity of the blown-out shot?—What I meant by being damp at this particular point was that there would always be a certain amount of water lying there. It would only be found there; but you could not have water all over the mine 2in. or 3in. deep.
244. Certainly not; but if you watered the coal-dust in the vicinity of the shot, and watered the roof, the sides, and the floor, would that be any good?—It would be a preventive, no doubt, and it is stipulated in the English Act that that must be done.
245. Recent experiments have proved that the flame from a blown-out shot will even travel further than the immediate vicinity?—Of course, that may be.
246. This particular blown-out shot only travelled 30ft., and if the watering had been carried out it would have dropped within the radius of the 30ft.?—Of that particular place.
247. I think blown-out shots have been known to cause explosions for a great many years?—Yes.
248. And to be always an element of danger?—Yes.
249. If any mine is well managed, would you have a blown-out shot in it?—Yes.
250. How long has it been known that coal-dust will explode?—Nine or ten years, I should think; but I could not give the exact date. There was an idea that it must be mixed with a certain amount of fire-damp before it became inflammable.
251. Then it was in 1886 it was known that coal-dust was inflammable?—Some people may have had that idea; but they did not test it until the last two or three years, when exhaustive experiments were made proving that coal-dust is explosive.
252. Was not it proved in 1886?—No; their apparatus was not sufficiently good to make experiments.
253. There had never been a case of any kind causing them to take precautions against explosions caused by a blown-out shot?—The only precautions that we have taken, as far as our particular mine is concerned, is to see that the coal is properly made ready before the shot is fired.
254. Previous to this explosion, was it left to the miners themselves to put in the shots as they pleased?—No; we had always a deputy going round, and if he saw the shots being put in wrongly he immediately stopped it.
255. But the chances are that the deputy has other things to attend to, and does not pass the shots?—No.
256. It is evident that he did not pass this shot. Do you think there was any gas in the mine on the morning of the explosion?—I do not think so.
257. There were safety-lamps being used in that portion of the mine where the shot was fired?—We do not know whether they were being used; they were found there, we do not know for what purpose they were there.
258. What is your presumption?—That there may have been a little gas in that particular place, or that they might have been expecting it on account of this fall. The lamps would be handed out to the men as a precaution.

259. That was in the bord below where the blown-out shot was?—Yes; in Brislane and Robert's bord.

260. Did you notice that slit going out towards the blown-out shot?—The slit on the right side? Yes.

261. Did you notice if the explosion seemed to have travelled along that slit?—It was difficult to tell.

262. Say, for instance, that the explosion had come up that slit and had struck a lot of coal dust here [indicated], would it not have developed fire in that bord?—How would you account for the brattice being up in Brislane and Roberts's bord, if there had been an explosion in that particular bord? After examining that place I do not see that the explosion could have originated there.

263. Did you examine Worthley's bord?—Yes.

264. There is a peculiarity about that bord—the explosion seems to have divided there?—Yes.

265. Did you form any theory as to that?—The only theory I formed was that the force of the explosion had gone in and struck the face, and had then gone out again.

266. It is very hard to find a satisfactory theory?—It may have been more intense in this particular place than in Brislane and Roberts's, because it had travelled uphill and would gather more coal-dust. Each of those places [indicated] would be much more knocked about about than the places lower down.

267. *The Chairman.*] Is this so much knocked about—Brislane's bord?—No; I do not remember any great knocking about in Brislane's bord.

268. Is there any knocking about in Worthley and Duncan's bord?—I do not remember.

269. *Mr. Joyce.*] Would not you have thought that if the explosion had occurred where that blown-out shot was that there would have been traces where it went down the slit to the next bord?—It appears to me that the explosion has gone down through No. 3; the evidences are upwards and outwards; it has pretty well died out at the sump. Then it has gone up Nos. 3, 2, and 1, through into the cabin and and away in this direction [indicated]. A portion has gone out to each incline.

270. From the appearance of the fall below the blown-out shot, how would you say the explosion travelled—to the bord below?—That might be an old fall, probably it is. I think the flame has gone outwards from the blown-out shot towards No. 2, and has come back into No. 3 and down into the sump level, and up Nos. 2 and 1.

271. And the fall in Worthley and Duncan's bord would be produced by the explosion?—Some of it might be.

272. Would some of it be there before?—At the end of the bore where the blown-out shot was we found pieces of brattice blown in amongst the fall. That is evidence of the fact that the fall had not taken place after the explosion occurred; it must have been previous.

273. Would not you presume that that was the end of the explosion where the stuff was charred?—The flame might be carried on; there was plenty of room for it to travel.

274. Where would the coal-dust come from to feed the flame?—It could be got off the roof. In travelling round the mine you find charring on the roof sometimes, sometimes on the floor, and sometimes on one rib. In No. 5 there is a proof of what I say. There was a powder-tin hanging on a nail; there was powder in it. The solder had been melted round about the neck of the tin, and the tin had dropped down, but the powder was not exploded. It would appear as if the flame had travelled over the roof, floor, and sides, but it had not exploded the powder.

275. The only place you got coal-dust about this fall would be on the roof?—Yes, and on the side.

276. This fall seems to be stony, so that the roof would be stony as well as the fall; there could be no coal-dust lodged there?—Only about the edges; but it is evident that there was sufficient to help the flame. It is simply a theory I am advancing.

277. Do you not think that if a big explosion ocurred at the blown-out shot you would be able to see which way it travelled down to the next bord?—There may be a difference amongst us regarding it, but it is evident that the explosion started out in two directions [indicated.] As far as I am concerned, it must have come down No. 3, towards the bottom level, and then have gone along and joined in No. 2 incline, because it is in No. 2 incline where the heaviest force has been, as far as I could see.

278. You say the miners are allowed to take their powder in?—Yes.

279. I suppose they bring in a tin of powder, and leave it in the bord. When going out at night, would they bring the tin back with them, if it had not been used?—It is left there hanging up on a nail on one of the brattices.

280. Is there anything to prevent them using any other kind of explosive under the present system?—No.

281. If they found another explosive would suit them better, would they use it?—Miners generally confine themselves to powder. I do not think they would benefit by using dynamite.

282. Do you make an inspection of the quality of the powder used?—No; no more than seeing one of the tins hanging up in the bord to serve each pair of men. The miners buy it from the local storekeepers. There are one or two qualities—Harvey's, and Curtis's—but we never inspect to see what the quality is.

283. You have been through the return-airway?—Yes.

284. Do you think a man could get through there in case of an accident?—I do not think he could get through in case of an explosion, for the simple reason that all the stoppings are blown out after the explosion occurs, and if you had the best return in the world the foul air would be drawn into it.

285. As in the case of an ordinary gas-explosion?—Yes.

286. Then your return must be useless, except for the purpose of a return?—For the carrying of air into the mine. If the stoppings are blown out the foul air must naturally come in through the stentons into the return, so that there would be no chance for a man to get through it.

287. It really means that if you have an explosion in a mine like the Brunner you must lose all the men in it?—No man under the same conditions in any other mine would have escaped.

288. What different conditions exist in other mines? You see sometimes cases of a big explosion in a mine, and a great many men are saved?—I do not know that there is any difference.

289. You see, according to your evidence, no one has a chance to escape from this mine in case of an explosion?—No; in every mine where you have stoppings like this you must have an intake and a return. I do not see how the men could have got out of this return. I said they could never get out of any other mine under the same conditions because the stoppings were blown out, and of course the foul air must work through each of the stentons. If a man tried to get out he would have to go through the foul air.

290. Why can you not construct stoppings that would stand?—I think then we should have to shut up our mines altogether. It could be done, possibly.

291. Coming back to the question of the explosion, you see very regularly that a number of men are saved in colliery disasters. Why is that?—It is because the mine is divided into panels. You might have twenty-five men in one panel, isolated by means of a barrier of coal which may be 200ft. or 300ft. in width. There would be fifty or sixty men working in the mine, and if an explosion occurs in the next panel it does not reach to another one, because they are isolated by the barrier of coal, and the men are saved.

292. Then the mine is isolated by a barrier of coal, and the air is practically in the same way? —Yes; they only want ventilation, and the current of one portion goes through that one portion only, and a separate current through another portion of the mine.

293. Would it not be practicable in the Brunner Mine to divide it into panels like that?—It is only a small mine. They only had about sixty men as a rule in the mine. In Durham they would have about seventy-five men in each panel.

294. Supposing you had another shaft through the hill, or a drive up to Coolgardie; do you think that would assist the ventilation of the mine?—The ventilation of the mine is all right; I think it is an adequate amount.

295. You think what I suggest would have been no good in the case of an explosion?—I do not think there would have been any chance for the men to get out. If they could only run about 30yds. before the after-damp overtook them—it would spread all over the place very quickly.

296. Do you think if you could construct very strong stoppings there might be a chance for them?—There might be; but we cannot measure the force of an explosion. We might put up stoppings which would satisfy all requirements, and still a severe explosion might take place. There was one stopping behind the dip, at the motor, which was carried away. It was 14in. thick. If we were compelled to build stoppings of that kind it would simply cripple the industry.

297. On the whole, the question seems to turn on the matter of cost?—You have a certain amount of risk to run in a mine.

298. You reached this blown-out shot, and saw no tools?—No.

299. Would you want a drilling-machine to bore the hole?—Yes.

300. Is it the usual course for a man to retire a short distance from the shot?—When firing that shot he would either go back to the slit [indicated], or to No. 3 incline, and he would afterwards go back to the place where the shot was fired.

301. Did you find any tools there?—I do not know what became of the tools, assuming they had been used. The drilling machine would not have been blown away, because the force of the explosion would not be very much there.

302. You searched for a fuse around the shot-hole. Did you find any?—Yes. I did not find it.

303. Did it seem to be fuse recently "run"?—Yes; very much discoloured; you could not tell under the circumstances what had been done with it.

304. Is it not a remarkable thing that the fuse was not burnt?—No, I do not think it is, where you had only a slight charring of the floor, because the flame would not last a great length of time. There is a kind of tape round it which renders it pretty strong and firm. That would also resist the action of the flame.

305. But the roof has been charred and coked?—There are a lot of sticks lying there that are not burnt. A piece of stick off the prop which stood there is simply charred.

306. Instead of having two brick walls and tamping, would it be possible to construct a cheap stopping with crib-logging and stowing in between?—I do not understand your question properly.

307. I mean to put in a crib-log stopping here [indicated], to tamp this drive up with clay for 40ft. or 50ft., and put another crib-log stopping outside of that. Do you not think that that would make a permanent stopping and a cheap one to stop explosions?—Yes; but the minimum distance between the two places must be 50ft. between the two headings. What size were you going to put them in?

308. Ordinary crib-log stoppings. You could tamp as long as you please?—It is just possible it might stand.

309. That would be a cheap method of construction?—It would be a fairly cheap one.

310. The construction of the bords or the shape of the gallery has very often something to do with the force of the explosion, has it not?—There are certain elements that come in, but unless combustion takes place we could not tell.

311. Was this No. 4 bord, in your opinion, well constructed?—The bord was constructed well enough.

312. You do not know the shape of the gallery. Somebody suggested in giving evidence that the shape of the gallery had something to do with it?—Possibly it may have; that is one of those things that we have yet to learn.

313. The majority of the men entombed were killed, or died from the effects of after-damp, do you not think?—No; the majority were killed by the explosion.

314. But a great number of those would be killed by the after-damp?—I do not think more than half a dozen would be. I think that the force of the explosion killed the lot, excepting those farthest in.

315. You say the resultant gas allowed your lamp to burn? Do you consider that this gas may have been produced by a coal-dust explosion?—Yes.

316. If you had a sufficient amount of nitrogen in the after-damp, would not your light burn in it quite easily?—No.

317. I think you are confounding choke-damp with after-damp?—No, I am not. Choke-damp or black-damp is simply carbonic acid. After-damp contains about 9 per cent. of carbonic acid.

318. Will not your light burn in it?—Not in that amount of carbonic acid.

319. I think a light will burn in after-damp?—It will burn in the after-damp of a coal-dust explosion.

320. You say the fireman examines all the places before the men go into them?—Yes.

321. I suppose he does not examine every face in the mine, but only those to be worked at?—That will depend on the Inspector, as far as he is concerned. During the day, the over-men inspect and examine each and every place in the mine.

322. So that an accumulation of gas might take place in one bord where the men were working and not be known to the fireman?—Granted; but no workman would be expected to go on working, but to come out.

323. A man might be working in his bord, and the gas accumulating somewhere else without its reaching him?—Unless in particular instances.

324. You do not think every bord and face ought to be inspected in the morning?—You would have to have three or four men travelling around all night, I think such an inspection would be useless. He would have to go all round the mine, including the rise workings.

325. Not if they were properly stopped?—If there was any gas accumulating, it would always go to the rise-workings.

326. But you would stop your workings when you had finished them, so that he would really only have to examine the working-places, where work was actually going on?—He is supposed to examine all the working-places, and those connected with them—that is, the jigs, inclines, and levels.

327. You know that an accumulation of gas sufficient to blow a mine up can take place in an hour?—From a blower?

328. Yes. Would not he find the blower when he went round during his inspection?—If he did not, it would make itself known if it was anywhere near where the man was travelling, because it has a bubbling sound.

329. You assume that the blower was not near where the fireman was travelling, but where some men were working. It might show itself in some bords where the men were not working?—It might.

330. You do not think, as a matter of fact, that all the bords should be examined before the men go to work?—No, because it would be simply a waste of time.

331. *Mr. Park.*] Did you see any tools for laying trams about that particular bord?—None of any description.

332. We had some talk about section 40 of the Act. I will read it to you, so that you will understand what I mean: "Within one year after commencing the working of any bords, stalls, or long-wall workings in any mine, there shall be made and completed at least two separate and distinct shafts or outlets to the surface from such mine, intercommunicating with each other, so that such shafts or outlets shall afford a separate means of ingress or egress available to the persons employed in such mine. Such shafts must not, if made after the commencement of this Act, be nearer than 50ft. to each other. Proper apparatus for raising or lowering persons at each such shaft shall be kept on the works of the mine, and, if not in actual use at the shafts, shall be so kept as to be quickly available for use." What is meant by "inter-communicating with each other?"—I should take it to mean that each of those stentons must be driven over; and that in certain portions of the mine certain doors must be put in so that you can get from the intake into the return.

333. You were asked if 50ft. would be sufficient. Would you suggest anything more?—I do not think that it is necessary. The English Act makes it 15yds. I think our section is ample.

334. Coming to the blower, can a blower take place in a solid face?—You might strike it in driving.

335. As well as in the working?—In driving a level you might strike a blower.

336. Is a blower likely to occur in the old workings?—I do not think so.

337. There would be no danger in the old workings?—I do not think so.

338. If it occurred in a working-place, the men could get notice of it from the noise?—Yes.

339. Would the noise give notice to the men at a distance?—It would depend upon the amount giving off.

340. If it were a big one it would be more dangerous than a small one?—It would be more dangerous, but there would be more noise.

341. The more noise there was, the more dangerous it would be?—I should assume so.

342. *Mr. Beare.*] You say the stoppings have been blown out, and therefore the best return-airway you could have would have made no difference. Supposing the stoppings had not been blown out, do you consider the return-airway was in fair condition, and of adequate dimensions?—Yes.

343. Do you think that practical and experienced miners working in the mine would have had a difficulty in finding their way out?—I do not think so. It is fairly well defined as a return.

344. I think you also gave a description of the coke-dust and coal which was on the rails. I suppose you would expect this in case of a gas-explosion?—Not in a case of a pure gas-explosion.

345. They were indicative really of a coal-dust explosion?—Yes.

346. Have you heard of the Blackwell and Albion Mines explosions at Home?—I have read of the Albion.

347. Do you agree with the conclusions come to by the Commissioners in that case?—Yes.

348. With regard to there being no evidence of any tools being found at the blown-out hole, would not a drilling-machine be the only tool necessary?—Yes.

349. Supposing the hole had been previously drilled, no tools would have been required?—Nothing, except a little tamping and fuse.

350. The slit referred to by Mr. Joyce was covered by coal-dust, was it not?—Yes, and charring.

351. *Sir J. Hector.*] Do you think you could from memory mark the limits to which the flame extended down the slit to which you refer? Was there any evidence of the flame having scorched the timbers, or where the mine was scorched rather than blackened?—There has been some charring in No. 2. From the blown-out shot it extended to No. 2, and up that to a point opposite the pump. Then it extended down from the blow-out to the third incline and the sump-level, along the sump-level and up Nos. 2 and 1.

352. I am talking of the scorching. How far do you think the men were burnt?—The men were burnt in No. 5 incline. We found the bodies there burnt. The men had all left their places with the exception of one or two, and we also found that the clothing of the majority was scorched, and in the places on the west side, in No. 5 incline above the middle level, the clothing on the men was scorched. There has been flame in Nos. 5 and 6, and it has gone away towards No. 7. Beyond that point there has been no flame, because the bodies showed no signs of burning. The explosion seemed to have spent itself in No. 2.

353. Have you heard of them using water and salt in the vicinity of the shot-holes?—Yes.

354. Have you any opinion as to the wisdom of doing that?—It would be a preventative.

355. You have seen the hand-grenades filled with chloride-of-ammonium solution used for fire extinguishing. Do you think the chloride of ammonium would be better for use in the mines than common salt?—Yes.

356. Would it be possible to have a solution of that chemical prepared for use in case of any doubtful place where the deputy thought it might be required? Or would it be better to sweep out the whole mine and water it?—The salt would be a preventative.

357. Would it not be an advantage in all fiery mines that are inflammable to have some arrangement for distributing or throwing chloride of ammonium over the fire to prevent its spreading. I am talking of the engine-house and engines?—It would be an improvement to require that to be done.

358. Do you know on what date the English Act was amended to require the watering of dusty mines?—In 1887. I do not recollect any previous clause in the old Act of 1872.

359. There was some question of finding a fuse that had been burnt or expended. I presume you refer to the burnt piece of fuse?—It had been expended; there was no powder in it.

360. *Mr. Skellon.*] Regarding the blown-out shot, you found some lumps of coal on the rails near to the shot-hole. Was not the coal in the face shattered?—Yes.

361. Could not a previous shot have brought some coal down and shattered the face prior to the shot-hole being fired, even supposing the hole had been fired that morning?—In driving the bord some coal would be knocked down, but in this particular instance the road had been relaid along the rib-side and the coal is left on the side.

362. Might it not have come down as the result of the concussion arising from the explosion? We want to find out whether this shot-hole was put in some time ago when the bord was made, or on the morning of the explosion?—My belief is that it was put in that morning.

363. Could it have been put in previously, and the coal having been shattered around the hole the force of the explosion brought these lumps down?—These lumps of coal are lying on the rails close in by the rib-side, and I should imagine that when the bord was being driven the road would be left in the middle of it.

364. It is evident that the tram was put in when that pillar was being stripped?—Yes.

365. And the shot-hole may have been put in when the tramway was worked previously?—I do not see how they could use it, because the tub could not be taken past that point. There are some projecting pieces of coal which prevent the tub going past.

366. When they were driving the bord, might not that hole have been put in?—It might.

367. And the concussion from the explosion might have brought those lumps down?—How would you account for the presence of the fuse lying in a direct line?

368. That has been fired, no doubt, for some time?—It is charred.

369. But is it not possible for it to have been fired previously?—It is possible, but I hardly think probable.

370. *Mr. Proud.*] Were men put in at that bord to get coal?—We do not know what the orders were from the overman or deputy.

371. *Mr. Skellon.*] Is the floor of the bord fairly slippery?—Yes.

372. Have you ever seen a man fire a shot when there has been a slippery parting on the floor without holing it?—Yes; but it is burnt right into the rib.

373. Do you think the concussion of the air from the shot started these men running?—I think so.

374. How far was the farthest man away from the blown-out shot?—I could not tell the distance, but you could get it on the plan.

375. Do you know the distance?—About half a mile.

376. Is it a rare experience for a shot to be blown out?—No.

377. Have you ever known men to rush out of a mine simply through the report of a blown-out shot?—No.

378. *Sir J. Hector.*] Blown-out shots are not so very uncommon, but blown-out shots hitting the floor are uncommon?—That would depend upon the amount of work the shot would require to do.

379. I mean the fact of it striking the floor would be one of the sources that incidentally led to the explosion?—Yes.

380. *Mr. Skellon.*] You say the men use fireclay for tamping. Where do they get it from?—In our mine it is plentiful enough.

381. When you went into this bord, did you examine it thoroughly?—Yes.

382. Did you notice if the day of the month was marked up there—the 26th?—I did not.

383. It is a custom for the fireman to mark it up in every place he goes into?—Yes.

384. In your mine, if you found any gas, would you allow the men to work with naked lights in one bord and with safeties in the next?—It would not be easy to make them work with naked lights in the bords on the return side.

385. In case of an explosion, the lamps would go out?—Yes.

386. If a man had not been through the return-airway, could he possibly find his way out?—With his light out?

387. Yes?—I do not know. I do not suppose he could in the dark, unless he followed the wind.

388. *Mr. Park.*] Did you find any other marks in the bord?—No.

389. I believe it is customary for the fireman to put the day's date on the shovels?—On the faces generally, and in the places nearest in.

390. Did you find any marks at all?—No; I did not look for them.

391. *Mr. Beare.*] I think Mr. Cochrane said, when he came on the scene of the disaster, he found the fan had not been reversed. Have you anything to say about that? Could the fan have been reversed?—I do not think it would have done any good, because, as a matter of course, all the fans are made to work one way. In this particular case it would have meant taking off the belt and crossing it, and by that time it would have simply dragged the air back over the men.

392. I think evidence was given that the rescuing-party went into the overcast on getting into the mine?—My reason for getting into the overcast was because when I got in the fumes were coming up the main dip, and I wanted to get in through to see if the bottom side was clear of gas. If it had not been clear it would have been no use trying to get down here. We found this was clear, and then we led our brattice up, put a stopping across, and went down through the overcast.

393. *Mr. Proud.*] If you had had a pressure-blower, would it have operated?—Yes, considerably, if one had been erected there to force the air through. But in this case, on reversing the fan, it would have taken at least an hour to cross the belt. By that time the men were all dead, and it would be forcing the after-damp back.

394. *Mr. Beare.*] You said that damping or wetting a mine would be a preventative. Have you followed that in your works?—No; we have not found it necessary.

395. And it is not necessary by law?—No. I consider our mine sufficiently damp, and I do not consider watering necessary.

396. Would you consider the Brunner Mine sufficiently damp?—Since the explosion I do not think it is very dry.

JOHN HAYES examined.

397. *Mr. Park.*] You are a mining-engineer, Mr. Hayes?—Yes; and manager of the Hokonui Railway and Coal Company.

398. Have you been in that position long?—Four years. I have been a mine-manager since 1883 in the Old Country.

399. Do you know the Brunner Mine?—I visited it about a week after the explosion.

400. Did you make a careful examination?—I was in the mine probably ten days.

401. What were you doing?—When this explosion occurred I was sent for by the Premier to act as an expert on behalf of the Government in endeavouring to find out the cause of the explosion if possible. I made an examination, in conjunction with Messrs. Brown and Cochrane.

402. Will you give us the result of your examination as shortly as you can?—Briefly, I consider that the explosion was caused by a blown-out shot, and intensified and carried on by coal-dust. I put in here a plan from a survey I made showing the position of the shot and other details which I noticed. [Exhibit 10, plan of the blown-out shot by Mr. Hayes, put in.] At point "A" on this plan I found a shot-hole with evidence of having been charred. Its directive force was, as shown by this section, coming out of the ground at a distance probably of half a chain, and its point of intersection with the ground is marked—about 30ft. from the hole. At this point I found a fuse about 20ft. from the shot-hole, which was apparently a fuse from there.

403. What sort of fuse?—It was a bit of fuse which had run, and, as far as I could judge from the flare of the lamp, it was not an old fuse.

404. Do you know where that piece of fuse got to?—I do not. It was picked up by one of the miners. We found in this bord, for a distance of 3 or 4 yards from the shot-hole, that the coal was very heavily coked. In one or two instances it was coked an inch deep. It was measured by Mr. Lindop. Mr. Brown and myself took off some pieces with our knives, and we also measured them. We found this coking along the rise side of the bord for a distance of 3 or 4 yards.

405. For how many feet from the hole?—Three to four yards, in the neighbourhood of the shot. The roof showed evidence of distillation at very great heat.

406. Distillation of gas?—Distillation of coal. The coal is really distilled, and the hydrocarbons were sticking to it almost like icicles. I have seen the same thing in another explosion at Home, but to a much greater extent than shown here.

407. What have you to say about the hydro-carbons?—There was evidence of distillation of hydro-carbons from the coal. Of course, this was due to the large amount of heat, which had carried away all the volatile matters and left the more solid portions sticking to the roof. It was dropping like icicles, in some places 3in. or 4in. long. I did not take any away, but they were that length. There was evidence of force coming towards No. 2 incline. This was shown by the indications I saw on the props, and here and there where we saw similar marks. Even the props had pieces of brattice-cloth driven into them, undoubtedly showing the direction of the force. The cloth had spun around the prop, and was clinging to it away from the direction of the shot. I consider it very probable that, from the expansion of the shot, the force came largely down the hill. A great deal would go out that way, and it went straight on until it came probably to the sump-level and down the slit. A portion would pass out at No. 2 incline. With respect to the arrows shown on plan [indicated], I should say that it is very probable that the back-lash, or the in-rush of air following the reaction of this first out-rush, would make its way through in this direction [indicated].

408. You think the back-lash went in the direction of No. 3 incline?—Yes, that is the working-place. It must be so to a certain extent, for the initial force of the explosion from the blown-out shot would cause a partial vacuum, and that vacuum must be filled up from somewhere. I consider that it is very possible the force came in this direction. There is a slit from this point [indicated] to the sump-level, and the main force of the explosion would be largely directed towards that, and possibly directed towards No. 3 incline, and to the main incline. It would then rebound back. I form that conclusion for several reasons. One reason is that it is a well-known fact that in all coal-dust explosions the first evidences are very often made indistinct by the action of the back-lash. I can give the Commissioners confirmatory evidence of that. I will read a quotation showing the researches on this question in England. [See Appendix—page 9 of Mr. Hayes's Authorities—Summary of Paper, by Mr. W. C. Blackett, colliery-engineer, November, 1894.]

409. *Sir J. Hector.*] You have not given us any idea of the appearance of the floor. You described the roof. What did you see on the floor besides the fuse?—There was a tramway laid in the bord. The condition of the floor was very crisp under our feet. After a time it got crushed down by people tramping over it. It was just the same as if you were treading on coke-dust.

410. *Mr. Park.*] How far did that extend from the line of the shot?—Probably half a chain on each side, roughly speaking. I noticed at the point of intersection with the floor that there was a certain amount of coal-dust about, and that it was blown very heavily into the end of a lying prop, practically into the grain of the timber. This prop was lying on the floor about 32ft. from the blown-out shot-hole. There is also pretty strong evidence in this part of coal-dust which had become coked and had remained on the standing prop. This prop is almost in the direct line of force.

411. *Sir J. Hector.*] Was there any sign of the back-lash on the lower side?—You will get that almost anywhere. In many cases there was evidence of oscillation.

412. *Mr. Park.*] What was the appearance of the coal where the shot-hole was?—There was a certain amount of coal blown off the mouth of the hole, as shown in this section [indicated]. There was also a certain amount of coal on the floor.

413. Was it lying on the rails?—I would not be sure, and how much I could not state. This corner of this pillar [indicated] was partly cracked in this direction by the force of the shot. But the coal was not holed at all—that is, under cut.

414. I suppose that would be the reason why the shot did not have the desired effect?—That would be one reason.

415. Did you make this plan from actual measurements?—From actual measurements. This directive line was got by putting a pole into the hole and producing it in a straight line to this point [indicated].

416. That would also give you the depth of the hole?—Yes; the shot being put into the solid would give it, and not being "holed" would give it such a tremendous grip that it could do nothing else than act as a cannon. It was directly into the solid, without being under cut.

417. Did you take particular notice of the tram-rails?—I saw the tram.

418. There was a suggestion from one of the Commissioners that the coal found on the rails may not have come from the shot-hole but have come from the roof, owing to the concussion caused by the explosion?—That is quite feasible, but a little bit of coal was certainly blown off the mouth of the hole.

419. Would you be able to identify the piece lying on the rails as part of it?—Not unless I could see the hole in it, and I did not see it. Besides, it would probably be blown off into small pieces—more likely than not.

420. Therefore it is feasible that the coal that was lying on the floor might be coal either from the shot-hole or from the roof?—I think there was rather more on the floor than would come from the mouth of the shot-hole.

421. And the coal may have been left there by some previous workman?—Unless it had fallen from the top, as is very likely.

422. So that there are three theories: that it may have come—(1) from the shot-hole, (2) from the roof by the concussion, and (3) it may have been left by a previous workman?—I think the more reasonable theory would be that it came partly from the roof and partly from the shot-hole.

423. And the immediate vicinity of the shot is very near the top of the roof?—Yes; there is some top coal not taken away.

424. Is that an ordinary way of putting in a shot-hole, especially in regard to the nearness of the roof?—That all depends upon the work the shot has to do. If you want to do certain work with a certain shot you have to be guided by circumstances, and place it where the shot would do the most work.

425. You examined the whole of the mine?—I think, fairly.

426. Did you notice anything where you came to the damper portions of the mine?—Yes; in places where the mine was more damp than other places there was less evidence of fire.

427. Would you say that on account of the dampness of the damper portions that the fire had spent itself as it reached those places?—Most likely.

428. Did you notice that any of the men had been able to run a little distance?—All the bodies had been got out before I arrived.

429. Did you examine the ventilation of the mine?—Yes.

430. On the whole, what was it like?—Very good indeed.

431. And the stoppings?—Most of them were blown out.

432. Did you see what they had been like?—Good jig-stoppings or crib.

433. There were other kinds of stoppings?—Yes.

434. Do you think the crib-stopping was as good as any other kind in that mine?—I think it is a very good and substantial stopping. My own practice is to use brick; that is because I can get brick more cheaply than anything else.

435. Did you notice any means of escape in case of accident?—Through the ordinary return-air course. I was through it. It was quite sufficient.

436. Did you examine the machinery about the mine?—I suppose you mean the general hauling machinery?

437. Yes. Do you think it was sufficient?—Yes. I only looked at it generally.

438. And the appliances for getting the coal out of the mine?—They were ample for the demands upon them. In fact, there was a certain amount of surplus mining machinery about the place doing nothing.

439. In connection with this mine, is there any likelihood of the explosion having taken place through gas from the goaf?—I do not think so.

440. Why?—To begin with, there is no goaf here. It is on this side [indicated], and all the evidence I saw of any flame having come here was from the sump-side.

441. Does the outlet prevent any gas from the goaf coming to the sump-side?—Yes.

442. And from the workings where the men were?—Yes. Any gas which could come from this goaf would get immediately into the return, and could not possibly get to the men in those workings.

443. That is to say, it would have to cross the return-air current?—It would have to blow the air back to get to those men.

444. What deductions would you make from the men having been working an hour and a half before the explosion occurred?—I think the deduction would be that everything was all right when they went to work.

445. And the explosion would occur from some cause that arose afterwards?—Yes.

446. Of course, that would be compatible with your theory about the explosion?—I consider that it was caused by a blown-out shot, intensified by coal-dust.

447. In the mine you are manager of what do you blast with?—I prohibited blasting some time ago, not as a matter of safety, but as a matter of saving the coal. We do not blast there except in very exceptional positions and circumstances. It would not benefit us to blast as a general rule.

448. *The Chairman.*] What coal do you get?—Superior brown coal. We "hole" and wedge it down.

449. *Mr. Park.*] What kind of lights were used in the Brunner Mine?—I must ask you to bear in mind that I did not see the mine under ordinary conditions; therefore I do not know what its condition was like before I went there. From what I saw afterwards, when I was expecting to find more than the ordinary amount of gas, I did not find any large escape at all. I did find a little, but only a very small quantity.

450. Does that answer imply that naked lights would not be dangerous generally?—Not generally.

451. I suppose we may take it that, after an explosion of that sort, you would expect to find a considerable quantity of gas?—You would in this case, owing to the disarrangement of the ventilation. The ventilation would not be as thorough as under ordinary conditions of working, and naturally you would expect to find a little gas where you would not expect to find it in ordinary work. That is the common experience in all explosions.

452. *Mr. Guinness.*] From what you saw with regard to the ventilation of that mine, if you visited it while the ordinary working operations were in progress, do you think you would have noticed less gas or any gas?—With the exception, I think, of one case only, the only gas I found was over "falls." The exceptional case was the deserted part of the pit, which had not been worked before the explosion; otherwise I did not find any gas excepting where there had been a fall of the roof.

453. That would, I presume, take place in consequence of the explosion?—Most likely; it may have been before or after, but on the west side in the upper workings, from the bottom level I naturally expected to find a little gas. I examined for it there, but did not get any. The brattice had been taken down, and I naturally expected to have found a little gas there.

454. With regard to the brattice, what do you say with respect to the workmanship of that?—It was very good.

455. Just go back to the blow-out hole where the explosion occurred. Could you tell, by an examination of that hole, whether it had been recently drilled, or whether it had been there for some time?—I could not tell. The only part I remember was the hole having some evidence of powder about it. It was disfigured, and had no appearance of newness. But I noticed that a little hole had been cut in the side to allow the foot of the drilling-machine to stand, and this seemed to me to be rather new.

456. That, of course, would not be affected by the explosion?—Not to any extent. That little hole seemed to me to be new.

457. Generally, you can say that the only portion in the neighbourhood of that hole that was not likely to be affected by the explosion presented an appearance to you as if it had been recently done?—I thought it was a comparatively new hole. The hole itself would be disfigured by the effects of the shot blowing out.

458. What do you say with regard to a man getting out of that mine if an accident occurred, and the lights were blown out?—It would all depend upon the condition of the atmosphere—whether the atmosphere was charged with poisonous gas or not. If it were not charged with poisonous gas, of course, the ordinary ventilation would be quiet for the time being, on account of the stoppings blowing down.

459. Thus it follows, as a consequence of the explosion, that the ventilation would be interfered with?—So long as the stoppings were blown out it is bound to be interfered with.

460. You have carefully examined all the ventilation in the mine?—Yes.

461. Did you notice anything improper in the method of conducting the in-taken and out-taken air?—No. It was properly ventilated, as far as I could judge.

462. *Mr. Beare.*] As a mine-manager you had no fault to find in what you saw?—Not the slightest.

463 Neither with the ventilation, machinery, or stoppings?—I see nothing to cause me to alter my opinion that I formed as to the theory, that the cause of the explosion was a blown-out shot igniting the coal-dust: in fact, everything I saw strengthened that opinion.

464. Supposing we were told that the men travelled some distance from where they were working, would that be in favour of the theory of an explosion caused by coal-dust?—It would all depend upon where those men were.

465. Supposing you heard that one man travelled between 30 and 40 yards?—I would like to know where that man was in the first instance before I gave an opinion.

466. There was a man travelling, working on No. 5 incline, on the west side from here to here [places indicated on plan, Exhibit 9.] If it had been a gas-explosion, would it have been possible for him to have travelled that distance?—It would not be impossible in either case; so much depends upon the local condition of affairs at the time. A man might feel a severe concussion there, and run for it. In the case of a large colliery at Home—after a heavy fall of the roof that has happened—the men have run, thinking it was an explosion.

467 Do not experts say that in the case of gas-explosions the speed is much greater than in the case of coal-dust explosions?—I have never heard that advanced outside of this Court.

468. Then it is not so?—There is always one point in the case of explosions of firedamp: there has been a certain amount of alarm amongst the men when they run for it beforehand.

469. What would be the resultant gas in the case of a coal-dust explosion?—Carbonic oxide (carbon monoxide).

470. And in the case of a gas-explosion, what would be the resultant gas?—Carbonic acid.

471. Which would be the more dangerous?—Carbonic oxide is the more deadly, and its effects on the system are somewhat different.

472. What would be the effect of carbonic oxide?—The lights would burn so long as there is not too much air in it. The effect on the system would be to produce fainting-fits, and giddiness, and pain in the head. The legs up to the knees would begin to get very weak.

473. That is the resultant gas from a coal-dust explosion?—Yes.

474. Supposing you were told that those were the symptoms, would you say that they were caused by the carbon monoxide?—Yes; I have experienced the same at Home.

475.—You think there is no difference in the speed of the explosions in the case of gas and coal-dust?—I do not think so.

476. You are an authority of some weight in respect to coal-dust explosions?—I have read a good deal about it; I do not know that I am an authority.

477.—Can you give the Commission some idea of the quantity of gas generated by coal-dust?—The gas distilled from coal-dust would be very similar to the town-illuminating gas, and we have also to remember that an inflammable and explosive gas is distilled from coal-dust by the heat consequent on an explosion. Greymouth coal is reported to yield over 12,000 cubic feet of illuminating gas to the ton. Uncondensed volatile vapours will probably raise the amount to say 16,000 cubic feet of gas per ton, this, according to the amount of air present, will give an explosive mixture of from 80,000 to 200,000 cubic feet, or, say, 150,000 cubic feet average from each ton of coal-dust.

478. I believe it was not until lately that it was known that coal-dust contained this amount of explosive force?—Not until recent years.

479. There is no doubt, according to authorities, that coal-dust alone is a perfect explosive. Is that not so?—No doubt at all. I will give you the results of experiments made at Home. [See Appendix, Experiments in Public (pages 7 to 8 of Mr. Hayes's Authorities), by Mr. W. Galloway. "With Cannon Shots," *Colliery Engineer*, January, 1895.]

480. As a mine-manager and expert, could you give us any opinion as to the use of these high explosives in a mine like the Brunner Mine?—I have used them.

481. Do you use them now?—I do not now blast at all. We get our coal by "wedging."

482. What is your opinion as to these high explosives being used in mines?—I have used dynamite of various kinds—roburite, tonite, rackarock. The latter I would not use at all, as I do not consider it safe. Roburite I am rather partial to; but in one case at Home, where roburite was introduced into the mine the men struck against it.

483. Why?—They did not like the change from powder; they preferred gunpowder. They alleged that it produced noxious fumes which were injurious to their health. I do not know whether that was the case or not. I know that the effect of the smoke on my system was infinitely less injurious than the smoke from ordinary powder.

484. Would you recommend its use in New Zealand mines instead of ordinary gunpowder?—If I were working a mine which had not a large quantity of gas I would most likely use roburite in preference to any other high explosive.

485. You know a good deal about English mines, and you have thoroughly examined the Brunner Mine. Can you say if the Brunner Mine was a dry and dusty mine?—I never saw it under normal conditions, because, after the explosion, everything was dried up by the intense heat; and, at the time of my examination, it was only then beginning to get back to what might be considered its normal state. Never having seen it before I am rather at a loss to answer the question directly.

486. Would you say that in its normal state it was a dry and dusty mine?—I do not think the English inspectors would class it as a dry and dusty mine.

487. I suppose it follows as a matter of course that it is not a fiery mine?—I should not consider it a fiery mine at all.

488. I presume the English inspectors would not insist on the Brunner Mine being watered if it had been in England?—Not up to the time of my leaving England six years ago.

489. There has been a good deal of talk as to the ventilation of this mine. Supposing the ventilation had been greater, that would have had a tendency to make the mine drier?—Yes.

490. And therefore there would have been a greater chance of a coal-dust explosion?—If the coal-dust were very much drier.

491. Therefore too much ventilation is as great a danger as too little?—Yes. In the case of a coal-dust explosion a large amount of ventilation increases the danger by supplying oxygen to the flame.

492. I suppose if naked lights in working-places were prohibited there would be no danger of coal-dust explosions?—There would be no danger of coal-dust explosions, even if the open lights were used, so long as there was no gas.

493. Having found that blow-out shot, do you consider it was a shot put in under proper management and efficient supervision?—From the tremendous grip it had of the coal I should say not.

494. Would you say that it was a shot put in under the direction of the manager or any of his underviewers or overmen?—I should not think so.

495. You would rather think that it was put in by some one who was inexperienced?—Yes.

496. There was no undercutting at all?—No. It was the practice at Home where we had very fiery mines to do the blasting under the direction of a fireman or deputy, and in no case did we allow the shot-holes to be charged until the deputy was present to decide whether the shot was in the proper position and could be fired with safety. In mines where open lights were used that was not done.

497. *Mr. Joyce.*] Do you not think that it has been absolutely necessary for some years past that we should have had such supervision?—We are gaining more information every year about coal-dust explosions, and the danger is now understood.

498. Well, you must admit that we learned a few years ago that coal-dust was explosive?—Yes.

499. I suppose you will also admit that a very small proportion of gas, so small in quantity that it might not be discovered by the Davy lamp, would assist such an explosion?—Yes.

500. On the whole, you think it is necessary to have a special man to fire the shots?—Yes.

501. Are coal-dust explosions very likely to happen in Australian mines?—Yes; as they are bituminous coal-mines.

502. Brunner is a bituminous coal-mine?—Yes.

503. Do you not think proper supervision as to the firing of shots was necessary in the Brunner Mine?—I think experience there has not shown that it was necessary, because every skilled miner is supposed to be able and competent to fire a shot.

504. But you might have one unskilled miner who will jeopardize the lives of six hundred people?—He might.

505. I suppose you will admit that if there had been five thousand men in that mine it would have been impossible for one to have got out alive after that explosion?—As the result in this case showed, practically it was.

506. Can you suggest any one respect in which that mine could have been made safe so that some of the men, at any rate, could have got out alive?—I very much question whether there was a man alive three minutes after the explosion.

507. Was it at all practicable to place that mine in such a position as to allow some of the men to escape from the explosion?—I think they were killed by the explosion, and could never have got out alive.

508. We will assume that some of them were killed by the after-damp?—No.

509. Do you know the Coolgardie workings? Would a drive up there have been any good?—I do not see that it would. It is very possible that had there been communication with the Coolgardie workings the explosion might have gone up there to.

510. You say the coking is all around the blown-out shot-hole?—Not around the hole but in front of it; in the line which the flame would take.

511. Did you mark the line of the blown-out shot?—Yes.

512. And you also marked the floor where you assumed it struck?—That is the direction of the line [indicated on the plan].

513. There was no dent in the floor, was there?—When the survey was made so many people had been tramping about that all marks on the floor were destroyed.

514. Do you not think a blown-out shot would produce some kind of dent in the floor?—Not necessarily. The dust is so loose it would be carried on, and possibly deposited by the back-lash.

515. But if it produced concussion on the floor surely it would leave a mark there?—It might not have done so. It was an explosion extending over a considerable area, and so much so that there might not be any such special mark observable.

516. I take it that it did leave some mark?—It showed evidences on the props.

517. But it is coked very heavily quite close to the hole?—Yes; and you will find some slack coal on the low side of the bord.

518. Is not that rather against the theory of a coal-dust explosion?—Not all, because there would be a tremendous rush of flame here, and the intense heat would develop an immense amount of hydrogen gas This would be burnt, and we had evidence that it had burnt.

519. Yes; but where the blown-out shot was, would it not distil enough gas to char the coal?—It produces a temperature of 4,000°, and I think that is ample to distil it.

520. At any rate, it is ample to create fire?—Quite.

521. Then, all your evidence as to the coal-dust explosion comes to the fact that from 60 to 80 yards from the scene of the explosion there was the greatest heat?—The greatest force, not necessarily the greatest heat. I found evidences of great heat in several places, but there the conditions were favourable to it.

522. There was nothing like this heat in other portions of the mine?—Not to the same extent as in the blown-out shot bord.

523. Did you examine this lower slit [indicated on the plan] ?—Yes.

524. Can you say from the appearance of that slit which way the explosion went?—We understood that it had gone down, and then had made a back-lash and come up.

525. Were there any indications of that being the case?—One indication seemed to lead to another. If you examined carefully you could see indications both ways.

526. Would you state the indications?—The indications were interlaced one with the other, and it was only by very close examination that you could see them. The first evidences indeed seemed very contradictory.

527. Did you see any other portions of the mine where the flame went down the split and back again; where it came up and shot down?—No. I will read you some other evidence on that point. Mr. Blackett's Summary says (see Appendix, p. 9, of Mr. Hayes's Authorities), "Possibly the shape of the road, the temperature, and the pressure of the air may also be important factors. His explanations of the many-observed differences in dust explosions is that the in-rush of the air after the first out-rush produces secondary effects that hide the indications of the directions of the primary explosion." That is what I consider took place there.

528. Do you think that there would be a back-lash up this split [indicated on plan] ?—Most decidedly.

529. Would it not rush down and come round the bottom bords?—[Witness explained the direction the force appeared to have taken from the plan.]

530. If that were the case you should have the force showing in this direction [indicated on plan]?—There is the rebound to be considered. The position is that the back-rush was nearly as severe as the inward-rush, and that something of the sort has occurred is to my mind quite plain, on account of the tremendous amount of soot.

531. There is a heavier deposit of soot in that place [indicated] than in any other portion of the mine?—Yes; and it is also heavy here [indicated].

532. You say that at the time of the explosion the force split and went upwards and downwards?—To some extent; but I consider that the greatest force is shown here [indicated on plan].

533. So that the explosion took three different directions?—I think that it took two in its initial stage. [Indicated on plan].

534. If there had been some gas in the bord near the fall [indicated], do you think that it would have assisted the explosion?—Supposing that there had been a large amount of gas there, the only effect it would have would be that it would fill the vacuum caused by this explosion. Then, of course, it would reach the vacuum and intensify the explosion at this point [indicated].

535. Did you examine Worthley's bord?—I did.

536. There is some conflicting evidence there, is there not?—What I noticed particularly was that the force of the explosion entered at No. 3 incline; it did not travel through it, for the simple reason that there was practically no through thoroughfare. I saw Worthley's bord before I saw the blown-out shot, and I had some thought that it might have started at Worthley's. When I had finished the whole of the dip I went back to that bord and examined it very carefully, and the opinion I formed after the second and third examinations was that the flame or force went into it and practically spent itself near the end. I found evidence of charred or coked dust near the mouth, and I only found evidence of heat at the top end. The heat had caused the resin to exude from the props a little. It certainly had been a clean fire along there, not a dust-fire.

537. What do you mean by a clean fire?—Simply clean heat.

538. Mr. Lindop's evidence was to the effect that Worthley's face showed two lines of force?—It shows a certain amount of force having gone into the split and having gone back again.

539. That was the place that gave you some trouble at first?—Just at first. I went and satisfied myself on the whole point.

540. And were you satisfied that there was no cause there?—I was satisfied that there was nothing in that portion of the mine to produce an explosion.

541. Regarding the coal-dust fallen near the blown-out shot hole, perhaps that has come from the roof?—It may have done. There is a bit of roof-coal in it.

542. The shot-hole would be in 4ft. under ordinary circumstances?—Probably 3ft., or a little more.

543. Assuming the hole was 4ft. deep, there is 1ft. 11in. depth of coal gone away somewhere?—Yes.

544. That would be a considerable amount?—Perhaps as much as is lying there, but we have no direct evidence as to the depth of that shot-hole. It would probably be 3ft. 6in. or 4ft. 6in.

545. Can you account for the dust which has not been burnt, and also the pieces of timber lying unburnt?—Yes, because the heat at the bottom would not be so great as at the top.

546. Apparently there has been no fire at the bottom because the timbers show no signs of charring?—When we were examining this place in the first instance we were struck by the springyness of the dust under our feet. It was like treading on a lot of exploded coal-dust.

547. That would come from the roof?—No; it was from the heat, which had caused a sufficient quantity of bituminous matter to be partially discharged from the coal on the floor, and had rendered it explosive.

548. Do you not think the coal would be coked, and that the piece of timber would be burnt?—Not necessarily.

549. You think there would be sufficient heat to coke the coal on the floor without showing any signs on the timber?—The Brunner coal is so rich in gas that a comparatively small heat is sufficient to make it explosive.

550. You have been through the return-air course?—Yes.

551. Do you think it is a good one?—I have seen worse in larger collieries.

552. I think you have already said that you think a man might find his way through it?—I should have no difficulty in doing so in an ordinary state of things. I might say I went through it after the explosion: I entered from the top end of the west side workings and got out all right. It did not take me very long either.

553. Did you notice coal-dust on the prop near the slit in the blown-out bord?—Yes.

554. On which side of the prop was it—was it on the side nearest the blown-out shot?—On the side nearest the shot.

555. That would look as if the shot had gone down the slit?—The prop I am speaking of is the one in that bord just at the top of the slit [indicated].

556. If there had been a back-lash do you not think there would be some coal-dust on the other side of the prop?—In many instances we found the back-lash severe, and sometimes we found quite an excessive quantity of dust, and very fine soot on the other side.

557. Was that the case with this prop?—I could not be certain without my notes.

558. You have never had any personal experience of coal-dust explosions before?—Not in New Zealand.

559. Attended with loss of life I mean?—Yes, eight years ago in England.

560. Was that caused by gas?—In the first instance probably it was caused by gas distilled from coal, owing to some coal getting on fire. I suppose it was carried on and augmented by coal-dust. It was very disastrous.

561. *Sir J. Hector.*] How many lives were lost?—The only men in at the time were the men actually engaged in trying to extinguish the fire. The men at work had run away when the coal got on fire. About thirty were in the mine at the time of the explosion, and they were all killed.

562. *Mr. Joyce.*] You cannot say for certain that that blown-out shot-hole in the Brunner Mine is a new one or an old one?—I cannot say.

563. Might it not have been put in nine months ago?—It might. The effect of the powder was to hide any evidences of newness, and, in the same way any evidences of oldness. The only thing I saw that looked new was a small hole on the underside, cut to take the drilling-machine.

564. That was charred?—It was charred all round.

565. Assuming that the hole had been put in some time ago, and the cause of the explosion was not a blown-out shot, would you say it was caused by anything else?—You mean from the evidences I saw there?

566. Yes?—Indeed, I could not.

567. You could not reconcile the facts, according to the evidence you saw, with any other theory?—No, for the simple reason that the indications were so connected that it was impossible for any gas to have lodged there.

568. Assuming that the initial point of the explosion was in a bord lower down, then the force of the explosion went up that bord and struck the bord on the high side?—If it had done that it would have shown some evidence before it came there.

569. Are there no evidences lower down?—Nothing so severe as that.

570. Assuming you had a blown-out shot lower down, and that it had travelled a distance of 60 or 70 yards, what evidence would you look for then?—I should have looked for evidence lower down, but we did not find any.

571. Was the condition of the bord the same at the time you went through—just the same as it was before the explosion?—Yes.

572. Was this the only bord filled with water?—The low bords had been filled with water, and I could not get into them. I got to the water's edge in every case I possibly could.

573. Did you see the overcast which is below the mid-level?—Do you mean the undercast?

574. Yes?—I went across it.

575. Do you think it is well constructed?—It was constructed in the ordinary way.

576. Do you think it was sufficiently strong and good?—In the ordinary course it was.

577. I mean the overcast in the back incline near the dam?—The undercast here [indicated on plan] was not destroyed at all. The overcast was; the planking was blown out.

578. Did you see any stoppings there [indicated] over which the air went?—I could not remember. I remember there was a new stopping across some of these slips, because when I went to get into the return-air course I went along this level [indicated] and over new stoppings which had been put in rather than make a hole. We travelled a considerable distance to get into the return-airway. I saw no overcast there.

579. Is not this overcast marked on the plan?—There is not an overcast there.

580. You see where the dam is, just opposite to the sump-hole, that is the one I am speaking of. There is an overcast near the dam?—There is an undercast.

581. You say you use brick-stoppings in your mine?—Yes.

582. How do you construct them?—Ordinary brickwork.

583. What thickness?—It depends upon where they are placed. We generally use 9in. work.
584. It would be very hard to blow them out?—Not in case of a great explosion.
585. Do you not think you could make stoppings that would stop the force of an explosion?—You might; but what would you gain by it?
586. You would keep your air coming in the one direction?—You might; but at the same time you would intensify the trouble in the main intake.
587. Did you also see evidence in the mine that where the roadways were wet the force of the explosion expended itself to a great extent?—To this extent: that the explosion did not go to the mouth of the mine. It did not seem to have come over to the top of the dip. The upper portion of the dip was wet.
588. If the lower portion had been wet, do you consider it would have spent itself there?—That was dry.
589. I am assuming that it was wet. Do you not think in that case there would have been any danger?—Not if the whole place were soaked.
590. Do you think if it were sprinkled with water or salt it would be any safeguard?—Sprinkling would not have minimised the force of the explosion very much, if any.
591. You mean you do not wet coal-dust right through by sprinkling?—You would have to wet the stuff right through to be any real benefit.
592. How do you account for so much coal-dust being in this particular part of the mine?—There is always a certain amount of waste going on in a mine.
593. Do you think there would be more coal-dust there than in other portions of the mine?—There would be quite as much as anywhere else. In all working-places where there was a certain amount of dryness there would be dry dust.
594. Sufficient to produce an explosion?—Yes, if the conditions were favourable.
595. What are they?—One condition would be the dust being raised by some powerful agent.
596. It must be very dry and fine?—Not exactly fine.
597. Is not that one of the essentials?—Not absolutely; for a flame from an ounce of powder will project forward 23½ft.
598. You could not find any evidence of fine coal-dust when you went down the mine?—It was in various degrees of fineness.
599. Some of it was thoroughly fine and explosive I presume?—Some of it. We found very fine dust on the props.
600. You say there was no fire going up to the top of the dip?—I do not think the fire came up to the top.
601. You know where the dam is? I understand there was an aperture there 6ft. wide and 1ft. 6in. in height. I have been requested to ask you whether you consider that aperture of sufficient size to insure the safety of life?—I take it that that aperture would not be recognised as the ordinary way to the return. It would be simply for drainage into the dam.
602. Assuming it was an ordinary way to the return, do you consider it would be sufficient?—I would not make it as a provision for escape; I do not think any manager would.
603. You do not consider it was a proper provision to make?—Not if you assume that it was the sole one.
604. Assuming it was the sole one, do you consider it was a sufficient aperture?—Not if it were only 1ft. 6in. high. Of course, it is possible for a man to get in.
605. You know the return-airway?—Yes.
606. Do you know that portion known as the "stone drive," before you come to the upcast?—I do not know the local names. I was through a portion which was driven in stone.
607. Do you consider that sufficiently large?—I found no difficulty in getting through it.
608. Do you think it is sufficiently large to take the air out?—It was doing so when I was there.
609. There is no question as to the air being blocked up in that stone drive?—There was enough air to ventilate the pit thoroughly.
610. How many men could receive the air?—I did not measure the quantity, but I should think probably 16,000 or 17,000 cubic feet of air was passing through per minute, and that, of course, would provide enough air for 140 men.
611. You did not measure it?—I simply estimated it at that.
612. How much coal do you think would have been distilled by the blow out?—It is a difficult matter to estimate it. We have evidence of the force having disturbed everything. There may have been two or three tons; but I could not form a correct idea.
613. Was the lowest coal, lying near the bottom, anywhere charred?—Not in the immediate neighbourhood of the shot and a little distance from it.
614. If the coal came from the roof, do you think it would have been charred, assuming that the explosion caused it to fall from the roof?—If it fell from the roof it would have been charred. I did not handle all of the coal—that is to say, I paid more attention to the sides. There was a certain amount of coal fell.
615. Then the coal was not charred?—No; since the accident that portion of the mine had been tramped over.
616. I understand you to mean that before you got down a great many people had been over it?—It had been trampled down by people going along.
617. In your evidence you stated that at one place you found gas: where was it?—In the old sump-level. It was just in the top of the lamp.
618. Was there any large quantity of gas from the falls?—Not what I consider a large quantity. We only got it in our lamps near the roof, after the explosion, in that one place over the fall.

619. Assuming that there was a certain amount of coal-dust in the mine, would not the coal-dust accelerate the gas-explosion?—Yes, had there been a gas-explosion.

620. Assuming that there was a gas-explosion accelerated by coal-dust, would not you have carbonic oxide as a resultant gas?—You might have had.

621. With reference to after-damp, that contains a large proportion of nitrogen, do you know if the lamps will burn in it?—If the after-damp is pretty strong they will not burn.

622. If it is strong enough to seriously hamper a man's movements and check his breathing will his light still burn?—No light will burn; it will die out quickly.

623. The light will last much longer than the man?—I do not know. The general evidence in the case of firedamp explosions is that men want to go to sleep, and the lamp dies out. In the case of carbonic oxide, there are many cases in which the man has been dead and his lamp has burned itself out by consuming all its oil. It rather increases its flame. I have never heard of a case where an explosion has been one of firedamp purely and simply.

624. Assuming that it was firedamp that caused the explosion in the Brunner Mine, would you still think that the carbonc oxide is the resultant gas of coal-dust?—Yes; but still the question of firedamp is purely a supposition. In one case you have evidence of the dust explosion, and in another case you have only a supposition of firedamp. In the Whitehaven Colliery explosion (1882) coal-dust could have played no part; it was one of gas and air. A large volume of explosive mixture, which was known to exist, being probably ignited by a defective safety-lamp; its effects, so far as violence was concerned, were confined to the immediate vicinity of the explosive mixture. The violence or force of the explosion was less than in any other of the five. The flame had not extended 50 yards from where the explosive mixture had been before ignition. The workmen in the field of the explosion had all been under some alarm before the explosion, and after it had moved about 100 yards one of them escaped alive. Their bodies exhibited no signs of the severe burning and blacking common after explosions in dusty pits. The part of the mine in which the explosion occurred was wet—that is to say, it was a wet pit.

625. The bodies in the Brunner Mine were intensely black, were they not?—That showed coal-dust.

626. Under ordinary circumstances they would have been working in coal-dust, would they not?—In some cases the bodies did not exhibit any signs of coal-dust.

627. That may have been due to the place they were working in?—It is stated as a fact.

628. I do not think you can put it down as a theory that because a mine is black there has been no firedamp?—No; but where you have firedamp purely and simply you do not have that amount of black such as is found with a coal-dust explosion.

629. It has been stated that the majority of these men were killed by the force of the explosion. Can you explain why the mine was not more destroyed where these men were killed?—It was on account of its splendid roof. If it had been a roof such as we have in some of our Lancashire, Cumberland, and South Wales collieries there would have been falls extending probably over hundreds of acres.

630. How is it the props did not come down?—They were tightly wedged in.

631. As a matter of fact, very few props were broken?—A few only.

632. How do you account for so few being broken?—They were wedged tight. That would be one thing in their favour. They did not offer much resistance to the force.

633. But a man does not offer much resistance?—He is not tied top and bottom like a prop; he is a more flexible subject.

634. You say that a powder shot would produce 4,000° of heat?—Yes.

635. And the air in a colliery like the Brunner would be heated about 4,000°?—This intense heat might be carried 2 or 3 yards; of course, it would continue to get weaker.

636. Would the whole area of a bord for 2 to 3 yards be heated to that extent?—I do not say the whole area, but a portion of it would in the line the shot was travelling; then the heat would diffuse.

637. For how long would that portion be heated to the extent of 4,000°?—Not a great length of time; it would take a sufficient time to generate a sufficient amount of gas which would then be immediately consumed by the flame from the shot itself.

638. Do you really believe that the amount of gas generated has produced the amount of charring?—To a great extent.

639. Do you not think that having that gas produced there would then cause it to rush along and continue to produce gas as it went?—It would produce gas from the coal-dust.

640. Supposing that you had that gas, then you must have had more flame, and it is a wonder that the roof and sides do not show a greater amount of charring?—You must bear in mind that you found evidences of flame in many places, and then the flame in many instances would be particularly severe, and it wants sufficient explosive matter to carry it on. We have evidences of that when we were travelling round the mine, where the explosion has picked up the coal-dust and has been forced on with renewed vigour.

641. Your ordinary gas would produce enough heat by expansion, would it not?—You must expand or consume it to start combustion.

642. Would not the same amount of expansion come off the drive as from the place where the blown-out shot was?—Not necessarily.

643. Well, probably?—If you take a large body of gas and drive it forward in compression it presses the explosion into the drive, and the air in front of it which has been driven at a greater speed will generate a lot of heat. In the same way mechanically the air compresses; that accumulated air will be carrying with it a certain amount of coal-dust which it picks up by coming into contact with the sides. The heat becomes so great as to distil the hydrogen gas from the coal. The explosive force is after this gas comes back from the concussion, and when it expands again it is infinitely more explosive than before.

644. If that be the correct theory, would not you get more signs of the explosion in the slit than around this blown-out shot-hole?—Not necessarily, because I think the slit would be a feeder in a measure—that is to say, there would be a temporary vacuum caused, and the air would rush up the slit and fill the vacuum.

645. This theory is borne out by the evidence of the soot deposited there, which you might say is practically so much lampblack.

646. Therefore on the right of the slit, immediately above, you should have the greatest evidence of intense fire?—Yes.

647. If coal-gas had been generated when the explosion rushed out into the slit, would it not have got mixed with a greater amount of air?—Yes; but at the junction with the bord itself it has got more air and room for expansion, and naturally it would expand itself near the roof.

648. Yes; but it does not have much air till it gets to the slit?—A certain amount of air would come from No. 3.

649. You think you would not have the same signs of combustion at the slit as you had at the burst-out hole?—I do not see why you should have it any more there than nearer the hole; it was round about the hole the heaviest signs occurred and the severest heat arose.

650. Do you not think it would be as great?—I do not think so, because the resultant gases from powder is given by most eminent authorities as containing 50 per cent. of combustible matter. That in itself is a powerful agent.

651. You saw intense charring in other places in the mine?—In one or two places.

652. What would that be produced by?—I think in these places I saw the greatest evidence that the explosive force had been travelling in two directions and had met.

653. Assuming there was only one current of air going in one direction, can you account for one portion of the mine being more intensely charred than the other?—I do not quite understand your question.

654. Would there be a greater accumulation of coal-dust, which would produce a greater amount of charring in that place than in another?—Naturally that place would show a greater amount of charring.

655. *Sir J. Hector.*] Did you observe whether the tramway in No. 4 bord could be used or not?—I noticed the rails were very close to the side.

656. We had it in evidence that a tub could not have passed along there, showing that the tramway could not be used.

657. Is it your opinion that the tramway could have been used?—I do not think it had been used.

658. Would there be any advantage gained in working a mine like the Brunner to have a forced ventilation, as well as another ventilation, so as to send a volume of fresh air to the bottom of the mine?—There would be nothing gained by that.

659. The Coalpit Heath Mine, I think, is now standing full of water, and delivering over into the river. That mine is separated from the Brunner dip-workings by a line of fault. Do you know anything of that line of fault?—The only trace I have seen of it is in the drive here [indicated].

660. So far as we know, the dip-workings are 300ft. below the level of the water in the Coalpit Heath, and there is therefore that head of water in the Coalpit Heath at present. Is not that a menace to the Brunner Mine?—I do not think so. The fault would act as a natural barrier, and so long as that barrier is left intact I do not see any danger.

661. If the barrier were down, would it not be possible for water to leak along the line of fault into the workings of the Brunner Mine when the coal there is removed?—Possibly a little might, but, speaking generally, I should not say there is much danger about it.

662. *Mr. Proud.*] As regards the appearance of that shot-hole, do you think it was there six months ago?—I should not think so. I only saw it by the light of the lamp, and it seemed to me to be comparatively new, as far as my memory serves me.

663. The Brunner Mine being a damp mine, would not that be against the theory of a coal-dust explosion?—Yes, if it were considered a damp mine.

664. Supposing the air had been split here [indicated], and one portion had been carried around these workings [indicated], and taken by another return a considerable distance up here [indicated], would not that have been the means of most of the men being saved in case they had not been beaten by the force of the explosion?—It would certainly have been better practice, but I should say it would depend upon circumstances, because we have the concussion in the air raising up a cloud of coal-dust, and the flame would follow it up the split.

665. Supposing you had a return on this side [indicated]?—If there had been another incline run parallel to the main intake it might have been better; but as to whether it would conduce to greater safety or not I would not express an opinion.

666. But the force of the explosion might have been spent before it got to the return?—Yes; there would be a further outlet to a certain point.

667. *Mr. Skellon.*] How much coal do you think was blown off near the blown-out shot-hole?—As far as we could judge, it might have been about 16in. I could not tell how much had come off.

668. You say the return-airway was adequate for the purposes of egress. Supposing any person went into the Brunner Mine, could he find his way out by the return without a light?—I think I could if the same amount of air was travelling as at the time I went through it.

669. Could an ordinary miner find his way out? At the time of the accident a man would be excited; do you think he would find his way out then without a light?—I do not know; some men of course are more cool than others.

670. Whereabouts did you estimate there were 16,000ft. of air passing—through the return?—From the general evidences I saw in the main intake and main return. I did not measure it; I simply estimated it at about that amount.

671. Then it was not in the return that you estimated it?—I took it from what I noticed both coming into the intake and into the return.

672. Do not experts say it is preferable for a return to be larger than an intake? Does not the air that comes in expand into a greater volume with the heat from lights, shots, and other causes? —It expands, but as it expands it loses its density. It is my own practice to make the down-shafts larger than the returns.

673. Do not the ribs weather when they are exposed to the air for some time?—Yes.

674. Would not the explosion bring down a quantity of the weathered coal?—That was not the experience at the Lancashire explosion.

675. With regard to the charring about that hole, you say the blast went down the stenton and returned again. That being the case, would not it get greater force and be more liable to hold the flame and to char at that particular place—the set-off where the blown-out shot-hole was?—There was a great deal of charring along the rib-side from the force of the blast itself and the flame projected by the blast. That is where I referred to the pillar as being coked for an inch thick.

676. Do you not suppose it struck at this point [indicated] with greater force, and was held in the angle of the set-off which caused the extra charring?—[Witness explained the angle and direction of the shot, and the direction of the rebound.]

677. *Mr. Park.*] Supposing there were two outlets, as suggested, would they have made any difference in an accident of this nature?—I do not think so.

678. Would not the after-damp have killed the men in both outlets if the men had been running out just the same as it would in the one?—So long as the stoppings were blown out the course of the fresh air would simply be along the intake and into the return, and out at the nearest possible point. Then, at the first blown-out stopping it came to it would rush in and rush out again, leaving the roof liable to be filled by the process of combustion or expansion. Therefore all the men in that bord would be subjected to it, and they could not get fresh air until they came round here [indicated]. The last explosion I had to deal with occurred about a mile from the shaft, but sufficient stoppings were blown out near the shaft's bottom to disarrange the ventilation, and, in consequence, all the rest of that mile was after-damp.

679. *Mr. Beare.*] Have you read of the Blackwell and Albion explosions?—Yes.

680. Do you agree with the conclusions come to in the report?—Yes, quite.

681. I think you have authority for stating that the mere watering is not sufficient to prevent coal-dust explosions?—Simply damping is not.

682. It requires a variety of conditions and circumstances to produce a coal-dust explosion?—Yes.

683. And a small quantity of coal-dust is just as dangerous as a very large quantity of coal-dust?—Some of the explosions in non-fiery mines at Home prove that.

684. On the same basis, the small quantity of coal-dust raised by a shot is just as dangerous and likely to produce an explosion as a large accumulation of dust?—Yes.

685. *Mr. Joyce.*] Where was the place you found gas in the mine?—I said in the extreme end of the old sump-level, at some disused place. There was very little.

The Commission adjourned at ten minutes past 4 o'clock p.m.

John Hayes, mine-engineer, Gladstone, Invercargill.

YOUR evidence and plan shows part of shot-hole blown away, and yet you describe seeing a little hole for fixing drilling-machine. How do you reconcile this?

Reply collect. JAMES HECTOR, Wellington.

Sir James Hector, F.R.S., Wellington.

HOLES for fixing drilling-machine are in the coal wall at side of working-place, practically at right angles to shot-holes, and altogether unaffected by a blast. They are to be seen all over the mine.

JOHN HAYES, Invercargill.

TUESDAY, 12TH MAY, 1896.

ROBERT RUSSELL examined.

1. *Mr. Park.*] You are a hotelkeeper residing at Brunnerton and was formerly a miner?—Yes.

2. You know there was an explosion in the Brunner Mine, and you were appointed by the miners to make an examination of that mine after the explosion?—Yes, by the miners after the accident. I made an examination, in conjunction with Messrs. Robinson, Ward, and Daw.

3. Will you tell us what you did?—We travelled all the working-places as far as we could get.

4. Where did you first find signs of the disaster?—As soon as we came to the dip. We found things displaced, and when we got lower down we found the trucks blown up and the rope all twisted. We went down to the sump-level until we were stopped by water. We found that a strong blast had gone up the dip in the direction of this arrow [indicated on plan]. We came back and went into what was called the third place from the sump-level, and we went straight through that place, passed Nos. 1 and 2 into the third incline, and into the bord below. We kept going down the slits or inclines until we came to water. We were looking for indications of force to see where it came from. We found indications of force coming up from further down than we could get. We also noticed the same indications in Hunter and Denniston's bord. We found very strong indications of a blast going up somewhere in this slit [indicated]. We found about 3in. of coke-dust, as if it had been knocked up against the face. That was in the lowest bord we travelled. We had to go back up the next slit into No. 3 incline, and when we came to this bord [indicated] we found a little indication of gas on the top of a fall. We tested it with a Davy lamp.

5. *Sir J. Hector.*] Was that in the extreme corner of the workings?—No; the lowest line we reached, and the furthest in on the south-east corner.

6. What indications did you see there?—The rise side of the last bord we travelled was severely charred. There had been a fire there pretty strong.

7. All along?—No; where the fall is in the next bord (Geogehan's bord), close to the fall.

8. *Mr. Park.*] Did you go along that bord?—We went along that bord to the slit outside No. 3 incline, and back as far as the water would allow us to go. [Witness indicated on plan the direction in which he thought the blast had gone.] Near Hunter and Denniston's bord, on the rise or upper side of the pillar, we found severe indications of force. We also found charred coal about 3in. long on the side of the bord, as if it had been knocked with severe force against the side. We came back and found that the force had been very strong in No. 3 incline, as though the force had gone in a bit and had come out stronger.

9. That is to say, it had come both ways apparently?—Yes; just as if it had passed inwards and come back again stronger. This was in Hunter and Denniston's. The force appeared to have met nearer No. 3 incline. We then travelled these bords back towards the main incline. We went up the third incline from Hunter and Denniston's bord, and found that the force was still very great, going upwards. We had not examined up to that time Brislane and Roberts's bord, but on going into Brislane's place we found the force had gone in perhaps only 10 or 14 yards. There was very little indication of force in Brislane's bord. We went back to No. 4 bord, and towards the main incline. There was a large fall in No. 3 incline. We went straight up through No. 4 bord, and found, as soon as we got over this fall, very strong indications of a blast going in here [indicated], and lodging a lot of coked dust, &c., against this fall.

10. You found indications of the blast going inwards towards No. 3 incline?—Yes.

11. And the signs were lying on the fall?—Yes.

12. What were those signs?—They were the remains of burnt coal and coked coal, knocked up against the fall and props that were standing, and against the *débris*. We found also some brattice-cloth, with about two inches of coal sticking to it. The brattice-cloth was not burnt, but had been knocked into a little corner beside some stones. It may have been the remains of a stopping across here [indicated], and the fall would stop it going through. I could not say positively.

13. What else did you see?—We travelled back this bord [indicated], the sides of which are slightly charred, and going into this place, where it appears a bit wider, there are signs of the blast having gone on and struck No. 3 bord. From there we travelled to No. 4 bord, and found the blown-out shot.

14. Did you find anything else?—We found that the bord was severely burnt; the coal was charred for about 3 yards inside and 6 yards outside, in towards No. 3.

15. In which way did the force appear to go from there?—From there there was a slight indication of charring on the low side of the bord, opposite the blown-out hole, and it might be 4 or 5 yards from this slit [indicated]. The coal was slightly charred along the side of the bord.

16. Did the force appear to have travelled down the slit or up the slit?—Up the slit; there is a prop outside the slit and just in the bord. In my opinion, the force either came across the incline on the low side and recoiled back or else it must have come up the slit. I am inclined to think that it came up the slit.

17. Then it may have come two ways, outwards and possibly inwards?—The blast did come upwards, and both ways from the slit opposite the blown-out hole. The prop shows the charring coming upwards.

18. Do you think that the force might also have gone down the slit?—I could not find any indications. There are little pieces of coal on each side of that slit sticking out occasionally. It is not a straight wall; there is a corner sticking out showing stuff knocked up against it, and there is none showing going down, although there is soot, showing that the blast showed some force, looking down the slit. There is a lot of soot; there was a little bit sticking out like this [indicated]. There would be coked coal-dust sticking on one side, and on the opposite side there would be soot.

19. What were the indications when you got to the silt below?—In the lowest part we examined all the indications I found were coming from lower than ever I had been. They were similar to the indications I have just been speaking about, but there were little bits of coal the blast had blown up against the roof and the wall side.

20. Was there anything at all on the upper side?—There was soot on the opposite side coming down, and I also found that there was a return blast striking here [indicated], leaving a deposit of coke and coal-dust, and then a little further on there would be soot.

21. Do you know why the soot was deposited on the upper side?—I could not form an opinion, unless it was the result of flame having struck with some force on both sides.

22. Have you any idea where the flame came from that entered that slit opposite the blow-out? You say the blast went up the slit from No. 1 bord, through No. 2, and into No. 3 bord; then it split itself and went out towards the main incline, and in towards the face?—Yes.

23. Can you say where the force commenced?—It commenced further down the dip than ever I was.

24. Could it have travelled round from the end of the face towards this slit—I mean the one opposite the blown-out shot? Could it have come from the opposite side?—According to the indications, I do not know. It could not have come down or come from the slit where the blown-out shot is, because I take it it would have left some indications before it went up this face.

25. Were any props knocked down?—I found them knocked upwards.

26. Did you find any on the ground in No. 4 bord?—There was some coal lying there, and a little piece of timber. The coal was charred, as if the rise of the flame had been to the roof. They do not take the bords straight in. It appears to me as if this coal had been burning a considerable time, and had fallen down as it burnt. You walked crisply about on it as if it was half ashes and half coal.

27. Did you find the same indications in other bords?—Not of the same sort. This particular bord is more severely and peculiarly burnt than any other place. It showed indications of intense heat.

28. So the heat had been stronger there than in any other place?—It appeared to be the most burnt place.

29. I think one witness yesterday said he felt as though they were walking over ice?—It was very crisp walking. I consider that was from the coal sticking to the roof, burning a considerable time, and then dropping down to the floor.

30. Besides that coal, what else did you find there?—We found bits of timber and bits of fuse. There was a length of it.

31. Were did you first pick it up, and what did you do with it?—I picked up a part, and I think Robinson took another part.

32. What was the size of the piece you picked up?—It may have been 12in. long.

33. Have you got the piece?—I have not got it with me.

34. What was the appearance of the fuse like?—Just like ordinary fuse that had been used.

35. Did it look like "run" fuse?—Fuse that had been fired. It was cut up occasionally in places.

36. Can you give any idea of its age?—I would not like to express an opinion on that.

37. Do you think it had been trodden on where you found it first? Were you the first to pass through that bord?—We were, I believe.

38. Had any of the rescue-party been in there?—Not so far as I am aware. They would not travel that bord unless it was absolutely necessary.

39. Not to get into Brislane and Roberts's bord?—No.

40. Did you find a tramway?—Yes; the tramway was laid in close to where the shot was.

41. Have you seen the plan of that that has been produced?—No. [Exhibit No. 10, plan of blown-out shot-bord, shown to witness, who identified the shot-hole.] The tram was leading to the blown-out shot. The coal is perpendicular. The coal is really on top, and the tram would not be likely to get past the blown-out shot-hole in the condition the coal is in.

42. Why not get past?—On account of this corner sticking out in the bord.

43. *The Chairman.*] That is to say, the projecting coal would not allow the truck to pass?—No. [The fuse handed in by Mr. Bishop was here shown to witness, who said it might have been part of the same fuse that he had found himself. The part he had found was something similar. He found it lying on the floor.]

44. *Sir J. Hector.*] Was it lying on the crisp floor?—Where the fuse was it was not quite so crisp as nearer the shot.

45. *Mr. Park.*] Then the greatest heat was close to the shot-hole?—Yes.

46. And it got less and less as it got further away?—Yes, until it came to the stentons, where it disappeared altogether—the coking disappeared altogether. There is a slight bit in a line with the blown-out shot. The worst piece is 3 yards in and 6 yards out on the wall of coal.

47. Might not that have been accounted for by the fact that the blast ran in only on this side [indicated], and missed the dust, &c., in the low side?—There is very little coking in here [indicated].

48. I mean the dust which would be sheltered from the blast by the physical features of the bord?—Yes.

49. You say also that the coking was found very severe directly opposite the hole?—Not severe, but it was coked a bit more than it was in the other direction.

50. Did you see that prop lying there?—Yes.

51. It is close to the line of the shot; it is directly in the line of the shot. Did you find any indications on the prop which is lying down apparently? Was it standing when you saw it?—The prop lying down I did not examine. The prop standing up I did.

52. The reason I ask you is because one witness says there are signs of severe charring on the end of that prop, and apparently the blast has blown into the wood?—I did not see it, but it may have been there.

53. In what direction did the blast go by the indications on that prop?—The prop is standing just outside the slit, and the blast seems to have struck it on the opposite way to the line of the blown-out shot.

54. Supposing that prop was in its right position, what do you say then?—If that prop is in the right position at the top of the slit it showed as if the blast had sprung from here [indicated].

55. Did you see any stones near there that may have been hurled against the lower corner and rebounded back against the prop?—The stones are lying there, and the blast could not possibly have struck and rebounded to that prop, because the indications are in the opposite direction to what the shot was.

56. Practically, you mean to say it is very hard to tell in what direction the blast went in this bord?—It is very conflicting to know which way it went.

57. The indications being apparently in all directions?—Yes. I think the force went as the arrows show on the plan; but I could not say for certain which way the blast went.

58. In what direction did you go from where we have been talking about?—We continued up towards the main incline, following the direction of the blast and air going up Nos. 1 and 2 and the back incline. In No. 2 the appearances were the strongest. I did not get down to the lowest part of the mine. We got round the bord and as near as we could get to the bottom. [Witness indicated the way he went, the lowest place he reached, and the direction of the air-current.]

59. What other parts of the mine did you examine?—In Moore's place there are very strong indications of the blast going in and out. It seemed to be as strong coming out as it went in. In Worthley's place we found some peculiar indications. There had been a big fall in the third

incline. Crossing up and going to Worthley's there had been a piece of a pillar taken out, making a cavity, where there had been a fall. It is a very different fire. It had been very strong to anything we had seen before.

60. Is that in the bord?—Yes, near the face.

61. Will you just tell us about that particular fire?—After we went in a few yards from the third incline the force seemed to have died out, although there must have been very severe fire and flame. There were lots of this coked stuff.

62. Would that be accounted for by the fact that the blast could not get any further in, and simply took what it could get to feed on?—I do not think so, because the same thing would apply in Brislane's bord. It went in very strong there, but there was the same amount of fire as there was in Worthley's bord; and the same thing would apply to the flame not getting any further.

63. Supposing the conditions were the same?—Yes.

64. Well, what about the appearance of the flame—was it a different kind of fire?—Yes.

65. Have you any idea of where that fire came from?—I could not say.

66. You cannot say what generated it?—Not unless it was the fall I have referred to. There may have been gas on the top of the fall. My opinion at the time was that it must have allowed some gas to come through to account for the different kind of fire.

67. What you say is that in Worthley's bord there was a different kind of fire, and you think that that different kind of fire would have been caused by gas from the fall?—Yes.

68. And I suppose that the flame travelling up there would have ignited the gas?—Yes.

69. Please proceed with your description.—Of course, the fire must have been stationary for a time to burn the props; the place has been full of flame. The same indications were in Scott and James's bord; the fire had gone in, but not strong.

70. Do you remember going into McMinn and Peillon's place? — Yes; there was a fall there, and we found a small indication of gas on the top of this fall, but very little fire. We came out into Watchman and Pattinson's, and we found very conflicting indications in that place.

71. You mean that you could not very well tell the direction of the force?—It appeared to have gone two ways.

72. Where did you go then?—We came in at the face of Pattinson's bord; there were more indications of fire along the face of it; there was a slit upward to the bord above it, where there is a fall. There is a little gas there.

73. Did you find gas above all the falls?—No; it was above a fall of stone in Pattinson's bord. The appearances were as if the force of the blast had come down the silt; and a prop on the top side and near this fall showed very strong indications of the blast going upwards, because the coal and stuff had been knocked against it.

74. Where did you go to next?—After leaving Watchman's we came back out of the main dip, and up the intake airway.

75. Before you came away did you find any indication of gas, or of any rush of water from the solid?—No.

76. From the fault? You know that there is a fault running up here [indicated] ?—It was reported to us on the second day of our going in that some one had found a big blower.

77. *The Chairman.*] Did you verify it?—We went to see the place where this blower was supposed to have been found very strongly. We found something making a noise somewhere about there.

78. *Mr. Park.*] Near that fall?—Just above Watchman and Pattinson's place. We could find no gas coming out of this supposed blower, although we could hear something making a noise. It might have been gas, or it might have been a mixture of air and water. On putting Davy lamps to this place we could not find any indication of gas in the blower.

79. Did you find any indication of a fault about there?—I did not see any fault.

80. You say the noise was as if it came from gas and water. Did you look for water?—Yes; we could not see anything, but we heard the noise.

81. You left that side of the incline then?—We left those workings, and went up the next bord. We came out of the intake, and went up the main dip to the next workings—that is, the old workings. We travelled all through them, but did not find much indication of a blast. It seemed as if it had blown a lot of stuff in from the dip a certain distance. We found little falls, and there was some indication of charring or slight fire.

82. You agree with the other witnesses in this respect: that in this particular part of the old workings there were indications of burning or fire?—Very little.

83. Did you examine these old workings carefully?—Yes.

84. In what direction was the blast when you saw any?—It struck it here [indicated]. There were very slight indications; we saw some charring there.

85. Could you tell in what direction it was travelling?—I could only tell where it struck. [Witness indicated on plan.]

86. That is what you call the middle level?—The mid-sump level.

87. Where did you go then?—To the top of the level, to the old workings.

88. Nobody had been near those?—No.

89. Near the tension-wheels?—Yes; in the tension-wheel bord we found a bit of gas at the face. We found it about 2ft. in at the face on the right side, and we found it getting less until we got 4 yards back. A little over 4 yards back you could not tell it. It was 2ft. from the face, tailing back to nothing at 4 yards. We also found slight indications as if in coming in the blast had come in here [indicated], but there were no indications of force. It looked as if it had gone through No. 2 bord and come up the slit. It also appeared to have blown the stoppings in. It appeared to come from the main dip near the tension-wheels, to have travelled along the middle bord, and the lower bord, and to have gone up the incline. It had then struck something which

had forced it back, because it showed indications coming upwards, and those indications are stronger coming back than the blast shows going in.

90. There is clear evidence of a back-lash, do you not think?—Yes.

91. And there is slight charring on the props, but no fire?—Yes.

92. Then, apparently there has been no flame entering; but you think you found a little gas at the face. Could that be ignited?—There had been enough flame going in to ignite this gas.

93. But not to show any trace?—It did not leave any.

94. Where did you go next?—We travelled into the dip, came back and finished. We went around the top workings at the cabin and tension-wheel. We examined the bottom level on the west side. We found that a very strong blast had gone in the lowest level. We found trucks knocked away.

95. Did the blast appear to get less and less as it travelled westward?—Yes, westward and upward.

96. Practically, I suppose, there were no signs of it as it got west?—No.

97. Did you examine the mid-level?—Yes. We also went up the back dip to the dam, and the whole indications were that the blast had come in from the east side of the dip, and had blown the stoppings out. These were partly replaced since the explosion in order to allow us to get in, and for the purpose of keeping up the ventilation. At the dam we found a very small place to conduct the air through.

98. That is where you found a place 6ft. by 1½ft.?—Yes; it is not an overcast, it is simply a dam.

99. What is the size of that dam?—I did not measure. I measured the size of the place the air went through.

100. How did you get through this air-return?—The air has to go over the top of the dam, and the dam is to stop the water coming down, and to make it easier to pump.

101. How does the air cross the dam?—The water is pumped back within 2ft. of the top, and the air has only this 2ft. to go over.

102. Is there no other way that you can get through, or the air?—So far as I know it is the only way.

103. Are there not two dams?—Yes.

104. Is not there the same opening in both? Did you examine both?—Yes; but I did not notice any air about that one at all.

105. There were two dams, and the same opening over both?—There are two dams, but I did not take much notice of the second one.

106. Did you go through that 18in. place?—No; there was water on the other side.

107. Which way did you come?—We came back, and up the main dip, and round the pillar into the next level.

108. Then you went along the crib-level, following the air-return?—Yes.

109. To an undercast? Which way did you go?—We went in right along to the end of No. 10 incline—right into the old workings along the mid-level to No. 10 rise—going occasionally through the slits, and into this back level.

110. Did you find anything particular there?—That is all we saw.

111. You found the blast getting weaker and weaker as you approached the old workings?—Yes.

112. Did you examine anything further?—All the old workings, falls and goafs. We found the indication near the goaf very slight, and inside this level [indicated] there was no force apparently.

113. You know some of the dead bodies were found there?—Yes.

114. Did you travel back from the air-course, or what did you do?—We started from the inside, and went up the other places as far as we could get into the old workings. The indications were not strong there until we came back to No. 6.

115. The force has practically followed the return-airway?—In some parts, and in some parts it had not. It is very difficult to know where the air-current is in some parts there.

116. *Mr. Proud.*] Was it very feeble?—Yes, on the top of this incline it was very feeble.

117. *Mr. Park.*] Did you go up No. 5 incline?—Yes; there is more fire shown up No. 5 incline than in any other part of that side.

118. Did you see any signs of the force meeting there?—There was coal in that corner as if it had driven it into the grain of the props.

119. In what direction had it travelled?—Up No. 5 incline, and right to the top. There were also signs of some very severe firing in Nos. 1, 2, and 3 bords. We were going to go back from the face of one of these bords to the return, when one of the roadmen said they did not travel this way as it was not fit to travel. He told us that we had better take another one. We came back to the level, went under the undercast, and into the return.

120. Can you say whether the force had worked from the main dip to the westward in most cases?—All the way up it had. We went up through most of the workings until we came to behind the dynamo. We found there a very strong force had blown the bricks away.

121. Did you notice any indication of fire going into the main dip from the west side?—None at all.

122. And you say that at the dynamo the force seemed to have expended itself?—Yes.

123. Was the dynamo about the last indication shown of the force?—Yes; we found solid lumps of brickwork stuck together 20 yards or 30 yards away from the dynamo. Outside of that there was very little indication.

124. What was the size of the brickwork you saw?—About 1 yard square and one brick in thickness.

125. How much would that be?—4½in.

126. Of course, you understand the return-airway?—Yes.

127. Had you to crawl in any particular place, or was there sufficient room for you to get through?—I do not think I had to crawl. Some places are rather small, and you had to pull yourself together a bit in getting through.

128. Anyhow, you can manage to get along?—Yes.

129. Any coal-miner could get through very easily?—Yes.

The Chairman: It depends on the size of the coal-miner.

131. *Mr. Park.*] The current of air in this return is strong most of the way, with the exception of about a chain, where you found it a little weak?—Yes, in the return it is strong; but there was no difficulty in finding which way the air was going.

132. Is there a strong current of air down through the faces of the east workings?—The air is not bad down there.

133. And the only place you think the return is a little weak is in the west workings, near Nos. 5 and 6 inclines?—Yes.

134. You know something about stoppings. What do you think of the stoppings in this mine?—They are mostly brattice-cloth.

135. From the main dip are they mostly brattice-cloth?—I could not say, because the brattice is further on, inside of that. Where the stopping had been blown away and not replaced it was brattice. Regarding the main dip, I could not say.

136. Do you think that brattice-cloth would have been sufficient for stoppings for the bords near the main dip?—Perfectly sufficient if looked after. The bords do not go from the main dip.

137. What do you call those places [indicated on plan]?—Stentons or slits.

138. You know that they used crib-logging?—There was very little left; it was all blown away.

139. And brattice-cloth would have been blown away all the same?—Oh, yes.

140. No ordinary stoppings would have resisted the force of that blast?—I do not think so.

141. How long is it since you worked in a mine?—About seven years.

142. Have you worked in the Brunner?—I have worked in them all.

143. What experience had you as a miner or deputy? Were you ever a deputy in any mine?—I was deputy in the Wallsend.

144. What was the coal brought down with in the Wallsend Mine?—As a rule with gunpowder.

145. And was it a different mine to the Brunner?—It gave out a little more gas.

146. And still you used gunpowder for blasting?—Yes; we did try gelanite.

147. What do you say about the Brunner Mine? Was it safe or unsafe?—I should say it was a very safe mine.

148. Was it worked fairly well?—I think so.

149. *Mr. Guinness.*] Could you tell by your examination of the blown-out shot-hole whether that shot had been recently discharged?—No; how could you? It is all charred so that there are no indications left. I would not swear that somebody had not done some work at that shot after it was fired.

150. From the indications, you say that it is impossible to say whether it was a recently discharged shot or not?—Yes.

151. You noticed stronger indications of the force going up from the lower workings than going down?—Yes, decidedly.

152. Can you give any opinion as to whether that would be caused by a rebound, assuming that there was a blast at this blown-out shot, and that it had expended itself until it came to the lower end of the workings? There was a slight quantity of gas found in the lower workings. Would not the explosion cause a greater rebound back, and then shoot down?—It would all depend upon the quantity of gas found there.

153. Would the theory I suggest to you be correct?—It might be correct if enough gas were found to cause the rebound.

154. It is seven years since you worked in the Brunner Mine?—Yes; I cannot say that I worked in the rise part of that mine. It is nine years since I worked in the Brunner.

155. Was there much gas found in the workings, or any?—Very little, and nothing of consequence.

156. You have not been in the mine since?—Not into the Brunner Mine until after the explosion.

157. Do you remember what days you went in?—I was in on the 4th of April and the three following days. One day we missed. We were in on the 4th, 5th, 7th and 8th of April.

158. *Mr. Beare.*] You were working in the Wallsend Mine some seven or eight years ago?—Yes.

159. That was a mine containing more gas than the Brunner?—Yes.

160. What sort of stoppings were used near the faces in the Wallsend Mine?—Similar to the Brunner—brattice-cloth.

161. As a miner of experience you can say that there was no mismanagement or any bad material in the Brunner Mine—that is, in regard to stoppings?—I am not in a position to say, because the brattice-cloth stoppings were all blown away.

162. Did you see the temporary bratticing? Was it not the same sort of brattice-cloth that was used in the Wallsend Mine, and which was considered sufficient, notwithstanding the Wallsend had more gas in it?—Yes.

163. As a practical miner, from your examination of the mine, you saw nothing to find great objection to as regards the management and materials used?—No.

164. And the return-airway, a miner could get through readily enough?—Yes; there was nothing to stop him, but it would be a bit complicated if there was no one to show him the way.

165. The ventilation you say was good?—Fair; with the exception of the two places I have mentioned.

166. *Mr. Joyce.*] Have you formed any opinions as to how the explosion occurred?—I am not a good theorist.

167. Do you believe the explosion occurred as the result of the blown-out shot?—There are strong indications of fire having been at the blown-out shot, but the indications below the shot would imply that the explosion was below that.

168. At the time of the explosion, could the mine have been worked lower down than the place you made your examination at?—I believe the water was in over the level of the coal before we went there.

169. Did you particularly notice that prop which was standing near the blown-out shot?—Yes.

170. Was there any indication there of the force of the blast?—Yes.

171. Did it look as if it came up the slit or had gone down?—It looked as if it went up the slit, and rebounded off this corner—half going up one slit and half up the other. My opinion is that the force was going up.

172. Did you make an examination of Hunter and Denniston's bord?—Yes.

173. Is there any sign of fire at the end of that bord, as if the fire had gone up?—Yes; there are very strong indications at the face.

174. In line with the bord?—In a line with the slit going up, as if it had come up the slit and struck against the high side.

175. What would that show you—that the explosion came from a level below the water or from the blown-out shot?—In my opinion it must have come from below the blown-out shot.

176. As a practical man, do you think it possible for the force to be exerted on the high side of that bord if it came from the blown-out shot?—No; I think it would have gone straight in from the lower joint.

177. You say you made your examination on the 4th April?—Yes.

178. Why did not you go down before the 4th April? Why did you leave it so long?—The management thought it was not safe for any one to go down until the air was better.

179. Had the water risen much?—The pumps were not working, and the water had risen over the working-level.

180. And prevented your inspecting the mine in the condition it was in before the explosion?—Yes.

181. Going up the slit to the blown-out shot, did you see a truck there?—Not in the slit, there is a truck on the inside of the incline.

182. Did you notice anything about that slip? Was the coal charred on the high side or the low side?—The low side—second incline.

183. Would that also lead you to the conclusion that the blast went up the incline?—Yes.

184. You know the fall marked in No. 3 bord—Hunter and Denniston's?—Yes.

185. Did you notice any charring along the bord?—It was very very severely charred.

186. Nearly as severe as where the blown-out shot was?—Not so severely, but the next bord to that had been charred in places.

187. Did you see where the force had expended itself in No. 2 incline?—Yes; it was the strongest in No. 2 incline into the mine.

188. Had it struck the wall?—Yes, very forcibly.

189. What direction did that show you that the blast had gone?—It showed that it had gone up No. 2 incline very strongly, and had struck on the top of this gallery, above Pattinson's bord.

190. Did that show it had come from the blown-out level or from the water-level?—It showed evidence, as far as I got down, that it was still coming up from the water-level.

191. Do you know whether there was water in the bottom level at the time of the explosion?—There must have been water, because it could not have risen up so far in the time. I was only there after the water was up.

192. Assuming the blast could go down and meet the water, do you think it would then rebound back again?—I should think it would not be so strong if there was water there.

193. If the coal-dust blast went down and struck the water, would it not have expended itself in the water?—If there had been water there there would have been a very small rebound, but it is not the case at present; all the indications are going up.

194. If the rebound was not as great as the force of the explosion and the explosion went down, you would see the greatest marks going down?—You would naturally think so.

195. Does the prop blown out near the blown-out shot show that it was blown up the slit or down?—I have not examined that prop. I must have missed it. I saw the prop lying down, but did not pay any attention to it, and do not know whether it was blown up the slit or not.

196. You saw some coal lying near the blown-out shot on the floor?—Yes.

197. That evidently was roof-coal?—I did not say that.

198. You do not know whether it came from a blown-out shot or the roof?—I do not think much of it came off the roof. Most of it was blown off the hole along with the tamping.

199. Can you account for the fact that the block of wood lying there was not burnt, neither was the coal, and still the roof was intensely charred?—The flame might have hung to the roof.

200. Do you believe the charring and coking on the floor fell from the roof, or was it caused by the high temperature on the floor?—I believe most of it came from the roof, on account of the roof-coal burning.

201. I thing Mr. Hayes is of opinion that it was caused by a floor-fire. Are you of that opinion?—My opinion is that it came from the roof.

202. *Sir J. Hector.*] Naturally, the stuff dropped as it burned?—Yes.

203. *Mr. Joyce.*] With regard to the piece of fuse that was picked up, could you tell whether that fuse was fired a week ago or twelve months ago?—I could not.

204. Do you think any one could?—I could not.
205. You have had some experience of fuses?—I could not tell you when that fuse was fired.
206. In your opinion, the indications in the slit coming up to the blown-out shot were not conflicting?—I am perfectly satisfied that a big force came up.
207. You said you examined Duncan and Worthley's "face?"—Yes.
208. Was there any indication of gas there?—There was indication of fire, but not coming up the incline.
209. What would you say produced that fire?—I should say that there was gas on the top of the fall, and it ignited.
210. Did you find gas only over a fall?—I found it as a rule over a fall.
211. Did you examine Brislane and Roberts's bord? Did you find any indication of gas?—No; gas was found in the lamps, although Brislane's bord was "singing."
212. You would have some gas there then?—You might have gas there, but we could find none in the lamp.
213. Could you smell it at all?—I did not smell it. The only indication I had in Brislane's bord was a singing noise.
214. I believe safety-lamps were being used in Brislane's bord?—I believe so, but I do not know.
215. We will assume that they were being used there. Do you think it safe for safety-lamps to be used in that bord, and naked lights in the next?—It would depend greatly on the conditions.
216. I suppose you know that gas does not become explosive until mixed with a certain quantity of air?—Yes.
217. If you have a blower, the blower will light and burn itself out. If it is mixing with air in a bord do you think it is safe to allow naked lights to be used?—If there was enough air travelling through the bord to make it non-inflammable, it would be safe. It is not safe with 1 to 3.
218. What did you think of the ventilation in Brislane's bord?—It was not bad; the brattice was right up.
219. That brattice had remained standing in the bord?—It had been put up since the explosion. I do not know what the conditions were before. If it had not been bratticed up to the face it would have been badly ventilated.
220. The next bord was Moore's?—Yes.
221. Did you find any gas there?—No.
222. You say that you have been a deputy in the Wallsend Mine for some time?—Yes.
223. And you have had a great deal of experience in blasting?—Yes.
224. Is a blown-out shot a very uncommon thing when the holing is properly done?—It is not an uncommon thing—not very rare.
225. Will it happen under circumstances in which the holing is properly done, and everything complied with for safety?—Sometimes it will.
226. Then a blown-out shot is a thing you cannot prevent?—No; some will happen when you least expect them. You may make a mistake in the tamping, and that would cause a shot to blow out.
227. Did you notice whether there had been any undercutting or holing where this blown-out shot was?—There had been a little bit scratched in the blown-out shot-bord.
228. The man who fired that shot did not know anything about preparing it?—He could not have known; it was not holed or put in properly.
229. Did you take the line of the shot?—Yes.
230. Could you swear whether it struck the other side of the floor or roof?—By putting a long stick in and drawing it back, it appeared to me that it was just about the same distance from the roof as from the bottom.
231. Then the shot would not strike the floor?—No; the lower side.
232. It would strike a couple of inches from the side of the floor on the other side?—By the time it got there, the bord would be full of flame; the flame strikes both the roof and floor.
233. You examined the mine on the 4th April, and succeeding days? In how many places did you find firedamp and gas?—We only found it on the top of the falls on the sump-side, and in the bord with the tension-wheel, and the old workings.
234. And the place at the tension-wheel would be properly ventilated?—There is no one working there.
235. Did you see the two dams that have been referred to?—Yes.
236. Do you think the aperture there is sufficient to allow enough air into the return-airway?—If they compressed the air enough, it would be.
237. Under ordinary circumstances, is that 6ft. by 1ft. a sufficiently wide aperture?—It was a bit small.
238. Could it have been made larger just as easily?—Yes; if the management thought it was too small they could have taken the little bit of trouble necessary to make it larger.
239. Do you know what condition the bodies found in No. 10 incline were in?—Some of them withered. I did not get to No. 10 incline.
240. Were those you saw killed by the force of the explosion, or what was the cause of death?—I should think, partly gas, and partly by the force of the blast. At the extreme end, I believe the after-damp killed them.
241. You were in the mine during the progress of the rescuing-work?—Yes.
242. What did you notice with regard to the after-gas that was knocking the men over?—I noticed that I could not stay long in it.
243. Was your lamp burning more brightly or was it dim?—I do not know that I had time to look much.
244. You were only putting up brattice below the dip, standing on a plank?—Yes.

245. You must have been there some time—say, twenty minutes?—Yes.

246. Was your lamp dim or burning brightly?—I could not say whether it was brighter or dimmer, and I had no idea what kind of gas it was.

247. *The Chairman.*] What were your symptoms at the time?—I seemed to get a bit heavy, and wanted to get down below my feet. One could feel that there was something the matter. You felt as if you would like to get back, and that if you stayed any longer your head would drop, and your legs also would give out.

248. *Sir J. Hector.*] Did you feel sleepy?—Not exactly sleepy, but my legs were weak, and would not carry me.

249. Were you carrying a lamp at the time?—Yes; I never lost my light.

250. Did you ever in stepping forward allow your lamp to go near the ground?—When we were at work some one else was holding the lamp so that we could see, and he never had the same test as the man who was nailing the brattice up, as the gas was all on top. If you had been close to the ground where the lamp was you could have lived as long as you liked. I think it was poisonous gas.

251. *Mr. Joyce.*] Have you had any experience of the stoppings in mines?—Yes.

252. Do you think stoppings could be made that would have resisted the force of that explosion in the Brunner Mine?—The ordinary crib-stoppings are the best, but not a single-brick stopping.

253. As a deputy, you know whether a fireman generally makes his entry in a book?—Yes.

254. What was the practice in the Wallsend Mine? When you went round the mine, did you make the entry in the book afterwards, or did you wait until evening?—I would not make my report until I came out in the evening.

255. Therefore, there would be no entry in the books of the fireman or deputy of the Brunner Mine until they came out in the evening?—Not necessarily. When we came out of the shift for other purposes we would make a report, but we would not come out for that purpose.

256. What is the idea of carrying a book around in the morning?—I never carried a book. If you had to make an inspection you would need a book to note some little things required to be done.

257. Do you think it is judicious to have a deputy making roads, bratticing, and timbering, in addition to his other duties?—It depends upon the number of men to be looked after. Supposing a deputy had only a small section of the mine under his care, he could very well put up the brattice and attend to the firing.

258. Take the deputy in the Brunner Mine, do you think it is right that he should have to do all that work?—It depends upon how much he has to do.

259. He has to take roads, put up timber, and look after the bratticing. Could he do that and look after the condition of the mine, as far as gas is concerned?—Oh, yes; if he has got too much too do he would send out and get somebody to help him.

260. In going round a mine inspecting for gas, do you consider it necessary to examine every working-place or only the working-faces?—I would make an examination of the working-faces.

262. Do you think it is advisable to examine every face?—It would be advisable to examine every face, most decidedly. It is the safest course.

263. Would it be necessary? We have evidence that an explosion, occurring in a mine like the Brunner, must kill every man in it?—It is absolutely necessary. Each face ought to be examined, and it ought to be examined every morning.

264. How long would it take gas to accumulate in sufficient quantity to cause an explosion? Would not half an hour do it sometimes?—Yes; it would do it in two minutes; but not, so far as I am aware, in the old workings.

265. If you examined every place and found indications of a blower in the morning, would not you take steps to prevent an accumulation?—Blowers did not generally happen in my experience in the old workings.

266. Would not a fall generate enough gas in half an hour to blow up a mine?—Yes.

267. In the old workings, that fall would not take place without your hearing it?—No.

268. *Sir J. Hector.*] You say that in front of the shot-hole the crispness on the floor arose from the fall of burnt coal from the roof?—Mostly.

269. Do you think in such a case the dust would have escaped being consumed?—Wherever dust was found the crispness was not so great.

270. Was there any crispness at that spot [indicated]?—Not much that distance away. The crispness begins nearer the shot.

271. Were there any timbers left in the bords below where the shot was fired?—Yes.

272. Did you examine them?—Yes.

273. What did they show?—They showed as if the force had gone in mostly.

274. You mean towards the face?—Yes.

275. How did you judge it?—By the coal knocked against the top of the bord by the blast.

276. Was there any singeing of the props?—The props were not singed, but just the accumulation of *débris*.

277. Did you observe any dust not scorched?—There was dust scorched along the line.

278. Not on the caps?—Sometimes you found dust on the caps.

279. In the lowest bord?—I could not say.

280. Did you see any dust on the caps?—There was dust on some caps.

281. How near the water did you see any dust on the caps?—I could not say what was the nearest place to the water that I found the dust on the caps. It was all charred stuff.

282. Was there heavy charring on the floor?—Very little.

283. Along the side?—Yes.

284. Was there any continuous charring through the bords?—None of the bords were charred all the way through, but just bits here and there.

285. There would be an abundance of air along the lowest level?—Yes.

286. If an accumulation of gas suddenly burst out there, how far would it go?—It would make for this point [indicated].

287. Would it be cleared out by the air?—If it were cleared out it would go back to the shaft, and the bord would be filled up with air.

288. Were there any great falls in the roof in which the gas could lodge, or would the gas naturally ascend the workings?—The gas would naturally ascend from the falls, and, if not checked, there would be a great accumulation.

289. If there was an accumulation, would that accumulation be found going upwards?—It would get into the return-airway.

290. If it was a large accumulation of gas, it must have been very sudden. Had you any reason to think there was any great cavity which would allow the gas to accumulate, when its natural tendency was to ascend to the roof, where it would meet the air and be sucked up?—I have no idea what it would do.

291. What was the obstacle which caused the severity of the blast at this place [indicated on plan]? You say it there met an obstacle which made the return-air current feeble?—The force went up very strongly until it met the old workings on the edge of the goaf, and there it practically died out. You could see further than you liked to go without a plan; you did not dare to enter far into it.

292. Is it possible there was any dust and gas along the edges of the goaf?—There was a certain amount of dust from the fall.

293. Damp or dry?—Dry.

294. In the goaf?—I should think as a rule the goafs are generally damp.

295. Did you find any sign of gas along here [indicated]?—I found no sign of gas, but there may have been some in the goaf, in the old workings.

296. Are there any very large falls in the goaf?—I never got into the goaf. As soon as you get to it you have to stop.

297. Did the return rise parallel with the dip? Was it much damaged?—No; there were falls in some places.

298. Props and brattice blown from the cross-ways?—They were probably there before the explosion. That part has not been worked for some time.

299. How far were these strong props in?—They were all blown from here [indicated].

300. Were they blown a yard away or farther up?—We did not find anything solid.

301. You had to climb over them?—No, they did not impede us; they were all scattered.

302. Do you not often find shot-holes left in a mine which had been bored and never fired?—In rare cases you might find a shot sometimes.

303. Supposing a deputy thought a shot had been improperly placed, and had refused to allow it to be fired, what would happen in such a case?—If it were a working-place he would make the man undercut it. It would be left, but would be fired afterwards.

304. I understand you to say that in so much solid coal there is not much chance of finding a blower?—Where you are going into fresh coal all the time any of the old workings and goaf will give off a few blowers. I have always found a big blower in the solid workings.

305. *Mr. Proud.*] You said you considered the return-airway was practicable?—Yes.

306. And that on one side the air-current is feeble?—Yes; I believe the whole of the return-air does not go over the dam; I think it went up in the centre, where it is 2ft. 3in. wide by 4ft. high.

307. You also considered the air sufficient in the other workings to clear away any gas?—On that side there was sufficient scour to clear it away, but there was no gas there.

308. Would you describe how you tested for gas?—We used the Davy lamp.

309. What did you see?—When we got to the top of these falls [indicated] you could very nearly get the gas up to the top of the lamp. We found these indications a little over 2ft. from the roof.

310. From your observations, do you think the force of the explosion came from the lower places?—Yes, it came upwards.

311. You did not see any props blown out?—There were props blown off in the back inclines and Nos. 1, 2, and 3 slits. They were all blown out. Nothing was blown down in the middle.

312. *Mr. Skellon.*] You say there are some falls in the return?—Yes.

313. Could you get over them?—Yes.

314. In case of an accident, could a man without a lamp find his way through?—I do not think he would. As an instance of that, I might say that when we were going through we had three arguments as to which was the direction.

315. Would any practical miner, intending to rob a pillar, put a shot in in the direction this one is indicated on the plan? Would it not cause a loud explosion, and bring the deputy round?—I could not say. I would not care about doing it. If I wanted to get a bit of easy coal I would go where I could break it off with a pick.

316. Was there any holing done for this shot?—Yes, the coal is undermined slightly.

317. You do not think any man would try to rob a pillar by putting a hole in there [indicated]?—I would not care about doing it.

318. Would any practical man do it?—He would be very foolish if he did.

319. You say that the indications pointed to the explosion having come up from below the water?—Yes.

320. If safety-lamps were being used in one bord, would it be safe to use naked lights in the next?—It depends upon the quantity of gas being given off.

321. If a little were given off, there might be a large quantity given off within a short time?—Yes; I should think that the deputy in charge, if he had the slightest idea that there was gas giving

off in proximity to where the naked lights were being used, would not allow the men to continue working in that place.

322. Can a deputy tell what is coming within the next hour?—He would by testing occasionally for it.

323. You say when you were deputy in the Wallsend Mine you did not make a report until you came out in the evening?—As a rule.

324. Are you aware that you were committing a breach of the Mining Act?—No. I was working there seven years ago under the old Act. I am referring to the old Act.

325. You have not read the Mining Act then?—I think so.

326. Did you, as deputy, fire all the shots in Wallsend?—I fired all the shots in Wallsend after that explosion.

327. Was all the air going around the sump-workings before the explosion?—I do not know.

328. What did you generally tamp the shots with?—We would not allow the man to tamp the shot until the deputy saw what he was going to tamp with, neither to cut the fuse until the deputy cut it for him.

329. *Mr. Proud.*] Do you think it wise to have a special man to fire the shots?—I think so.

330. *Mr. Park.*] What was the date of your appointment to go down the mine?—It must have been two days after the explosion; we were down on the 28th of March.

331. Could you tell whether the falls you saw in the return had occurred before or after the explosion?—Some had fallen since the explosion, and some in my opinion before. The difference between those fallen before and those that had fallen since was shown by the deposit of soot and bits of coal, while another fall was clean.

332. What good would it have done if there had been stronger stoppings in the main incline?—If the stoppings in the main incline were tighter than those which were there, it would have made no difference.

333. *Mr. Guinness.*] You have said in your evidence that the reason you did not go into the mine to examine the lower workings was because the management considered it unsafe?—Did I say management?

334. Yes?—The management told us that it was the inspectors' instructions that no one should go in until the air had been sent through to make it safe. I meant the inspectors, not the manager.

335. *Mr. Beare.*] It appears that your theory is that the greatest force rising up from the lowest levels indicated to you that it was a gas-explosion, and the natural tendency of gas being to rise, there must have been an immense accumulation of gas to produce an explosion?—Yes.

336. Then there must have been a very large accumulation of gas in the workings lower than you went down, if your theory is correct?—There must have been a good bit of gas below, and I gathered from the indications that that was the seat of the explosion.

337. That is to say, there must have been considerable accumulation of gas to produce the explosion and effects it did?—If there was gas there it may have accumulated more as it travelled along.

The Chairman: I did not understand Mr. Russell to give an opinion as to the origin of the explosion. He said it was either coal-dust or gas; he did not say it was gas.

339. *Mr. Beare.*] You say, in reply to a question, that no practical miner would put in that shot if he wished to strip the pillar. Supposing there had been a hole there, would a miner have taken advantage of it and risked the consequences?—I could not say. I think the miner was alone when he drilled that hole.

340. *Mr. Joyce.*] If a man wished to rob that pillar, would not he be able to find a more convenient place to do it than at the blown-out hole?—He would take the coal off the side of the slit.

HENRY ALDBOROUGH STRATFORD, Warden and S.M., Greymouth, examined.

341. *The Chairman.*] One of the items we have to inquire into under this Commission is to ascertain whether any inquiry into the cause of the disaster has taken place; and, if so, what was the nature of such inquiry? And how was the tribunal constituted? The second question, as to how the tribunal was constituted, is the one into which we have to examine you now. Kindly state what steps you took on hearing of the accident with a view to holding an inquiry?—On the evening of the 26th March I was at the mine and some bodies were brought up. Immediately some of the relatives, who were in very great distress, surrounded me and asked my permission to take the bodies to their homes. I ascertained that it was likely to be a very tedious work to get the bodies up, and I determined to hold the inquest over a few days, in order that I should have a sworn jury to view all the bodies. On my way back I gave instructions to Constable Beattie, who was the constable at Brunnerton, to prick off a list of about a dozen of the best men he could find. I warned him not to get any disqualified persons, explaining to him what that meant, but to put some miners on the list, so long as they were not disqualified. I explained to him what I meant by being disqualified—that they should have no interest in the mine whatever, and not have been recently employed, or likely to be employed again, by Mr. Bishop, and in order that they should have no interest in concealing anything on account of their being employed, or likely to be employed, at the mine. On the morning of the 27th March, at an early hour, I went back to Brunnerton, and the distress then was so great—so many women coming to me crying to be allowed to take the bodies to their homes—that I determined at once to summon the jury to view the bodies in order that they might then be sent to their relatives' homes at Brunnerton. I then proceeded with Constable Beattie to the Courthouse to see his list, and to take his opinion about the various names, numbering six, two of whom I believe were miners. After asking him some questions, I learned that both of these men in some way or another had some interest in the mine on account of having been employed there. I, therefore, would not put them on. I did put on the name of one

—Armstrong—because there was some little doubt about him, in order to keep as closely as possible to the intention of the Act—that, while none should be disqualified, at the same time there should be three miners if practicable; but they could not be found. With regard to other names, although I was aware that the Blackball miners were down, I knew it would never do to place any rescuers on the jury, but I felt myself to be in the position that it was impracticable to summon any miners—first of all, any of the Brunner miners; and, secondly, it would not do to put any rescuers on, as that would be resented immediately by the men going down the mine to work. I was also of opinion that it was absolutely necessary at once to view the bodies for the reason of the relatives being in such terrible distress; and, under the circumstances, I had to let go the last part of the paragraph of the section, which says that, if possible, there shall be three miners on the jury; and I examined six of the best men, according to Constable Beattie's opinion, who knew the people well, and including Armstrong, a miner. Of the six, he could not be found, and I had to have five summoned, and I selected a Mr. Ring, who had been standing at the mouth of the mine, and whose was the only face I recognised, and who I knew to be a well-educated man. The jury were then sworn by me, and a precept was filled up, and the names of twelve persons whose bodies were lying waiting to be viewed were written on the precept. It was then filled in, signed by me, and the jury were summoned. They were all present, and were all summoned by the constable. We proceeded then to view the twelve bodies, and I at once gave permission to the relatives to take them away. We followed them to the houses—a few being there, and some at the mouth of the mine.

342. Is it not usual for the Coroner to issue his precept to the peace-officer, and to leave the peace-officer to select the jury?—I think it is usual; but this is an unusual case.

343. But it is lawful?—I think so, for the Coroner himself to select the jury. That is the way I proceed to work. I instructed the constable to summon six persons out of the twelve names he recommended, and he did so, the men themselves being present. He acted on the precept, there and then.

THOMAS ROBINSON examined.

344. *Mr. Park.*] What is your occupation, Mr. Robinson?—Aërated-water manufacturer, Taylorville.

345. What experience have you had as a miner?—About twenty years—seven to nine years in the colony; four years at Brunner.

346. What mines did you work in here?—Brunner and Coalpit Heath.

347. Which did you work in last?—Brunner, up to five years prior to the explosion.

348. You were one of the four appointed by the Miners' Union to make an inspection of the Brunner Mine after the explosion?—Yes.

349. You have heard Mr. Russell's evidence this morning?—Yes.

350. Do you corroborate what he says?—Yes; fairly well.

351. Will you tell tell us in what way you differ from him?—One was, when the question was put to him respecting mixed lights being used, that the men were using safety-lamps in one bore and naked lights in the next. I wish to qualify that a little. I understood Mr. Russell to leave the impression on the Commision that where the lamps were used there was gas showing from the solid face. In the place mentioned—Brislane's bord—the face was not progressing into the solid. They were taking back the pillar in the upper side, and were not likely to come into any such quantity of gas as they would have if driving into the solid. There was no danger in using naked lights below.

352. *The Chairman.*] Practically you corroborate Mr. Russell's evidence, although you give a different reason for using naked lights below Brislane's bord?—Yes.

353. *Mr. Park.*] They were stripping the pillar in Brislane's bord?—Yes. Had they been cutting into the solid I should have thought the naked lights below would have been dangerous. Brislane's bord was using safeties, and Hunter's naked lights.

354. If that were the case, you say there was little or no danger in using naked lights in Hunter's bord?—If they were not driving into the solid they were not likely to cut into any blowers.

355. What was the next point of difference?—In regard to Watchman and Pattinson's place. In the bord above Watchman's place, at the far end, there was a quantity of gas found, which I think Mr. Russell omitted in his statement.

356. Was that over the fall?—On the top of the fall. I think the Commission is not clear on that point yet, and probably I am myself a little bit hazy. Opposite this slit [indicated] is where the blower was found on top on the fall. The fall was heavy there and the gas was in the roof near the top of the fall. This fall continues, but is not heavy all along.

357. There is another slit near the face?—Yes; and any gas coming out of that blower would not be likely to get down; it would go up.

358. You mean any gas coming from that blower would not reach Worthley and Duncan's bord, or Denniston and Hunter's, as there is an air-course coming down outside?—I do not know where it would reach; it would go with the air-course.

359. But its liability to an explosion would be less if mixed with air. The more you diffuse gas, the less liability there is of an explosion?—Yes; if there is a good quantity of air.

360. Is not there a very strong current coming down that air-course?—Yes; and it was impossible for the gas to remain there in the morning.

361. You heard Mr. Russell say that he examined that blower. Do you agree with him that there was no gas there?—I agree with him. I do not know whether there was gas in it or not.

362. Could you not tell from any test whether there was any gas?—Yes; the blower seemed to be 2ft. or 3ft. in the crevice, nearer an overhanging rock, which rendered it impossible for us to test it. There may have been gas, but we could not tell.

363. What is the next point of difference?—I think these are the only points we differ on.

364. The men having been at work for more than an hour before the explosion took place, what deduction would you make from that?—The deduction I would make is that the working-faces were sufficiently safe, or the men would not have been allowed to go to work.

365. Having been allowed to go to work, and having been there for an hour, would not you suppose that the place had been examined, and found free from gas?—I should say the only point likely to be doubtful was in Brislane's bord, where the safety-lamps were found.

366. *Mr. Joyce.*] Did you find gas in any other place than Mr. Russell gives?—No, I do not think we did. There were two places mentioned—the bord above Watchman's on top of the fall, and No. 1 sump-level.

367. In the bord above Watchman's, was there a large or small amount found? Do you think from the fall there would be sufficient to produce an explosion under ordinary circumstances if mixed with air?—I could not tell.

368. Have you formed any theory as to what was the cause of this explosion?—No.

369. Would you say it was coal-dust or gas?—I could not say.

370. Do you think the explosion occurred from a blown-out shot?—I am not inclined that way.

371. Well, you do not believe it did?—No, I do not.

372. I think the next slit showed evidence of the force having gone up?—Yes.

373. Did you notice anything in Hunter's and Denniston's bord?—Just similar to what Mr. Russell has spoken about. There were indications of some considerable force having been exerted upwards, and having come up the slit.

374. We have had some evidence about a rebound. Do you know whether there was any water at the bottom of the dip?—I could not say, as we never got into the bottom level.

375. You do not know whether, during the last year or two, there has been water down in the bottom incline?—They have always been troubled with water in the main dip.

376. Assuming that there was water at the bottom, and the force of the explosion came down, do you think the resistance would have been as great as if it had struck the solid wall, or do you think the force of the explosion would expend itself in the water?—It is reasonable to think that there would be no such rebound from water as against a solid wall of coal; but I do not know.

377. Were you in with the rescuing-party?—Yes.

378. Did you notice how the lamps burned?—In our crowd they burned fairly well.

379. Was the light intensified or decreased from the gas?—I do not think I noticed; I never had to use the pricker to prick up the lamp.

380. Have you ever seen an explosion before, or been connected with one?—Not of any consequence.

381. When you were working in the Brunner Mine, some years ago, did you find gas pretty regularly there?—I found it on one occasion, which was stated in the inquiry.

382. Did you get singed yourself?—Yes, but to no great extent.

383. Where did the gas come from—a "blower"?—It may have been from the cutting.

384. Was that in the dip-workings or the "rise"?—The "rise" workings, right inside from the main drive.

385. In what is called the old workings now?—Yes.

386. Did you ever see gas in the mine at any other time? Did you ever notice it by the flare of the lamp?—We have had a flare in the lamp.

387. On account of the gas?—Yes.

388. Was it the custom to work at that time with naked lights?—Yes.

389. So far as you know, from your experience, the custom in the Brunner Mine has been to use safety lamps where there was gas?—Yes, when I was there.

390. You have never seen safeties used without there was gas?—Wherever there was the least idea she was making a little gas.

391. Unless she was making gas you would not use the safeties?—I could not say anything about that.

392. You do not know whether the fact of safeties being found in Brislane's bord was an indication that the gas was making?—I have no proof of it.

393. Do you think the deputy of the mine should be required to lay roads and cut timber in addition to his ordinary duties?—They do so in the Home country where I was, the same as they do at Brunner.

394. What was the practice when you were there? In bratticing, did they brattice right to the face, or how far away did they bring the air?—They bratticed by boards where necessary.

395. You say you have sufficient ventilation at the face. Do they brattice up to the face, or how many feet away do they keep the brattice?—It depends upon the condition of the face. If the air was very slack, they would keep the brattice out. If it was a leading place, and there was the least indication of gas being there, they would keep the bratticing close up to the face. They took all proper precautions at the time I was working in the mine.

396. What was the ventilation like at the time you were there?—Fairly good.

397. As good as you would find in most mines?—Yes.

398. Do you think the return-air shaft was sufficiently good?—Mostly, but in places it was narrow.

399. In other places, what did you find?—I think it was rather restricted.

400. Do you think it was sufficient to take out the air which was coming down the main intake?—I believe that it is possible to force sufficient air through a very small pipe.

401. Do you think it would be better for the mine to have a return-air course of larger dimensions in case of an explosion?—I do not think the air-course would help; had it been twenty times larger it could not have saved any lives.

402. Do you think if the air had been split at the top at the time of the explosion the men would have had any better chance of saving their lives?—I understand that it was split at half-way to the bottom.

403. Can you suggest any way in which the mine could have been made more safe?—Not under the circumstances.

404. *Mr. Proud.*] Where do you think the force of the explosion went generally?—Some of it, I believe, came up the main dip, and especially the main discharge from the explosion.

405. Where do you think the seat of the explosion was?—It is very difficult to form an opinion, for the reason that there were parts of the lower workings that it was not possible for us to examine owing to the water, and while the lower levels remain covered with water it is impossible to come to a conclusion. That is the matter to be regretted in connection with the examination of the mine.

406. *Mr. Skellon.*] Were there any indications of any gas having been alight at the time of the explosion?—My experience was that wherever there was any of it that it would light.

407. Could you point out any place where you think the gas had been alight?—In the top sump-workings; there is a level there, and when we examined it there were indications that there had been gas burnt in the place. There were indications on the props further back that gas had been alight. The indications were going outwards, while there were no indications of damp in the main drive of the flame having entered that part.

408. Do you think the men would be ordered to use safety-lamps in one place only when there was an indication of gas?—I do not think so.

409. *Mr. Park.*] Did the slit at the blown-out shot show any force both ways?—I would not like to say that any force had gone down, but it may have. The strongest signs of force are upwards in all those slits and inclines.

410. Did you notice any sign of a back-lash or recoil of the force?—That I cannot say.

411. You would not say there had been none?—No.

412. How do you account for the gas having been ignited in the upper-sump workings, and to there being no signs of flame going in?—The flame that may have gone in with the blast is not sufficient to show that it lit any gas that may have been in the old workings you refer to.

413. Do you think that the same occurrence took place at the bord above Watchman's as took place in No 1 sump?—I think it is likely.

JAMES BISHOP examined.

414. *Mr. Beare.*] You are a coal-mine manager of large experience?—I am mining manager of the Greymouth and Point Elizabeth Coal Company.

415. How long have you held that position?—In connection with this new company only a short time. I have been manager of the Brunner Mine for thirteen years. I have had twenty-five years' experience altogether as a coal-mine manager here and at Home; thirteen years of that time is colonial experience.

416. Will you tell the Commissioners, as far as you can, what the condition of the mine was the last time you saw it before the explosion?—So far as I saw the mine on the 18th and 20th March (that is the dip section of the mine) everything was in usual working order.

417. What number of men were employed in the mine?—Sixty-five.

418. Can you locate them on the plan?—Twenty were in the sump side, twenty-six were employed in the west side, and some on the main-haulage road. I produce a plan showing the position of the bodies when discovered.

419. When did you make your last inspection of the mine as manager?—I made a complete examination of the lower workings on the 18th, and on the 20th a partial examination, and had a conference with the underground manager regarding certain alterations he proposed to make.

420. Could you tell the Commissioners briefly what was the method of your examination?—It was to go round every working-face, and travel the edges of the goafs. These are all pillar workings [indicated] going up to the edge of the goaf. There we examined for gas going into the falls, and examined everywhere all along the edge of the goaf. We also took notice of "bad roof," brattice, stoppings, and so on.

421. And your examination was checked again by that of the Inspector of Mines?—Yes; it was subject to his periodical inspection.

422. Do you remember the last time the Government Inspector inspected the mine?—Yes, I remember his last visit; I think in January.

423. Were you present?—I do not know whether I was present in the dip section on that occasion. I do not think I was.

424. Has the Government Inspector, during his inspection, complained to you in any way about the management of the mine? Has he suggested any improvements?—Oh, yes, at times.

425. Any alteration in the management of the mine?—No alteration in the method of working. He has only suggested certain things which we have always systematically carried out.

426. No material alterations were suggested or made?—No.

427. I suppose the ventilation of the mine was the same just prior to the accident as it was when the Government inspection took place in January?—Yes.

428. And the system of haulage also?—It was the same system of general working as when the Government Inspector inspected in January.

429. Did you, as manager, make any change in your directions or management of affairs during that interval?—No.

430. Did Mr. Cochrane give you any directions or orders after the January inspection?—None at all.

431. Everything at that time must be taken as satisfactory, as far as the Inspector's report was concerned?—I think so.

432. When was the last occasion you were in the mine before the explosion?—20th March.
433. Which part of the mine was examined on the 20th?—That portion of the workings where the explosion took place.
434. Will you describe the examination you made on that day?—I had an object in view for making a special examination—for the purpose of making some changes. In view of the speedy extinction of these pillars [indicated]; it was necessary to examine these workings very carefully—the old workings above the air-course.
435. Did you find any gas that day, or were you searching for gas?—We were searching for gas in these old workings, and the only trace we found was in the far end of the level in the upper sump.
436. On the 18th, did you make an examination of the spot where the "blower" was supposed to have been found?—Yes.
437. You had been past the spot?—That was the travelling-road to these lower workings.
438. Can you give any explanation of that "blower"?—There was no "blower" there—that is to say, the gas could not have come from a recent "blower."
439. *Sir J. Hector.*] You mean more recently than your visit?—It might have given off after the disaster, and certainly after my visit.
440. *Mr. Beare.*] You say the Act was complied with, and all the regulations, and that the mine was in thoroughly good working-order prior to the accident?—The Act, general rules, and special rules were complied with, and all the workings were in good order.
441. I believe you have special rules for working under in the Brunner Mine?—Yes.
442. *Sir J. Hector.*] Are they special rules under the Act?—Yes; they are all posted up at the mine. We have no special rules for the mine other than the special rules under the Act.
Mr. Beare: But outside the Act, some of the mines, I think, provide rules themselves as between the men and the employers.
444. *The Chairman.*] Were there any such rules at the Brunner?—No.
445. *Mr. Beare.*] When you were making your inspection, did you make notes in any books?—Yes.
446. Can you produce any books?—There is a report written up weekly, and I also made notes of examinations in my own pocketbook, and then I wrote up my report.
447. You produce your report-books, Mr. Bishop?—Yes. [Books produced.]
448. Were the special rules kept at the mouth of the mine?—Yes; posted at the mouth.
449. Do you put in your report of your inspection of the mine?—Yes; I put in five books of reports for the last twelve months. [Exhibit No. 11.]
450. These books contain the reports of your visits on the 18th and 20th March?—Yes.
451. Will you describe briefly to the Commission the system of management by underviewer, overmen, deputies, and firemen at the time of the accident?—We have a manager, one underviewer, two firemen, a man to attend to the brattice and roads (a deputy), two night-shift men, who went on at night, and did any work that could not be done in the day.
452. And roadsmen?—One had been a fireman. There were five officers in all connected with the carrying on of the mine work.
453. The whole of the officers were under your own personal supervision?—Yes.
454. Supposing you were called away from the mine, what was your practice?—The underground viewer was left in sole charge for the time being by writing.
455. I think we might as well put in at this stage copies of the letters you wrote when leaving the mine in charge of the underviewer?—If it were necessary for me to leave the mine I was compelled to give that authority in writing to the man in charge of the dip—namely, John Roberts. This is a copy of my letter on the 4th March, 1896:—

"Brunner Mine, 4th March, 1896.

"Dear Sir,—You are hereby placed in full charge of the underground-workings of the dip district of above mine during my absence, and in all matters affecting the carrying on of the work you are requested to give the safety of the men your first consideration. Such places as are showing inferior coal to be worked only when compelled to do so for safety and efficiency.

"I am, &c.,

"Mr. John Roberts." "James Bishop.

That is the general form of authority.
456. Coming to the mine itself, will you tell the Commissioners what sort of a mine it was?—It was a mine that we sometimes had to meet gas in our workings, but in such case we never had any great trouble. Our ventilation was always sufficient to clear it away, and the general instructions regarding it were that no more work was to be put in unless that gas could be removed by ventilation. Safety-lamps were occasionally used, but only as an extra precaution.
457. Who supplied the safety-lamps?—The mine.
458. Who had charge of the lamps?—The firemen.
459. Can you say what sort of a mine it was as to the quality of the coal?—It is highly bituminous coal that used to be very famed for gas-producing.
460. Can you say if the mine was a "dry and dusty," or "fiery" mine?—I have never looked upon it as a "dry and dusty" mine, and not as a "fiery" mine.
461. You consider the mine one which was favourable to work in the manner in which it was worked?—Yes.
462. Coming down to the disaster, will you give the Commissioners the history of that as far as you know?—The mine was to start work at 8 o'clock in the morning, and the mine-men entered in the regular course at a quarter to 8. I visited the mine a short time afterwards, and saw the work start outside. I left the pit-bank for the purpose of entering the mine after writing some instructions to the clerk, when I was called by the engineer, who said that smoke was coming from the tunnel, and that there was a fire in the mine. I rushed to the tunnel mouth

and saw smoke issuing from it. I examined the fan and found it all right, and, I think, ordered it to be driven faster—at full speed—and in about one minute the ventilation seemed to take its proper course. I then entered the mine, and was overcome after going some 4 or 5 chains into the main tunnel. This was at half-past 9 in the morning. I was of course carried out, and was not able to get to the mine again until next day.

463. Was any one with you when you first entered the mine?—The engine-driver, Mr. Smith, entered the mine with me.

464. Will you state what happened when you got to the mine next day?—I entered the mine on the afternoon of the 27th, and made a search in this portion [indicated, the east dip], for the purpose of finding those who were still undiscovered—the east side of the mine—and I think the first body we found was that of Worthley, just at the lower side of his own place.

465. We have a plan here which we might put in, showing the position of the bodies—where they were found [plan put in—Exhibit 12]. You might say whether everything was done, in your opinion, for the rescuing of the men by the rescuing-party?—I think everything was done by these people who had charge of the work. [Witness indicated on plan the places where the bodies were found.] The whole of the bodies had been taken out by the Saturday evening, with the exception of one, hidden by a fall in No. 5w incline—namely, that of Kent. We continued searching for him from the Saturday until the Sunday morning, and then we left off as the people were exhausted. We resumed on the Monday morning early, and discovered his body about 10 o'clock.

466. What was the next action taken by you?—It was found necessary to take steps to bring stoppings up to these stentons, which had only been temporarily stopped with brattice-cloth, in order to obtain proper ventilation. We put in board-stoppings instead of brattice-cloth.

467. What stoppings had you put in previously?—Crib-logging filled with dirt.

468. Is that the best class of stopping you would have in the mine?—That is the best kind available where the bottom ground is constantly lifting.

469. What else did you do?—We continued searching the whole of the ground as soon as we got these temporary stoppings in order to endeavour to discover the cause of the disaster.

470. Who was with you?—Dunn and other officers of the mine; there were several experts going through at the same time, and also the four men who were appointed by the miners themselves.

471. When did you make the first examination of this mine after the rescue of the bodies?—We went down, but to make a thorough search was not possible.

472. Was there anything done or altered in the mine when you went in after the bodies rescued previously to the experts going in?—No.

473. *Sir J. Hector.*] What was the date when the representatives of the miners went in?—The miners went in as soon as we went in, and if they did not go in sooner it was their own fault.

474. *Mr. Beare.*] After the bodies were rescued, and on your first going into the mine, did you look for gas?—Yes, everywhere.

475. What did you find?—I going through these workings [indicated on plan], we found a fall on the upper side of Pattinson's place, and there was a little gas discovered in the highest part of the fall.

476. Who was with you on this occasion?—One of the overmen, Mr. Dunn. Then we went down the air-course, and in at the end of No. 4 bord we found another fall—between Duncan and Brislane's place. We found a little gas on the top of the fall, and also in the place below Denniston and Hunter's. Where the ground has fallen we found a little gas on the top of the fall there—*i.e.*, in the level next to the lowest. That is all we found as regards gas.

477. Can you say how much there was?—There were small quantities on account of the air not being able to reach the holes that had occurred in the roof.

478. Were there any other disturbances?—There was a slight burning in Pattinson's place on the lower side, and coked dust on the props. There was also a little burning for a short distance in Duncan and Worthleys's place and in Brislane and Roberts's place. There were indications of burning on the upper side for a distance of some 8 yards, and the brattice was blown inwards. The same indications were noticeable in Denniston and Hunter's—the brattice was blown inwards, and there was burning on the upper side of the face. Coming down No. 3 incline there were marks of charring, and proceeding along the level as far as I could wade in the water, there were strong marks of burning going outwards towards No. 2 incline. In the bord extending from No. 2 to No. 3 incline, in the lower one, the marks of burning were very slight. Great quantities of soot had been blown into the slits going between the bords. When travelling these bords some slight indications were seen, and the slit going into No. 4 bord had been very heavily coated with soot. There was also slight burning on the lower right-hand corner going up that slit. I did not go through the four lower bords of these slits. I did not go down as far as No. 2. I went as far as I could wade into No. 1. In the No. 4 bord the burning was on the upper side, facing the slit, and in the upper right-hand corner of the slit. A great deal of coking had been left within a small radius, within a few yards, of those two slits. There was a piece of coal left on the roof; this coal seemed to have been exposed to a considerable heat, and it had dropped from the roof as it burned and on to the floor, covering the floor, and making it quite crisp to walk upon. It was in this particular place on the upper side that this blown-out shot was found.

479. *Sir J. Hector.*] Did you find it on this occasion?—I think on this occasion; I was not the first to notice it. This is a plan prepared be me showing the position of the blown-out shot. [Exhibit 8 put in.]

480. *Mr. Beare.*] Was the shot-hole charred?—It is charred all around here [indicated] along the side.

481. With reference to the tramway, could you say why the tram was laid into that bord or when those rails were laid?—The rails were finished probably a week before the explosion; there is one bord working on the upper side, and then we come to Morris's working-place, No. 6

bord, going up the second level. We have there a slight charring along the rib-side, and in Scott's, the next bord above it, a slighter charring. The force of the blast has been the most marked in No. 2 incline.

482. *Sir J. Hector.*] When you say "most marked," what do you mean?—The disturbance is greatest here; it seems to have gone up and struck this rib of coal here [indicated on plan], and then to have gone back again to the main incline and straight up, knocking the stoppings out in places until it reached the dynamo. It carried away a brick wall at the back of the house. Very little damage was done on the main haulage-road; there was a slight breakage of timber at the very end, but there was no harm done outside of that at the top of the main dip. There was one point outside (opposite) the cabin where the rails were displaced. There were no indications of burning in the dip. We met with some water there, and the probability was that it checked the tendency to fire.

483. Were there any other indications that you found?—Taking the lower workings on the west side, there were no indications of burning at all, as though the blast had gone in at the lower point, knocked some trucks over, and had spent itself. There was a large deposit of soot and dust there, but no signs of fire. In the western workings the burning was confined principally to Nos. 5 and 6, and some places between No. 5 and the main incline. There were indications of fire having gone through the cabin when the first stopping was knocked out.

484. How do you know it came from this direction [indicated]? Was there burning there?—The main blast had joined there; there seemed to have been very little burning, and all the men seemed to have come a considerable distance from their places. All these men had travelled from their working-places.

485. *Mr. Beare.*] Before you go on, could you give a list of those men who were out of their places?—I cannot mention the names without referring to the list.

486. Were there any other indications of violence?—No; the indications of violence are very slight in this part. There were displaced props in these two inclines, but no very great violence.

487. Were there any other indications in any other portions of the mine?—No; nothing but what I have described.

488. Did you examine the edge of the goaf workings?—Yes; there is nothing there but the fall I spoke of, which concealed the last man we found.

489. Was there anything in the goaf workings to indicate the cause of the explosion?—No.

490. Was there any change in these indications you have told us about from the time you saw them until the experts saw them?—None whatever.

491. Was Mr. Dunn with you the whole time?—Yes, and there were other people as well.

492. Were you with the experts when they made their examinations?—The experts were there at the time, but I was not always with them.

493. Will you describe more fully the lower workings? No doubt, you have heard it stated by some witnesses that they could not get down for water. Could you state where that was?—In the lowest level. Of course, as I told you, I got along the level portion by wading in the water.

494. *Sir J. Hector.*] How many days before Lindop went there?—It was afterwards that Lindop got down. The men before him recovered some of the bodies in the portion the next morning after the accident.

495. *Mr. Beare.*] Will you describe what the condition of that level was when you last saw it?—It was an ordinary working-level, and the water was confined to this portion [indicated on plan]. We used to draw the water from here [indicated].

496. Was that a solid drive?—A solid rib along here.

497. Was there much change from the time you saw it till the time the experts went down?—There would be no change at all, but the water would be a little higher.

498. How much higher?—I do not know exactly what it was when we got through, but the misfortune was we could not make a careful examination of this lower point, in consequence of having to devote our attention to getting out the bodies; and I had overlooked this point.

499. But from your personal knowledge you can say it was a solid drive, practically the same as this?—There was no working going on in it. It was simply a channel by which the coal was taken out of the mine. The coal came from these working-places along here, and was hauled up by the engine. There were no falls, so far as I know, or great cavities in the roof.

500. Coming back to the intake and return-airway, will you state whether in your opinion it was enough for the mine?—Yes; I think there was excellent ventilation for the number of men employed.

501. How many cubic feet was it?—From 14,000 to 16,000 cubic feet of air per minute used to go through these workings.

502. Were there any complaints ever made to you by the miners or anybody else of want of ventilation?—No.

503. Or about anything at all connected with the working of the mine?—No; I cannot recollect an instance having been brought to me, or of my having been spoken to about any complaints of that kind.

504. You have heard the evidence given here—that the miners could not find their way, in case of accident, through the return-airway. Do you think there would be any difficulty?—There would be difficulty in any one finding his way out of the return-airway under the conditions that existed at the time of this accident.

505. But under ordinary conditions would the men be able to find their way out through it?—Not the slightest difficulty. It is certainly not the best roadway to travel, but there is no difficulty about the men, under ordinary conditions, getting through it.

506. There has been some evidence given as so the blasting, and as to men taking powder down. Will you explain fully the practice in regard to the miners taking in powder?—We allowed each pair of men to take between them a canister containing 4lb. at a time.

507. Is that the general custom?—That has been the custom since I have been on the West Coast of this colony, and I think it is a fairly good regulation.

508. Who supplies the powder?—We get the powder, and the miners buy it.

509. Could there be any possibility or danger of the miners going into the mine with more than the regulation quantity of powder?—No; I do not think so, or that any of them ever desired to do that.

510. What was the system of blasting adopted in the mine?—Each man was permitted to fire his own shot, unless in the case of their being firedamp. In special places it was the fireman's duty to fire the shots—wherever firedamp was, or a suspicion of firedamp.

511. What was the custom with regard to deputies' reports?—The fireman's book was kept at the cabin underground, in order that he might fill in his report as soon as he examined, and there was a copy sent up to me during the forenoon. If I did not happen to be in the mine, a copy was sent out.

512. That would be a daily report?—Yes, of the fireman's examination.

513. What was the deduction from the fact that the men had been working one hour and a half on the morning of the explosion?—It was that the mine had been found quite safe, and that the fireman had admitted the men in the usual way.

514. You have heard the evidence given by Messrs. Cochrane, Lindop, Scott, and Hayes. Do you, as an expert, agree with the theory that a blown-out shot was the cause of the explosion? —The theory advanced by the experts is not inconsistent with the appearances that are shown in No. 4 bord. In my opinion there has been a shot fired there, and that the place has been set on fire. From that point the explosion has originated.

515. Would you say, set on fire by the coal-dust having been ignited?—The coal on the sides and on the roof, and any dust that may have been about the place has been ignited. There is evidence of slow burning all around the neighbourhood of that hole. In my opinion, it was caused by the blown-out shot igniting the coal-dust; and a blown-out shot such as this would be quite sufficient to account for the appearances.

516. I suppose you know that this opinion has been backed up by considerable authority during late years, particularly in the case of the Blackwell and Albion Mines' explosions. Is not that so?— The Albion was different. I thought it was a dust-explosion under very dissimilar circumstances. It was a shot used in quite a different way.

517. It was similar in this respect: it was the ignition of coal-dust caused by a blown-out shot? —There was more than coal-dust ignited in the case of the Brunner, which is shown by the firing, because the shot had been sufficient to set fire to the coal around. The place has been slowly burning for some time. It was no passing flame that made the appearances we observed in these particular places.

518. *The Chairman.*] You say "burning for some time." How long?—For two or three minutes, for such a show of coking cannot be produced instantaneously by a passing flame, I take it. I put in here a collection of specimens of dust and coking and coal taken from different parts of the mine after the accident. [Exhibit 13 put in.]

519. *Mr. Beare.*] You say that the fact of this blown-out shot would account for the explosion. Are there any other circumstances which would make you come to the conclusion that it could have been caused by anything else?—I did not see anything else that would have caused it. I searched every place where there was likely to be an accumulation of gas, and I saw nothing to prove that any accumulation could have existed.

520. Speaking as an expert, could you say if the effects of a gas-explosion and coal-dust explosion would have been the same, as far as the burning and charring are concerned?—I think that there would have been less charring with a gas-explosion simply, and had the explosion really originated from gas it would not account for the fact that in many of the places we saw the successive indications. I think gas would have expended itself within a shorter distance, and we should probably have lost no lives at all.

521. That is your experience as far as the gas extends?—In the case of a gas-explosion, if you had 10 cubic feet of gas, it would make only 80 cubic feet of explosive mixture. Had there been a gas-explosion it would have been confined to a limited area.

522. *The Chairman.*] Would not the gas have set fire to the coal-dust?—I think it would have been too quick in its action to have done that.

523. *Mr. Beare.*] You heard the evidence of Messrs. Russell and Robinson with regard to the direction the force appeared to go in. They said that it appeared to have come from the lower workings. Have you anything to say in reference to that?—I do not think the indications are such as to warrant that opinion. I inferred from the evidence that they looked upon the blast as having started in the level in the sump neighbourhood. If so, I think it would have taken the most direct line up, and have gone straight up the main incline, where we should have seen the greatest effects, instead of in No. 2 incline.

524. Would you go so far as to say that the men in these bords would have escaped?—I think we should have lost very few men if it had been a gas-fire only; but if there had been a large accumulation of gas, there might have been after-damp formed sufficient to have killed two or three men; but I think the bulk of them would have escaped.

525. In your opinion, could there have been any place in the mine where there could have been an accumulation of gas?—No.

526. Was there any danger of an accumulation anywhere?—In no place more than another; supposing there had been any gas.

527. Who was in charge of the machinery at the time?—We had an engineer in charge of the engine.

528. I suppose there were sufficient men employed to work the machinery?—Yes.

The Commission adjourned at 4 o'clock.

WEDNESDAY, 13TH MAY, 1896.

JAMES BISHOP'S examination resumed.

529. *Mr. Beare.*] On the question of rules, did the men have a reasonable chance of learning these rules?—Yes; they were posted outside the mine, and the men could have copies on application at the office. I have a copy of the notice I posted on the pit-bank on one occasion. [Exhibit 14.]

530. Will you please read that notice?—"To miners and others employed.—The miners and other employés of the Grey Valley Coal Company are hereby requested to make themselves acquainted with the 'Special Rules' of the mines. Copies of the above-named rules may be obtained on application at the mine office. Any breach of the rules will be dealt with as the law directs.—JAMES BISHOP, Manager. 12/1/91."

531. *Mr. Joyce.*] When was that notice posted?—In 1891, and the rules have been kept posted ever since.

532. *Mr. Beare.*] We omitted to put in the piece of fuse found in the blown-out shot-bord?—Here is the piece, I put it in. [Exhibit 15.]

533. This piece of fuse was picked up by you opposite the blown-out shot-hole?—Yes; it is a piece of spent fuse; it is impossible to say when it was fired.

534. Can you explain the reason of a lot of coal being found close up to the shot-hole?—The only reason that presents itself to me to account for the quantity of coal lying there is that a portion of the hole has been blown off. The nape of the hole has been blown off. Some of the coal lies between the face and the end of the rails; about 6ft. 4in. is the distance of the rails from the face. There is some loose coal also lying along the top of the rails for some distance back from the face.

535. Can you say anything as to when this hole was drilled, or give any opinion at all about it?—It is almost impossible to say when the hole was drilled; it may have been drilled some considerable time ago.

536. And forgotten to be fired?—I cannot say.

537. Have you any recollection of having forgotten it?—No; it would probably be done by the underviewer.

538. I think that you were also manager when the Wallsend Mine was being worked?—I was manager at the time.

539. And evidence has been led to show that the Wallsend Mine was more fiery than the Brunner?—It was a more fiery mine, and was worked with locked safety-lamps.

540. How were the blasting operations carried on there?—Sometimes it was done by blasting with gunpowder, the shots being fired by the firemen or deputies. We afterwards introduced what is known as the water-cartridge—that is, a charge of high-explosive dynamite or gelanite surrounded by water and fired by electricity.

541. Was the result successful?—Yes; but we had mis-shots with it.

542. What were your reasons for using it in the Wallsend Mine and not in the Brunner Mine? The Wallsend was a fiery mine; every face was giving off more or less gas; therefore, it was necessary to take the precaution to prevent the gas being lit when firing the shots. In the Brunner Mine there was no such difficulty; in very rare cases had we much gas to deal with.

543. Can you offer any opinion as to the use of high explosives, or as to the advisability of introducing them into the Brunner Mine?—In the light of this explosion, I think it is very desirable to be cautious. I have already tried roburite in the mine, not owing to gas, but for the prevention of powder-smoke.

544. Do you know which the men prefer?—I think the men all prefer the ordinary blasting-powder, seeing that they have been trained to its use and are familiar with it.

545. You were one of the rescuing-party. Can you tell us what gas you found in the mine then?—I was not in the rescuing-party until after the air had been taken round the mine. I told the Commission yesterday, as you will probably remember, that on my first entering the mine I was overcome by the fumes 4 or 5 chains from the mouth.

546. What was the resultant gas you found after the explosion?—I should say, from the effects produced on myself, that it was largely carbon-monoxide (carbonic oxide) and not the ordinary after-damp.

547. I suppose you also know that the lamps of the rescuing-party burnt all right when the men were overcome. What inference would you draw from that?—That would be the same—carbonic oxide. I have seen another thing in another mine in New Zealand—men knocked over and the gas burning—at Shag Point.

548. What gas would you look for if it had been a gas-explosion?—I should have expected to have had more carbonic acid.

549. Would the lamps burn in that?—They would not have burned so well.

550. Some question has been raised before the Commission as to the advisability of introducing an air-shaft into the mine, or another return-airway. What is your opinion as to the advisability of doing that?—I think it must be admitted that the more outlets you have the more safe any man would be. But, in connection with this mine, had their been another return-airway, and had the return-air passed through it, and had the result of that explosion passed into that return, where the men were travelling, the result would have been fatal to them; and I do not see that it would have helped the men to escape, unless the mine had been divided into two distinct districts, separated entirely from each other by barriers of coal. Of course, a reference to the plan shows that the mine is of too limited an area. The number engaged in the mine at the time of the explosion was only equal to one ordinary shift in a mine of ordinary extent.

551. Your opinion is that it could not have been worked advantageously in any other way than it has been worked so far?—That is my opinion. Of course, I do not say that there could not be improvements.

552. Coming to the question of ventilation, it very often happens that the greater the ventilation the more likely there is to be danger. And in reference to the fan ventilation, I understand that that only sucked up the natural moisture of the strata?—I think the greater the ventilation flying through the mine, the tendency is to make it drier. We have a case that has been referred to several times—namely, the Albion Colliery.

553. And in making the mine drier the coal-dust would naturally become more explosive?—Yes.

554. So that there is just as much danger in too much ventilation as in too little?—In the case of a coal-dust explosion there is certainly greater danger. I would like to refer to the Albion case, as it has been referred to before by witnesses in giving evidence. We have it on record by Mr. Henry Hall, one of Her Majesty's Coal-mine Inspectors, who was appointed to inspect this particular mine, "That the explosion was started, and traversed four miles of roadways and killed 290 people, being stopped only by water. Had the men in that district remained there they would have been safe, but they attempted to get out and met the after-damp. Horses standing near the faces in that particular district were found alive." [See General Report of Mining Industry of United Kingdom, 1894, page 22.]

555. I think it has been laid down by authorities that coal-dust is nothing more than minute globules of inflammable gas?—I am not quite certain about that. It has been laid down by scientists that under certain conditions it has given off gas, which is then in the position of gunpowder—expands quickly, and is dangerously explosive. As soon as you get the coal-dust in a position to be absorbed and expanded quickly, it becomes then equal in its force to gunpowder. Gas, paraffin, and the usual other hydro-carbons are given off.

556. Would there be a difference in the rate of speed of a gas-explosion as compared with an explosion of coal-dust?—It is very difficult to say. I think the ignition power of the firedamp would be more like a flash, whereas the ignition of the coal-dust would be much slower if it started from a blown-out shot. There would be slow burning for some time.

557. Of course the evidence given here in reference to the Brunner explosion seems consistent with the view that there was slower burning. Can you say whether or not water would be a complete cure against all danger by sprinkling or spraying the roadways?—I do not think that water-spray, as already introduced in England, has been found to be a perfect cure for the trouble. There would still be an element of danger, unless they could thoroughly wet the roofs and sides as well as the floor. The place must be thoroughly saturated.

558. *Mr. Joyce.*] Do you produce the reports of Roberts and Morris, firemen?—They have been put in.

559. Have you found gas pretty regularly in the mine since you have been there?—We have found gas pretty regularly in some parts, in small quantities, on examining the working-faces.

560. I suppose you had full confidence in the firemen?—Yes.

561. Morris is one of the firemen?—Yes.

562. Did you ever have any trouble with him about an explosion at any time?—No.

563. Do you remember any man being burnt?—Yes, I remember a man being slightly burnt.

564. What year was that in?—In 1894; there was a man named Maddox burnt slightly in the west side of the pit.

565. I think Morris found gas and had not reported it?—No, he had reported it; at least, it would have been reported. It was in the afternoon shift and he had not had time to report, but as soon as he came up he would have reported.

566. Still, he allowed the man to go to work?—No; the man was burnt by going into a place he had no right to go into.

567. Do you know whether he had been instructed not to go?—I am not certain; it was decidedly a place he ought not to have gone into.

568. Even although not instructed, he had gone in?—No practical miner would have gone into the goaf.

569. Of course there would be no caution-board up there?—I am not certain; I do not think there was a caution-board there.

570. Was it in the goaf or in a bord?—It was at the edge of the goaf; instead of going towards the air-course he went into the goaf where the fall was.

571. Do you remember a man named King being burnt?—I remember a man named King being burnt in quite a different part of the field in the Brunner Mine.

572. How was he burnt?—I cannot quite remember the incident, but I think it was partly his own fault. I think it was a very similar case to the case Robinson cited regarding himself. I will put in, for the information of the Court, a sketch bearing on the accident to Maddox.

573. *Mr. Guinness.*] Was that made at the time?—Yes; and sent by the manager to the Inspector. [Exhibit 16 put in.] If he had kept in the air-course he would have been all right.

574. *Mr. Joyce.*] Do you remember the circumstances under which King was burnt?—I do not remember the circumstances; it was a long time ago, six or eight years ago.

575. Did Roberts make reports then?—Roberts's books must be there [referring to Exhibit No. 1.]

576. I see that Roberts's last report is dated 24th March?—That was the last working-day before the explosion.

577. I see that Roberts reported gas on 17th March, and Morris has not reported on that date?—The mine may not have been working, and Morris may not have been in.

578. *Sir J. Hector.*] Does it often occur that the mine is not working?—Very often.

579. There would then be no report from the fireman?—No report from the fireman or underviewer.

580. Would that account for the blanks in the books?—It would.

581. *Mr. Joyce.*] On 21st February Morris reports: "I have examined all working-places; found gas in No. 5 incline; ventilation good"; and on the same day Roberts reports: "I have examined all roads and workings, and found them free from gas"?—That is explained by the fact that, before any one proceeded to work, the gas would be removed; and that Roberts went round after the men started work, and that there was then gas. Roberts goes round two hours after the men start work.

582. On the 24th February Roberts reports: "I have examined all the working-places in the mine, and found them free from gas, and in working condition. Fireman reports gas in top of No. 5 incline; these men work with safety-lamps." He evidently did not find gas that day?—No doubt it had been cleared by ventilation. Roberts's instructions were imperative that the men were not to be allowed to go to work with naked lamps unless the gas could be shifted. Roberts would make his inspection probably between the hours of 8 and 10 in the morning.

584. On this day Morris reports that he had inspected at 8 a.m.?—That means the 8 o'clock shift. I think you will find several entries in the books for 8 a.m. and 2 p.m., just as the shifts change.

585. Do you know, as a matter of fact, whether there was gas in the mine, or whether gas had been found in the mine a few times within three months previous to the accident?—I am certain it was found.

586. To show how an accumulation of gas may take place: On the 27th of February, Roberts reports: "I have visited all working-places and found them to be free from gas, except showing a little gas in No. 1 bord on sump-side—a little feeder in the cutting; place cleared with ventilation." While Morris, on the same day, reports: "I have examined the working-places; found them free from gas; ventilation good."

587. In that case probably the gas would have been cleared between the time that Roberts went round and Morris came on?—I think that bord was all right. There was no accumulation there. I think he says the ventilation cleared it.

588. What gas would have accumulated between the time those men went round?—I am not quite certain if that was a working-bord. Probably Roberts may not have examined that particular place, not being a working-bord; otherwise I could not account for it.

589. According to this, Morris only examines the working-places and roads; therefore, it must have been a working-place?—It was apparently a very small quantity according to Morris.

590. How many accidents have you had in the mine from gas since you have been there?—Maddox and King. There was another case, many years ago in the upper levels, of two men being very slightly burnt. Then we have Robinson's case.

591. Did you ever know of an overman being burnt?—Yes; I am very glad you have mentioned that case. It was Noble.

592. An overman?—No.

593. And Hodgins?—He was a certificated manager at the time, and I had nothing to do with the underground working. He burnt himself by accident, through going into a place where the brattice had been removed. He was burnt in 1893 or 1894.

594. Was that his own fault, or how did it happen?—I am inclined to think it was in consequence of an error. He made an error in allowing the brattice to be removed before the place had been ventilated. The case of Noble, though it was not a case of gas, was as follows: In consequence of a bump in the roof and an earthshake, some coal was thrown up at the end of the pillar and stirred up the dust, which was ignited by an open light, and burnt the man very severely. It occurred in the Coalpit Heath.

595. *Sir J. Hector.*] It did not travel through the mine?—No.

596. *Mr. Joyce.*] Then on the 14th March there is a difference of report between Morris and Roberts. Roberts reports at 4 a.m., and Roberts fills in the report at 8 a.m.?—You will notice from the two reports—he has not signed the upper one—that 4 a.m. was an early start, and in consequence Mr. Roberts went on.

597. Morris says on this date: "Examined all working places; found them free from gas." And, on the same date, Roberts says: "Have examined all working-places, except No. 1 bord, sump-side a small 'blower' in cutting, and a little gas showing on high side. Place standing; ventilation good." No. 1 bord on the sump-side is the bottom bord, which has been filled with water since, is that so?—Not the bottom bord, but the bord next the sump-level.

598. How far below the bord where the blown-out shot was?—Two bords, about 14 yards; but it is several chains distance from the level.

599. If the gas had been in that bord on 14th March, would it have been allowed to continue there until 26th March?—No; there is no reasonable prospect of its being allowed to continue there. Besides Roberts's report shows that it was not allowed to continue.

600. There is nothing in these reports as to precautions having been taken by either of these two men to free it from gas?—I think you will find that Roberts said in one case, "Gas cleared by ventilation."

601. He said, "Fireman reports gas in top of No. 5 incline; these men work with safety-lamps; ventilation good." There is nothing there about clearing. Would he have reported it?—I am quite sure that he would mention it. He may not have mentioned all the precautions he took.

602. You understand thoroughly what is in the report?—Yes.

603. Then, I do not see any report at all where gas has been found?—That is the last report showing gas.

604. Assuming that the gas had not been cleared out by ventilation, would it have remained in No. 1 bord until the 26th March?—Unless it could have been removed it would have remained.

605. From personal knowledge, you cannot say?—I can say it was not there on the 18th March.

606. Were you in No. 1 bord on the 18th March?—Yes.

607. Did you make a particular examination of No. 1 bord?—I had a safety-lamp with me—a Davy.

608. That is the lamp ordinarily used for testing?—Yes.

609. You found no sign of gas in the bord?—No.

610. Would you swear positively that there was no gas on the 18th when you tested?—Yes.

611. Have you ever had any experience of blown-out shots in the mine before?—Yes; we had a blown-out shot occasionally.

612. Do you think it is possible to avoid blown-out shots?—Yes; almost.

613. In what way?—If the shot or the coal is properly prepared for blasting—that is, properly undercut, and the shot is in proportion to the work to be done, and properly tamped, there ought to be no chance of a blown-out shot, or very little.

614. Then, there is a chance of you having blown-out shots?—Of course, there might be a possibility.

615. And I think the possibility of blow-out shots in the Brunner Mine is that you have had shots blown out when the holes were properly undercut?—Not always.

616. In some cases they were?—Well, there was something wrong, or else a shot would not have blown out.

617. In every case?—Yes.

618. You think if a shot were properly undercut and "holed" it would have no possible chance of blowing out?—A man might, with the very best of intentions, make a mistake; the tamping may not go home, and the charge might blow out, as that is, under such circumstances, inevitable. The cutting may be well done, and still it might blow out; but it must be due to some fault of some kind in the work.

619. I think you admit that the most careful men may have blown-out shots?—I admit that.

620. With reference to that blown-out shot bord, which the experts consider to have been the initial point of the explosion, do you think the man who fired that shot was guilty of carelessness or want of intelligence in not undercutting?—There is no evidence of undercutting, although I do not say that there was not some undercutting done on the small portion that has come off the face of the shot; but I do consider that even if the hole [indicated] had been well undercut up to the rib from the wall it must have resulted in a blown-out shot.

621. Why?—Because the hole is put in obliquely to the side of the pillar, instead of being in a line with it; therefore it goes into the solid. The enlarged plan shows that.

622. So, considering the line of force, you would say that it was a very carelessly put in shot?—I consider it was a great error of judgment to put in a hole in that form.

623. You were speaking about a fire having occurred in that bord. How long would it have burned, in your opinion?—Some little time before the explosion took place which resulted in the disaster.

624. A few minutes?—I should say it was a minute or two before the effect was produced that is shown there.

625. Apparently your version is correct, because there was a coking there, and every sign of fire?—That is what leads me to that conclusion.

626. You reckon that the coking could not have been made unless there was flame for a few minutes?—Yes.

627. We have had some evidence about the force of the explosion in the slit below No. 4 bord. Did you make an examination—a particular examination—of that slit?—Yes; I went all through it.

628. What would you say about it?—I do not think there has been any force in it, and the severe burning where it is charred does not indicate any very great force. I refer to the slit on the lower side of the bord, opposite the blow-out.

629. You think there was but very little force exerted in the slit?—I do not think there could have been much force to allow the great accumulation of soot there.

630. Your opinion is formed because there was an accumulation of soot?—That is one reason.

631. Any other reasons?—My opinion is supported by the fact that wherever we find the greatest force we have no burning.

632. Is it generally your experience, during your visit through the mine, that wherever you had the greatest force you had the least burning?—Yes; the severest force is in the main incline and the main dip, where there is very little burning.

633. Might not the soot in that slit have been deposited after the explosion by a rebound going up?—I do not see how the rebound could have come off. Of course, we are very much in the dark as to what might occur.

634. When you made your other examination with the experts, was there not a considerable amount of water in the lower workings?—I could wade for a considerable distance.

635. Still you could not get as far down as before the explosion?—I was in the lowest level.

636. But you could not examine it thoroughly?—No.

637. Therefore there might have been an explosion down there?—I do not see that there is any ground for supposing that an explosion took place there.

638. Do you think the direction of the blast seemed to be up from the lowest level?—I think from the incline it was upwards. My opinion is that it swept round from the bord to No. 3 incline, went along the level, and gathered force in No. 3 incline; it swept along the level, and up No. 2 incline, a portion going up the main dip, and a portion going up No. 3, a very small portion, however.

639. I understand that in Brislane's bord safety-lamps were being used?—There were two lamps there. Here are the two lamps in use in that bord. [Safety-lamps produced.] They are a

type known as the Marsaut. Inside of this shield there are two gauses. The lamps are now in the state they were found. Here is also a fireman's lamp used for testing. It was Morris's lamp. [Lamp produced.] It was found hanging on the prop in the end of Brislane's bord. The prop was lying down, and that accounts for the glass being broken.

640. Will you tell the Commission why safety-lamps were sometimes used in the mine where there was no gas?—If it had been a place gas had been found in, although there was no accumulation of gas, we gave them safety-lamps as a precaution.

641. Can you say why, if gas had been found there, the fireman did not report it? There is no report from the 14th to the 26th March?—There is a report every day.

642. There is no report of gas having been found?—I am very certain that he did not find it. The report on that morning had not been written at all. The fireman had evidently gone back to see the men into the working-places.

643. Can you regulate the number of revolutions your fan goes?—A hundred and fifty to a hundred and sixty revolutions per minute.

644. Have you got an automatic recorder?—No.

645. How do you work out the number of revolutions?—The engine goes fifty to sixty revolutions, and it is geared 3 to 1, so that the fan is doing three times the speed the engine goes; and if you multiply the engine revolutions by three you get it.

646. It is only a question of guessing then?—There is no guessing about it. The man knows what his steam-pressure gives, and how much to give the engine. He knows exactly how much his engine is doing.

647. If you had a recorder, do you not think it would have been better?—Undoubtedly, perhaps, better.

648. Were your instructions from the coal company to keep the expenses as low as possible?—No; I had no instructions from the coal company under that head at all; and when it becomes a question of keeping down expenses at the risk of efficiency I could not agree to manage any concern of the kind. They gave me no such instructions—neither the old company nor the new company.

649. Did you examine Worthley's bore after the explosion?—Yes.

650. Did you find evidences of two currents of force going in different directions?—I do not think that. It had a burnt-up appearance. It is a little conflicting. I think a portion of the blast went up the bord where the blown-out shot occurred, and a smaller portion went up No. 3 and entered in Pattinson's bord and stopped. It practically died out there, because there is no evidence of burning in Pattinson's bord itself, which would be the readiest outlet for the blast. I did not see any great conflict with regard to Worthley's bord.

651. I want your opinion of it. Assuming that you had a force in this bord lasting two or three minutes, would you explain to the Commission how the fire would ignite the coal-dust?—I take it that from a blown-out shot such as that would be there would be a big body of flame, and the coal having been exposed to the atmosphere for some time would be in a condition to be readily ignited. Then the gas would be given off after burning some time, which, with the inrushing air coming back to the blown-out shot, would have the effect of causing a rush upwards; then when the inrush came back the fire would start, and when it got into the working-places in No. 3 bord it would light up afresh.

652. There was no bodies found near the blown-out shot, nor any tools?—No.

653. And no signs of a tub or truck?—There had been no tubs filled there.

654. To get a tub up there would there have been any difficulty?—No great difficulty. A practical miner would soon get his tub in there. There is not ten minutes' work in picking off a bit of coal—that is, coal which is easily got,—and it would not have been any trouble to take a tub in.

655. Would it be a likely place for men to be put to work in?—It was a place that had been got ready for the purpose of being started; I cannot say what orders had been given by the underviewer. Probably he had told somebody that it was their next working-place, and therefore they had taken the opportunity of putting this shot in.

656. Do you think it is a likely place for an underviewer to tell a man to go to work in?—Yes.

657. If a man wanted to rob a pillar, could not he select a better place?—I do not assume for one moment that any man wanted to rob that pillar, and I do not cast an imputation of any kind on any man as to his wishing to do anything against the rules, or as to any man desiring to rob a pillar against authority.

658. Such is a theory that has existed?—I do not think so, or that the experts settled on any such theory. It is not my opinion.

659. That is your opinion. One expert gave me another?—I say that it was not the intention of any man to rob a pillar without any authority whatever.

660. The Wallsend Mine was a fiery mine, and there were special precautions taken when the gas was found, were there not?—Yes; it was a pit worked with locked safety-lamps, so that it was a question of taking special precautions. Every man used a locked safety-lamp, and was searched for matches every day. I was there frequently.

661. Do you recollect searching the men for matches when they were using safety-lamps?—We took to using that precaution. Of course, the men were not allowed to go with naked lights.

662. Did you ever have any experience of men going in with matches and lighting pipes?—No, I have not had that experience. I found a box of matches on a man once.

663. You know that such things have occurred?—You could not get direct evidence in any case. I believe that Mr. Hayes had an experience of a man having a lighted pipe in his cap when using a locked safety-lamp.

664. Do you think it was right to work with safety-lamps in Brislane's bord, and in the bords around to use naked lights?—The trace of gas would be so small that lamps were only given to

Brislane as a precaution. I am quite sure that if Morris thought there had been any quantity of gas there all the men would have had safety-lamps as well as Brislane.

665. In your evidence as to the resultant gas, you said you considered it was carbon non-oxide?—Largely.

666. Assuming that you had a firedamp explosion, that explosion would be accelerated by the coal-dust?—No doubt.

667. And carbon non-oxide would be produced by the coal-dust being ignited?—No doubt to some extent it would.

668. You say you could not suggest any improvements that might be made in the working of a mine such as the Brunner?—Yes; of course, to abolish all blasting-powder would be one.

669. Well, on the subject of blasting-powder, we have heard experts of authority say that blasting-powder is a very dangerous thing to use in a mine—in fact, one of the most dangerous explosives?—Yes; blasting-powder has the greatest flame.

670. What you require in a mine is a flameless explosive, or one almost so?—Yes.

671. I suppose nitro-glycerine would be the best only for other dangers?—Yes.

672. Has a flameless explosive the highest power?—Yes.

673. Have you tried carbonite?—We have tried roburite.

674. Did you find it desirable?—Yes, when you got a uniform result; but the trouble is to get anything like a uniform result. Perhaps we got it in bad condition, and therefore could not get uniform results from it.

675. Have you ever tried roburite in good condition?—We got some excellent shots with roburite.

676. Is that the only other explosive besides blasting-powder you have tried?—Gellanite, in water-cartridges.

677. You would not recommend gellanite?—No.

678. One of the explosions took place through the gellanite not being used with water-cartridges?—Yes. Not one of them is flameless.

679. And dynamite would be altogether out of the question on account of the fumes?—Yes; and the shattering effect on the coal.

680. Do you consider, if you had a good quality of roburite, it would be a good explosive?—Yes.

681. You did not see the roburite tests made here—roburite from the Defence Department?—No.

682. Would you also say from your experience at Brunner that watering is necessary before you fire a shot?—I do not think that watering is necessary, and I never regarded the Brunner Mine as a dry and dusty mine.

683. Still we had experience that, although it is a comparatively wet mine, you had a big explosion of gas or coal-dust?—I think that with fairly reliable flameless explosives, if the cutting and holing is well done by a properly-authorised person, watering is not necessary.

684. You do say that shots ought to be fired by properly-authorised persons?—In the light of those explosions I would not allow any miner to fire the shots.

685. You keep a barometer and thermometer?—Yes, in the outside office.

686. Will you explain where the outside office was?—About a couple of chains from the mine-mouth. It is always open to people.

687. Would that be a better or worse place that the mouth of the mine?—I do not think there is anything to be gained by putting it at the mine-mouth.

690. Do you consider, in view of the way the steam would raise the temperature at the mine-mouth, that they were in a better place?—I should say they were in a better place.

691. And you do not know whether that blown-out shot-hole was put in when the bord was being made or whether it was put in on the morning of the accident?—I do not know. I have a faint recollection of the overman having reported a shot being prohibited to be fired, but whether it was in that bord I do not recollect.

692. When was that?—Some considerable time ago, when that district was being worked.

693. Who was the overman?—Roberts; but I cannot swear whether it was in that bord.

694. If you had a firedamp explosion, accelerated by dust, would it not produce the same effects as this explosion at Brunner?—Yes; I suppose its effects would be practically the same.

695. As a matter of fact, any firedamp explosion now must be carried on by dust, according to authorities. Is not that the fact?—Yes.

696. Were you in the bord when the four miners examined it?—I believe I was; but I cannot be quite certain.

697. Were you there before the miners went in?—No; I had never been in since the explosion.

698. There has been a question about that overcast, or stopping. It is an aperture 6ft. by 18in.?—It is the face of a dam. [Witness indicated on plan the place referred to, and said it was necessary to have such a narrow aperture to regulate the ventilation.] I always tested and found 6,000ft. of air passing over this dam for the men located there.

699. Then, your evidence is to the effect that if you did not have a regulator in that place the air would go in one direction only instead of being divided as required?—Yes. If I enlarged that aperture to a greater size all the air would go through, and would not divide into the two channels. I have had to take it off the one and put it on the other when I thought it was necessary. Of course, everybody acquainted with the mine will admit that the Act is properly complied with, and that the air is quite sufficient for the number of men employed.

700. Do you always have enough ventilation in the mine to clear out the powder-smoke produced by blasting?—I would not like to say that; sometimes when blasting in another mine I had to ventilate all the time to keep it clear.

701. Do you think there could be a coal-dust explosion from a naked light?—Yes; we had one explosion, but it only burnt one man.

702. Was that coal-dust?—Yes. It was Noble's case. A bump in the roof in the Coalpit-Heath Mine sent up some coal-dust, and his lamp was standing on the road. The coal-dust fired from the lamp, and burnt the man very severely. The explosion did not extend.

703. Can you give any reason why it did not extend?—There is the powerful effect that would be produced by a blown-out shot. We had a similar instance in Durham, when several men were burned in a coal-pit.

704. There was not then a concussion?—No.

705. If you had a powerful air-current running through the mine, would it not have tended to clear the mine of dust?—I do not think it would.

706. Do you consider your return airway sufficiently good for a man to get out?—Yes. It would be rather difficult to get out in case of an explosion. I do not consider, however, that any such airway could have been made that would have helped any man to get out after that explosion.

707. Can you suggest any opening or aperture which could be made in order to allow some means of escape?—I do not know anything unless there was a special drive made and kept in reserve. The ordinary return airway could not be made accessible without you have another return air, as the air return must have been filled with gas, and the products of the explosion would go through the air-course.

708. By having several air-drives not connected at all, would not that have assisted?—We might have avoided the explosion; there are many things that could be accomplished in that way.

709. Would it be possible to divide your mine into districts?—The mine was so small—containing sixty-five people all told—that I think it would have been contracting it too much to divide it into two separate mines. We had other portions of the mine working—in the rise and the dip; and if the Coolgardie portion had been connected with the dip by a drive as suggested those men would have lost their lives also.

710. The Coolgardie men?—Yes.

711. You think there is nothing practical about having a drive from Coolgardie, and a furnace and fan there?—No.

712. Do you consider the crib-log stoppings used in the mine good stoppings?—Yes; most authorities agree that it is a very good stopping where the bottom is inclined to heave. It is better than brick. We could have brick stoppings along the dip.

713. Is it possible to construct stoppings that would resist the force of an explosion?—It might be possible—it would not be right to say impossible; but in well-equipped mines—equipped with the very best appliances—they still have their stoppings blown out.

714. You used board stoppings at the same time?—No, merely brattice-cloth. It makes very good temporary stoppings for the working-faces, better than boards.

715. Did you not use board stoppings?—Very few; I think there was one board stopping.

716. They are not any good in a mine?—Not wherever the floor lifts; there was no serious danger from having this one in the position it was in.

717. You had some doors in the mine also?—Yes.

718. Were they well constructed?—Yes.

719. What were they made of?—Of timber—of 1in. timber properly hinged. There were two near the motor-house, and one in the west mid-level.

720. Do you think that the coal lying in the fourth bord came from a blown-out shot?—I think so; I do not know of any other place it could have come from. The indications of charring are present on the side of the pillar. If the coal had come from the side of the pillar the charring would not have been much, because it would have fallen with the heat.

721. Do you think it could have come from the roof?—No; the roof is charred all over.

722. And the crispness on the floor—do you think that that is a patch of coke that has fallen from the roof?—I think so.

723. How long ago is it since you have known any one to be working in No. 4 bord?—Several months since; it must be seven or eight months.

724. Has any gas ever been found in its vicinity?—No; it was quite safe.

725. You have no recollection of gas being reported as being found?—No.

726. Would there be a larger accumuluation of coal-dust in that bord than in any other part of the mine?—I do not think there would be.

727. It would be only a small amount?—Yes.

728. Then, a small amount is as likely to produce as great an explosion as a large amount?—I attribute the explosion to the ignition of the coal-dust.

729. You say you do not consider the mine dry or dusty?—Not as the mines we have heard spoken of are under the English Act; they have to be watered.

730. Do you consider it was fiery?—No.

731. What would you define as a fiery mine?—I consider a mine fiery when all the working-faces are giving off gas, and you have always to work with locked safety-lamps everywhere.

732. But you do not consider a mine fiery where you can use naked lights?—No.

733. You have no doubt about the age of the tramway?—No.

734. It may have been used when the bord was made?—Yes.

735. What is the floor of the bord composed of?—Black-bottom—carbonaceous matter first, and then fireclay, and lime afterwards.

736. What did you use for tamping in the Brunner Mine?—Bottom stuff.

737. Did you use fireclay?—Yes.

738. How did the men get it?—They took it off the floor.

739. Do you not think it would be better to provide the men with fireclay?—They were not careful; but I have examined their tamping and found it was mainly composed of earthen material and fireclay.

740. That is another element of danger, because in allowing the men to make their own shots they might put coal-dust in as tamping?—It is an element of danger, and one that should be guarded against.

741. It is absolutely necessary that the tamping should not be with coal-dust, is it not?—Coal-dust tamping is an element of danger.

742. Have you ever known men to use coal-dust?—I have examined frequently, and often found the tamping to be of bottom stuff. The firemen never reported coal-dust to be used. Roberts was a certificated man. He held a second-class certificate, and had had a long experience in connection with the mine. Morris did not have a certificate; but he had been very nearly all his time in the Brunner Mine. Both were trustworthy men. I always found them so. They were never likely to allow gas to remain in a working-face without clearing the mine of it.

742A. *Sir J. Hector.*] You promised to give a list of the men killed, and the places they were found in, especially those in the eastern side?—Yes; I will put in a plan showing where the bodies were found. Pattinson and Watchman were in their working-places. The pony-driver, Cunliffe, was found in the lower level close to the sump-edge. Then, you have the two Geogehans. They were furthest in, and nearest the sump-level. Brislane was the length of the slit away from his place. Morris, the fireman, was laying rails in Denniston and Hunter's bord.

743. Where was his testing-lamp hanging?—It was hanging at the upper end of the same slit, just inside Brislane's bord, the upper end of the incline, close to where Roberts was lying. Roberts was in the incline.

744. Had any person any occasion to be in the bottom level at work on that morning?—Only the pony-driver. He drove his horse along the foot of this level [indicated on plan].

745. When would he begin work?—At 8 o'clock.

746. Would there be trucks ready for him?—Yes.

747. Then, it is reasonable to believe that he must have travelled backwards and forwards with a naked light for an hour and a half before the explosion?—Yes, with the trucks.

748. Would he have any time on his hands to wander into any other part of the mine?—I do not think so.

749. You have said that this cutting alongside the No. 4 bord had been prepared for about a week, and that the rails had been laid for less than two weeks, contemplating commencing work on this pillar. Had not a piece been taken off before the rails were laid?—There was a "set-off" left there in driving the bord [indicated on plan].

750. Is it possible when the rails were laid that a charge could have been put into that shot-hole and not fired off?—The track was made by Morris. He is not at all likely to have done that.

751. There is a possibility that a slight gas explosion would have ignited the charge if one had been left in the hole?—Possibly.

752. So that it could really be only indirectly the fault of anybody?—I do not think it is at all likely that that took place, but it might be possible.

753. *The Chairman.*] Is there any chance of any man storing powder in that place?—I do not think so.

754. *Sir J. Hector.*] If the coal were on top of the rails, and the rails were only laid a week before, does not that show that there must have been a fall of coal subsequent to that week?—Yes.

755. And the coal did fall on the rails?—Yes, it was on top of the rails.

756. The coal that was lying on the rails had evidently come from the vicinity of the shot-hole?—I think so.

757. It was not a fall of the roof?—No; nothing had come from the roof.

758. You say in your experience that the roburite you used might perhaps not have been of good quality?—It was not any good whatever.

759. You would not be surprised if the experience of another manager for four years in another part of the colony was that some 10 tons of roburite had been used, in blasts varying from a single cartridge to sixteen, and that not a single accident had occurred, nor had there ever been a misfire?—That would not surprise me.

760. So the roburite in your case must have been imperfect?—I know it is the explosive used at Home.

761. You say that firedamp would cause an acceleration of a dust explosion, and produce results practically the same. Have you, in your experience, or in the course of your reading, seen it clearly proved that a mere flash of firedamp would ignite the dust?—I have not seen it clearly proved. I said it would raise the coal-dust and cause an explosion.

762. Would it ignite the air charged with suspended coal-dust?—I consider that if it had been a firedamp explosion it would only have extended over a limited area, and then have died away.

763. Do you think the back-lash of a firedamp flame could have exploded the coal-dust, or is not the evidence the other way?—So far as I have read, it requires intense heat and a violent shock to start a coal-dust explosion.

764. *Mr. Proud.*] Was that pillar next to No. 4 bord arranged to be any man's working-place that morning?—I do not know what the underviewer who set the men to work that morning might have done. I am not quite certain. It is only conjecture when I say it might have been intended to shift certain men to that place as soon as they finished the place they were in.

765. Is the mine inspected by the workmen?—It has not recently been inspected by the workmen at regular intervals.

766. Would not it be well to carry out that provision?—This clause in the Act I supported very strongly, and I gave the men every encouragement to inspect the mine. The men have power to appoint their representatives.

767. Would it not be well if it were compulsory?—It would.

768. And they would be paid for inspecting?—Yes.

769. You say the reports that morning were not written up?—The fireman's report was not written up.

770. Do you not think it is desirable for the reports to be written up before the men leave the station?—It ought to have been written up immediately the foreman came up from his inspection. I think he went back to attend to some little matters before writing up his report. The object of giving them that report-book to take into the mine was in order that the man might write it up immediately he returned to the cabin. It is provided for in the rules that the fireman shall immediately make his report. Had there been anything wrong the men would not have gone into their places.

771. Would it be better if there were a danger-precaution book kept?—The special rules are explicit on that point. I think they provide that the miners are to report any defect they notice.

772. *Mr. Skellon.*] If a miner found danger he is supposed to sign a report?—I think the special rules state that if at any time any man finds any danger existing in a mine, or anything indicating danger, he shall report to the management there and then, and not wait till he writes it in the book.

773. But he is to sign the report-book afterwards?—There is a provision in the Act which provides for the men making a report, and we have to provide a book in which the report shall be entered. Rule 34, which is of greater value and more importance than the other, is as follows: "If while at work, or at any other time, miners shall discover or be informed of the existence of any obstruction in the ventilation, or stagnation or impurity of the air of the mine, accumulation of gas or water, or of the existence of any defects in the walls, roofs, or any other part of the mine, they shall be bound to give instant information to the mine-manager, overman, or the person in charge of the mine for the time being, so that these defects may be remedied and the danger therefrom averted."

774. *Sir J. Hector.*] Did the men ever make much use of that provision enabling them to inspect the mine?—Before the strike we had the inspection regularly made.

775. Not since?—It is one of those things not regularly attended to.

776. *Mr. Proud.*] Do you object to mixed lights in mines?—I do not look upon them as very good practice, except as a precaution. We consider our ventilation sufficient to keep all faces clear.

777. Have you ever had any fatal accidents from careless tamping, or premature firing of shots?—No.

778. You have never had any outbursts of gas?—We had a small outburst of gas in No. 7, west incline, on one occasion. There was a place driven there, and there was an out-rush of gas. That was in 1893. We left the place for a day or two until it took off; and we stopped that place in the mine.

779. Have you ever made any observations upon the connection of the presence of gas with the state of the atmosphere?—I have not noticed that the rise or fall of the barometer had any appreciable effect on the gas. We find gas with high and low barometers. I do not think the atmosphere had any great effect on our mine.

780. What was the observation on the 26th March?—The barometer was somewhat lower than customary in this neighbourhood. (*Note.*—The barometer was 30.0, and the thermometer 54 degrees; four days after they were: barometer 30.0, thermometer, 55 degrees).

781. Did you find that, under the influence of certain winds or certain kinds of weather, the gas is given off in larger quantities than usual?—No, I do not think it is. If there is a sudden break of the roof it might cause gas to be given off. We have a small seam of coal which gives off gas freely, but it varies a great deal.

782. Have you ever made experiments underground to ascertain whether there were any phenomena connected with the escape of gas, such, for example, as the occurrence of small earth-tremors?—No.

783. Do you think it would be desirable to have a lamp that would test for smaller quantities?—I think it would be necessary to have a lamp that would give a test for smaller quantities than the ordinary Davy safety-lamp. We cannot test for less than 3 per cent. with the present lamps.

784. Do you think an indicator which would indicate 1 per cent. would be useful in testing for gas in the return-airway?—In this colony we have had Liveing's indicator, which was considered most sensitive, but it is not considered reliable enough. The general experience is that it is unreliable. There was a new lamp introduced by an inspector and professor of science, which indicates down to 1 per cent., and there is the German Peiler lamp, which goes still lower—namely, ¼ per cent.

785. Will you show the Commissioners the distribution of the air?—[Witness indicated it on plan]. On the 20th March there was 16,500 cubic feet passing into the main intake and into the dip, about 7,000ft. of which would be distributed to the east, and the balance to the west of the workings.

786. You do not think there was any chance of escape?—There was certainly no chance under the conditions existing. I have already mentioned that I only penetrated 5 chains into the tunnel, after the accident, when I was overcome; therefore I do not think it was possible for those men who were in the mine to have escaped by the return.

787. *Mr. Guinness.*] What would be the distance the men would have to travel to get to the mouth of the mine?—67 chains at the least.

788. *Sir J. Hector.*] Did you see the smoke that came out of the mouth of the mine?—Yes; it was black, yellowish smoke.

789. Can you recognise it as being similar to the smoke shown in these plates of Hall's experiments made in England [plates produced]?—The bottom part was yellowish, and the upper part seemed to be made up of soot and fine dust. It was very black.

790. Was there any evidence of flame?—No; it did not ignite in the open air.

791. Which of these plates did it most resemble?—It was most like this one [second plate of Hall's report]. There was no flame in ours; nor did I see any ignition when I first went into the tunnel. I went quicker than the air was travelling. Of course, the inrush first would be a little quicker; and the restoration of the ventilation would not have taken very long if the stoppings had been there. You could almost calculate the time the ventilation was in being restored if you estimate that the air was travelling at the rate of 5ft. or 6ft. a second, and that the total distance it had to travel would be 90 chains (= twenty-three minutes).

792. *Mr. Proud.*] I suppose you consider the bord and pillar system the best?—Yes.

793. What is the size of your bords?—The bords were driven 18ft. wide, and 11 or 12 yards was the greatest width of the pillars.

793A. Do you drive the bords by marks?—We cannot drive them by marks, as the coal has an undulating roof.

794. What was your system of taking the pillars out?—In commencing work, the system is to take a strip alongside the pillar, and when you get that strip along there you bring back the remaining part of the pillar to the end [indicated on plan].

795. *Sir J. Hector.*] Can you explain the reason why the general direction of these bords towards the fault suddenly varies?—I suppose it is in consequence of some change in the rock.

796. Do you not think that indicates any proximity to the big fault?—No doubt some change will be found some distance before you get to the fault.

797. How far do you consider you are from the fault?—2½ chains.

798. Was the fault clean on the western side?—Both sides are clean.

799. Did not you go into a great mass of coal in driving through the fault?—Yes; we got one patch of 900ft.

800. Did that interfere with the tightness of the faults?—No; it is only a local thing.

801. *Mr. Proud.*] What percentage of coal do you get?—We expect to get 40 per cent. on the first working, and I suppose we lose 10 or 15 per cent. in pillar-working.

802. You have not tested your safety-lamps by gas?—No; we have no apparatus of that kind.

803. It is in use in some mines?—It is a very valuable thing, no doubt.

804. *Mr. Skellon.*] Do you think that the coal found on the rails in the No. 4 bord came from the shot-hole?—A portion of it might. I think it would be a portion of the ring of the hole that had been blown away. I do not think it is reasonable to suppose that all this coal for a width of 5ft. went bodily everywhere. I think that there is coal gone from the face, as the face is considerably shattered.

805. Is it not likely that the rib has been weathered by the air, and that the concussion of the explosion has knocked the coal down?—It is quite possible; but when you come to consider that all the shot-holes used in drilling that bord are still there, and that the line of every succeeding shot is to be seen on the side of the rib, some being pretty low down, I do not think that the coal has gone. I have looked at it in that light myself; and the only chance I could see of from where else this coal could have come and gone to is where it is still lying, immediately in the corner where there is a break.

806. Would not the coal weather?—Undoubtedly. But the nature of this coal is very hard. Had the shot-holes not been there, it would have shown that the explosion was not accountable for that quantity of coal.

807. You think that this hole might have been heedlessly fired?—I am not saying that.

808. You believe it was fired that morning?—Judging from what I saw, I do.

809. Do you think that any practical miner would charge a hole like that without doing some preparatory work?—I am quite sure a careful miner would not do it. They do err in their judgment, and I will not say that a practical miner would not do it. It is not the work of a man who has been some time considering what he was going to do before he did it.

810. *The Chairman.*] It would take a practical miner to bore such a hole?—It would take a man who knew how to use the drilling-machine.

811. *Mr. Skellon.*] He would naturally put his rammer in to see how far the hole was in?—I think it is quite possible that he would know from his boring-machine how far the hole was in.

812. Supposing that hole had been bored previously, he would naturally put his rammer in to see the depth, would he not?—Very likely he would; it is quite natural to suppose that he would test the depth.

813. At any rate it is not the work of a practical miner to bore or fire a shot like that?—I do not think so; he might have been a practical man who has been in haste and not considering what he was going to do.

814. The firemen were both lost?—Yes.

815. Did your under-viewer make a daily report in reference to the work of the mine?—Yes.

816. And entered everything that occurred in his report-book?—Yes.

817. Can you tell how many times during the last twelve or thirteen months gas has been reported by him to you?—I cannot say from memory; you have the books.

818. Do you think that it was on forty days that gas was reported?—Quite likely, considering that the safety of the whole mine depended upon his reporting it.

819. He was supposed to examine the air-courses carefully?—Every week.

820. He would note that in his note-book?—He travelled the air-course.

821. Are you aware that it is only mentioned ten times for thirteen months?—Probably he was in error in not entering it. I know that every week he came through it, unless I was absent. I know he came through that return.

822. Did you not examine his report-books to see that it was entered?—I saw his report every day.

823. Did you know that it had not been entered?—I conferred with him every day. He would not miss reporting that fact although he did not enter it.

824. Did you ever withdraw the men on account of gas being reported?—I withdrew two men from one place once on gas being reported.

825. Has it not been the custom in the Brunner Mine simply to give the men safety-lamps when gas has been reported?—It was customary to make the place secure by clearing the gas, and when the orders were given they were carried out. The place was cleared by ventilation, and safety-lamps were given out as a further precaution.

826. Are you aware that in thirteen months it was only cleared by ventilation five times, according to the report-book?—He may have reported in that way; but there is no doubt at all that the men were not allowed to go without safety-lamps when there was danger.

827. Were safety lamps used on the day of the explosion, and naked lights also?—Yes.

828. Do you believe in that system?—It was not good practice, perhaps; but still, if gas ceased to be making, I take it that the fireman had found such a small quantity that he had given these lamps merely as a precaution.

829. Have you ever issued orders against it?—Yes; not against giving the lamps as a precaution, but as against mixing the lights.

830. Is not that using mixed lights?—Not altogether.

831. *Mr. Park.*] When safety-lamps are used, do the company have to provide the lamps?—Yes, they provide everything.

832. And when naked lights are used the men have to provide themselves?—Yes.

833. What is the distance the men would have to go from the old workings to get to the return airway?—About 120 or 130 chains.

834. *Mr. Skellon.*] Did you ever issue orders for the men to travel through the return airway?—No.

835. Did you ever tell them how to escape in case of accident?—I do not think it is necessary to issue a general order. I think if there had been an accident to block the main tunnel, there would be an officer in the mine who would know the ground thoroughly, and who would be quite capable of leading the men out. That is my reason for not issuing orders of that kind.

836. You say that your fireman entered his report every day after inspecting the working-places?—Yes.

837. Are you aware that from the 6th of February, 1895, to the 24th March, 1896, he missed reporting for fourteen days?—I do not think so.

837A. Or less Sundays, 151 days?—I do not believe it.

838. I took it out of the books myself?—I know that he did not do anything of the kind. I can account for that. There have been two shifts working overtime, and there has been another fireman.

839. Have you produced all your books?—I have a number of Morris's report-books. I can bring other books containing reports, when there have been other shifts. I am quite prepared to produce every book in connection with the mine, if desired by the Commission.

840. I have gone through the firemen's books, and there are 151 days when no reports are in his book?—I am certain the fireman reported every day the mine was at work; another fireman probably reported. Roberts reported every day. Fortunately, one of the firemen is still living, who was working a double shift.

841. There are some months when there are reports for only ten or twelve days?—That is so, unfortunately, when the mine has been stopped. Our average working-days are only three per week.

842. There are a good many days on which no report is made?—I may have missed the book, but I am not intending to mislead the Commission.

843. The Act says that the fireman shall immediately report to the mine-manager?—He must have reported verbally.

844. Did they make any report to you on 26th March?—No.

845. Was it the usual custom for the roadsman to report after every shift to you, as required by the Coal-mines Act, Appendix 28?—I did not desire the roadsman to report to me. He had a superior officer, and reported to him.

846. They would report daily to the mine-manager any question that arose?—That is intended.

847. *Mr. Guinness.*] What did he say to you at that morning shift, at 6 o'clock? Was there a shift that morning at 6 o'clock?—No.

848. *Mr. Skellon.*] Was the roadman not there on the night of the 25th?—I do not think there was any roadman in the mine that night.

849. *Sir J. Hector.*] They came out the evening before the explosion?—Yes.

850. *Mr. Skellon.*] There was firedamp in your mine?—Yes.

851. All the men were allowed to fire their own shots?—Yes. Where they were working with naked lights.

852. Did you give your firemen authority to allow the men to fire shots?—A written authority was given that the men were only to fire their own shots in such places as I have mentioned.

853. Have you got that authority?—I do not know, as it was some time ago.

854. *Mr. Park.*] When you went into the return, did you find any difference in the air on the morning of the explosion?—Not immediately after the explosion.

855. *Sir J. Hector.*] Did you go into the return?—I went into the fan-doors.

856. How long after the explosion?—Immediately after; as soon as I got to the tunnel mouth.

857. *Mr. Park.*] Would not that prove that the explosion had not gone into the return?—Yes, that the explosion had not gone through the return at that time.

858. You found a lot of crib stoppings blown away, which would allow the blast to get in. Where was that?—That is further in the mine. That was found later.

859. Did you find any signs of the explosion in the return, further in than the return doors?—No, excepting at the very lower end. It had gone through by the cabin, and there we found some burning. In the upper part of the return there was a quantity of dust mixed with soot.

860. In connection with this dam that has been referred to, was there plenty of room for the miners to get along there?—It was not a road the miners would have travelled in any case.

861. Was there a practicable road into the return other than that?—If they wanted to go from the lower district to get to that return they would have to go up the main dip, and into the return at the mid-level.

862. You say this aperture was only for the purpose of distributing the air?—Yes.

863. In this air-return there is a shaft, is there not?—Yes.

864. Something was said about the necessity for having signal-boards there and guide-boards. It was in connection with subsection 38 of section 33 of the Coal-mines Act, which is as follows: "Ladders, and, when necessary, convenient platforms connected therewith, shall be provided in each rise, upcast, or passage giving access to workings at a higher level in a mine, and a notice shall be posted at the foot of each such rise, upcast, or passage, stating the height of such rise, upcast, or passage, to the chamber or drive above."—I read that section to mean that if the men are compelled in going to and from their work to ascend or descend from one level to another that shall be done. This shaft cannot be treated as being a passage through which the workmen have to go to and from their work. Therefore, I do not consider it necessary to have that notice.

865. There were no workings there then?—No. The depth of the shaft is 29ft. 9in.; 6ft. diameter at the bottom and 7ft. at the top.

866. In connection with your theory of how the explosion occurred, how do you account for some of the men on the western side having run several yards?—I take it that the whole of the men on the western side escaped the blast. I think almost every man on the western side had time to move from his working-face, and that he was overpowered by the after-damp.

867. There was no sign of burning on them?—There was in one or two cases, in No. 5 and No. 6.

868. That was where the strongest blast was, on the western side?—Yes.

869. And there was also some flame up Nos. 5 and 6 inclines?—Yes; beyond that there had been no flame.

870. As you came out towards the dip there was some one found stripped of his clothing?—That was at the top of the main incline.

871. He had been in a blast of wind, not in a fire?—There would be heat, of course, but it was the rapidly moving blast that stripped him.

872. Can you account for the flame not being so strong in the western workings and lower down on the eastern side as in Nos. 2 and 3 inclines?—You mean from the appearance of the two sides?

873. Yes?—I think that is accounted for by the explosion having been initiated on the eastern side.

874. Then it was far stronger on the east?—Yes.

875. But there was evidence of its having travelled towards the west?—Yes.

876. Had the dampness of the western side anything to do in breaking the force of the flame?—It would meet some water in the main incline near the cabin which would probably kill the flame to some extent. It burst through the cabin but was checked there.

877. Have you ever seen an accumulation of water there?—There is water in the sump, lower down.

878. And in the level itself?—There was no water in the level itself the day after the explosion.

879. You heard the evidence yesterday of the miners who made an examination of the mine. They seemed to think that the blast had met a large volume of water in the level? What do you say to that?—There was no water in the level for it to meet.

880. And you did not see any water in it when you made the first examination?—The first time I attempted to go along it the water was up to my middle—3ft. deep.

881. How long would it take the water to rise that 3ft.?—Three or four days after the explosion.

882. In some mines the miners are paid for small coal. What was the custom in your mine?—We paid for it per gross weight—small and big.

883. *Mr. Beare.*] I think you said in your examination that gas had been found periodically in small quantities?—Yes.

884. And you also said that there were no bodies found near the blown-out shot?—No.

885. That would not be inconsistent with the fact of a shot having been fired there—that is to say, there would have been time had a shot been fired in the ordinary way for the workman to get some distance?—A man could have got to any working part of that district before the fuse went off.

886. *Mr. Joyce.*] Mr. Bishop, you said that there was no direct return for the men on the sump-side. If the dam had not been there could the men have got out?—I said clearly that there was a return, and a better road than going up the top of the dip and over the return. Instead of going up the air-course they would go up the main dip and join the return at the mid-level.

887. But that would only leave one road?—There is the intake at present; they go in this way and out that way [direction indicated on plan].

888. *Sir J. Hector.*] There was no sign of the explosion in the return air-way?—No; it never got into it.

889. You referred in your evidence to an upper seam, which you described as having some gas in it?—As liable to give off gas after an explosion.

890. Are you aware if any falls had occurred in the roof of the main seam prior to the explosion, or if any falls had laid bare that seam?—I do not know of any.

891. How were you aware of the existence of this seam?—We saw it in the falls or bumps in the "rise" workings.

892. Where was it that you discovered that the seam was "gassy"?—Near our top workings; we were driving on to it, and found it gave off gas freely—in the old prospecting dip, outside the fault.

893. Have you seen the upper seam inside the fault?—As far as I know, it has not been seen.

894. *Mr. Beare.*] With reference to the blown-out shot-hole, did you at any time ever give instructions with regard to the men firing shots—I mean recently?—No.

THOMAS BROWN examined.

895. *Mr. Park.*] You are manager of the Coalbrookdale and Granity Mines, Westport?—I have been district manager for about five years, under-manager and manager for twenty years, and coal-mining all my life—for thirty-five years.

896. You made an inspection of the Brunner Mine with Messrs. Lindop, Scott, and Hayes?—Yes, and with Mr. Gordon, Mr. Cochrane, and four working miners.

897. This was about the 28th of March?—I cannot tell the date we commenced the inspection, but it was shortly after the explosion.

898. What was the purpose of the examination?—To ascertain the cause of the explosion.

899. Can you tell the Commission what you think was the cause of the explosion?—A blown-out shot.

900. Was that a blown-out shot in No. 4 bord?—Immediately in a line with Brislane and Roberts's place, No. 4 bord, east side of main-dip incline.

901. Please give the Commission your reasons for thinking it was a blown-out shot in No. 4 bord?—I do not know of anything else that would have produced the same conditions.

902. When did you come to the conclusion that it was a blown-out shot?—As soon as I saw the bord.

903. And before you saw the shot-hole?—Certainly; some considerable time before that: in fact, I was searching for the blown-out shot.

904. Did you mention it to anybody?—I mentioned it to Mr. Lindop, and I said that was the place.

905. But you did not tell him you were looking for a blown-out shot?—I could not swear that I did; I am under the impression I did.

906. When you got into the No. 4 bord you were on the look-out for a blown-out shot?—Yes.

907. From the appearances of the bord?—There is an enormous quantity of charred coal there.

908. How did you enter that No. 4 bord?—We entered it from the No. 3 incline [indicated].

909. So you came in from the face?—Yes.

910. Tell us how you carried on your inspection?—We went along each bord, taking the centres, until we came to No. 1 incline. We began at the lowest level, before the water rose, and walked until we came to the water, taking each bord, stenton, and road. It was a most complete investigation, and everything was noted. The working miners did the same. They followed out the same lines as we did, and walked outwards and inwards. They went first ahead of us, and sometimes we were ahead.

911. Where did you first make up your mind as to the blown-out shot?—From the crispness of the coal under my feet. That first attracted my attention.

912. Where did you find that crispness first?—On the floor of the No. 4 bord, going outwards from No. 3 incline. That led us to closely inspect the bord. Another reason that led me to the conclusion of the blown-out shot was that I have had three explosions in my place from blown-out shots. Nobody was injured in any case; but they would have been very serious matters indeed if it had been a close mine like the Brunner. The physical features of our coalfield are very different from what they are here. With us the seam is cut by numerous gullies and gorges, which expose the seam. The bords are driven right out to daylight. The explosion from the blown-out shot expanded out to daylight, and set the bush on fire in the river side. Such open workings give us fresh air.

913. It went up the main incline?—The bord was not worked out in the first working. The seam is very high, and in making the bords about 8ft. high they take down the top coal at the first working. We were taking down the top coal when this blown-out shot occurred.

914. In taking down the top coal, would there be any dust?—There was very little dust indeed. It was a badly-laid shot on the wall side, and was put too much into the solid. The under cutting was very well done, but it was too much into the solid. The men were immediately discharged.

915. Was it anything like the one you found in the Brunner Mine?—It produced the same results inside the bord. The coal was charred 5 chains away from it, and, I have no doubt, had it been a closed place the men would have been killed. The overman was over 5 chains away from the place and was hurled against the air, not in the direction the air was coming, but back towards the return. He was hurled through a canvas door over 5 chains away. I immediately took action to prevent the colliers firing shots of their own accord immediately on hearing of the Brunner accident. I sent Lindop back and asked him to put a man on specially for the purpose of shot-firing. We also got special instructions for the firing of shots prepared. The change was made early in April, after the explosion at Brunner.

916. What was the date of your arrival after the explosion at Brunnerton?—1st April. Lindop was sent back a week previous in order to hasten on the bringing into force of this new rule, as I saw that there was such an amount of danger attached to it, and I was not prepared to take any risk.

917. *Sir J. Hector.*] You did not make the change on account of the blow-out in your own mine?—I was not impressed with the danger. There was no one injured, and no harm done excepting the charring of coal.

918. *Mr. Park.*] Did you make any further investigations in the mine, or did you stop when you considered you had found out the cause of the explosion?—We went through every part.

919. Did you change your opinion when you were going through?—My opinion was rather strengthened.

920. You were through to the west side?—Yes.

921. Did Nos. 5 and 6 inclines, on the west side, show signs of great violence?—Yes.

922. How does it go?—The blast goes down the slit and along here [inclines indicated], and the two forces met here. There is evidence of very strong pressure being exercised in the cabin. The whole cabin is blown away. Everything is blown inwards with terrible force.

923, Why did it make its way so far as Nos. 5 and 6?—There is nothing to prevent it. It would find its way along the level and up the Nos. 5 and 6 inclines with terrible force.

924. Would the fact of the workmen being at work up there have any effect in causing it to be of greater force up those inclines? Would there be a greater deposit of coal-dust from the workings?—I do not think so. You will notice the pillars further back. The air is coming in that direction, so that it is carrying the dust away, and therefore any dust made would be carried away from these workings.

925. You think the air-current is strong enough to take away the coal-dust?—There is a very good current indeed. I do not mean any current would carry away the dust. It would simply carry it as far as, and deposit it on, the first timbers, where the dust has accumulated.

926. Do you refer to the force of the blast or to the ordinary air-current?—The ordinary air-current.

927. One of the miners said there was a very faint indication of air-current in here [indicated]. He seemed to think it had lost itself in some of the wide bords?—I was not paying very much attention to the condition of the mine after the explosion. I was looking for indications of the explosion.

928. What were you expecting to find?—I was not expecting to find it in anything like the same condition. The condition of the mine was very much better than I expected to find it.

929. Did you find all parts of the mine in the same condition?—I was simply astounded. I went into every conceivable place where there was likely to be an accumulation of firedamp, and I found it very much better than we expected.

930. We were told that there was gas over nearly all the falls by one miner—a little?—I only saw gas there on two occasions. I am not certain about the second, but I am certain about the first.

931. What sort of a mine would you call it? Would you call it a dusty mine?—Not within the meaning of the English Act.

932. A damp mine?—A little damp.

933. What portions of it were most damp?—The pillars in the lowest bords seemed to be the dampest, and there was a good deal of water there that had accumulated from the time of the explosion. Just before we left, the mine was being got into its normal condition again, and the moisture was beginning to ooze from the coal. It was not a very damp mine, and it could not be considered a dry one.

934. In a moderately damp mine is there likely to be a dust explosion?—In the mine where the explosion occurred at Denniston there was a deal of moisture in the bord. It was a very moist atmosphere.

935. You say your mine was damper than this?—I should think it was.

936. Still, there was a coal-dust explosion?—Yes.

937. You are aware it was not from gas?—Yes.

938. You have not any gas at all?—No. On account of the physical features it is almost impossible to have gas. The covering is very thin, being cut by the gorges and fissures. Everything is allowed to drain off, and we are free from gas there.

939. The fact of some of the bodies being found away up here in a natural state: would that be on account of there having been no dust there?—The fire was very much greater in the main dip than anywhere else, and they got the full force of the blast.

940. Were the stoppings of the mine fairly good?—Some were excellent, and could not have been better.

941. Do you believe in cribbing?—Yes, because the greater the pressure the tighter the stoppings become.

942. Consequently wooden or brick stoppings would have burst?—They crack like a piece of cardboard. They are the worst stoppings to put in.

943. If you had board or brick stoppings, the rise of the floor and the subsidence of the roof would have burst them, I suppose?—They would have been forced out.

944. And you do not think there could be any improvement on what was done in the mine?—No. I think it was a blessing the stoppings were blown out, as otherwise the consequences might have been more serious outside the Brunner Mine.

945. In what way?—The blast would have gone out of the tunnel like a cannon, and would have carried everything before it.

946. In view of the fact that the men had gone into the mine and worked an hour and a half before the explosion, what deduction would you make from that?—I should make the deduction—and the evidence is overwhelming—that it was not a firedamp explosion. There is no doubt about it.

947. Supposing it had been a gas explosion, would not the fact of the men having been working for over an hour tend to prove that there was no gas in the mine?—That there was no explosive mixture where the men were working.

948. Would the fact of their using naked lights have facilitated an explosion had there been gas?—If the lights came into contact with the vitiated air it would explode.

949. Very readily?—At once.

950. Did you go through the return air-course?—I did.

951. What did you think of it?—It is a very decent air-course for an old mine; certainly ample for requirements.

952. When you went in, what was the state of the ventilation of the mine?—At the commencement?

953. Yes?—Just about as wretched as it could possibly be. The ventilation was not coming through its right course during the first part of my inspection, and the pillar-courses were not then ventilated. They had not enough timber for that part, and the air was circulating round these workings [indicated]; but on the other side there was nothing going through, so that if there had been firedamp in the mine previous to the explosion you would naturally have expected to have found a large quantity afterwards, but nothing of the kind was there; that is one feature of the thing that surprised me very much.

954. And also strengthened your theory about the coal-dust explosion?—Personally, I have no doubt about that.

955. Did it strengthen your opinion?—Most assuredly it did. I expected to find a large accumulation of firedamp almost everywhere.

956. Which only would have been so had it been a gas explosion?—There is no reason that there should be. If there was an accumulation of gas it only proved that the ventilation had been disarranged. You would naturally expect to find a larger accumulation then, when there was no ventilation at all in another part of the mine.

957. I suppose that there is no chance of gas coming from the goaf?—Do you mean in reference to this explosion?

958. Yes?—None whatever; it had nothing whatever to do with this explosion.

959. Supposing there was gas coming out of the goaf, would it reach the men who were working or would it reach the return air-course first?—It would certainly go into the return air-course, because the ventilation runs in such a direction as to take the gas away from the men. Every precaution is taken to sweep the impure air into the return air-course.

960. Supposing the old workings on the other side to have been bad, would there be any chance of gas coming from there?—Those are "fast" places; there are no old workings there.

961. *Mr. Beare.*] As a manager yourself, would you say that the usual conditions of coal-mining were fulfilled in connection with the Brunner Mine, and that the Act and rules are fully compled with?—So far as I am aware; but that is a question I can scarcely answer, as I know nothing about what was done previous to the explosion. There are many indications in a mine in regard to the roads, brattice, &c., which show whether a thing is fairly managed or otherwise.

962. Briefly, your opinion is that the mine was fairly well managed?—I do not think there is any doubt about it.

963. You would see what the stoppings were composed of, and you have said that they were more than sufficient—in fact, ample—for the working of the mine: have you anything to add to that?—The stoppings were all that was necessary. It would be a bad job if these stoppings had not gone down. Nothing in this world could have saved the men who were there, as it was.

964. I believe you were the first to discover the blown-out shot-hole?—Yes, I was seeking for it, and I was the first to discover it.

965. Are the roadmen employed in your mine required to make daily reports?—Certainly not. There is nothing in the Act to provide for that so far as I am aware.

966. Would there be any other material difference in the effects of a gas explosion and a coal-dust explosion that you would naturally look for?—A gas explosion could not produce the same conditions. It is simply impossible. A firedamp explosion has a very feeble flame compared to this. The flame must have been most intense—in fact, the bord where the blown-out shot occurred must have glowed like a furnace for a time, because large quantities of gas have been distilled from the coal by the fire. The force of the heat must have been also most intense on the same side of the pillar that the blown-out shot occurred. That is the same pillar from which I myself took off an inch of distilled coal. The pillar itself had the silvery-grey appearance of pure coke, and I asked that the dust should be taken off and kept as a memento of my visit. It was a most astounding thing to look at. No firedamp explosion could have produced the same conditions.

967. Can you say anything as to the rapidity of the blast: supposing there had been a gas explosion, and supposing there had been a coal-dust explosion?—That is a scientific question that I can scarcely answer. I should say a firedamp explosion would travel like a lightning flash, but a coal-dust explosion is slower and more intense, having to provide its food as it goes along.

968. Looking at the disastrous effect of this explosion, if it had not been a firedamp explosion, would you not say that there must have been a considerable accumulation of gas to produce the effects?—From what I saw, a firedamp explosion was impossible. Every little bit of gas seen in the mine has been faithfully reported by the men. I knew the underground manager and the fireman well, having known them for twenty years. I would go anywhere with them and trust them anywhere—Roberts and Morris.

969. What opinion would you express as to the workmanship of the blown-out shot? Do you think it was a shot put in under proper management?—The management cannot be held responsible for anything of that kind, for it is impossible for the management to keep one man to watch every other man. They can only prevent these things by finding them out before they are done.

970. Seeing that there was no under cutting, and that the shot had been put pretty well into the solid, I suppose you would say that it was not a shot put in under the management of the fireman?—I dug my hands into the floor, and the floor does not show any marks, and there were no indications of any under cutting having been done. There may have been under cutting, but I could not see any.

971. *Mr. Joyce.*] Did you examine the slit in the low side of No. 4 bord? Did you notice where the explosion had burst itself?—It was most difficult to say in which direction the blast had gone.

972. Did you notice the prop in the slit being charred or burnt?—I did not notice it. There was a part blown that way and this way [indicated] towards No. 2 incline and part in the opposite way to No. 3 where the blast had thrown the coal-dust into the roof or stone fall and buried it from 18in. to 2ft. deep.

973. On which side of the prop, the high side or the low side?—The charred dust on these props was very thick. They were in a line with the blown-out shot.

974. On the high side or the low side?—I do not quite understand you, because that bord seems to be driven on the level. I am strongly of opinion that the charred dust has just licked the prop.

975. It was on the low side?—It would be in line with the blown-out shot.

976. That would be the side nearest the blow-out?—Yes.

977. Was there indication of much force near those props?—No.

978. Following down that low side of the slit, you do not know which way the force exerted itself?—I cannot say exactly. It is more than probable that it went down. [Witness referred to his notes]. I have it here, that "The prop opposite the low slit is strongly capped with dust on the low side."

979. And the lower side would get the back-lash?—Yes.

980. *Sir J. Hector.*] What was on the lower side?—Charred coal-dust unconsumed.

981. Was there anything on the upper side?—No. The prop is slightly charred on the high side, as the force going in line here would strike heavily there [indicated], and the rebound would char this dust and coke it. The coke-dust I am referring to now is not like coke. It seems almost in a plastic state—sufficiently distilled to make it cohesive.

982. *Mr. Joyce.*] Do you know whether there was any water in the low-level at the time of the disaster?—I really could not say. There was a certain amount of water when we were examining it.

983. Assuming there was water in the low-levels, and the force of the blast went down that slit, would it not have expended itself in the water?—No; it would go round with terrible force, and strike the pillar on the other side.

984. Assuming the water was there?—The water would not be sufficient to prevent it striking the wall on the other side, but I repeat the water was not there when the explosion took place. It was after the explosion took place. That is proved by the boy being found there, and the fact that he was actually taking coal through there at the time he was killed. The water must have accumulated after the explosion.

985. You have not been in the lower level? I was not in the level where the boy and horse were found, but Messrs. Cochrane and Bishop were. I was down to the lowest level, but not in it.

986. You were not down below that?—No, there was no place to go down below.

987. There are these two bords [indicated] ?—I was not there; that is the exploring-drive.

988. Would it not be possible for gas to make in one of these bords?—I do not think so. Gas was never seen there; and in the long prospecting-drive itself there was no gas found.

989. Would it not be possible for gas to accumulate?—I cannot say what would be possible. All I can say is that it did not accumulate gas after the explosion.

990. Assuming gas had been accumulating in the working-places to the east, and the air-current had been coming back to that No. 4 bord, do you not think it might have brought the mixture of gas and air with it?—It might have, but it did not.

991. How can you say it did not?—Because it would not produce the same results if it had been a firedamp explosion.

992. If the explosion in the Brunner Mine had been started by firedamp, would it have produced the same effects as an ordinary coal-dust explosion?—Yes, but it would not have produced the same results as a blown-out shot in that particular place. There is no other place in the mine that shows the same results as round the blown-out shot. The conditions are peculiar to that place. I have seen four or five explosions: one shortly before I left Home, one at Wallsend, and another in the Brunner Mine sixteen years ago. None of these explosions showed anything like the same conditions that this blown-out shot shows. I would not have known this was a blown-out shot if I had not had the experience of three blown-out shots at my own mine.

993. Assuming you had fire there, must not there have been rather slow combustion in No. 4 bord to bave produced the coking?—The heat was very intense and rapid for a few minutes.

994. How is it that you did not get the heat running down the slit?—Is it at all likely that it would go down that way when it can come up this way [indicated on plan].

995. You only saw the marks of inflammation in No. 4 bord?—The explosion took place afterwards. What the blown-out shot would do would be to cause a very sudden compression. The air would sweep up the airways, and of course would set in motion clouds of coal-dust; and so long as there was sufficient oxygen this combustion would be continued.

996. Could not the same conditions exist with an explosion of firedamp accelerated by coal-dust?—They do not. In this case there is no other bord which will produce the same conditions.

997. What is the difference in the conditions of other bords outside of this blown-out shot bord and the conditions which would exist in the case of a firedamp exposion accelerated by coal-dust?—There is more coking of coal and coal-dust, showing that a greater heat has been produced.

998. If you had sufficient heat to roast the coal-dust after the explosion, would not you have exactly the same symptoms as now?—No; on account of the intense burning being so much in one place.

999. You mean that at any lower temperature, coal-dust would not have exploded in the same degree?—In that bord?

1000. No; other bords? Are the conditions in other bords the same as they would be if it had been a gas explosion accelerated by coal-dust?—I should think so. My idea is that a great proportion of the explosions we have had in past times have been greatly intensified by coal-dust.

1001. Leaving out the blown-out shot bord, are the conditions in other bords of the incline the same as would be produced by a firedamp explosion accelerated by coal-dust?—I never saw a firedamp explosion that was started by coal-dust; and never having had that experience, I cannot say what the conditions would be.

1002. But you think they would be the same?—I should think so, from the quantity of charred coal-dust; but that is only surmise. I cannot say from actual experience that it is so.

1003. I suppose that blown-out shots are common occurrences in mines?—Not by any means.

1004. Do you know that most of the English authorities go to show that blown-out shots have produced a great number of explosions since 1881?—They blow out; but still every blown-out shot does not produce an explosion.

1005. Certainly, under certain conditions?—There are many conditions required to be exactly fulfilled before you get the right thing.

1006. In your opinion, would you get a better result if you used roburite and nitro-glycerine for blasting?—I have tried and have been somewhat unfortunate. We tried roburite. We had two ranges blown up in one week in Wellington through carelessness on the part of the miners in allowing the detonators of the dynamite cartridges to get away in the coal.

1007. What were you using at the time?—Dynamite.

1008. Does roburite blast well?—We were not very well skilled, and had not a general success with it. We got one good shot out of half a dozen.

1009. I believe that you did not have a very good quality of roburite?—That might have been so.

1010. Do you think it necessary that the fireman or some other responsible person should see that the shot is properly holed and undercut, and should fire the shot himself?—I handed in some rules and you will see what we have done.

1011. I saw them. Do you think there is an element of danger in allowing each miner to fire his own shot?—Yes, and there has always been.

1012. Do you not think that the man who fired that shot was negligent or careless, presuming a shot was fired?—I have seen worse shots than that fired in my place. I have seen them strike into the solid coal, and I have sacked the men for it.

1013. Do you not think this man was grossly careless?—He has not known the danger attending it.

1014. You said that you only saw gas in a couple of places; that would be a small amount of gas you would get in your lamp?—Yes.

1015. Do you think the Davy-lamp is as good a tester for gas as you could have?—It is all right for an accumulation of gas; for telling the percentage of firedamp that is in the atmosphere below the explosive point, it will not do anything of the kind.

1016. It would take you all your time to find 3 per cent. with a Davy?—I should think it would.

1017. Do you know what percentage of firedamp and coal-dust will produce a very heavy explosion?—We can have an explosion from coal-dust without firedamp.

1018. I understand that there are no means in New Zealand of finding 1 per cent. of gas?—The Mines Department have an instrument, but it is not a great success; there are lamps in Great Britain indicating a ½ per cent.

1019. Do you not think it is necessary, in view of the explosion at Brunner, to have some means indicating a small percentage of gas?—I certainly think so.

1020. Do you think that the stoppings were as good as could be made?—They were the crib-log stoppings.

1021. Did you see any deal-board stoppings in the Brunner Mine?—I did not notice any; at my place we use nothing else but deal boards. There is no necessity for anything else. What you want is wind, and to carry it well.

1022. We have it in evidence that in Brislane's bord safety-lamps were being used. I do not know whether there was gas or not in that bord, but assuming there was gas there, do you think it was right for the men outside that bord to be working with naked lights?—That would depend upon the condition of Brislane's bord, and the reason that the lamps were there.

1023. I am not talking about reasons—assuming the gas was there? — No. If there was an accumulation of gas in Brislane's bord, and you were working with safety-lamps on account of that, it would certainly be wrong to work with naked lights in that district (always assuming there was an accumulation of gas).

1024. Do you think it would be safe to be working where the falls were with naked lights?—Certainly not, and, what is more, there is no underground manager or fireman who would allow such a thing. It goes without saying that neither Roberts nor Morris would permit anything of the kind, and, what is more, the men would not do it themselves. The thing could not occur in practice.

1025. Mr. Hayes has had an experience of a man smoking his pipe when they were working the mine with safetys?—Men are mad enough for anything, but I do not believe you would get men to work below this fall with naked lights if there was an accumulation of gas there.

1026. But the fact remains that they do it?—Such a thing would not occur with us. I would discharge every man about the neighbourhood guilty of doing such a thing.

1027. Are you in favour of using mixed lights in mines?—No; if it is necessary to use safety-lamps in one bord, it it necessary to use them in all the districts.

1028. Miners have a great objection to working with safety-lamps, have they not?—Yes; it is very natural. It is a very poor light, and, in my mind, the risk is very great from falls in the sides and roofs.

1029. Assuming that you had to use safety-lamps in your mine, do you think the death-rate would increase?—I am sure it would, largely.

1030. You think it would be very difficult to work your mine, on account of the roof, with safeties?—Yes. The safety-lamp shows all round; but in order to get a light on the roof you have to tilt it.

1031. *The Chairman.*] Then you cannot tell the state of the roof at all with the safety?—No; you have to tilt the lamp to get at the roof.

1032. *Mr. Joyce.*] If you had it in your working-place, I suppose you could not see within two feet of the roof?—You would not see it at all; you would have to be a great distance away from the face to throw a light on the roof.

1033. Would you be surprised if they found gas in the main dip during the progress of the rescue work?—I would not be in the least surprised.

1034. I am talking about the firedamp?—How can anybody tell that?

1035. I want to know if it was possible to tell that firedamp was present during the rescuing work?—Supposing they did find it, how could anybody tell whether it was ordinary firedamp or carbonic oxide?

1036. What proportion of carbonic oxide would you require, mixed with air, to produce an explosion?—I could not tell.

1037. What is the effect of carbonic oxide on a man?—The man instantly falls down unconscious. He can walk for some little time in black damp, and he can breathe with the firedamp.

1038. You say your roadmen are not required to make daily reports, but the deputy does, and the fireman?—Yes. We have rather a different system to most mines. We work under the Northumberland system purely and simply as far as the deputies are concerned. Thsy examine the roads and districts, lay roads, cut timber, and travel round among the men in order to see that they are safe, and that everything is right with them. They are constantly travelling round.

1039. Do you think a deputy should be required to do bratticing, lay roads, and cut timber in addition to his ordinary duties?—These are his ordinary duties.

1040. Do you not think his ordinary duties should be to go and look for gas, and inspect the mine?—We have from fifteen to twenty men employed where we have one deputy.

1041. That would mean four deputies in the Brunner Mine to sixty-five men; do you think that number was sufficient to do all this bratticing and road-making?—I do not know anything about what they would do here, but I am speaking positively about our own mine.

1042. Do you remember the date that you found the blown-out shot?—The 5th of April.

1043. The ventilation on that date was fairly good, I suppose?—It had been restored to its original course, and it was all right.

1044. Was it restored to its original course on that date?—Yes. We made one day's inspection prior to the air being restored, and then we stopped until it was restored.

1045. *Sir J. Hector.*] What was the date of your making the previous inspection, before the air was cleared?—I do not remember.

1046. *Mr. Joyce.*] Do you consider that watering a mine would allay the danger?—Anything that will lay dust must minimise the risk.

1047. Do you consider that no miner should be allowed to fire a shot except under the supervision of a deputy or competent official?—It would be the safest way. It is, perhaps, going too far to say that they should not do it. It would certainly be safer to allow skilled men only to fire all shots.

1048. Under present conditions, miners being allowed to fire all their own shots, there is always an element of danger such as at Brunnerton?—There is no doubt.

1049. And that danger would be materially reduced if the shots were fired under proper supervision?—Quite right, and you might just as well look the thing square in the face.

1050. *Sir J. Hector.*] Are you aware that experience shows that the greatest deposit from a blast of coal-dust is always on the opposite side of the prop to the side the blast comes from?—Not always, but generally.

1051. It has been pretty well shown that the greatest accumulation of coal-dust is on the lee of the prop, or on the further side of the prop from the source of the explosion?—That is sometimes so, but there are exceptions to that rule. We have found in some inclines where the greatest force has been exerted the props perfectly clear on the upper side, and, in the same line as the force, charred coal, but that might arise from the second rush taking away the deposit of dust. In some cases we had an unmistakable deposit on the same side as the return lash.

1052. In making observations, did you distinguish between the thoroughly exhausted or coked coal-dust, and that which was only comparatively exhausted?—Yes, the mode of deposit seemed to be pretty well the same in all cases. There were evidently two blasts.

1053. By the term "blast," do you include the in-rush?—No.

1054. How far do you consider the blast extended in this mine?—Do you mean the explosion itself?

1055. I mean the one blast?—What we call the blast means everything that took place from the commencement of the explosion until it rushed to the tunnel mouth.

1056. Then, what you describe as the blast would be very different in different places?—Yes.

1057. The fact of the stoppings being blown down had no immediate effect, for the reason that the air-current was reversed at the time?—If the explosion had been confined to the main tunnel, the bodies would not have been got out yet.

1058. With regard to the use of roburite, here is a telegram I have received from the manager of another mine [telegram read]. Would you say that is a sufficiently good record for roburite?—Yes.

1059. It would indicate that the sample you operated with was defective?—Yes.

1060. *Mr. Proud.*] You mentioned about the falls of roof and sides. Do you not think that if there were a proper system of timbering and examination of the slab of the coal, accidents from falls of roof and sides might be reduced?—We keep up the Northumberland system: as soon as the men pass a certain point, the deputies undertake the retimbering.

1061. You have the deputy system?—Yes, and the deputies are in all the time.

1062. Does not that conduce to the safety of the mine?—Yes; up to within eighteen months ago we had very few accidents. We had one bit of bad luck, and then we got down to the normal condition of things again.

1063. Can you give any farther information as to what you observed in the Brunner?—Nothing more than what I have already stated to you about blown-out shots. If you think it is necessary, I can produce the overman who was with us when the blown-out shot took place in our mine. He is with us still. His name is John Harris. There is no firedamp there.

1064. Can you suggest anything to the Commission with a view to preventing similar disasters?—The idea thrown out by Mr. Joyce is a very good one—viz., that the shots should be fired by skilled men only. It would secure greater safety to the working-miner. One is often asked for work by a man who is not a miner, and, assuming that there is no skilled man to superintend the use of powder, he is sent into the mine and has to take his chance.

1065. *Mr. Skellon.*] The Act says that no person under the age of eighteen years shall be allowed to charge a hole. Do you not consider that clause wants altering?—I think that if the idea were carried out that has been suggested, that the shots shall only be fired by special men, it would remove the danger altogether. I think the colliers themselves would look upon it as a boon.

1066. You saw the return airway?—Yes.

1067. Do you consider it good enough for a travelling roadway?—Do you mean under ordinary circumstances?

1068. No; under extraordinary circumstances, when a man would require to get out quickly after an accident?—In the case of an explosion, if a man attempted to travel through the return, he would not be in the same condition of mind as he would be under ordinary circumstances. The place might also be changed as the result of the explosion. In this case the timber had been scattered about in all directions, and falls had taken place. But for an old mine it was a very reasonable airway. I have had the opportunity of travelling a good many airways in Northumberland, and have seen many that were no better, and yet employing many more men.

1069. Of course, we are advancing now?—Yes; during the last twenty-five years.

1070. Could not there have been gas in the working-places from 8 to 9.30 a.m. without it being noticed by the workmen, supposing they were "holing"?—There are none of those places very high, and the men carried lights in their hats.

1071. While they were "holing" on the ground?—I do not think they did. I noticed the men kept their lamps in their hats "holing" or not "holing."

1072. But is it not possible there was gas?—It is quite possible that some accumulation of gas may have taken place.

1073. You say the roadmen did not make special reports?—They do not report in writing. They report not only at the end of the shift, but during the day. We have no report-book at all.

1074. *The Chairman.*] They report verbally?—Yes, and frequently during the day. What we call roadmen are the men engaged in bringing out the coal.

1075. *Mr. Beare.*] Is the fireman a deputy?—Yes.

1076. *Mr. Park.*] Mr. Bishop told us that the exploring bords [indicated on plan] were full of water. Would there be any possibility of gas coming from those exploring bords?—There would certainly be less chance on account of water being there.

1077. These bords would only be filled with water on account of being the lowest part of the mine?—That was before the explosion.

1078. During the working of the mine, could any gas accumulate there?—I do not think there would be any gas there.

1079. Whether there was any water or not?—I do not think there was the slightest chance of it.

1080. *Sir J. Hector.*] If gas was given off, what would become of it?—It would be diffused.

1081. *Mr. Park.*] You said there was a dissimilarity in bord 4 as compared with other bords?—Yes.

1082. Was there any great dissimilarity in the signs in the other bords?—Not much.

1083. They were pretty well all alike excepting No. 4?—Appearances were very much the same in all the other bords.

1084. *Mr. Beare.*] Before the Brunner explosion, I believe, in your mine shots were fired by miners, and the blasting was carried out absolutely by miners, like the system adopted in the Brunner Mine?—Yes.

1085. A question has been suggested whether lives might have been saved if there had been another outlet or air-shaft?—I think the poor fellows were doomed from the very first, no matter if they had another outlet. Supposing you could get up that road, then the impure air could get up also.

1086. Then, the mere putting-down of another shaft would not have saved them?—It would not have been any good. The amendment pointed out by Mr. Joyce is the one we shall have to take in the future—viz., the proper supervision of blasting.

1087. And not allowing the use of blasting-powder?—I do not know that it would be any great hardship to abolish it. It is a source of danger on account of careless tamping.

1088. *The Chairman.*] There is no danger of careless tamping with roburite?—I do not think there would be any great hardship if a high explosive were substituted, and every other precaution taken. We are all anxious for that.

1089. *Mr. Skellon.*] Of course, if a high explosive were used, and the deputies were to charge the hole, the deputies would have to do the tamping?—No. Everything should be done to insure safety.

1090. *Mr. Proud.*] Would it be practicable to introduce the panel system here?—No; the bord-and-pillar system seems to work very well. We have a large margin of safety.

1091. Could you not drive gateways to the boundary, and work the face back by juds or lifts? The roll in the strata would not allow of that.

1091A. The explosion appears to have exhausted itself in the old workings behind the electric motor?—Yes.

1092. Have you any other suggestions to make?—I think strong representations should be made with regard to the disposal of the funds collected for these accidents. There is a large fund accumulating, and no provision is made for the wives and children of the men killed in ordinary accidents in the mines, such as by falls in the roof. I think some provision ought to be made to relieve these cases also from the large fund now accumulating.

The Commission adjourned at a quarter to 4 o'clock p.m.

INSPECTOR MCGOVERN examined.

In reply to the Chairman, Inspector McGovern said he was in charge of the Nelson and Westland Police District. He received no precept regarding the inquest after the accident in the Brunner Mine. There were numbers of miners available for service on the jury who were not employed at the time. He saw them in Court, and heard them give evidence that they had not been employed. The inquest was adjourned to the 15th of June, on application of the foreman of the jury. The Coroner was about to adjourn the inquiry for a week when the request was made, as the experts could not be ready with the plan sooner, to adjourn to the 15th June. He got a telegram from Mr. Stratford asking him to get all the evidence together—this was on the same day as the accident.

HENRY ANDREW GORDON examined.

1093. *Mr. Park.*] What are you, Mr. Gordon?—Inspecting Engineer for the Mines Department.

1094. What experience have you had in mines?—About forty-three years.

1095. You know the Brunner Mine?—Yes.

1096. You know that there was an explosion there on the 26th March?—Yes.

1097. Did you at the request of any one make an examination of the mine?—I came from Wellington on the Monday after the accident, and went into the mine on that day to examine it.

1098. Did you take charge of the mine?—No.

1099. What did you come down for?—To endeavour to ascertain the cause of the explosion.

1100. And you made a thorough examination?—We could not make a thorough examination that day. The mine was not safe; it required to be put into order before we could make a thorough examination. It wanted ventilating. Stoppings were put in, and the ventilation restored before we could examine the mine.

1101. How far did you go down?—To the water-level. In the lowest level there was water, and we could not get into it excepting at one end. There was a truck standing at the end of the level on rails; the truck was in the water.

1102. Did you go down to there and return?—We followed the workings down the east face.

1103. *Sir J. Hector.*] Who was with you?—Messrs. Brown, Lindop, Scott, Hayes I think was with us the first day, Cochrane, and two miners.

1104. *Mr. Park.*] Did you make an examination of the eastern workings?—We made an examination, but could not find anything that day that would clearly have caused the explosion. Then we decided to get the ventilation restored before going down again. We went down again two or three days afterwards.

1105. And did you find the cause of the explosion?—No doubt the cause of the explosion was a blown-out shot in No. 4 bord. The hole was there, and it showed the coal coked all around it. Rails had been laid in that particular place. The coking was excessive in that bord.

1106. Did you notice the extraordinary coking before you found the hole?—The hole was found before I came. I believe Brown found it. I was at Kumara when the hole was found; it was the day I came back that I went down to see this particular place.

1107. Did you make an examination of the western side of the main dip?—Yes; but I could not see anything to show what was the cause of the explosion.

1108. Did it appear as though the force of the explosion had come from the east side of the incline, and had travelled into the west side?—Yes.

1109. Did you notice if it appeared to get stronger away to the far west or less?—Less as it got to the west. [Witness indicated on the plan the direction the explosion, in his opinion, took.] There was an immense quantity of dust lying in the incline.

1110. Did it blow out all the stoppings?—Yes.

1111. What do you think of those stoppings?—They were safe enough.

1112. I suppose if they had not been blown out the blast would have gone up the main incline to the top?—Yes.

1113. And have wrecked the machinery at the mouth of the pit?—The force would have broken almost any kind of stoppings that could be put in the pit.

1114. It is said that the mine is one that has a rising floor and a falling roof, and for that reason the stoppings made of crib are the best that could be used?—They make a very good stopping.

1115. Had you been at the mine before, or at any other time?—I have been there several times.

1116. Shortly before the explosion?—I had not been in the mine for at least six months before.
1117. What do you think of the machinery and appliances?—They seemed to be all that was required.
1118. Was the machinery fairly well manned. I suppose that you made a specialty of that?—No; I did not make a specialty of it at that time because there was an Inspector of Mines for the district, and I left that to him.
1119. You were satisfied that it was all right?—Yes.
1120. Did you see the air-course?—I went through the return air-course.
1121. What did you think of it, as to its sufficiency?—It was good enough to carry off the return air.
1122. When you were in, did you find a fairly large quantity of air coursing through the mine?—There was plenty of air in the air-course.
1123. Could a man get along that air-course easily supposing there had been a block in the main dip?—He could get along it; of course, it was not good walking.
1124. Would you expect good walking?—No.
1125. Especially after the blowing-out of the stoppings?—No.
1126. Did you notice anything wrong with the management of the mine?—No. I look upon Mr. Bishop as an extremely careful man.
1127. Did you know any of the officers of the mine below Mr. Bishop—Morris, for instance?—I did not know Morris personally.
1128. Do you think that the conveniences about the mine were as good as they generally are?—Yes.
1129. Did you find anything whereby you could attribute negligence to the company or manager?—No; there was nothing. I am satisfied of that. I could not attribute negligence to the company or manager.
1130. Did you notice the air-current on your last visit before the explosion?—No; I never was through the air-course.
1131. The intake?—That was the proper road.
1132. Was there a good air-current through the mine?—Yes.
1133. I suppose if it gets in it must get out?—Of course, if there is a current at all it must get out.
1134. *Mr. Guinness.*] You observed at that blown-out hole the direction of the discharge?—Yes.
1135. Did you take any measurement to see in which direction that shot blew out?—No; the hole was about 2ft. 1in.
1136. Did you minutely examine the locality?—Yes.
1137. Could you say from that examination whether the shot had been recently discharged?—There was no doubt about it, because of the coking about the hole. That was the only place where there was so much rubbish, and there was not the slightest trace of gas. I consider the disaster totally due to the coal-dust explosion.
1138. Did you go down towards No. 1 road or drive?—Down all the dip-workings.
1139. Did you observe any indication on the sides of the slit going down?—The force had appeared to have gone in both directions. There is no doubt it went downwards and inwards, and it cannoned against the slit, where it had split itself into two divisions; the greatest force was upwards.
1140. You have no doubt it cannoned against that slit and went down this bord [indicated on plan] until it got to the lowest workings?—It could not go any further.
1141. Did you notice if the greatest force were observable on the sides of this slit [indicated] in an upward direction instead of a downward direction?—I would not expect that because of the force of the rebound; and another matter is that the explosion would gather force as it went up. The principal force of the explosion in some bords was upwards; that was shown by the props, a great number of which show that the greatest force was upwards.
1142. Would you expect from a blown-out shot and coal-dust explosion to see most of the indication of the force going upwards?—It would depend on circumstances. It might go partly both ways.
1143. I want your opinion as to whether you think that from a blown-out shot the greatest force is upwards or downwards?—It would be upwards, because the intensity of the explosion would increase as it travelled.
1144. Did you ever gauge the quantity of air coming down the intake?—No; I have asked Mr. Cochrane, and he has told me the quantity. I think the quantity of air sufficient for all the men in the pit, and more.
1145. You say you have known Mr. Bishop for how many years?—I have known him ever since he became manager of the Brunner Mine. He has been manager of the mine for thirteen years, and I look upon him as an extremely careful man.
1146. You have every confidence in his efficient management of the works connected with the mine?—I have every confidence in that man. I believe him to be a first-class reliable man.
1147. Have you ever drawn either Mr. Bishop's or the proprietors' attention to any machinery or appliances in or about the mine as not being sufficient, or defective in any respect?—No.
1148. You have often visited that mine, and the last time was six months before—about?—It would be more than that; it was in the month of May or June last year.
1149. During the last ten years you have been Inspector of Mines have you made systematic visits to these works?—I have been frequently in the mine.
1150. Did you observe the manner in which the works were carried on?—Yes; and I never found any fault or objection.

1151. *Mr. Beare.*] You say, from your different examinations of the mine, that as far as you can see the management was good in every respect. Did you at any time have occasion to refer to the Inspector as to any want, or did you find any-deficiency in the Inspector's reports?—No; I was quite satisfied with Mr. Cockrane's report.

1152. Did you examine the blown-out shot-hole very closely?—Yes.

1153. Do you think it was put in under efficient management?—I could not tell that. I cannot tell what it was tamped with, or how it was tamped; but at any rate the hole seemed to be put in such a way into the solid that it was likely not to break away the coal but to blow out, and that very likely caused the explosion.

1154. That is to say, it was too much into the solid?—Yes.

1155. Would you say it was put in under the fireman's instructions?—I could not tell.

1156. Do you think, if there had been another shaft or another outlet in the mine, it would be the means of saving the lives of the miners?—I think there was sufficient opening to give plenty of air for all the miners working in the mine.

1157. Can you speak generally as to the mines in New Zealand where blasting operations are carried on in getting coal?—I cannot speak generally, but evidently there was blasting being carried on in this mine at the time, and that caused this explosion.

1158. *Mr. Joyce.*] If there had been more openings, do you think the men would have had a better chance of escape?—An explosion of that description is very sudden, and even with more openings I do not know whether they would have had much chance of getting out.

1159. Then, no matter how many openings you had, sufficient after-damp would be generated to overpower the men who were not killed by the explosion?—Yes, I think so, as none of the men got far away from the workings.

1160. Could you suggest anything to make the mines safe in case of an explosion?—The only way to prevent a coal-dust explosion would be to keep the bords well damped.

1161. Outside of that, could any means be devised to work the mines by shafts, drives, or tunnels?—I do not think so; you could not make any change that would prevent any explosion of that kind.

1162. Do you think it necessary to damp the sides, roof, and floor within a radius of every shot—say, 20 yards?—It is not absolutely necessary, but it is always safer; there is a far less chance of a coal-dust explosion occurring if all were damped.

1163. The use of salt is also a preventative?—Yes.

1164. You have had a good deal of experience in shooting and blasting?—Not in coal; but a good deal of experience in blasting.

1165. In your experience in blasting have you ever noticed that blown-out shots are inevitable?—Occasionally.

1166. In the light of this recent explosion at Brunner, do you consider it is necessary that shot-firing should be carried on under the charge of a competent person?—I think it is advisable.

1167. Do you think, in the light of this recent accident, that it is absolutely necessary?—I think that in a coal-mine a man ought to be told off to do it who understands the business.

1168. You also say that a spray of water should be used?—I say that spraying or watering would prevent to a great extent coal-dust explosions.

1169. Do you think an ordinary miner could find his way out of this return-airway in the Brunner Mine in case of explosion?—I believe he could.

1170. Would he not have a difficulty in getting away, assuming lights were out?—True, you would have some difficulty in finding your way out of any coal-mine unless you knew the actual road in. If you were in the main intake you would go against the air.

1171. You were asked about the slit down the side of No. 4 bord. Did you notice if the force went up that slit?—It went in both directions.

1172. Not down the side of the slit?—Part of the force went down, but the greatest force went upwards.

1173. Assuming the great force had gone down that slit, would not you see marks going downwards?—They showed distinctly that the force came downwards, but the greatest force in all the principal bords and inclines showed that it had gone upwards; the props were standing in a leaning direction upwards, showing that the force went upwards.

1174. I just wanted evidence about that particular slit?—No doubt the force was upwards here [indicated on the plan], but there was a great force downwards.

1175. And all the marks as far as that particular point are in a downward direction?—I do not know that that would be so. The upward force seemed to be the greater force.

1176. Do you not think you would have a big force going downwards, and that it would have split when it got lower down?—I think the explosion would be intensified.

1177. Do you not think there would be a large deposit of coal-dust there?—There was a large deposit of coal-dust there, and there was also a large deposit in the main heading.

1178. It would not be intensified by the coal-dust going down that way to the face?—The coal-dust would be in the shape of coke; the coal got coked at several points. The shot going out caused the roof of the bord to be entirely coked.

1179. Would not the rebound after it came back with greater force strike the high side of the bord near where the blown-out shot met it?—No; because the force split and went up the second incline, and also up No. 3.

1180. Really you would not have much force going back that slit, and the rebound would not be great?—It was not so great as in some of the others.

1181. Do you think it would be as great as the downward rush?—There would be a considerable rush upwards, where it would find a way out.

1182. Would the water at the bottom level act as a rebound or a wall?—There could not be any water the day the men were working, because on the Monday afterwards there was very little

water in the level when I was there. I know Messrs. Cochrane and Bishop went into the level, and only got over their ankles.

1183. Assuming water was there, would you have a rebound?—But I am not assuming water had been there. If the level had been full of water it would not have made much difference.

1184. Would not the force expend itself in the water to a great extent?—It would expend itself, no doubt.

1185. Did you make a careful examination of the stoppings?—Yes, just to satisfy myself. I did not examine every stopping very carefully, but merely to see if they had been blown out.

1186. Just a passing glance as you went along?—More than that. I did not count every stick, but I made a good examination.

1187. Do you know the ordinary Davy lamp?—Yes.

1188. Do you think that is a sufficiently powerful test for gas in mines?—The Davy lamp will tell if there is much gas.

1189. It will not test under 3 per cent., will it?—I think it will show the slightest cap upon 2½ per cent. of gas.

1190. Do you know that ½ per cent. of firedamp mixed with coal-dust is a very explosive mixture?—Coal-dust is not very explosive, but it is much more explosive with gas. I would not say that ½ per cent. would make a very great difference.

1191. Do you know that all the authorities say that 1 per cent. of gas is a very great explosive if mixed with coal-dust?—In reading the Royal Commission's report they say 2 per cent. of gas, if mixed with coal-dust, is a great explosive.

1192. Do you think there was a considerable amount of coal-dust in this mine previous to the explosion?—Yes; plenty.

1193. More than there should have been?—It is not very general in the mine, and I could not say it was an extremely dusty mine. The coal is naturally a gaseous coal, and a coke coal generates gas fast.

1194. That would be coal-gas?—It would have great force.

1195. Do you not think, as you say that 2 per cent. of firedamp assists an explosion, that you ought to have some better means of testing than a Davy lamp, which will only give 2½ per cent. of gas?—There are other lamps to test for gas with.

1196. Do you not think these other lamps should be used in preference to the Davy lamp?—They say the Linan's lamp is set down to test ½ per cent.

1197. Is that lamp used in mines?—Yes.

1198. Do you not think, in view of the fact that you have got an explosive mixture that you cannot test with the Davy lamp, a better lamp should be used?—I think it would be advisable to have the best class of lamps for testing.

1199. Do you not think it is necessary in the interests of the miners that such an indicator should be used?—I think so.

1200. *Sir J. Hector.*] Reference has been made to the immediate effect of blown-out stoppings. Supposing at some place in the main incline the stoppings were broken through; that, of course, destroys the circulation of air. Would that increase or diminish the violence of the explosion?—I think it diminishes the violence to some extent, as one part of the mine does not show nearly as much violence as another portion.

1201. But the explosion was proceeding against the indraft?—Yes.

1202. When these stops were closed the indraft would cease?—Yes; it became an outdraft backed by the explosion.

1203. So that it would rather increase the violence of the explosion towards the mouth?—As far as the mouth it would increase.

1204. About this question of a rebound: I suppose the blown-out shot would give out intense heat?—It did so.

1205. And it would project the wave of heat and set fire to the coal?—It did that.

1206. Would the intense coal fire not draw in the nearest supply of air in order to assist combustion until it was checked by the want of air? Where would it get that air?—The nearest air-current goes round here [indicated] farther down than the bord where the blown-out shot was.

1207. When it reached that air would not it attract the air to the seat of combustion?—Yes, it would.

1208. Would that be sufficient to account for a double discharge, one downwards and one upwards in the slit?—I think it very likely that that is what would take place.

1209. You did not observe any evidence bearing on that point?—No; I did not see evidence in this particular slit, but I did notice the coking.

1210. Was there coking in the slit?—Yes; it was on the caping of the slit at both crossings, but not so much on one side as on the other. The coal was heavily coked on the roof, and I observed down the slit indications that the force had gone down, indicating that there was a current down.

1211. How did you judge?—You could see some timber.

1212. Was there timber in the slit?—There was something down the farthest slit in the way the post was lying.

1213. There was coking in the slit?—Burnt coking in some parts. That was shown by the way one post was lying—that force had gone in one direction.

1214. Did you examine the slit at all?—Yes; one side was clear, the soot was on the low side.

1215. Did you observe the props lying on the ground and the prop still standing supporting the roof?—Yes.

1216. How were they affected by the explosion?—There was coal-dust on one side, and the other side was clean. I did not observe the foot-end of the prop. The standing prop was burnt on the side that the explosion came from.

1217. Was there soot and coke on the side of the prop next to the blown-out hole?—I cannot remember that. Some props had coke, I think, hanging on to them.

1218. Did you see any dropping of coke from the roof?—In some parts the roof was greatly coked.

1219. Did you notice the tramway?—Yes.

1220. Was it quite clean?—There was coal lying upon it; it was almost buried.

1221. Was it coal that had fallen since the burning?—Yes, I think some coal had fallen since the fire; but I did not observe it closely.

1222. *Mr. Proud.*] Do you consider the coal-dust in the Brunner Mine very inflammable?—Yes.

1223. Was No. 4 bord the seat of the explosion?—I have no doubt about it.

1224. And it was carried on from place to place by coal-dust?—When it picked up the coal-dust the explosion was intensified and carried on. The first day I went down the mine there was a tremendous lot of coal-dust lying about.

1225. *Mr. Skellon.*] You said there is no doubt the shot had blown out recently on account of the coking round the hole. Does a blown-out shot coke round the hole?—It is not exactly the hole, but all the place, that it coked, including the roof.

1226. You gave as your opinion that the shot had blown out recently on account of finding coke round the hole, is that correct?—That was the place where the greatest heat appeared to be in the mine.

1227. But a blown-out shot would not coke, would it?—A blown-out shot would cause an explosion, and that explosion of coal-dust would naturally coke all the coal round about it.

1228. If there was no explosion, would a blown-out shot coke all round the hole?—No.

1229. What was the depth of the slack coal found in the floor of the bord?—I could not tell you, but I do not think there was a great deal; no more than you would generally find in a bord of any bituminous mine, where the coal is very liable to crumble.

1230. When a bord is worked out, do you not think if the dust was cleaned out before lifting the road that there would be less danger of coal-dust explosions?—There would be less danger.

1231. *Mr. Guinness.*] You said in reply to Mr. Proud that you thought Brunner dust was very dry?—Inflammable.

1232. You know that in the dip-workings there is a stream of water there caused by the mine leakage?—Yes.

1233. Are you aware if it was a dry mine, a damp mine, or a wet mine?—Some of the bords are very dry, while in the dip incline the water is running down.

1234. What would you say about the bord in the neighbourhood of blown-out shot?—There was no sign of that being wet, it appeared to be a dry bord.

1235. That was practically as you saw it after the explosion?—Yes; when I saw the bord before it was not properly dry, after the explosion, neither was the incline where water was running down.

BRUNNERTON, THURSDAY, 14TH MAY, 1896.

ROBERT TENNENT examined.

1. *Mr. Park.*] What are you, Mr. Tennent?—I have been a deputy in the Brunner Mine for thirteen years, and under Mr. Bishop all the time. I have been a coal-miner fifteen or sixteen years. I have been in the mines over forty years—thirteen years in New Zealand, all the time in the Brunner Mine.

2. Do you remember the accident of the 26th March?—Yes.

3. Had you been in the mine the night before?—I came out the night before at 6 o'clock.

4. Had you been in the mine prior to that?—Yes; since the day-shift went on. I have not been strictly a deputy since the beginning of November. My work has been preparing roads.

5. What where you doing on the 25th?—We were putting up timber on the right-hand side level, going down the dip on the west side of the mine, between Nos. 6 and 7.

6. Whose bord were you in?—In no particular place on that day.

7. Did you find any gas about the mine immediately prior to the 25th, or on the 25th?—I had no authority to examine the places unless I had been told off to do it by the overman. It was not part of my duty to make an examination of the workings from the time the single shift came on. I was opposite mate to Morris.

8. What sort of a man was he?—A very faithful, able, and experienced man.

9. You have been through the whole of the mine?—I was put in charge of the dip-workings by Mr. Bishop—to take full charge of the driving in the dip.

10. You know something about stoppings?—I know everything in connection with the mine.

11. Were they suitable stoppings, or the best that could be got for this particular mine?—At the time the stoppings were built I advised that they should be of crib logging, as the moment the ground lifted the stoppings got firmer. I advised crib-logging stoppings on account of the heaving nature of the ground. The ventilation was very much improved after that class of stoppings was adopted.

12. When were they adopted?—Possibly eighteen months ago.

13. And the return airway, was that good?—I know nothing in regard to the return, because I only once travelled it during my time in the Brunner Mine. It was not my duty to travel it unless the overman asked me. Sometimes he went himself, and sometimes two of his companions went.

14. As you know the mine thoroughly, was there any place where gas could accumulate?—No; I know of no accumulation of gas in that mine.

15. Do you know the very lowest workings of it?—I know every inch of the dip.

16. Do you know if any gas could accumulate in the lowest part of the main dip?—I was in there shortly before the water came up.

17. What did you see?—I saw nothing. We fixed a flat sheet in this bottom place to make communication a few nights before the water rose.

18. *Sir J. Hector.*] Down far in the prospecting drive?—At the two places below the main working level now. [Position indicated on plan.] There are no slits up to the main level. The water runs alongs the main level, and goes into the bottom section, and the air was carried down by means of a brattice.

19. *Mr. Park.*] What sort of mine would you call the Brunner?—Not a fiery mine.

20. Have you been in any fiery mines?—I have been in the most important mines in Scotland. I was fireman there—at the Greenfield Colliery, Hamilton. It belonged to Mr. Foder.

21. What sort of ventilation had the Brunner Mine?—I would say it was a first-class ventilation all round, and compared favourably with what I have seen at Home.

22. Had it the necessary statutory air measurement per minute per man?—Yes, 100 cubic feet.

23. Was there 100 cubic feet for every man who was working?—I am quite satisfied of that.

24. Are you satisfied as to the inspection of the mine, that the fireman carried out his duties?—I never had a doubt about Morris. I always looked upon him as a man who attended strictly to his duty.

25. And as to the inspection of the mine by the Inspector?—I have seen him there at times, but I have never travelled with him.

26. If there had been an accumulation of gas in the mine on the morning of the explosion, have you any idea where it could come from?—The only two points, to my knowledge, where gas could possibly accumulate were behind Denniston's and Pattinson's—the topmost place and the lowest. There was a fall at the end of the fourth bord, above Brislane's, and there was a little gas lying there.

27. Do you know if that fall was down before or after the explosion?—It had been left there a considerable time. I had occasion to go into Brislane's a week before the explosion to start a shift there, and the overman told us that there was a little gas there.

28. You are satisfied it did not come from the west side?—No.

29. You think it is impossible that the gas could have accumulated in the west side?—I cannot think so.

30. Do you know of any complaints amongst the miners about the management?—I never heard of any.

31. You know the men were at work for a little over an hour before the explosion took place?—Yes.

32. From that would you suppose that there was no gas found in the mine when Morris inspected that morning?—No; Morris's report would not go so far as that.

33. It would be the very opposite he would report?—Morris's report goes strictly to the working faces. There might be a possibility of gas existing in the two points I have referred to, and still Morris would report "clear."

34. How was that?—Because he might not examine these places, simply because they were not working places. It would simply be a matter for the fireman on duty. I would not say Morris travelled from behind Denniston's place down to the bottom level.

35. If he did his duty, would not he have done it?—According to his report he could have done, or he could not have done it. There are two report-books, and I heard that the over-man's report indicated gas where the fireman's report did not indicate any. That is a point allowed wholly to the discretion of the fireman on first. He has to examine these places, and there is a possibility he would not examine that place behind Denniston's and Pattinson's.

36. I think you said you could depend your life upon the fireman having done his duty?—He would; even if he had not examined this place thoroughly. I cannot say whether he did or did not.

37. Did you examine the mine after the explosion?—I went round on the Monday after the explosion, along with Mr. Bishop—I was in charge of the lamps—to examine the faces.

38. Do you know if there was a tramway laid into No. 4 bord? Do you know when that tram was put in?—I was not here when that tram was laid. I was only here eight days before the explosion. My mate laid that tramway.

39. Were you away long?—A couple of months. It was not long before I came back that he relaid all this No. 3 incline, and all these places. When I left, all this district off No. 2 was standing, and my mate relaid the incline, and put rails in all the places here. The four top places were going when I came back.

40. Then, it was intended to work all these pillars?—Yes, to take them out.

41. That was the reason for altering the tramways?—Yes.

42. They were not going any further into the fault?—The coal was in these pillars. The four top pillars we worked.

43. There was nothing to prohibit the pillars from being taken out, because all the coal had been taken out, and that side was exhausted against the fault.

44. There is a blown-out shot in No. 4 bord?—I have seen that place.

45. What do you know about it?—Only from what I saw.

46. You do not know who put it in?—I could not say. I was in there, and there was a piece of a blown-out hole there.

47. You did not make much of an examination of the blown-out hole?—I saw a stick sticking in it.

48. Did you pull it out?—Dunn, the underground manager, was with me.

49. Did anything happen to him in the explosion?—No, he was not there.

50. What did you see?—I saw the place charred all round.

51. There is more charring there than in other places?—Yes. The next place below Pattinson's place shows the most severe burning I know of in the mine.

52. Were you in the mine before the floor got tramped on, and did you feel the crispness under your feet from the coking of ashes and stuff?—I believe I was in the bord the night we were in search of bodies. I saw all the bodies in this locality as they were lying, and I assisted to remove them.

53. What conclusion did you come to from seeing them?—Everybody I saw was lying just exactly where we would expect to find them—where they had been working.

54. What do you think was the cause of the explosion?—The greatest indications, to my mind, are taken from the appearance of the bord at this point. There is a point in the charring where the burning seemed to be most severe [indicated]. That is the point where it seems to be about equidistant from either side from the shot-hole. The charring goes back up the slit, and on the roof there is a marked line of burnt matter. From the appearances I saw, the opinion I came to is that there has been a conflict between two waves of flame on this side and on that side.

55. You saw indications of two flames?—Yes, one proceeding from either side. They had met at the place marked on the roof, as it is very well defined.

56. Did you find any coking on the side of the opposite wall?—Behind; a little more particularly on the high side.

57. Did you find coal on this tramway?—There is coal lying there between the rails.

58. Where did it come from?—From the shot-hole. I think most of it came from the shot-hole, although possibly a bit came from the roof.

59. Is this section something like it? It falls off apparently to nothing, and is higher immediately under the blow-out?—That is what drew my attention to the hole.

60. Some of the coal is lying on the rails?—Yes, it is crushed to a certain extent.

61. And is the tramway laid close alongside the pillar?—The tramway has been laid in a direct line to the face of coal. It would appear that it was laid too far off, and the over-man has thrown on about a couple of yards of coal. That might be when this coal was thrown on.

62. How long is it since the over-man refused to allow the work to proceed? Whose place was this?—It belonged to the Geoghegans.

63. And the over-man, in your opinion, compelled them to leave 2 yards?—I reported that this was going too much up-hill, because we were likely to tap gas.

64. That was the reason the bord was stopped?—The place was getting too wide for the roof. They were going beyond the width of the bord. This coal was thrown on the rails.

65. You say you were also afraid of getting gas if you proceeded?—Yes, on climbing up-hill.

66. This tram was being laid practically a few days before the explosion: what would it be laid in for?—I suppose to start the place at some time or another. I did not ask my mate when he got orders to lay the rails in, but I should think it was very likely he got orders to strip this pillar.

67. Who was your mate?—William Sheard.

68. Was there any sign of weathering along this pillar when you saw it last time?—From the slit here [indicated], the coal was completely roasted or charred. There is severe charring all over that point, and it tails back to the slit. From this point [indicated] it loses itself.

69. Supposing a flame came down this way [indicated] then this place would be rather sheltered, would it not?—No. [Witness showed on the plan the direction which, in his opinion, the flame took, and where it struck the pillar, as indicated by the severe burning.]

70. Do you think the blown-out shot had anything to do with the conflagration?—I could not say, even if there were a part of the hole left. Possibly there might have been a shot fired there that morning, but I could not say.

71. You examined the western workings on the right-hand side of the dip?—Yes, I have been working there all the time.

72. There were signs of a strong blast in Nos. 5 and 6 inclines?—No. 5 is very severely burnt, particularly on the pillar opposite the first bord, and the pillar there is very much charred. [Witness described on the plan the places and nature of the charring in the different inclines and bords.]

73. Where did the flame seem to die out?—It goes everywhere towards the west, and appears to die out in that direction. The indications are not so strong in No. 6, and although the flame has been very severe in No. 5 west—the props in that incline are scorched—but the inside prop, and the props next to the incline, are perfectly free from any coking. Behind that prop there is coking, and the same in No. 6.

74. That is to say, a flame passed to the western end of the workings?—Yes.

75. *Sir J. Hector.*] You mean the props are coked on the west side, and the same in regard to No. 6?—Yes.

76. How do you account for that?—The only thing is that the flame has possibly turned from the slit here by the force going into this bord. It went up and came back.

77. *Mr. Park.*] Did you know the men working in the sump-level personally?—Yes, I knew all the men in the mine.

78. Were they experienced and careful men?—They were all colliers.

79. What do you mean by that?—Men who have been brought up to nothing else. The only lads who did not have a great deal of practical experience were the Geoghegans. All the others were experienced men. Denniston and Hunter were possibly as practical men as we had in the establishment. Denniston was an old man, between fifty and sixty—a man who had done nothing in his life but get coal.

80. Did the machinery of the mine work well?—I never heard of anything wrong with the machinery. I never heard of the fan being out of gear, and never heard of any block in the ventilation through the fan.

81. *Mr. Guinness.*] You have been acting in the capacity of deputy in this mine for thirteen years?—Yes.

82. In November there was some change made, was there not?—When the change of company took place there was a single shift made.

83. Consequently, one of the deputies had to go off?—Yes, we only wanted one deputy for each shift, and the oldest deputy was kept.

84. Who was that?—Morris.

85. What work did you take up in the mine from November?—Preparing roads and going about all over the mine, on the evening shift coming off.

86. That was in any part where the shift had been at work?—Wherever the over-man found work was wanted I was sent to do it.

87. Would you have any man in the mine with you?—No one but my mate, William Sheard.

88. You continued to carry on in that capacity until you were ill?—Yes; I took sick, and went away for a rest in the month of January.

89. You returned and resumed your duties—when?—I had just been working eight days before the explosion took place.

90. Was Sheard your companion?—All the time; he has been my mate during all of this work, and through all the dip operations.

91. Who took your place in your absence?—No one.

92. Do you know why?—I could not say why. I asked leave from the over-man, and it was granted at once. This class of light work was given to him so that he might do it himself while I was away. In the daytime he was to do anything he could.

93. The last time you were in the mine was 6 o'clock on the 25th?—Yes; we came out at 6 o'clock. The day previous to the explosion was an idle day.

94. Nothing was doing?—On the Tuesday evening I asked the over-man if he could not give us anything to do. There was high flood in the river. He told me about this timbering in Nos. 6 and 7, and said we might do that. We went in at 10 o'clock in the morning, after we had had our sleep, and attended to this work; and came out between 2 and 4 o'clock.

95. Did you observe that tramway in No. 4 bord where the shot was put in?—I saw the road when I went to put up the brattice.

96. I am speaking of the time before the explosion. Do you remember noticing a tramway in any of your visits for the eight days prior to the explosion?—No; I had occasion to go down and work, and I came up by Moore's place; and I made a short cut up the dip to the second incline. I took no thought of any danger, and travelled through all the slips often with naked lights. I would have gone into any part of this ground with naked lights night or day.

97. You always considered it perfectly safe from gas or damp?—Yes; I would not have taken much liberty in going into the working places after hours, because it was not my place to go down; but behind all this area [indicated] I never for a moment thought anything about danger.

98. Did you know Roberts?—Thoroughly; he had been here all my time.

99. And you found him working in the mine when you took charge?—Yes.

100. What position did he occupy all the time he was in the mine?—He was deputy. I do not remember him getting coal out. He was appointed a deputy when we went through the back part into the rise workings.

101. What do you say with regard to Roberts's practical experience?—I looked upon him as a reliable, practical man. He was a very careful man, and very civil, and I always respected him.

102. *Mr. Beare.*] Seeing that you have spoken so well of Morris and Roberts, would you say from your knowledge of them, that in all probabllity they did examine all parts of the mine?—I never had a doubt of Roberts, the underviewer, examining his part of the workings.

103. You would say, in all probability they did examine the mine?—I would have no doubt about that. It was more directly the duty of the over-man to examine any places that were abandoned or fenced off.

104. Then all these years you have never had any cause to complain about the working of the mine, and you have never heard any complaints from other miners?—No.

105. In all probability, in your position, you would have heard had there been any serious complaints?—Yes, I would have heard of them.

106. Have you ever had any personal experience of explosions before?—No, not of this nature. I have had an experience of burning in a mine—an experience of a severe explosion. I refer to another colliery. It was more severe than this. It blew the trucks out of the mouth, a distance of 300 yards, but there were no men in the mine. They had been withdrawn. It was a strong feeder of gas that kindled.

107. You said you were quite satisfied to go round with the men in the lowest levels with a naked light?—In that back area. We travelled it, looking for materials for our work.

108. But were you in the lowest level when they were breaking out?—On the 24th we were in the bottom bord on the pony level.

109. Was there water in it then?—No, it was working then. On the 24th we fixed Denniston's flat sheet. We were sent to do this work for the two Geoghegans, to find a place for them, and to make it ready for them to start. We travelled down the second incline, and came along the level from No. 2 into No. 3. We were told it was No. 2 Flat Sheet, but, in order to make no mistake, we went up No. 2 incline, and came out there. At twelve o'clock on the 24th we came out. Everything at that time seemed in its usual state. There was no more work done there at that time until the morning of the explosion.

110. *Mr. Guinness.*] You went down and found several of the bodies?—Yes.

111. Did you find them pretty well where you expected to find them?—Yes, all where we expected to find them.

112. Were you able to go along the main level? Was it perfectly dry on the 24th?—Yes, they were working.

113. Were you able after the explosion to go along?—No; the first time I was there was with Mr. Bishop and Mr. Cochrane, and the water was along this face, lower end of dip sump level [indicated].

114. On the incline there was a track and a pony-truck: was that pony-truck found in the level?—They were found in the level, but I could not say where.

115. Where was the body of the pony found?—I could not tell.

116. When you went there with Messrs. Cochrane and Bishop, what depth was the water?—I did not go through. I saw Messrs. Cochrane and Bishop wading along to examine the high side of the pillar. As far as I could tell, the water was over their knees. In parts it was dry. There was one portion of the floor which had holes in it, which would account for the water coming up to their knees in that part. Past that there was a hillock, which was dry. You could not walk along there now.

117. *Mr. Joyce.*] Your opinion was that there were two flames: that they had met there in the 4th bord, and this opinion is confirmed by the current and flame you saw in the top of the roof?—That is my opinion. It shows two flames there.

118. Did you and the over-men and everybody else have any conversation with one another as to that shot having been put in previous to the explosion?—That is not true.

119. Did you ever see the blown-out shot-hole?—I know there was a part of a hole left there.

120. In your opinion is that blown-out shot the same as you saw before?—As far as I can say it is.

121. You say that you would expect to find gas in Denniston's bord and Pattinson's?—On the Friday after the explosion I was sent by Mr. Bishop to brattice Brislane's place. The only reason for my thinking of the possibility of gas accumulating there, was that on turning the air into this part I found a little gas on the top of a deep fall at the back end of No. 1 bord or No. 2 bord, between the levels. That is all the ground in work there.

122. Assuming the gas had accumulated in Denniston's and Pattinson's bords, are the marks of the explosion in the mine consistent with the theory that the gas did explode there?—Behind Denniston's place there is a severe burn on the low side of the pillar. It appeared to me as if the force had struck backwards on to this pillar.

123. In your opinion was the explosion caused by the ignition of gas in Pattinson's bord?—There is a possibility of it being kindled if gas had existed there.

124. Are the marks in No. 4 bord consistent with the marks in Pattinson's bord?—They were in a direct line with the slit where Pattinson was working.

125. Are those effects consistent with an explosion in Pattinson's bord, or with an ignition of gas?—The evidences are conflicting on this point. It is difficult to know at which point the explosion has occurred, whether at the lower or upper end.

126. But is there any doubt that it started in the upper place of Pattinson's bord?—The evidences are conflicting, and I could not possibly say, although I might think that Pattinson might be the originator of the explosion.

127. At the other end of Pattinson's bord?—No; behind Denniston's. The gas has accumulated in either of these two points.

128. In your opinion was it in either of these two places?—There is no possible place that I know of that gas could accumulate.

129. In your opinion was this explosion a gas explosion or a coal-dust explosion?—With reference to the shot-hole, I could not say that there was no shot-hole there, simply from the fact that I was not present. It is possible that a shot has occurred there, or been placed there, even though all the local conditions go against it. As far as we can gather, there were no tools or any indications of any persons or of any collier being at that place.

130. If a collier had been there, would you think his tools would have been found in the vicinity?—I would naturally expect so.

131. In the majority of cases a collier leaves his drilling machine close up to the shot-hole?—He would have left his tools in a safe place.

132. Close by the hole?—Near the hole where he was working.

133. There was some coal lying on the floor. I do not think you satisfactorily explained where that came from. Do you think it came from the mouth of the blown-out shot or from a point lower down?—I will answer that question as directly as I possibly can. There is a breaker of coal lying along here [indicated]. This coal is loose. This is caused by the age of the place. When a place stands there is generally a loose part of the coal goes along the pillar, and particularly at a point like that.

134. *Sir J. Hector.*] That is caused by the weathering of the face?—Yes; I would naturally have expected that a practical miner would have taken off all this coal in the first place before firing a shot.

135. For what reason would he do that?—To give the shot all the liberty he possibly could. The coal is loose on this side down to the ground underneath the hole, and of a shivery nature right down to the ground.

136. Therefore, the force of the explosion would knock that loose coal down?—Quite possibly it might do so. There is a point here, with reference to that hole, I wish to explain. This hole, to my practical knowledge, leading from the road, is not such a fast hole as is represented—I mean the shot-hole. I would naturally expect from the most experienced miner in the mine that when that hole was drilled, he would drill it on something of this line [indicated], because he has to gauge the coal and to work the face by the way his road is going in.

137. You do not think he would drill with the grain of the coal?—With the rise of the coal he would naturally incline the hole to gain a face.

138. Assuming he was making a new working-face for himself?—Yes; the lay of the wall if in the coal is supposed to be fast, but on that view it is not so fast as we would expect; because the most practical collier in the colliery would naturally incline his hole into the wall to gain a face.

139. Would not he under-cut?—Yes.

140. Is there any under-cutting there?—There has been no under-cutting done.

141. *Mr. Joyce.*] There are no signs of under-cutting being done there, you say?—I would naturally expect that a collier would have taken all this loose coal off before firing a shot, under-cutting very often. If he had been going to blow that solid coal out he would have made a hole the opposite way.

142. This blown-out hole was in before the explosion. Do you know who put it in?—It was the Geoghegan's place—who left part of that hole blown off. It was fast to the corner.

143. How long would that be since it was done. Something less than twelve months. It might be eight or ten months before the explosion. I think about that time the bord was started.

144. There were safety-lamps being used in Brislane's bord. Can you tell me why those safety-lamps were being used?—On account of the presence of gas. It was known that the place was making a little gas.

145. Can you say when that was known?—On the afernoon previous to the explosion. About eight days before the explosion, I was sent to Brislane's place to change the road from its original course in behind the brattice, into the other side of the brattice, so that the brattice could be taken directly up to the face. There was a bit of bad ground at the floor end, and it was to avoid that we altered the road.

146. So that, very probably, Brislane's bord was making gas on the morning of the explosion?—I know it was making a little gas, because it showed on the occasion of our having to disturb the brattice to put a road through it. The place was perfectly clear, however, when we went into it. At lunch-time, we went to the cabin for our lunch, and knowing that we had been disturbing the bratticing, the overman took a safety-lamp and examined the place before we started. He found a little gas in it, but very little. Still we knew the explosive was there, and I could not expect any other thing, because we had been disturbing the bratticing all the time we were working. When we completed our work and put everything right, we examined the place before leaving, and it was as clear as this hall.

147. Do you think Morris gave the men these safety-lamps because there was gas making?—There might be an indication of gas and there might not. When we gave safety-lamps, under circumstances of that description, we had not lamps to-day and naked lights to-morrow. We kept these lamps in the place until we were satisfied it was free from gas.

148. But you did not use lamps unless you found indications of gas?—Not unless we found indications.

149. Do you think it was safe, when you were working with safety-lamps in Brislane's bord, to use naked lights in the other bords? Which way was the air coming in?—It was coming down the incline. Of course, in the matter of light, it might be necessary for lamps to be used in the places below.

150. I am not talking of the matter of light, but of the matter of safety and common-sense?—For the most part, I saw the lamps given to us in the incline.

151. Do you think it was safe to use naked lights in the return air-course when you were working with safeties in Brislane's bord?—I would not say it was safe, although I would have no fear so far as that is concerned when there is no possibility of anything kindling at Brislane's place. The most dangerous light that came into contact with Brislane's place was that of the trucker, who was passing up and down from his return. So far as the Geoghegans were concerned, and Denniston, they were more out of the way. The air had to come into contact with the air in the incline, and by the time it got there it would be thoroughly diluted.

152. You know that gas is only explosive when mixed with a certain proportion of atmospheric air?—Yes.

153. If a good-sized feeder had developed itself in Brislane's bord, or the bord above, it would probably have extended until it got mixed with the air lower down?—The gas going in was sufficient to make the air explosive.

154. Can you suggest any way in which Brislane's bord could have been ventilated?—It was ventilated in the ordinary way. I consider Brislane's place was worked in the safest way, and on a principle to which no objection could be made, because the gas was carried forward to the return air-way. There was no danger to the men.

155. You say you have seen a gas explosion at Home?—Yes, but not as big as this.

156. Were the conditions existing in the mine at that explosion similar to the conditions existing here?—They were very much the same. In some cases there is a greater proportion of carbonic acid gas.

157. How did the gas appear in your lamps? Was the gas that resulted from the explosion at Home similar to that in the Brunner Mine, or was it simply carbonic-acid gas?—It was more deadly, and put the lamps out. It had a more wetting effect on the light.

158. You have said the ventilation of the mine was fairly good?—Yes, taking it as a whole.

159. Could it have been improved?—I should say the ventilation, so far as I have been accus- to it at Home, was not what is called first-class ventilation.

160. Had the ventilation been better in the west workings, would the accumulation of gas have been more likely to have been cleared?—It would be swept away to the north part. I never saw any accumulation of gas there. I think that throughout the whole of that district we had more gas than in any other district.

161. Assuming a miner got to this blown-out shot, would he make his road clear first before he started to blow out the shot?—He would leave the shot till after he had the road to the face.

162. Would he have cleared his road to get the truck up before commencing to put in the shot? —Very likely he would.

163. Was it a likely place for any miner to be put to work to?—Not according to our ordinary custom, because there is a pillar there, and it would be our last working-place.

164. That would be the most likely pillar for a man to be put to work at?—It would be against the regular order of work.

165. You mean the order of work must be regular if that was to be the next working-place for a miner?—I think so.

166. Assuming a man wanted to get some easy coal, and to rob that pillar, would it not be a likely place for him to put a shot in?—It is not often that a man goes into a place to fire a shot if he wanted to do that. He would find coal where it is loose.

167. You do not think a man would go in for the purpose of getting a cheap bit or two of coal? —I would not suspect he would do it very readily. He might do, but I would not suspect it.

168. Assuming he did, how long would it take him to clear the road?—It would pay him to take the coal off the side. There would be no clearing—simply a matter of filling the coal into the tub. It would take him a shift.

169. Assuming he wanted to get his truck past, up to the blown-out shot-hole, how long would it take him to clear the road?—A quarter of an hour would do it. The coal is loose; it is just a matter of pulling it down.

170. Where did you split the air in the Brunner Mine?—At the cabin. It came out of the west level.

171. How did you split it?—Each section took its own air. The west section took the air off from this point [indicated], and the other current went down into the sump-section.

172. If you split it lower down, could you make the ventilation better?—There was only one way in which it could possibly have been done—that was, to carry the current of the sump-section to the bottom, and to bring it up through here [indicated] by an under-cast into the dip-road.

172A. Is it your opinion that if that had been done you would only have had a loss of life in one section?—That would not have saved life there; but there was one respect in which it would be an advantage. There would be a permanent ventilation so far as the dip is concerned.

173. It would not be possible to have ventilation for a mine in any way so as to stop an explosion?—There is only one possible way, and that would be to make two separate collieries by a barrier, so as to divide it into two districts. You would want two separate pits.

174. Would that be an expensive way of working the mine?—Certainly it would be. In all coalfields of this kind there is not enough coal to guarantee that it would pay to work it in that manner by having two separate pits.

175. You think that a sufficient amount of air went down over the men on each side, and that the air was divided properly?—I think the division was not very far out of the way.

176. In your opinion was the air properly split?—It could not have been easily confined; supposing it had been confined, there was a sufficient quantity.

177. In your opinion, was a sufficient quantity coming down on the east side?—Yes, so far as the total ventilation was concerned. So far as the total volume of air coming from the mouth of the tunnel was concerned, I consider it was fairly equally divided between each section.

178. You consider that each section got a proper amount of air?—According to the volume that was coming in.

179. Do you really think they got the proper amount of air?—I should rather have seen more, but under ordinary circumstances we could always find our way through.

180. Do you believe in blasting with powder?—Yes, I think so. I never saw anything else used.

181. Have you ever seen a coal-dust explosion?—I have not been connected with an explosion of that description.

182. Was there much dry dust lying in the mine?—I would not say it was a dry mine, compared with what I have seen. In some parts the mine is drier than others, and the second incline was very dry.

183. That is where the greatest force was exerted?—Yes, after. Before the explosion there was no water in the incline.

184. What depth was the dust?—You were wading in it to a certain extent, and it had to be shifted off the road to get the trucks clear.

185. When you shifted it, where did you place it?—Just by the side.

186. You did not take it out of the incline?—No; if there was room at the side we just shifted it there.

187. You say you originated these crib-stoppings in the Brunner Mine?—I spoke of them, and understood they would be built, because we had so much trouble with the wooden-board stoppings before the crib-stoppings were built. It took all the time of the men to keep the wooden-board stoppings in repair.

188. About eighteen months ago you started the crib-log stoppings?—I could not say the date.

189. Did you replace all the board-stoppings with crib?—Excepting one below the pump. I think it is the first or second below the pump. This stopping was left for a communication for the air to travel through. There was a slide-door that was made on purpose for the deputies and officers to travel through, and that was the only one left. It was rebuilt not long before the explosion—possibly three or four months.

190. In Brislane's bord the lamp of Morris, the fireman, was found. What would that indicate?—It would indicate to me that possibly a little gas was making in the place.

191. And Morris would be there testing?—He might look when the miners went in to see if there was any difference when the men came back to work.

192. You also stated that in the reports Morris did not report gas, while the under-viewer did?—Yes.

193. That was accounted for by the fact that Morris only went to the working-faces?—I would account for it so.

194. When the under-viewer made his inspection of the mine would he have it finished before the explosion?—It depends entirely if there was no stoppage in the workings on the west side. While I was deputy the east side was accounted the most important part of the workings.

195. How long would it take the under-viewer to go round to make his inspection?—He generally inspected half a side in one part of the day, and took the other half the other part of the day. He never hurried himself in going over that ground.

196. Do you think one man was sufficient to make that inspection?—Perfectly.

197. Do you also think that all the faces should be examined every morning, before the miners are put in to work?—Certainly.

198. You think the principle of examining only working-faces is followed?—There is a possibility of that. In all cases it would depend entirely on the fireman, as he has to satisfy his own self on this point.

199. Do you not think he should be compelled to satisfy himself and the men that every place or incline, or working-face, is free from gas when the men go in to work?—He might be compelled. I can speak personally. I know while I was making the examination in the morning, I travelled every hole and corner I could find in connection with the workings. I was educated from the very beginning of my firemanship to do this.

200. Do you think that future firemen should be compelled to examine every face?—It would be much better that that should be done. That would lie in the hands of the Government Inspector, or the senior officer of the mine.

201. Do you think an Act should be made to that effect?—I think it should be enforced to a certain extent.

202. Have you any recommendation to make with regard to the firing of shots, coal-dust, or explosives?—I would make a recommendation. I have heard since this inquiry started that the deputies have to fire all shots. In my opinion that would to a certain extent diminish the danger, but not all. The great point in a deputy firing a shot is to see the shot put into the hole. There is nothing in the lighting of the fuse; but the great point with a view to lessening danger is to see the shot before it is put into the hole, because a fast hole is not the most dangerous hole we have to contend with. The most dangerous hole is when the cartridge is not put back to the back of the shot-hole, leaving a space behind the powder for the ensuing flame. It is absolutely necessary that the deputies, if they have to light the shots, should see the powder put into the shot-hole, and the quantity of powder.

203. Would you recommend that deputies should charge the shot as well as fire it?—I would not say charge it, but to see the powder put properly into the shot-hole.

204. Do you consider, as a practical miner, that there ought to be any watering done round the shot-hole?—That would depend a good deal on whether the place had been very dusty. If the place is bare of dust, I think there would be no necessity for anything of that kind. With regard to the danger of coal-dust, it is in the working faces where the greatest amount of danger would be—where everything is of a loose nature, and where we find the dust is mixed up with the atmosphere the men are actually working in.

205. Do you remember a very large amount of dust in the No. 4 bord, where the shot was?—In any bord standing in the Brunner Mine for possibly nine or ten months there is a coating of damp dust on the caps and on the surfaces. It would exist there as it would do in any other part of the mine.

206. Do you believe it did exist?—I cannot doubt it.

207. In that case was there no risk of danger in the fourth bord?—I could not say. I am simply giving the facts.

208. Your experience shows it was a damp place?—That is in the workings all over the mine.

209. I think there was a big flood in the river on the morning of the explosion?—A heavy flood.

210. Would that flood tend to generate gas?—It would depend on how the barometer read—upon the atmospheric depression.

211. You do not know whether there was any connection?—Colliers have to guard against that. If there was a depression you would naturally expect an easier flow of gas.

212. Have you any recommendations to make as to what should be done in mines when there is a depression in the atmosphere?—Put a few more revolutions on the fan.

213. Did you always keep your fan going uniformly?—I have known it slack. That was chiefly through the engine-driver. When deputy, I used to go into the mouth of the tunnel to see what amount of ventilation was coming in, and if I thought it was slack I would go back to the man in charge and tell him to put it a little harder. That did not occur often.

214. Did you ever have any facilities for testing the amount of air?—Yes; the anemometers used by the over-men. We sometimes measured the air with them.

215. Have you been a manager at Home at any time?—I left a situation of the kind when I left Home. I was seven years in one place before I came to the colony, and I hold a certificate of competency under the English Mining Act. I passed the examination in Edinburgh in 1875.

216. What kind of tamping did you use in the Brunner Mine?—Damp tamping; generally clay picked up off the roadway, if they can find it; not dry stuff.

217. The fact that the day previous to the explosion was an idle day would tend to generate gas, or allow some accumulation to take place, would it not?—I should think that would not have much to do with the accumulation of gas. Provision was made for the inspection of the mine when it was idle.

218. If you had no clay handy, where would you get any?—No man would put in dry tamping into a shot-hole. He would damp it in some way or another. He would empty his "billy" if he could find no other way.

219. Then damp coal-dust is bad tamping?—It is prohibited by law. I have seen miners, as a rule, where they could not obtain clayey matter, take a shovel and scrape the damp matter out of the bottom of a truck. That would be principally damp slack.

220. Do you not think stations ought to be provided in which tamping ought to be kept, rather than take the coal-dust off the floor?—It might do. In a grent many instances throughout the Brunner Mine, where the bottom is cut up for the road, there is a kind of fire-clay matter, and this makes the best possible tamping.

221. Do you not think some tamping ought to be made?—It might save danger from that kind of tamping. I consider damp tamping of any kind has very little tendency to cause anything of an alarming nature.

222. You know the dams in the mine?—Yes.

223. There is a stopping, where the air goes over the place?—There is a bit of rock that has come down in the back-stopping.

224. There is an air regulator there, I think you call it?—Not at that dam [indicated]. I have measured it, and it is supposed to be 6ft. wide, as nearly as possible, and about 3ft. high. I do not say that that is a good thing. It could be better.

225. Are there two places about there for the ventilation of the mine?—That is the only return from the east side.

226. *Sir J. Hector.*] I suppose, when you talk of a damp coating formed of dust in the standing parts of the mine not in daily use, you mean that underneath that coating the dust is dry?—Quite dry underneath—the second coating. It could be stirred up by a violent shock.

227. Do you not consider the hole referred to would be too fast a hole to fire?—Supposing all this coal was taken off, and the hole was made ready, I would have considered that the shot would have caught on to the coal.

228. You mean that the hole was not in a fit state to be fired?—Not as it stands.

229. You say something about the hole having been made twelve months before?—There was a little bit of the hole made when the shoulder was "cast" on.

230. Some coal had been shaken off. Do you suspect at the time that hole was made it was fired?—It is the back end of the hole.

231. What became of the front of the hole?—The shot had been fired, and it had broken off.

232. When?—At the time the place was going.

233. Is it the coal you describe as having been shaken off this hole that was lying on the top of this tramway; it has only been there eight days, because the tramway was only laid eight days before?—If that is the hole, the back part is left. It has nothing to do with this.

234. I understand you to say that the coal which rests upon the rails is coal that was broken off this face?—The loose coal all through is, I think, "breaker" off the bord.

235. When did you see that loose coal?—When I saw this charring.

236. Are you aware whether the coal still standing on the east side [indicated] was charred or cracked?—Yes; it was charred. You could see the "break" going in behind it; that is by the age of the place and the constant crumbling nature of the coal. On account of this you naturally expect what we call a "breaker" of coal, or the "weathering" of the coal—where the coal is broken by standing or pressure.

237. If it showed that the coal on the roof and the coal on the wall and floor had been on fire at the time of the explosion, would that be consistent with this blow-out?—No. I attribute the charring to the fire that existed there. Assuming this shot has been fired, the greatest flame would have been up this way [indicated], where the shot would have struck, and, of course, the biggest amount of charring would have been in front of the shot. It exists about the same distance on either side. I would have expected had it gone back this way it would have tapered off in another direction [indicated].

238. Would you expect that the shot had fired the coal in the roof?—I would not say that the shot had not fired the roof, but there is a possibility of a shot lighting the whole thing. I would not say there was no shot there, simply because I was not present.

239. But there was extraordinary burning?—There was severe burning.

240. Now, you say that severe burning was caused by the meeting of two flames, but you had no air between the two flames to make this severe burning. If two flames met in a close passage like a tunnel do they continue to burn?—I think so.

241. Where would they get their air from?—From inside.

242. That would not be air. On which side of the fall did you see the deposit of soot?—On the inside of the fault.

243. From that would not you rather judge that the under-current of dust, flame, and smoke had travelled in the direction towards the fault?—It is that way [indicated]; there is a forward flame, and then it has come back in an in-rush, while the work of destruction has gone forward a second time.

244. Was this bord tolerably clean the time you were in it before?—Not this bord.

245. Was it very sooty?—I was not in there all the time it was standing.

246. You do not know whether there would be a sufficient quantity of coal-dust to cause such a deposit of soot as existed on the inside of the brattice?—This place was all dry. The force going up-hill would give it a tendency to make it dry.

247. Was it any person's working-place that morning of the 26th?—Not to my knowledge.

248. *Mr. Proud.*] You mentioned gas having been observed. Was the brattice kept close up to the face?—Brislane's place was bratticed as close as it could be. That was the only fast place in the mine on that side.

249. There could not be any accumulation?—It was not possible. I was sent up to shift the brattice in that place—to leave it as it had been at first. By doing so the place was left absolutely free of gas. There was a good current of air going into the face; in fact, we had not to put up any brattice. We had closed the incline up, which was open at the top. I should have put more air in, but the air we had was sufficient in that place—Brislane's. I ordered the men to leave the bratticing open at the top, and the air I put into Brislane's was sufficient to free every particle of gas out of it. Afterwards I travelled over this fall to the steepest part of the incline. There is a fall down here, and I found a little gas on the top of that fall. Possibly that might have been freed. I came on to the brow of No. 3 incline. There was a thick stopping across here [indicated]. We found water up to this flat-sheet. I know it was roofing down at the bottom level. I broke down this stopping, and gave it free vent from here. I know there was a big difference in the ventilation. As I was going home in the morning I did not examine it. There was a hole there, but not sufficient to give vent to the air. It had been cleared out to give more ventilation. I did not go back into the place after I was there. It would have a tendency to clear the gas, because there was more air travelling.

250. You mentioned that at that fall you thought there might be some gas?—I walked all over here with a naked light. I only found gas over the fall, and that led me to believe that if there had been an accumulation of gas this would be a likely place.

251. It was only an assumption on your part. You never found gas there?—I had no evidence to prove that gas existed there at the time of the explosion, except the fact that we found gas there previously. Finding gas there previously, I assumed there was a possibility of its accumulating if any disturbance had been made in the ventilation.

252. In the exploring dip did you use safety-lamps?—No.

253. How far were you below the old level?—The stone drive is fully 1,000ft., in breaks of 500ft. each. There would be 200ft. previous to this done by ourselves at the time we were driving the dip. We went 200ft. in, and when it was completed, there were two 500ft. contracts let, so that the whole thing would be about 1,200ft. long.

254. Was there any explosive used in driving?—We never saw gas there. There was one point about the fifth bord where we got gas, and gas along with water. We worked half a night with safety-lamps, and no blasting was allowed. That was the only point we found gas.

255. How long ago?—Three years since.

256. You mentioned that a shot that was cut into the solid in a drive uphill, if it blew out, might be the means of tapping some gas?—I would not think it had anything to do with gas. That bord was driven too much uphill. That is the cause of that shoulder being cast on.

257. Do you think the force of the explosion came up from these bottom places?—They were flooded with water. This part [indicated] was standing full of water up to the main level.

258. Do you think the force of the explosion came up that way?—No; it came up No. 2. The most severe part was from No. 4 bord upwards. There were some indications in Nos. 4 and 5 bords, and it seemed as if the forces had been generated from that point [indicated].

259. The last time you came out, did you find everything right?—The ventilation was working all right through the airway. I made a special point as deputy to see what quantity of air was going in, and that everything was in good order. On the 24th they worked Denniston's Flat sheet, and everything seemed to be in good order—clean and dry. We had done a big amount of work that day.

260. *Mr. Skellon.*] Did the deputy travel all the roadways and airways, as well as the working-places, in the mornings?—Yes, he did that.

261. Can you tell why they laid the rails so close to the pillar in No. 4 bord?—They were laid under the fall. There was a hole in there to take the coal down.

262. It would be useless for a man to fire that shot if he could not get his tub there, would it not? Before he put such a shot in he would take this coal down first?—Yes; he would have to do so before he could get his truck along.

263. You mentioned that you thought that it had not been a fast shot?—Yes. It was fast in relation to the way they were going. It would not be so much the rise, but they would put it in that way to catch the coal to gain a face.

264. Would it not be better if they wanted to catch a face to put the shot in the opposite way?—Putting a shot in that way would make it as fast as the other.

265. I did not say that?—No; but, catching that corner out, either of them would be fast. Supposing the shot would be put in that way, the resisting power of the shot would be almost the same as shown there. If that is a correct copy on the plan of the line of resistance, then that shot to be there would be nearly the same. No miner would put a shot—at least, I would not put a shot—in off this side to blow that corner out. If I were going to put a shot in, I would put it in here [indicated] to blow the piece right off.

266. Then you would not gain your face?—No; that is the proper place to put a shot-hole in to gain a face under these circumstances.

267. Is it possible for a shot to do its work if bored in that direction? Would it bring the coal down?—Yes, the way it is standing.

268. It must be standing out in the bord to what it is in the plan. You said you did not understand the word "weathering." The meaning is that where the face is exposed for a long time to the air it gets flaky?—Yes, I understand the term.

269. Then, this face may have weathered, and the force from the explosion may have brought the coal down. It does not follow that it came from that shot?—I would not say that. The flaky coal here has a tendency to thicken as it goes down.

270. You say you never heard the miners in the Brunner Mine complain?—I never heard grumbling amongst them. There were never any serious complaints that I know of.

271. They must have been an agreeable set of men if they did not make any complaints?—They did not make any complaints to me.

272. Did they never complain of smoke hanging in their working-places?—I have seen the faces of the workings smoky, and I would not refrain from saying so while the workings were smoky. They were smoky, and at times, in fact, between one incline and another, we could not see any light.

273. *The Chairman.*] That was some years ago?—Yes; this thing has troubled me most. I am satisfied there is no man in this employ who has suffered more from this explosion than I have, as I know all classes of work that have been done in this district, and I greatly regret that such a calamity has happened. We had battles, and sometimes we had to contend with gas. There is no getting away from that fact. I am determined to give all the information I can.

274. *Mr. Skellon.*] Can you remember how often you reported gas?—I reported gas whenever I found it. No man possibly could report gas in any minuter quantities.

275. Was it very often?—I could not tell. I never pass the least particle of gas without reporting it. Neither would I do so if I were put in that position again.

276. You say, the men having been at work an hour, Morris would have reported everything safe. Can you account for his not having entered it in his report-book?—He generally wrote his report at lunch-time.

277. That rule goes against the Act?—Yes, I know perfectly well. I quite agree with you; but I know that was Morris's way of writing his report.

278. From the 20th to the 26th of March, can you tell us how often he entered up his report?—Twice—on the 20th and another date not given. He only reported on the working-places. He came in on the 25th to do some work. We had a job to do there on the night of the 24th, and when he found it done he returned home, so that there was no report made.

279. There are only three reports from the 20th to the 26th?—We were idle on Monday, we worked on Tuesday, we were idle on Wednesday. That is what made me ask the overman on Tuesday night if we were to go in on the following day, knowing that we had been idle the day before. The rule was that when there are two days idle together we laid up one of them unless there was special work to do.

280. Did you make it customary to enter the reports when you admitted the men?—At the mouth of the mine?

281. No; at the cabin?—The men came to the cabin.

282. Once you let them in past that, did you enter it at the time?—Yes. I did not as a rule write my report in the morning. I could show it if it were wanted before the men went in. When the overman came in to the cabin I entered it.

283. You say that the hole was there nine or ten months?—Part of it was left.

284. Could you say if it was the same after the explosion?—Much about the same.

285. When you have done taking up roads, did you generally clean the bord out?—No; we took the rails up and left the bord as it was when the rails were lifted.

286. You just shovelled the coal-dust on one side and left it there?—We never touched it, but left it there.

287. There would be much less chance of a coal-dust explosion if all this stuff were cleaned out?—Yes; but I never saw it done.

288. Mr. Joyce spoke to you about an underviewer. Of course, the fireman, if he saw gas, would take some brattice up before the underviewer came in, so that he, the underviewer, possibly would not find gas when he came round?—If gas was found in a place that would naturally be the place we would go to.

289. *Mr. Joyce.*] The question I asked was, why did the fireman report no gas, while the underviewer reported gas afterwards?—Supposing there was a place where a little quantity of gas might be lying, if there was no occasion for the daily report on the mine, the fireman might examine it carefully to see whether it would come in nearer, but he would not report it. The overman would report it. He would report it personally to the overman, but it would not necessarily follow that he would report it in his book.

290. *Mr. Skellon.*] If he found gas in a working-place, would he report that?—He would report that; but if the place had been fenced off he would not report it. He would examine it for his own information, and if it showed any difference to what was the case on the previous visit he would report it to the overman.

291. You say the deputy should see the shots fired. In a small mine having only one deputy or fireman, do you not consider it would be a great hardship for the men to have to wait for the officer to come and fire the shot?—If it is made a law that deputies have to fire all shots it could not be helped. I should say it was the more necessary that the officer should see the shot charged and put in the hole, because the most important point is to see it before it is put into the hole, for in a great many cases the practical miner would not put his shot in before the fireman was present, because there would be a tendency for that shot to get damp.

292. But still a man might have to wait for a couple of hours?—I see no advantage in the deputy simply lighting the shot, as there is nothing in putting the lamp to the fuse. The great point is that the deputy or authorised party should see that the powder is put into the shot-hole properly. The cartridge might be stuck into the shot-hole without the deputy knowing what quantity of powder was in the charge. If it were the practice for him to see the charge put in, he would be able to judge in regard to the quantity of powder. Working with safety-lamps in blasting is a further precaution.

293. But it would be a loss of time to the miner to have to wait for the deputy?—It would be a great loss of time, and a great inconvenience to the deputy also.

294. *Mr. Guinness.*] You said that this blown-out shot-hole might have been put in ten months ago?—I remember part of a hole was left.

295. Did you take the measurement of the depth of it?—It would measure almost the same, as far as my memory goes, ten months ago as it does now.

296. You measured it then?—Yes. Not me, but the overman, Mr. Roberts. I was present when he measured it.

297. What do you remember was the measure then?—It was a little longer than from his elbow to the end of his fingers.

298. Have you seen it measured since the accident?—Yes.

299. Can you say whether it was driven further ahead or about the same depth?—I do not think it has been driven further ahead.

300. You are prepared to swear it has not been driven?—I would not say it was not driven.

301. *Sir J. Hector.*] Do you think that the hole was fired ten months ago?—That had been a fast hold when the bord was being cut.

302. *Mr. Park.*] Are there any cracks about?—Yes; alongside.

303. Ten months ago?—Yes; it was opened a little alongside of it by the force of the powder. It was the least cracked.

304. *Mr. Beare.*] If there had been a gas explosion in Pattinson's bord, would you have the same effects given off at so many different points?—I could not say anything about that.

305. Do you think there was a possibility of an accumulation of gas anywhere sufficient to produce an explosion of such extent?—No; that is my trouble.

Constable Beattie examined.

306. *The Chairman.*] Did you receive a precept from Mr. Stratford to summon a Coroner's jury?—No.

307. Were the jurors indicated, or did the precept generally direct you to summon the jury?—It was a precept generally to summon the jurors.

308. How did you know what jurors to summon?—Mr. Stratford, the Coroner, told me not to summon any one connected with the mine.

309. How came you not to summon any coal-miners?—I understood from Mr. Stratford that there were no coal-miners to be put on the jury.

310. Were you not acquainted with the Act, which says that there shall be a certain number of coal-miners on the jury?—I may have misunderstood Mr. Stratford. He came here one day, and asked me to indicate six good citizens for him, and I did so.

311. Who were they?—The best men we could get about Brunnerton. I did name a miner named Armstrong, but we could not find him, and Mr. Stratford had to put a Mr. Ring, of Greymouth, on. There are coal-miners round here who are not connected with the mine.

312. I suppose you would not have had any difficulty in summoning them?—No.

313. Were you acquainted with the clause in the Coal-mines Act?—No; I am not well acquainted with that clause.

314. And Mr. Stratford made no reference to it?—I understood from him that no miners were to be on the jury.

315. I understand you simply summoned the jurors who were pricked off by Mr. Stratford?—Mr. Stratford asked me to pick six good reliable men as a jury.

316. And no coal-miners?—I understood him to say, "nobody connected with the mine."

317. *Sir J. Hector.*] Did you take that to mean they must not be coal-miners of any kind?—Yes; although I did have one miner down—a man named Armstrong; but we could not find him. He had been mining, but I was not aware of it at the time of mentioning his name to Mr. Stratford.

318. I suppose there were other miners who were accessible, and who you might have summoned had you been aware of the section?—Yes.

319. Men who might have been connected with the mine in former times, but who at the time of the occurrence were not connected with it?—There are men here who have not been connected with the mine for some time past.

William Dunn examined.

320. *Mr. Joyce.*] You are underground manager of the Brunner Colliery?—Yes

321. For how long?—Since this explosion. Previous to that I was getting coals.

322. Did you ever work in the dip-workings?—Yes; about two years ago.

323. Previous to the date of the explosion where did you work?—In the Coolgardie rise workings.

324. During the time you worked in the dip-workings did you ever see gas accumulate in the Brunner Mine?—I did not.

325. Did you ever see signs of gas?—Not at any time.

326. Do you know what the custom of the fireman was?—The custom was to go all about the mine to see if it was all safe before the workmen went into work. He then returned to the cabin and sent the men to their places.

327. Did he examine only the working-places, or the whole of the mine?—That question I am not prepared to answer direct. He is supposed to examine all the mine and all the adjacent places to the working ones.

328. Do you know if it was the custom of the fireman to do that?—I could not say whether he examined them or not. I can only say what was his duty.

329. Were the men always under the impression that the fireman did that before they went to work?—Yes; I have never heard any opinion expressed to the contrary.

330. I believe that Morris was the fireman during the whole time?—Yes; he was a very experienced man.

331. What was the custom of the underviewer? Did he make an examination daily?—Yes; I have seen him personally examining the edges of the goafs adjacent to the working-places.

332. I suppose the underviewer took nearly the whole day in making his examination?—In making his examination, a part of the day.

333. Do you remember the explosion of the 26th March?—Yes.

334. Is it probable that the underviewer would not have seen the bottom part of the mine on that day before the explosion occurred?—It is just possible that he might have gone in the west side first, and by doing so he would not have seen the bottom workings.

335. Have you had any experience in blasting at the Brunner Mine?—Yes, but have had no blown-out shots. I have seen blown-out shots. If a shot is in too heavy, it is possible for it to blow out. Provided it is not overcharged, and it is properly undercut, and that the weakest part is not out towards the hole, it will not blow out.

336. Can you always get a successful shot under those conditions?—It is not practicable, under those conditions, to have a blown-out shot.

337. Did you ever see a blown-out shot?—Yes; I have seen them in this mine.

338. Did it produce much commotion, or raise much coal-dust?—Yes. I saw a shot blown out in the old Brunner dip-workings that raised a great cloud of dust and filled the place full of fire; but it did not produce any further explosion.

339. How long ago was that?—About eleven years ago.

340. Have you been aware that coal-dust is a very explosive agent, for some time past?—Yes, for some years.

341. Do you know whether the majority of men working in a mine are under the same impression?—A great many are under that impression, and a great many do not believe in it.

342. Do you think that watering round a shot would minimise the danger of an explosion?—In a dusty mine, certainly it would.

343. In the Brunner Mine, do you think the danger would be minimised?—I could not say that it would be minimised much unless it was watered for a considerable distance away from the shot.

344. Say, for a radius of 20 yards?—That might do.

345. Do you think a high explosive would be better than powder?—Yes, on account of producing less flame.

346. Is there any particular explosive which you have seen which would be much better than powder?—I have seen roburite, but it was not a great success, probably on account of defective quality of the material. At the same time no flame came from it.

347. If roburite were used instead of powder, and assuming that this explosion was caused by blown-out shot, do you think you would have had this explosion?—I do not.

348. Gas is only tried for with the Davy lamp?—With an improved Davy.

349. That will show you up to 3 per cent. of gas?—Yes.

350. Do you not think you could get some better form of lamp, or a proper indicator?—I do not think it is necessary to have under 3 per cent. I think the Davy lamp is sufficient for ordinary purposes, but for extraordinary purposes it is useful to have those machines that indicate ½ per cent. of gas.

351. Do you know that 1½ per cent. of gas mixed with coal-dust is a very explosive mixture?—Yes; and 2 per cent. is very explosive.

352. So that mixture in a mine would not be detected if you had no better means of detecting for it than a Davy?—Yes.

353. Do you not think it is necessary, seeing that that amount of gas and coal-dust is explosive, that we should have a better means of testing for it?—Yes.

354. Did you go down the mine immediately after the explosion?—Yes.

355. How far did you get the first day after the explosion?—To the top of the dip. There were no falls in that distance, but there was a set of timber down; but no stone. We met the first fall down the main dip.

356. Did you meet any falls which completely covered the passage from the floor to the roof?—No.

357. There was room for the air to get over the top?—Yes.

358. Have you ever examined the return airway?—Yes, frequently since the explosion.

359. Was the return air-course ever pointed out to you before the explosion?—No, it was not necessary. I was not working in that part of the mine.

360. When you were working in the dip, where would you have got out?—I came out at the return, and I had no difficulty in finding it by the air-current.

361. Do you not think it would have been an improvement if the return had been made larger?—The larger the better.

362. What do you think of the ventilation?—Good.

363. We had some evidence to-day that the ventilation could have been much better?—That would apply to every mine.

364. You have worked in the collieries at Home?—Yes.

365. Was the ventilation in the Brunner better than it is at Home?—It will favourably compare with the majority of mines I have worked in.

366. You know where the dam is?—Yes.

367. Have you seen the air-regulator there?—Yes.

368. I believe it averages 6ft. by 18in.?—The area is about 10ft.

369. Do you think that regulator is sufficient for the purpose?—Yes.

370. If the air had been split lower down, would not there have been greater facilities for escape in case of an explosion?—No; that is no part of the escape from that part of the district.

371. Could not you make an escape?—Yes; but there are different roads independent of that.

372. Where would you place those roads?—One is situated through the sump. To get to the return airway you go straight up the dip into the mid-level, through the undercast, and then straight up; if that one is closed you could go through from the old sump workings; if that were closed, turn to the right hand below that portion, and go higher up than the cabin. There are three distinct roadways independent of the airway.

373. But they all join the main return airway?—They join the main dip. They are distinct roads out, and one could not block the other.

374. Was it not inevitable that in the case of an explosion all these roads would be filled with choke-damp or noxious gas?—Yes.

375. Assuming that you had a firedamp explosion, then every one in the mine would be killed?—It would depend upon the extent of it.

376. Assuming you had a gas explosion which raised the dust, you would still have the same conditions as you had in this case?—Yes.

377. Did you go down the mine to make an examination?—Yes.

378. When were you first down the sump workings?—On the Monday morning after the explosion.

379. Did you make any examination there for gas?—I found gas in the burnt portion of the mine at the end of the level lower than Denniston's bord, on the top of a fall. I found it in a blind bord below Denniston's, on the top of a fall; but it was only a small quantity.

380. Gas is generally found in the vicinity of falls?—Not in the vicinity if the ventilation is good. If it is found on top of falls it is because it is difficult to get ventilation.

381. There are a good many old falls in the Brunner Mine, are there not?—Yes, in that district.

382. All along on the left-hand side of the dip?—No; there was that one and another.

383. That would be one at Denniston's and one at Pattinson's?—Yes.

384. Were any precautions taken to clear the mine of coal-dust?—Not that I am aware of.

385. The coal-dust was lying in a considerable quantity everywhere, was it not?—No.

386. Was not there a great quantity in No. 2 incline?—I was not there until after the explosion, and I do not know if there was a quantity there.

387. Did you examine the blown-out shot bord?—Yes.

388. Do you know whether that shot-hole was put in on the morning of the explosion or whether it was in for some time previous?—I have my opinion about that; but as to actual proofs I have none. My opinion is that the shot was fired that morning.

389. Did you examine the slit on the low side of the bord?—I did.

390. Did you notice indications of which way the force had gone?—I believe it went both ways. I examined two posts in a line from the lower side of the slit in the bord below which was facing towards the shot, and I found them considerably burned, showing that a great force had gone down that way.

391. Do you consider that the fire in that bord was both on the floor and on the roof?—Yes; heaviest on the roof.

392. Can you account for those props not being charred if there was a fire on the roof?—Which props?

393. The props in the bord alongside the slit?—Both those props had charred dust on them. There was an indication of heat, but not of direct charring. There was a considerable amount of dust on both.

394. Assuming that the fire in that bord reached from the floor to the roof, do you not think that both props would have been charred?—Not necessarily. I saw charring in a line with the crispness, and there is coal lying on the road; but I did not notice whether it was charred on the high side—in my opinion it was not charred.

395. Which way do you think the explosion went?—The force showed that it had gone round the second incline.

396. Had it crossed over the fall?—Yes.

397. And then got into the third incline?—Yes; the indications were both coming up and going down the third incline.

398. Can you account for the two forces meeting together in the third incline?—Yes. My opinion is that the explosion started from the blown-out shot, the firing being heavy there for a considerable time, sufficient for the distillation of the coal—for at least one minute. There is a terrible amount of soot at that point. I measured it only this morning, and found soot half an inch thick along the wall side. The indications are going into No. 2, and along the incline with great force into No. 3. My opinion, to account for the heavy fire causing so much burning, is that when it shot away it went down the slits into the bottom level. These two forces would come back, and that would cause a fire there also; the forces coming back would check the velocity of the explosion, and burst into flame with greater intensity.

399. You think that these forces got down to the No. 3 incline; instead of going up they went down?—Near Worthley's bord. I believe the force came upwards at the end of Brislane's bord (the farthest one down) and met the force coming from the middle.

400. Brislane's bord was a solid face?—Yes.

401. Do you remember whether any safety-lamps were found there?—Yes, two.

402. And Morris the fireman's lamp was also found?—Yes, I was there when it was found.

403. What would that fact lead you to believe?—That the fireman that morning might have found a trace of gas there, and he would clear the gas out and put the men in with safety-lamps for fear the gas might accumulate there during the day-time. The fact of the lamps being found shows that they had looked for it, and the man would be given the safety-lamp as he went into the place instead of being allowed to use a naked light.

404. Do you think it is a wise thing to permit safety-lamps in one portion and naked lights close alongside?—I do not, if the gas is really there.

405. Even if you found a trace of gas, and you consider it likely to make again after being cleared out with the brattice, do you consider it wise to use a naked light?—It depends upon the air-course.

406. Say the air was coming down?—It would not be safe.

407. You do not think it is the proper thing to do to have safety-lamps in one bord and naked lights close by?—I do not.

408. Where this shot was blown out there was a considerable amount of coal lying on the rails; do you think that coal could have come from under the blown-out shot, or from the weathering?—It would not come from the weathering.

409. The coal has been described to us as being very brittle, and if the bords are left open the coal is likely to break off at the bottom; as a matter of fact, without any blast that coal might have broken off?—Not there.

410. Why?—From the position it was in.

411. How does the position lead you to judge?—The bore of the coal was upwards, and the coal was lying in the opposite direction.

412. Was not that the way you would get a truck full of coal?—If it was undercut, and if that shot had been made ready and left in for a considerable time, coal might have come down.

413. Then, the coal lying there might have been produced without a shot having been fired at all?—I do not think so.

414. Is it feasible?—It is not.

415. I think you admit it might crumble down. Do you consider it will not come down from a "fast" corner?—No, there is no place where it could come down from that way.

416. What is your opinion about the man who fired that shot; do you think he was very careless?—My opinion is that the man did not know what he was doing, and the danger he was exposing himself and others to.

417. You consider he was very careless in firing it, assuming that it was fired?—Yes.

418. Do you think a gas explosion could have been produced between Worthley's and Denniston's bord?—I do not think that the accumulation was sufficient to do that.

419. Assuming you had a mixture of coal-dust and gas, and that the explosion took place in these bords, either at the top of Pattinson's bord or lower down Denniston's bord, do you think the force would be exerted in the same way as it was in this explosion?—I think so. I think the force would have gone out through the bord instead of up the incline. If it had been in Pattinson's bord it would never have reached the bottom; it would go straight along the bord into the main dip and into the west workings, on account of the intake air.

420. Did not this particular explosion go right to the bottom against the air?—Yes; it was only a short distance, and would go against the air.

421. Assuming the explosion took place in Denniston's bord, the same thing would not apply?—If the explosion had taken place in Denniston's, the indications shown in No. 4 bord would never have been shown in it. The charred coal-dust and pieces of brattice-cloth blown into the fall that has been referred to would not have taken that course if the force had come down. If it had taken place at Denniston's bord it would have gone in two directions [indicated].

422. Did not the force come down the slit and then go back against the air?—Yes. [The witness indicated on the plan the direction the force took.]

423. Your opinion is that a blown-out shot, and not gas, has produced the explosion?—That is my opinion.

424. Was there much coal-dust where the blown-out shot was?—I could not say. I was not in the place until afterwards. There was a certain amount of coal-dust, which was produced before the explosion.

425. Was there a large amount in No. 4 bord?—No, there was not an extra large amount there, not what I would call a large amount.

426. *Mr. Park.*] What do you think of the ventilation of this mine?—I think the ventilation was good.

427. You said there were three ways in which you could get into the return air-course independently of a place above the dam?—I said there were three ways I could get out of in case of any place being blocked, independently of the dam altogether.

428. Could you have got away along the dam if you were blocked in one place?—I could have got out and got into the return over the dam if the others were blocked up.

429. Did you see the lowest level in this return side previous to the explosion?—I did not.

430. You had not been down the pony-drive?—No; I was at work in a different part of the mine.

431. You are firm in your opinion that from the blown-out shot bord a strong blast had come up towards Brislane's and Roberts's place?—Yes.

432. If it came up from the lower level, and up No. 3 incline, would not you have seen the marks of force on the lower side of the fall?—Yes.

433. But instead of that you found the whole of the marks or indications on the fall on the side next the blown-out shot?—Yes.

434. Do you remember what those marks were?—Charred coal-dust, bits of board, and brattice-cloth.

435. In your opinion, there was not the slightest chance of the blast coming from Brislane's bord down into Denniston's and Hunter's?—I do not think it did, not as a starting-point.

436. It would blow from No. 4 bord into Brislane and Roberts's place?—It would strike the pillar, and might check itself on the corner.

437. Mr. Tennant said that in a mine when safety-lamps are once used they continue to use them for as long as it is absolutely necessary in that particular place?—That is so.

438. They use them for the shift?—They do not put a naked light in that day, or for a longer time if necessary.

439. Supposing the brattice-work had been led up to the face in Brislane and Roberts's bord, would that carry away all the gas that would be likely to accumulate there?—Yes.

440. Mr. Tennant says the brattice was carried as near as possible to the face, so as to send the current of air through this bord and Brislane's?—That is so.

441. That would prevent any possibility of gas collecting in that face?—Yes.

442. Would there be any great trouble in getting through the return-air course for a miner who was well acquainted with the mine?—An ordinary miner would find his way out of the return, providing he could travel with the air.

443. We have been told that the fan is never stopped?—It never stopped.

444. That would show that the return air-course was clear enough for the air to get through?—Yes; so far as it was not destroyed by the explosion.

445. Would you call the Brunner a fiery mine?—No.

446. The men having been at work in the mine for over an hour that morning, do you think the fireman had reported that everything was safe?—He had put the men to their faces on account of their being safe.

447. Do miners ever go into a mine without first hearing the report of the fireman?—The fireman tells them whether they have to go to their places or not, and whether they are safe.

448. Until he does that, what is the rule?—They wait at the cabin until they are told to go.

449. *Mr. Guinness.*] You said you did not think it proper to work with safety-lamps in one bord and at the next bord to use naked lights. Did I understand you to give that opinion on the assumption that there was gas in the other bord?—I certainly understood Mr. Joyce's question to mean that if there was gas in one bord where they were working with lamps, whether it would be safe to work with naked lights in the other; and I said, if the air-current was in that direction.

451. The fact of safety-lamps having been found in Brislane and Roberts's bord—is that conclusive proof that there was gas there that morning, or that there may have been gas there some days before?—It is not conclusive proof to me that there was gas there that morning, because if there was gas there and had not been cleared, the men would not have been given lamps to put them into it. They were only taken there as a precaution, and under those circumstances I would consider it quite safe to use naked lights in the bords below.

452. You minutely examined the mine after the explosion for the purpose of endeavouring to ascertain the cause?—Yes.

453. Did all the evidence you observed indicate to your mind that it was a gas explosion, or a coal-dust explosion?—They indicated to my mind that it was a coal-dust explosion.

454. *Mr. Beare.*] When you were getting coal in the mine yourself as a miner were you satisfied with the management and working of the mine?—Yes.

455. Since you have been appointed an underviewer, which has been very lately, have you found it necessary to introduce any improvements?—No.

456. I think you are quite satisfied with the way the mine is managed?—Yes.

457. With regard to the stoppings. Do you know anything about them? I suppose the stoppings are the best that could be put in—crib-logging?—Yes.

458. Can you say as an experienced miner whether the mine was a dry and dusty mine?—I would not have considered it a dusty mine.

459. *Mr. Joyce.*] If the mine were not a dusty mine, how do you account for the coal-dust explosion?—I suppose the fact shows that there was sufficient dust to cause an explosion in spite of my opinion.

460. You said, with reference to bratticing Brislane's bord, that you considered the gas, if there had been any, would be diluted by the air. Assuming that gas had been making there, and that it had got diluted by the ingress of the atmospheric air, would it not become very explosive?—Of course it would.

461. Is there anything against the theory that there was a blower there, and that because it became mixed with air it ignited?—There is no indication of any blower.

462. And no indication of any gas in the vicinity?—Not for a considerable time afterwards.

463. Is there any indication of gas there now?—It was full of water. I only found gas once, that was where the air was checked below; but the bord was filled with water next day.

464. *Sir J. Hector.*] Where were you at the time of the explosion?—In another mine up the hill.

465. How long was it before you heard of the explosion?—Half an hour afterwards.

466. Did you observe any vapour or smoke coming out from the fan?—I did not observe it at the fan. I rushed at once down into the mine.

467. You said it was a coal-dust explosion?—In my opinion, yes.

468. Do you think it could possibly have been a firedamp explosion augmented by coal-dust?—I think the burning was not severe enough in any part for a firedamp explosion.

469. Was not the burning in No. 4 bord severe?—It did not extend far enough.

470. If there was an escape of firedamp travelling eastwards, in order to get the dangerous mixture you have mentioned of 2 per cent. of firedamp and coal-dust it would still be requisite to have something very different to coal-dust?—Yes.

471. If the coal-dust was consumed by the introduction of a dangerous mixture which was not very dangerous before then it would become highly dangerous; is that your meaning?—Yes. At the same time it would take a strong detonator to start an explosion from coal-dust with air.

472. Have you had any experience in coal-dust explosions? You do not know whether it is possible, by a firedamp flame, to ignite coal-dust when it is not suspended?—I do not think it will light when it is not suspended.

473. *Mr. Proud.*] Have you any knowledge of a previous explosion?—No.

474. You say you found gas—where?—Near the bottom bord; a considerable distance away from where the men were working with safety-lamps. There was considerable charring in one district.

475. Where did you say the force came from?—It was hard to say. There were indications in both directions in the lower portion of the bord. There was a truck loaded with coal standing in the level (No. 3 incline), and it showed the force going in pretty strong. It was standing all right, and I do not think the explosion originated in that part of the mine.

476. Would that indicate it to be a firedamp explosion or a coal-dust?—I do not think it would interfere very much with the roads. The force would go over the tub, unless there was some stoppage.

477. *Mr. Skellon.*] You said there were three ways you could get out?—Yes.

478. How long have you worked in the Brunner Mine?—Six years and a half.

479. Could any man have found his way out if not acquainted with the mine?—Yes; a man could have found his way out of the dip-workings, provided there were no falls to stop him.

480. You say you could find your way out by the air?—From the mid-level.

481. Did not the air pass out through different workings?—Yes; there is a current of air that always keeps on travelling.

482. Did not the air appear to be more in one place than another?—Yes. [Witness indicated the course of the air-current on the plan.]

483. Is there any way of getting into the undercast?—Yes, there was a door for getting into this undercast. There is a good travelling-road where the two air-courses come together.

484. You said there was not much dust on the floor of these bords?—I said there was a considerable quantity since the explosion.

485. Before?—I was not in that bord.

486. When the small coal and dust gets on to the rails, is it not piled up on the high side when they clear the roads?—Yes, when it is necessary to clear the roads.

487. Would that not be an element of danger in view of a coal-dust explosion?—Yes.

488. About the course of this blown-out shot: before a man wanted to take coal out of that bord, would he not pick off this corner [indicated on plan]?—Not necessarily; before putting the shot in there they would have the coal ready for filling. It would only take a few minutes to strip this pillar before allowing the truck to go in.

489. Do you know if any man was put in to strip that pillar on the 26th?—I cannot say whether any man was put in that morning.

490. Before a man fired that shot, would he not be likely to hole it before firing?—One of his mates could go to get the coal ready in this place, so that they could start work at once when they got to the new place instead of both stopping there before it was ready.

491. If they were going to get coal there, the place would be kept open for them, would it not?—They might have to go to that face when their place was finished, but they violated the rules if they did it without instructions. The bord is heavily coked here [indicated].

492. Would not the fact of the set-off being there cause the fire to hang and to coke the more?—It did not do so.

493. It was very crisp walking under foot?—Yes.

494. That was caused by the coal from the roof?—I do not think so, because it is less on the roof.

495. It may have fallen down?—It was hanging down.

496. What you mean by weathering is the rib being exposed to the air gets flakey?—There is a rib of coal left, and the exposure to the air causes the material to crumble and fall.

497. And the concussion caused by this explosion would no doubt cause it to fall down?—Yes, in small pieces.

498. Would that account for the coal lying there?—It would not account for it.

499. Where would the coal fall if it did not fall alongside the rib?—It would not account for it, because the shot-hole was not overcut, and the coal was on the other side.

500. Would you put a shot-hole in like that?—I would not.

501. Is there any crack up the face where the shot-hole is?—That is in the coal. The coal is broken up at the end of the shot-hole. I did not see this place before the explosion, and cannot say whether that was in before this time.

502. You said safety-lamps were only taken in as a precaution. When the workman found gas there and lamps were taken in, would that not be a precaution also?—If gas was there it would be a precaution.

503. The men would have to get safeties when gas was showing?—Yes; it was the custom to do so.

504. Have you known men ordered out of the mine in such a case?—I cannot say I have. I have known men being prohibited from going into their places because of gas in other places.

505. You say it is not likely that gas was in Brislane's bord?—I say it is unlikely that there was a strong blower.

506. Is it not more likely that you would get gas in Brislane's bord than anywhere else?—I could not say; it is the only place where there were solid workings.

507. Are you not more likely to get gas out of the solid than out of the pillars?—Yes.

508. *Mr. Guinness.*] You said that you did not think that this was a gas-explosion?—Yes.

509. If it had been a gas-explosion, would you have expected to find gas given off after the explosion?—I should certainly have expected to find some indication.

510. Could you find any that would lead to the inference that there had been gas?—No more than I found in the severe burning of that bord.

511. *Sir J. Hector.*] What is the state of the mine now?—Very good; the ventilation is safe.

512. Has there been any gas reported since the 26th March?—It is sometimes reported as on top of falls. We climb over the falls and sometimes find it.

513. Are these new falls, or falls that were there before the explosion?—One fall is a new fall. I think the fireman reported he found gas there yesterday, but not to a serious extent. It was very difficult to remove it from that place with the present ventilation, as the bords have been driven to the rise, and the fall is all in the bord. This bord is backed at the end with water; it is No. 4 bord.

514. Did you examine the shot-hole yourself very closely?—I did.

515. You have mentioned that half the round of the shot is still shown?—Yes.

516. Was any of this part coked?—It was coked the same as other portions of the coal.

517. Was there any coking immediately round the blown-out hole?—There was more soot and black than coke, and the coal is very crisp.

518. Looking at the section on the plan, you will observe that there is a cavity as if part of the shot-hole had been torn away and the coal with it?—Yes.

519. Was there anything peculiar about that piece?—It looked a recent fracture. You could tell from the position of the flakes too that there had been no pick used upon it after the shot had been fired. I could not see any indications whatever.

520. It gave you the impression of being a recent fracture?—Yes.

521. Was it coked?—The fractured part seemed to be.

522. Was there any portion coked around the face?—There is a very severe burning the whole way round.

523. Does it present the same or a different appearance to the part immediately to the west?—It presents a different appearance, much blacker like silvery coke.

524. As if the coal had been distilled?—Yes.

525. What was the roof like?—Like distilled coal.

526. Were there drippers from the roof?—Yes.

527. And this point here [indicated on plan], what was the nature of the coking—was it clear, bright coke or dull?—It was more in the nature of soot, as if something had prevented the coal being distilled.

528. Where was the greatest evidence of distillation of coal by the intense heat?—Round about the roof and round this corner and stenton [indicated on map].

529. In the bord but not the slit?—Yes; also in the slit.

530. *Mr. Skellon.*] There was a blower in Brislane and Roberts's bord. Is that correct?—I never saw one there. There is a blower in the top bord over a fall in Pattinson's place.

531. Have you found any gas in it since?—I have not found any gas in that bord; I found gas once at the end of the bord.

532. *Sir J. Hector.*] There is a little blower at present about somewhere?—Yes; the one making a considerable noise.

533. You got a little gas in that, did you not?—Yes; Mr. Hayes and I saw it yesterday.

534. Was it of any importance?—No; it is right in the airway; it took us a lot of time to get it at all.

ROBERT ARMSTRONG examined.

535. *Mr. Joyce.*] You are a coal-miner, residing at Brunnerton?—Yes.

536. Have you been a coal-miner for many years?—Forty.

537. Did you have much experience in the Home-country?—About ten years.

538. While there, did you ever meet with any explosion?—Small cases of gas.

539. Did you ever work in the dip-workings, Brunner Mine?—Yes.

540. When did you last work there?—Thirteen months ago.

541. What portion of the dip did you work in?—All through it. I had night-shift; there were two shifts on at the time. I was deputy in the night-shift.

542. While you were deputy did you ever make an inspection of those workings for gas?—Yes.

543. Did you ever ascertain if there was ever gas in any portion of the workings?—Several times.

544. Could it always be cleared easily away by bratticing?—Yes.

545. Were you in the habit of using powder there?—Yes.

546. Did you ever see men working in gas in the dip?—I have seen them working with a small tracing of gas.

547. With a couple of feet of gas?—I could not say there would be a couple of feet.

548. Sometimes something very near it?—No; I have seen 2ft. of gas where I worked myself in the night time, but we would be able by bratticing to clear it.

549. Have you ever seen miners working where there would be 2ft. of gas in that dip?—I would not like to swear to that.

550. Was there something like that amount?—A little accumulation perhaps; there might be 1ft. on the upper side of the bord-tailing down to very little.

551. Were they working with safety-lamps?—Yes.

552. What did they use in the next bord—naked lights?—I had never more than two or three sets of men in the night-shift, and they were never in close proximity to one another. There were two pillars in between.

553. Where have you been working during the last thirteen months?—Down in the Seven-mile, prospecting for the company.

554. When you were working down in the dip, did you ever have an explosion?—None.

555. Did you notice any coal-dust there?—I would say nothing unusual.

556. Do you know No. 2 incline?—Yes.

557. Was the coal-dust in that incline ankle-deep?—I never went ankle-deep in it.

558. Did it ever get over the rails?—Not to my knowledge; the track was always a good one.

559. Did you ever have to get off the road in any way?—Not in my time.

560. When you cleared the road, did you pile up the dust on the sides, or take it out?—It was thrown on one side. I have seen the truckers scrape the flat sheet and throw the dust on top; the miners only dragged it on one side.

561. It would come off the full truck, would it not, and into the road again?—No; it went out.

562. How many times did you see that done?—A long time.

563. Did any of the miners do it?—None of the miners did it; the truckers did it.

564. How long have you known that coal-dust explosions are likely to occur from blown-out shots?—That is a question I cannot go into because I know nothing about it. I never knew or heard of a coal-dust explosion before.

565. You made an examination of this mine, did you not?—Since I have been in: in fact, I had charge of the survey. I had charge of Mr. Young, and to look after the safety of the survey party.

566. You have explored in the mine since the date of the explosion, have you formed any theory as to the cause?—I could not say I could give a correct theory of the explosion.

567. As a coal-miner, what is your opinion?—I believe that there has been an explosion in No. 4 bord of No. 2 incline. There has been an excessive burning there, and I have never seen these indications in small gas-explosions before.

568. Have you never heard anything about coal-dust before?—I know nothing about it.

569. Not of your forty years as a miner?—No.

570. You saw that blown-out shot?—Yes.

571. What do you think of the man who put that shot in?—My opinion is that he did not know what he was doing. If he knew what he was doing he was doing wrong to do so.

572. How do you account for the fact that no tools were found near that blown-out shot-hole?—I could not give any reason.

573. Do you not think, as a coal-miner, it is natural you would find tools in the vicinity of the shot?—I would naturally expect to find some tools used by the workmen.

574. These we have not found?—I never saw them.

575. What time did the men go to work?—I could not tell; it was the Friday before I got here. I was in the Seven-mile at the time.

576. Assuming a man wanted to get some coal out easily, do you think he would select that place as the most desirable place to get it?—I should not do so.

577. What would be his idea in putting that shot in?—The only explanation is that the men knew they were going to this place. They must have been finished in the other place, and knew they were going to be sent here, so they might have put the shot in in anticipation.

578. Why would they go there on that particular morning, would they not wait until later on?—No. If I am working with my mate in the bord above, and we were finishing perhaps that night, then there was no more to be taken off this pillar, this place would be put a certain distance back. We might have noticed that we would shift down the following day into this place, and, on finishing our day up above, we would go down to the new place most probably for the rest of the day.

579. Would not you take some tools down to bore a hole?—Yes; at the same time, there is a possibility you would shift your tools when firing that shot for fear the underviewer would come along and catch you.

580. It would be necessary for me to take the coal out as quickly as possible?—Not at all.

581. Would not the underviewer come in next day and see there had been a charge in the hole, and would not he know that there had been no authority for firing it in that place?—If the blast had been successful I do not suppose anything would be said, because he might have heard it fired, and had he gone into the place it might not have been done.

582. Would not the fireman know?—On the following morning he would.

583. He would know if the men were not to work in that face the day before that no shot ought to have been fired, and he would report it?—He would want to know who was working in that bord.

584. He would know the two men who were working?—Yes.

585. Would it not be an advantage to the man who fired that shot to bring his coal out immediately?—It is always the miners' practice to take his coal out, if ready, immediately.

586. In order to do so, he would prepare his road, first of all, along this blown-out shot, would he not?—The deputy generally makes the road fit for the truck to come along.

587. If a miner were taking the coal out himself, and the road was not fit, he could not wait for the deputy, what would he do then?—He could go on filling three or four trucks to keep his turn going.

588. Your opinion is that a man was not likely to go to that hole for coal?—I could not form an opinion as to whether a man went there or not.

589. Your opinion is that it would be likely, but if a man wanted to get easy coal he would go to that place for it?—I do not know what he might do, but the majority of men would not bore the hole in the same place. I do not think a practical miner would have fired the same shot.

590. Might not that hole have been put in when the bords were being constructed?—That I could not tell.

591. Is it probable?—It is likely; but I should say it is too wet.

592. But when that bord was being constructed ten months ago?—I cannot speak of that as I was not there.

593. Might not that shot have been put in and blown out in that period?—I really do not know. All I know is that there is excessive burning there, and the indications suggest to me that the force had started from about the blown-out hole.

594. With reference to the safety-lamps that were being used in Brislane's bord, might the force have generated somewhere near Brislane's bord?—I do not think so; my reason is that I got the brattice-cloth driven directly into Brislane's bord.

595. But it might have worked round up one of these slits to the bottom level, and then gone back again?—I do not think that it is possible.

596. Do you think from the fact that Morris's safety-lamp was found in Brislane's bord that gas had been found that morning?—If Morris had found gas in that bord he would not have withdrawn the lamps until such time as he got instructions from the overman to withdraw them, even if no gas had been seen for a week in the place.

597. Of course, if Morris had found gas a week before he would have reported it?—Yes.

598. If he found it before he would report it in his book, and unless he found the gas he would not use safety-lamps?—That is so. I have put safety-lamps where there was no gas.

599. For what reason?—I had found a trace of gas four or five shifts in front, and have kept the safety-lamps burning. My orders were not to withdraw until I got orders to do so.

600. If Morris had found gas four or five shifts before, he would have reported it in his book, would he not?—I think so.

601. And if it is not reported in his book, he must have found it that morning?—I would not say that; but if he had any doubt at all he would give the men lamps.

602. On March the 14th, 16th, 17th, 18th, 19th, 20th, and 24th Morris reported, "I found the workings free from gas." I do not see any mention in March that he had found any gas in the mine. Do you think he would be doing his duty if he had found gas there and did not report it?—I have known him thirty years, and I never knew him to neglect his duty.

603. Did you ever know safety-lamps to be put in where there was no trace of gas found?—Yes.

604. Where?—In the Brunner dip; because gas had been found thirteen days before, and the lamps had been kept there, especially when they were going through coal.

605. There would have been a report on that gas being found when they were going into the solid?—The report might have been quite clear, but still the lamps would have been given. I have reported myself "clear"; at the same time, I knew it was my orders not to withdraw the lamps until such time as the overman was satisfied.

606. Before you put your lamps in you had found gas. Have you, in your experience, known safety-lamps to be put in before you found a trace of gas. As a starting-point, as we find that Morris has not reported the gas in Brislane's bord for over a month before the explosion we must presume that gas was found on the morning of the explosion in Brislane's bord, otherwise safety-lamps would not have been given?—I would not presume that. At the same time, Brislane's might have had safety-lamps all along till such time as Roberts would see fit to tell Morris to withdraw them.

607. Brislane might have had safety-lamps for over a month?—Yes, for all I know.

608. As a matter of fact, gas must have been found in Brislane's bord, and a report made by Morris?—Yes.

609. The inference then is that gas was found that morning?—I might state here that it makes us so confident that Morris did his duty in the night-shift for two years. I saw him going round in the morning. He always passed in the morning, and I consider did his duty in every respect. Where there has been a further fall on the top of another fall I have on several occasions gone with him to the top of them.

610. I am only assuming that if he did not report he must have found gas that morning?—I cannot say.

611. How far would a man go away from that shot, assuming he would go to another place while it was being discharged?—I would have liked to have been outside the mine.

612. If you had been the man firing the shot, where would you have been?—I do not think I would have been the man to have fired a shot like that.

613. But how far do you think they would go in the case of an extraordinary shot?—I should think they were quite far enough if they were at the end of No. 2 incline.

614. You think that is the farthest a man would go?—That is as far as I would go in case of an ordinary shot.

615. And you would expect to find the body of a man there?—I did not see anything found.

616. You would expect to find the body of the man there who fired the shot?—If it were an ordinary shot, and the man was not in his place, I am confinent you would look for him there.

617. If you were not confident that it was not an ordinary shot, and you were not working in this place, how far would you have gone away?—If it was a fair shot I would go the distance of the first stenton.

618. You say you would not put a shot in like that?—No.

619. Have you ever seen a blown-out shot?—No; I have seen the flash come out of the shot.

620. Have you ever met with a blown-out shot?—I have had it flash out as much as 20 yards from the workings. It was shaley-coal.

621. In the Brunner Mine?—In the Brunner, but not in the dip, and outside of this first fault. It would have carried the flame 20 yards.

622. No matter how careful you are, do you not have blown-out shots sometimes?—They cannot be guaranteed against very well.

623. When you saw this blown-out shot which you had in your experience, did it ever strike the floor?—I could not exactly tell. I was standing a fair distance out when it occurred.

624. Did it raise any coal-dust?—Coal and flame. There was no gas within 25 yds. to light it.

625. Did you notice any marks afterwards?—I did not pay particular attention, and I did not notice any dent in the floor or walls.

626. Do you consider, if you were working with safety-lamps in one portion of the mine, that it would be advisable to use naked lights in another part of the mine in the same shift?—It depends whether there was gas there, and the quantity of it.

627. What quantity would you require to have in one bord to make it unsafe?—I should say that where you would find over a foot of gas in one bord then it would not be safe to work with naked lights in the next bord to it.

628. In the direction the air was travelling?—Yes.

629. You know that pure gas is not explosive of itself. It must be mixed with a certain amount of atmospheric air before it explodes?—What I call gas will explode when I find it in the Davy-lamp. We get the limit of the explosive power then.

630. Do you consider the Davy-lamp a sufficiently good test?—I have worked with it since I was a boy, and I have always found it good enough for me.

631. Have you had the experience in the Brunner Mine of men being burnt with gas?—On several occasions. I was there when Proudfoot was burned, fifteen years ago.

632. The custom was then to work with safety-lamps where gas was, and not with naked lights, as at present?—I think they were all naked lights. I do not think many lamps were used at that time.

633. What did you use for tamping, when firing in the Brunner Mine?—I gathered up damp bottom.

634. Principally coal-slack?—Mixed with fireclay it made the best tamping.

635. Was it always necessary to scrape around for yourself when you wanted to get any tamping?—Yes.

636. Sometimes you used the stuff at the bottom of the truck?—I never did that.

637. You always complied with the provisions of the Act?—I cannot say that I always complied with them. There are few miners who will stand up and say that they always complied with the provisions of the Act.

638. Do you not think, as a matter of fact, the deputy ought to go round in the future and see every shot fired?—If many shots are going to be fired like the one in No. 4 bord, I think it is high time somebody took charge.

639. Do you not think, as a precaution, the deputy should go and charge the hole and fire the shot?—They should stand by and see powder put in, and the quantity.

640. Do you not think it is necessary that it should be tamped? You might have another man who would blow up another sixty-five men?—I think it is quite in keeping that the deputy should see the shot properly made ready before allowing it to be fired.

641. What were the stoppings like when you were in the mine?—Very good; timber and small stuff filled in between; crib-logging.

642. What was the ventilation like?—Very good.

643. Did you ever have trouble with the powder smoke?—In the night shift I could not say I had much. I could not tell what was done in the day. In the night-shift it was pretty clear.

644. As compared with other mines, was the ventilation in the Brunner Mine satisfactory?—It compared favourably with others. I worked in Ayrshire, Scotland, where they used powder, and I have used dynamite and gelatine.

645. In the coal-mines?—In coal, not in a coal-mine. I have never seen roburite used in coal.

646. Do you not know that powder produces great flame? You would not tamp with a mixture of slack and water?—I have used it for forty years, and found nothing to beat it for getting coal. I have tried dynamite in the Brunner Mine.

647. You do not think dynamite would be effective on account of the fumes?—No.

648. Do you think that watering a mine, 20yds. on each side of the shot, would be effective in preventing another explosion?—I have no information as to whether it would be much good. It would depend upon the places working. An average coal-mine draws a certain amount of damp during the night. There is a lot of damp generally in the coal-dust.

649. Was the Brunner damp?—In some places.

650. You do not think that watering would be effective?—It would only damp the coating on the top?—I do not think it would be much use.

651. I suppose you have tried to devise means to prevent an occurrence of this explosion?—I consider they have taken the right steps in putting on special men to fire the shots.

652. Do you think that will be an easy preventative?—I do not know, because we may get explosions still.

653. You would still get explosions?—We might not get so many.

654. Do you think it is absolutely impossible to find a preventative for an explosion such as that which occurred in the Brunner Mine?—I cannot account for that explosion; my experience is that it was not gas. I have travelled the mine, expecting to meet with large bodies of gas in places. I have worked all along the falls where you would naturally look for it, but I did not get it.

655. Did you get much gas when travelling round with the survey party?—In three places.

656. Did you get in Brislane's bord?—No. I was four times in Brislane's bord, and I never got any that I could see in the lamp.

657. Did you examine Worthley's bord?—Yes.

658. Where did you think the explosion went there?—I think the explosion went down the bank, and the force went up No. 2, down No. 3, and must have met a back current of air. When it came out of No. 2 it came right up No. 2 incline.

659. But that does not account for the conflicting currents in Worthley's bord?—I cannot account for them. There is excessive burning. I could pick up indications underneath the mouth and fall of the force going that way [indicated]. The brattice-cloth and coal has been hammered right in.

660. *Sir J. Hector.*] Where would that brattice-cloth have come from?—It must have come inwards with the blast. I think there must have been a brattice bord there to conduct the air down.

661. Is there nothing left?—Only the bord—you can step across it. I think the force afterwards went inwards. I followed it down to where Hunter worked.

662. *Mr. Joyce.*] If it went inwards it would strike Brislane's face and rebound, would it not?—There is no burning that I could detect in Brislane's place. I am satisfied it went down by the timber.

663. How can you account for it going along there, instead of turning the corner and going down Brislane's face in a natural way?—I account for it that it hung there, cleared the stoppings in No. 2, and met further air coming in to meet it at this point [indicated].

664. That would not account for its not following Brislane's bord?—Brislane's bord being solid, anything solid would cause the breakage of the force.

665. Would it leave a mark?—It would leave no mark; it filled this bord entirely.

666. There is no sign of charring in Brislane's bord?—The first charring I got is down Hunter's bord [direction indicated]. There was brattice and slack dust picked up from the corner going down in the direction I have indicated.

667. Where did you get that?—In the direction I have indicated, opposite Hunter's bord, going down in the same spot I found the falls. I traced it all the way down.

668. Did you examine the slit at Denniston's?—I had occasion to go down there.

669. Which way had the blast gone there?—I did not pay any attention to it, having to attend to the surveyors. I did not go to the flat-sheet, where the boy was found, and do not know what force had been exerted on that track.

670. You know where the dam is, the air regulator?—Yes.

671. Do you think that is sufficiently large to conduct the air, it is 6ft. by 1½ft.?—It is large enough for the number of men there.

672. How many men do you think it would support?—It should supply air for sixty men.

673. When you were working in the mine did you know the return air-course?—Yes; I was through once seven or eight years ago.

674. What was it like when you went through some years ago?—I did not see any great change. It was a fair travelling road; a fair current of air. I could not carry a naked light in parts. I always found that the fan was kept going regularly.

675. Do you think that the majority of miners could find their way out of this return air-course?—If they did not know, perhaps they would have difficulty; but any miner who has been accustomed to mines could always follow the air current, and either go against it or with it.

676. In that case they would be going with it?—Yes.

677. Would you be liable to get lost?—I do not think so.

678. Would you have been liable to get mixed up in the directions, and not be able to find the proper one?—I think there would always be an officer in the mine who knew all the levels, and who could get the men out in the best direction. I would always trust to him.

679. Do you think it would be advisable to have the return air-course larger?—I could not say. I think there is enough air there for the number of men employed to clear everything.

680. Do you think the use of safety-lamps, and holing coal without powder, would be advisable in the Brunner?—As far as I can see, they could blast now as safely as at any time since I have been in the mine.

681. What provision would you recommend in regard to blasting?—I should recommend that the deputy should see that the shot was well made ready and the hole drilled, and should see the shot rammed home. If it was a 3ft. holeing, I would not put in a 4ft. shot-hole, but a 2ft. 6in. shot-hole.

682. Assuming the man had come from another place, they must have known something about coal-mining, otherwise one of them would not have gone along to the blown-out hole to secure his place for the next day?—That is a question. I can only assume they did that; and if you and I had been mates it was only natural that I would, when we were finishing the work: There might be a little loose coal, and I would say to you, "Now we are going to that place, you can go on filling, and I will go and get this new place ready."

683. You would have to explain this to me first?—You would very soon get the explanation.

684. Working on the assumption that both the miners would be practical miners, any man with a practical knowledge would not have to put a shot in like that?—Not in a place like that.

685. *Sir J. Hector.*] Supposing a miner going round found a hole already bored, when he was looking about to prepare a place, would it not be a temptation for him to charge it?—I do not think that any miner would charge that hole. I think it would be a foolish waste of time: it would be better to drill a fresh one.

686. For what purpose could it have been put in?—I cannot tell.

687. *Mr. Park.*] Is it in a line with the other holes you saw along the bord?—No; the others are more in a line with the bord.

688. I mean with reference to any. There are holes running along the bord in a straight line: Does this hole run along this line?—It is underneath that line, more into the pillar. The line of the shot, as near as I could tell, would strike the lower part of that bord in the solid pillar. I left the stick in the hole, and it was about 2ft. 6in.

689. Did you feel quite sure, from the look of the hole, that it had been fired?—There has been an exceptional burning.

690. Looking at the hole itself, has it the appearance of a shot-hole that has been burned off?—It stands to reason that it has never done any work, because there is 2ft. 1in. of the hole standing at the present time. It might have been fired, but has not broken the coal. I can form no idea as to when it was fired.

691. *Mr. Beare.*] You say you find powder effective in blasting: Can you say what is the general opinion amongst the miners with regard to the use of high explosives instead of powder?—I think I can say that every coal-miner prefers powder. I think some of them put it in front of high explosives.

692. Have you ever had charge of shot-firing when safety-lamps have been used?—Yes.
693. Can you say what your instructions would be to the men?—My instructions were to undo the lamp. I fire the shot myself.
694. Have you ever refused to fire a shot yourself?—Yes, on one occasion.
695. Why?—I told the men not to make up the shot. When I went into the face I told them I would not fire it. I found more gas than when I went round at night. They came to me between 3 and 4 in the morning, when I was having my lunch.
696. *The Chairman.*] Do you generally have your lunch at 3 or 4 in the morning?—Yes, in the night shift. The fireman came to me to fire a shot. I examined the place, and also the place next to it, and found traces of gas in both places. I was quite satisfied that I should not fire the shot. I refused to do it. The men started grumbling. I told them they could go to my "boss," who was in the mine, for redress. Mr. Bishop happened to be in the mine surveying, and I referred them to him.
697. *Mr. Skellon.*] Supposing one of your mates went there to get the coal ready, would not he take his tools?—He might take what he was working with.
698. If he were going to fire that shot, where would he be likely to place his tools. Would he not put them in the slit?—I do not think a man would want any tools at all.
699. Would not he have taken his drills and pick with him?—I would.
700. When he was going to fire would not he most likely leave them in the upper slit?—I think so. I should, if they would be far enough away up there.
701. Then, if a man had fired that shot, very likely his tools would have been found there?—Yes.
702. The set-off on the pillar [indicated] is about 6ft. wide?—Yes, that is the full width. He was stripping that pillar along the rib.
703. Then, if that shot was put in, it would not be wider than the present face?—I do not know.
704. It would have made it more than 6ft.?—Yes.
705. You said there are crib stoppings, and brick as well?—There were brick stoppings behind the dynamo, and brattice stoppings on the main road. The only crib stopping was down the main dip.
706. What is the effect of dynamite on coal?—We tried it twenty-three years ago. We had pretty hard coal, and the explosion of the dynamite made a hole that you could have buried yourself in, and did not even pull the bottom down, but crushed the coal to bits all along the bord.
707. You say, if anything happened, you would trust to the officers to take you out by the return air-way. Do you not think the officers would make their way out without waiting for you?—I do not think that any officer could have got out after that explosion, not even the best they had. In an explosion like that they would soon have met the fresh air coming in quicker than the back draft was going out.
708. Did not you tell us the explosion went up the intake?—Certainly.
709. Is not there a better chance of getting through the return in case of accident?—The fan was travelling all the time, and before they could have got into the return the fan would have taken in all kinds of noxious gases. The only show was for any one to go out the intake, where they would meet the fresh air.

BRUNNERTON, FRIDAY, 15TH MAY, 1896.

ROBERT BARNETT examined.

1. *Mr. Joyce.*] What are you, Mr. Barnett?—I am a ganger on the Brunner Railway-line.
2. You had a son-in-law working in the sump-workings of the Brunner Mine killed by the explosion?—Yes.
3. He met with an accident a short time before the explosion, did he not?—Yes.
4. Can you tell the Commissioners the nature of that explosion?—He received a small blister upon his neck, caused by a burn.
5. What was it that produced it?—He told me it was a gas explosion in the roof. By the look of the blister, it was from a burn. As far as I can recollect it was about the 19th or 20th of March.
The Chairman: We cannot accept that as evidence.
Mr. Joyce: I thought your Honour would not stick closely to the rules of evidence in an inquiry of this kind.
The Chairman: We most certainly shall, Mr. Joyce.
Mr. Joyce: Then I shall not ask this witness any further questions.
6. *Mr. Guinness.*] Did you not give evidence before the Coroner's inquest?—Yes.
7. Do you remember what date you stated this burn or blister was noticed upon your son-in-law's neck?—To the best of my knowledge it was the date I have mentioned.
8. Was it not in the previous month—February—that you said it was?—No.
9. *Sir J. Hector.*] Was it an old blister?—No, it was freshly done.
10. *Mr. Proud.*] Do you think it was a burn received down the pit?—The deceased told me it was done in the pit.
The Chairman: We cannot receive as evidence what he told you.
11. *Mr. Proud.*] Not on the surface?—No; he told me he got it in the pit, from a pot-hole in the roof.
12. *Mr. Joyce.*] Brislane was his mate, was he not?—Yes.

JAMES WARD examined.

13. *Mr. Joyce.*] You are a coal-miner, residing at Brunnerton, Mr. Ward?—Yes.

14. Have you had much experience in coal-mining?—Eleven years—all in New Zealand, mostly in the Brunner and Coalpit Heath Mines.

15. How long have you worked in the Brunner Mine?—Ever since the Coalpit Heath stopped. I was in the Brunner Mine the first six months; then I went to Westport Hill, Koranui, Tyneside, and Coalpit Heath. I was in Brunner all the time during the eleven years, with the exception of six months.

16. Have you worked in the sump-workings?—Yes.

17. How long since?—A little over two years ago.

18. Were you getting coal?—Yes.

19. Did you ever find any indications of gas in the sump-workings?—Not when I was working there.

20. Did you ever see gas in it at any time?—Yes.

21. In any quantity?—Yes.

22. *The Chairman.*] When?—During the last six weeks; since the explosion.

23. *Mr. Joyce.*] In how many places?—Five.

24. In anything like considerable quantities?—Yes.

25. How much would you say—how many feet?—Brislane's place was the worst—the one I saw gas in.

26. How much was in that place?—The "break" is about 12 yards back from where he was working. The gas was "caught" about 2 yards further than this "break"—10 yards from the face.

27. Was any one present when you found this gas?—Yes, William Daw and George Newlands.

28. Who tested for the gas?—No one. We went in that bord that morning at 6 a.m. Daw said gas was showing in his lamp, and we put our lamps down to the ground.

29. Did you make an examination of the mine in conjunction with Daw, Robinson, and Russell?—Yes, on the part of the miners.

30. While making that examination, did you come to any conclusion as to the cause of the explosion?—Yes.

31. Tell the Commissioners what conclusion you came to?—A gas explosion.

32. What were your reasons for coming to that conclusion?—The same indications were apparent in every place where the gas had exploded—charred deposits remaining.

33. Do you consider that wherever you saw charred deposits there you had had gas?—Yes.

34. And the excessive heat there was caused by the gas?—Let me retract what I said. You asked me if where I saw the charred deposits there had been gas—not in all places, because it was deposited with the current.

35. You said in your answer that there had been gas, and that where the charred places were they were produced by the gas deposited there by the current?—Yes.

36. Did you examine the blown-out hole?—Yes, in what was called the fourth place.

37. There was a tramway laid up to that hole, was there not?—Yes; but no tools were found in the vicinity of the shot-hole, and no body that I am aware of.

38. Assuming that there was no body and no tools in the vicinity of the shot hole, would you consider the shot was fired on the morning of the 26th or not?—No.

39. Say, for instance, a miner was going to change his place next day, the 27th, it was a common thing for him to go to his new place and commence work?—Yes.

40. Well, if he came out to commence work, what would be the first thing he would do?—Fetch his tools.

41. Would he take them back to his own place or leave them in the new place?—He would leave them at the new place. That is the case in my experience.

42. Assuming that a man had fired that shot, where do you think he would deposit the tools?—Inside the slit.

43. If there were no tools found in the slit, you would come to the conclusion that the hole was not bored that morning?—Yes.

44. From your examination of the hole, can you say if it was possible for it to have been bored for a long time?—I could not say whether it was new or old.

45. There was also some fuse found. Could that fuse lie there for a number of months without being disturbed?—I never had any experience, and could not say.

46. Did you examine Brislane's bord?—Yes.

47. There, I believe, safety-lamps were being used?—Yes.

48. Was there any indication of violent explosion in that bord?—No.

49. Did you examine Worthley's bord?—Yes; there were indications of a very severe flame coming down into Worthley's bord.

50. Where would you say that flame came from?—From the top of the fall above Worthley's place.

51. Would it go through Brislane's bord?—No.

52. I think old falls produce a large quantity of gas?—Sometimes.

53. That is a most likely place to find most gas—namely, close alongside of a fall?—Yes.

54. Assuming your theory, that the gas came down over a fall, is correct, is it possible that the gas explosion would produce the same results as you have in the Brunner Mine now?—Yes.

55. How do you account for the very strong charring round the blown-out hole?—Only by a flame coming up on the two sides, "bashing" on the pillar side.

56. It would strike the blind wall?—Yes.

57. And the slits not being exactly opposite to one another—that is what you mean?—Yes.

58. Have you any experience of working with safety-lamps in the Brunner Mine?—Not in the Brunner, but in the Wallsend and Coalpit Heath.

59. Were safety-lamps ever used when no indications of gas were found?—No.

60. What conclusion would you come to from the fact that Brislane and Roberts were using safeties?—That there was gas in that place.

61. Do you consider it advisable or good to use safety-lamps in one bord and naked lights in the bord immediately below if there is gas about?—It depends upon the quantity.

62. Say you had an accumulation of gas like you had had in Brislane's bord on Saturday morning, would it be safe to use safety-lamps in Brislane's bord and naked lights in Geoghegan's and Denniston's?—No.

63. What do you say about the ventilation of the Brunner Mine?—I do not consider the ventilation was good.

64. What are your reasons for saying it is not good?—When I say the ventilation is not good, I think the ventilation is not good in any place where it will not carry the powder-smoke away.

65. Has your experience been in the sump-workings that the powder-smoke will not carry away?—Yes.

66. Well, if the powder-smoke will not be carried away by the ventilation, then the gas will not be carried away?—Yes.

67. It requires much less ventilation to clear gas than to clear powder-smoke?—Accordlug to my experience.

68. Have you inspected the return-airway?—Yes.

69. What do you consider about that? Was it as good as it ought to be?—It is sufficient to carry the ventilation round, but it could be improved.

70. What effect would improvements have upon it?—It would create a better current of air in the mine.

71. Do you think an ordinary miner could find his way round that return air-shaft?—It depends upon where he started from.

72. If he started from the left-hand side of the sump-workings, below Denniston's bord, could he find his way?—He could get round.

73. Would it be difficult for him to get round the return-airway?—Yes.

74. Say his lamp went out, would there be sufficient air-current to show him where the return-airway was?—No.

75. He would require to have his lamp alight to get out?—Yes.

76. You do not think that he could follow the back air, and get out by returning to the back airway?—No.

77. Have you ever had an experience of blown-out shots in the Brunner Mine?—Yes.

78. Will shots blow out even although all care is taken?—Sometimes.

79. What has been the effect of the shots you have seen blown-out?—To produce a flame.

80. Anything like an explosion?—Nothing in the shape of this last explosion.

81. Would the explosion extend for a few yards?—Yes.

82. Created by coal-dust?—By powder.

83. You think that powder would expend itself when, if it was due to coal-dust, it would take a few yards to do that?—Yes.

84. What was the state of the sump-workings—were they wet or dry?—I should consider them damp workings; there was a certain amount of slack lying around, as in any working-place in the pit.

85. Was there a large amount in the working-places?—No.

86. Do you know whether there was a large accumulation in any place?—No.

87. What was the custom when the slack got over your rails?—It has never been the case where I have been.

88. What did they do after it stopped the flat sheet?—They scraped it off down the incline and "chucked" into the end of the bord.

89. Would there be a good accumulation of dust below the flat sheet?—No.

90. If the ventilation of that mine had been good, do you think the blown-out shot would have caused an explosion?—No.

91. You have seen the stoppings since the accident?—Yes.

92. Do you consider them good and sufficient?—Yes. Not as good as could be got, but sufficient for the purpose.

93. There is a kind of air-regulator over the dam of about 6ft. by 18in., do you know that?—Yes; I consider it sufficiently large to carry the air.

94. Would it improve the ventilation of that regulator were it larger?—If it was made larger it would.

95. Would it create a greater current?—I do not say that it would allow a greater current to come through.

96. Not with the same pressure?—I do not know anything about it.

97. Could you tell me whether that place where the blown-out shot was was likely to accumulate gas from its appearance?—No.

98. You do not think there was any gas there originally, before the explosion?—No.

99. *Mr. Park.*] Supposing a person knew of that blown-out shot-hole, do you think he would take down tools with him if he were going to put another shot in?—Yes.

100. What tools?—Drill, powder, and fuse. If he had not, he would take his pick and drill, powder and fuse.

101. I asked you if he knew there was a blown-out shot-hole, but was going to fire that again, what would he take?—His powder, fuse, and tamping-rod.

102. Did you notice particularly the charred coke-dust in this No. 4 bord?—Yes.
103. Did you notice how it felt under your feet?—It felt crisp.
104. We have been told that there was about 1½ft. of crisp stuff under foot, is that so?—I do not think so.
105. Did you measure it?—No.
106. Did you look at the roof?—Yes.
107. What did you see?—The roof is charred.
108. You saw things like icicles hanging down?—Like blisters.
109. Did you see the same effects in any other part of the mine?—No.
110. Did you notice in this particular place that there was far more heat than in any other?—No.
111. Do you think there was the same amount of heat in any other place than there?—There was as much.
112. Whereabouts?—Going upwards to Worthley's bord in No. 3 incline, and in the first, second, and third bords of No. 5 incline on the other side of the pit.
113. How did Nos. 5 and 6 inclines on the west side look?—The first three bords showed signs of very severe fire going up the main incline, and did not show so much in any place I was in. At the top of the main incline a big deposit of coal-dust was shown, going up the main incline on the sides; not coal-dust, but "coal-char."
114. Did you notice towards the No. 3 incline a fall going out of that No. 4 bord, and approaching that bord? [plan handed to witness and place indicated.] Did you notice the fall in No. 4 bord?—Yes.
115. Which way had the blast travelled at that particular spot?—In towards No. 3.
116. And is that how No. 3 received the blast—from this No. 4 bord?—It received the blast out of this No. 4 bord.
117. With reference to these falls, did you notice anything to indicate that the blast had gone that way?—Yes, the fall shows a thick deposit of char. There are some prop-ends along the fall in that bord, and the coal is thrown clean into the prop-end.
118. Did you ever see the signs of what is called the "back lash" in any explosion you have seen?—I do not understand what you mean.
119. Have you ever known a blast to travel up a bord, strike the face, and then return?—I have.
120. Did you notice signs of that done in this slit [indicated]?—No.
121. Is that not a usual thing to see?—I do not understand what you mean.
122. Supposing an explosion occurred at this blown-out shot, travelled down the slit, and up this rib [indicated], might it not have returned again and then spent itself through this No. 4 bord?—I do not think so.
123. Why?—For the reason that the explosion would have gone back on the level, because it was open ground.
124. Where do you think the explosion first occurred?—Below this bord, No. 4.
125. What are your reasons for so thinking?—All the force seems to be coming up from below.
126. Where could it start from—do you think it began in the Pony Track?—It would burn there.
127. Is that where you think it began?—I could not think where it began.
128. What would be the most dusty part of this mine?—The most coal-dust I saw was up above the main dip, above the dynamo.
129. Is that not the place where there is the least sign of fire?—Yes.
130. Is there not a good deal of water about there?—No. There is a little water, but that part is the driest part there.
131. And the explosion seems to have spent itself by the time it reached there?—Yes, after it got there.
132. Was there any sign of fire all along this main dip near the dynamo?—No.
133. Did you know Roberts and Morris?—Yes.
134. What did you think of them as miners?—They were both capable men.
135. How do you account for the heavy charring in Nos. 2, 3, and 4 bords of No. 5 incline?—It met another body of gas there.
136. And that was one of the incline works?—Yes, No. 5.
137. Do you say the greatest sign of charring was in the parts of the mine where the most work was being carried on?—Yes.
138. Would not this place where they were working naturally be most dusty?—Not in my opinion.
139. Where do you think the most dust would be?—In the drive above the dynamo.
140. In the lower parts would they not be the most dusty—on the inclines that were working?—I do not think so.
141. Do you know where gas is most likely to be found—in working the pillars or in working the bords?—In working the bords.
142. They were working the pillars at the time this explosion took place, were they not?—Yes.
143. *Mr. Guinness.*] When did you last work in the lower dip—before the explosion, I mean?—About two years ago.
144. And you had not been in these works until after the explosion?—No.
145. When you gave your opinion as to the ventilation not being good, are you speaking of what you observed in your examination after the explosion?—No.

146. You are speaking of the ventilation you saw in your experience two years ago?—Yes; I was working there.

147. Do you know the statute number of cubic feet of air required to be sent down per miner?—No. I know, according to the Act, that 100ft. per minute should go round the working-faces.

148. Are you aware of the fact that at that time there was that quantity, and a good deal more going down?—It might go down the dip, but still it might not go round the working-places.

149 Could you say it was not going round the working-places at that time?—No.

150. Have you had any knowledge or experience in coal-dust explosions?—No, excepting that which I have read.

151. Have you ever had any experience of a gas explosion?—No; only what I have seen of its effects afterwards.

152. Could you tell the Commissioners what are the different conditions that would produce a coal-dust explosion or a gas explosion?—No.

153. Then it is merely hazarding a guess when you think this was a gas explosion?—No.

154. On what do you base you reasons? Would you say this was a gas explosion, and not a coal-dust explosion?—There is no indication of flame coming up the dip; you can travel along this level until you come to No. 2 incline, then when you come to No. 2 incline you find indications of flame going back, and a charred deposit. Going further along to the end of the level you find 2ft. of gas tailing back to 4 yards; that showed to me conclusively that the gas had exploded and had thrown that deposit on these props. The same level below shows the same indications.

155. I understand you to say that in the locality where the blown-out shot was found there are more indications of fire than in any other part of the mine?—Yes.

156. Is that the place where you think you are likely to find gas stored?—No.

157. How do you account for the excessive burning there, if it was not caused from the effects of the blown-out shot?—By the flame shooting up these two slips [indicated] and hitting on the side of the bord.

158. Have you been into this mine since everything has been made ready for the men to resume work since the explosion?—Yes.

159. What do you say with regard to the ventilation there now?—It is very good.

160. *Mr. Beare.*] You told the Commission that since the explosion you went down and examined the mine, and that you found gas in Brislane's bord about 10 yards from the face?—It was not any examination.

161. But you found gas there?—I was not examining for it.

162. Not when you went down?—We were looking for the men.

163. Seeing that the ventilation of the mine at that time had not been properly restored, would not you expect to find gas there?—Yes.

164. You told Mr. Guinness, when you gave your reasons for supposing it was a gas explosion, that you would go further and state that the initial point of the explosion occurred in the main incline?—I would not say that that was the starting-point.

165. Can you say which was the starting-point?—The whole force seemed to be going up from below. You could not get to the starting-point, or what in my opinion was the starting-point.

166. Because the starting-point was down the lower workings?—Where we could not approach for water.

167. *Mr. Joyce.*] Do you know where Hooly's bord is on the west side?—Yes.

168. Did you examine that bord and find any indications of gas in it?—No.

169. Of fire?—Yes. There is some more flame going out of Hooly's, and more flame going out of the bord below where there was no work going on.

170. That is a long distance from the blown-out shot?—Yes.

171. Assuming that a coal-dust explosion did take place, do you think that excessive charring in No. 5 incline and in Hooly's bord could be accounted for by the coal-dust?—No.

172. Do you think that the blast could have reached that bord through the lamp-cabin?—No; it could not have got through into those bords. There are signs of flame going into No. 1 bord off the main level.

173. Would you say that the flame had reached it through the lamp-cabin?—Yes; that is where I think it got in.

174. Is there any difference shown in the force between Nos. 5 and 6 inclines, and right inside the dip, and the force shown at the blown-out shot-hole—from the appearance of the charring and coking?—There is a slight difference; it has been more severe where the blown-out shot was than in Hooly's bord. It has taken a more severe flame to burn it.

175. How are the slits constructed where Hooly's bord is?—I could not say.

176. Would the fact of the slits not being opposite to each other account for the charring on the top side?—If this slit [indicated] had been opposite these other two slits [indicated], in my opinion the blast would have had a straight rush, and you would not have had that charring in the blown-out shot.

177. And for the difference in the amount of flame showing on the bord between Hooly's and the blown-out shot: is there not a difference?—In Hooly's it is a clear flame; in the other one it is a clear flame also, but it has burnt the coal and has hung there longer.

178. In the 5 and 6 inclines, does the coke there look like a gas flame or an inrush flame?—It looks as though another body has been alight in No. 5. The force has returned against the level, because it shows deposits returning out of the level. It is my opinion that gas was alight in No. 5, and has returned along the level again.

179. In your opinion, that accounts for the excessive charring?—Yes.

180. *Sir J. Hector.*] You say there is charring about the blown-out hole?—It is a burnt "char."

181. Was the coal burnt deeply?—Yes, for a good space.

182. How deep?—Some one stuck a knife into it, and it was 3in. deep, and some of it was only 1½in.

183. If it were 1½in. deep, every yard of surface would give over a cubic foot of burnt coal?—I do not know anything about cubic measurement.

184. There would be a considerable quantity?—Yes.

185. Was it burnt to coke?—Thoroughly.

186. If it were thoroughly burnt it would give off 10,000ft. or 11,000ft. of gas to the ton; and, if that gas could not be consumed, would it not travel along with the force of the explosion? Would not that be a natural source for the gas to come from with which to burn other places when it met naked lights where the men were working?—I cannot understand you.

187. You say there was a gas explosion in No. 5?—Yes.

187A. Where do you think that came from?—From Nos. 1 and 2 below.

188. Were you ever in this mine when they were working in this bord (No. 5)?—I never worked there; I worked on the opposite side.

189. Did you know of gas having been found there?—No.

190. Would it not strike you as curious if gas were suddenly to appear in these two distant places [indicated] on the same morning for the first time in any quantity?—Yes.

191. If it could be shown that a large quantity of gas must have been suddenly produced, and that it had swept rapidly up the face and been carried in various directions through the mine, and when it reached the miners who were at work there was a gas explosion, would not that account for the matter?—Yes.

192. Therefore, all you would require would be a large quantity of gas, and for it to travel rapidly through the mine?—Yes.

193. Would that fit in with your theory?—It would burn up everything going along with it.

194. You cannot say from anything you saw that there is any place where gas could accumulate at the lower end of Nos. 5 and 6 bords?—Yes; in one of two places.

195. How?—There are two blind bords—there is a stopping here and a stopping there [indiated], which allow no air to get into it.

196. What are those stoppings made of?—One is of stone, and the other of canvas.

197. That is to allow a certain amount of air to work in?—It is to allow the air to get through.

198. *Mr. Proud.*] I think you said that you never worked in any part of the pit that was considered dangerous on account of firedamp?—No.

199. You say that you have seen a blown-out shot. How far did you see the flame going back?—About 10 or 12 yards.

200. You think that the force of the explosion came up from the lower workings?—Yes, from below.

201. I think that you said the air was not carried along the working-faces?—Only when I went in to look for bodies.

202. While you were working down there, did you consider the air was carried round the working-faces?—Yes.

203. I suppose you could not work coal without firing gunpowder or some other explosive?—Not according to my idea.

204. *Mr. Skellon.*] You said that if a man were going to make a hole in No. 4 bord he would take his drill with him. Would not he want a pick as well to stamp the hole?—It would depend upon if he wanted to make a hole.

205. If he had to bore a hole he would want his drill?—Yes.

206. Did you notice in that bord whether the tram-line is not laid close to the pillar so the trucks could not get up to the shot-hole?—Yes.

207. Instead of firing that shot, would it not be more likely that a man, if he wanted to get coals from there, would strip underneath so as to get his truck close up and pick the coal into the truck at once?—I do not think it would be easy for him to do so. It would be easier for him to take it all down and fill it into the truck.

208. If he put a shot in there he might bring the top coal down, but then he would have to fill it all out before he could get at his bottoms?—The coal is partly holed on the bottom and only bored in the face. [Witness indicated on the plan where the shot was holed.]

209. Have you ever seen slack piled up on each side of the rails?—Yes.

210. Do you not think that would be likely to cause a dust explosion, having the slack piled up on each side?—Yes, if there is such a thing as a dust explosion.

211. You say the men were working the pillars that morning?—Yes.

212. Was not Brislane's a fast place?—No.

213. You said the Act provides for 100 cubic feet of air for each man round the working-places?—Yes.

214. I would like to read you the clause of the Act regarding this matter, as I would like the miners' attention drawn to it: "An adequate amount of ventilation shall mean not less than 100 cubic feet of pure air per minute for each man and youth, horse, pony, donkey, or mule, which shall sweep undiminished along the airway to each working-place"—not "round the working-face."

JAMES WARD re-examined.

215. *Mr. Joyce.*] When I asked you a question about the ventilation of the mine, I wanted to know where the air was split at the present time. Can you show me on this plan [produced] where the air was split previous to the explosion?—I cannot swear to it, but only where I was led to believe it was split. [Witness indicated on plan where he thought the air was split.]

216. By whom were you led to believe it was split there?—By William Sheard and Robert Tennent.

217. Was there a place where you saw a brattice-cloth—where the air was split or stopped?—When we went down exploring there was no stopping in any part of the dip.

WILLIAM DAW examined.

218. *Mr. Joyce.*] You are a coal-miner residing at Brunnerton, Mr. Daw?—Yes.

219. How long have you been residing here?—Twenty-one years.

220. How much experience have you had as a coal-miner?—Eighteen years in the Brunner, Wallsend, and Coalpit Heath Mines. I was in Victoria prior to that.

221. Were you ever working in the dip-workings of the Brunner Mine?—Yes; about eighteen months ago.

222. Were you working on both sides?—Only on the sump side.

223. Did you ever see any gas there at any time?—Yes, on more than one occasion when I was working there.

224. What was done with the gas when it was found?—Brattice was put up to clear it out, and we were given lamps.

225. Was that always the case?—I would not say always; but while I was there.

226. Would safety-lamps ever be used when there was no indication of gas?—No.

227. While you were working with safety-lamps did gas ever accumulate, even though the brattice had been brought up?—I could not say. We had the Davy-lamp, but we would not try much.

228. Did your lamp ever give an indication when you were working?—In both cases; we often met it by accident.

229. You have examined the mine since the date of the explosion?—Yes.

230. Have you formed any theory as to how that explosion took place?—I think it was gas.

231. Where do you think the seat of it was?—In my opinion the seat would be the lower part of the mine on the sump side. The lower part was not explored when we made the examination, on account of the water.

232. You saw as far as you could get. Did the indications all appear to be coming up from the low level?—Not in all cases.

233. You did make an examination of the lower levels when they were free from water?—No.

234. Were you prevented from examining the mine on account of its being unsafe?—I was not.

240. From the lowest levels you got to, did you find indications of force coming up from there, or were some coming up and some going down?—The principal flame was in No. 2 incline. [Witness indicated the direction which in his opinion the force took.]

241. You know where Worthley's bord is? Is there any sign of flame there?—Yes.

242. What do you think produced that flame?—Up Worthley's bord there is a fall, and it contains gas. I reckoned that the gas exploded there, shot up the slit into Worthley's bord on the high side, because there is charred coal on the high side of the fall.

243. Did you find gas lower down than Worthley's bord?—There are indications of gas on the top of this fall.

244. Your opinion is that the gas generated at that fall, and went up the face of Worthley's bord?—That is possible.

245. Does the force seem to have gone in this direction?—It could not go any further in Worthley's bord on the high side. It has gone up from this fall into the two slits and struck Worthley's bord on the high side.

246. Did you examine the blown-out shot?—I made a thorough examination and found excessive charring on the roofs and sides. No other place in the mine was charred as badly as that, in my opinion.

247. What is the reason for your opinion that the blown-out-shot bord was charred more than another?—On account of the force going up the main slit and striking the bord on the side.

248. In nearly every case the slits happen to be opposite each other, do they not?—The slits in this case are not opposite one another.

249. If the slits were not opposite one another, do you think you would have had all this charring?—It is quite possible it would have gone up the slit.

250. Is there any great charring at the top of the incline?—At the top, no.

251. Did you find in the right-hand side of the main dip any evidence of charring?—Yes.

252. Assuming a coal-dust explosion had taken place, do you think you would have had that charring in Nos. 5 and 6 inclines so far away from the blown-out shot?—I do not know anything of a coal-dust explosion.

253. Do you think, even if you had a coal-dust explosion, the coal-dust was ignited where the blown-out shot was?—I should think not.

254. Assuming there was a coal-dust explosion, and that the coal-dust was gathered up as it went along Nos. 5 and 6 inclines, do you think you would have a greater amount of coal-dust burnt in that incline?—Between No. 2 incline in the main level and the west side there is very little sign of the blast until it gets to between Nos. 4 and 5 inclines on the west side. Then it begins to show signs of fire on the props and bords. When you get to No. 5, that shows great signs of fire.

255. So that between the blown-out-shot hole and Nos. 5 and 6 inclines seems to be the place where there has been no explosion worth speaking about?—It is burnt more severely than what it is in those two places.

256. Was there a large amount of coal- or slack-dust found in Nos. 5 and 6?—No more than usual.

257. Did you see the depth of the blown-out-shot hole?—It was a little over a foot.

258. Is it in a good place to put a shot?—No.

259. Do you think, from the indications you saw, you could say whether it was a new or an old shot-hole?—I do not know.

260. In your experience have you had a blown-out shot?—I have seen them.

261. Is it possible to prevent them in practice?—I hardly think it is, because you might get a blown-out shot at any time.

262. What did you tamp with in the Brunner Mine?—Principally fireclay and damp slack.

263. Did you ever have any place where you could obtain fireclay to tamp with?—We used to get the fireclay ourselves.

264. If any fireclay did not happen to be on the floor, what did you use?—We used to go for it.

265. Say, for instance, that two men were going to change their place, and one of them went along to fire that shot, do you think he would bring his tools with him?—Certainly he would.

265A. What tools would he require?—A pick and shovel to "hole" it and make it.

266. *The Chairman.*] But assuming the hole was already made?—If he went to fire that hole he would want to take his fuse and powder and tamping-iron, and he would require to scrape it out. Nobody would fire that hole if they wanted to get coal.

267. *Mr. Joyce.*] Why?—Because they would not get any coal by firing it.

268. Do you consider that shot-hole was put in when the bord was being made?—When the bord was being driven. They were driving that bord too wide, and it is my opinion that the overman had come along and refused to allow them to fire it, because a little further back you can see where there are holes in a line along the bord.

269. You think the overman came along and stopped them firing it?—Yes; when they were driving the bord.

270. Does the fact that no tools or bodies were found in the vicinity of that hole suggest any doubt to you as to the shot being fired on the 26th of March?—I do not think there were any bodies found there. I think the nearest found was in the incline. I think it was the body of O'Loughlin. It would be quite likely that some would be found in the bord above.

271. What do you think of gunpowder as an explosive for use in a mine? It is gunpowder you have seen used?—Yes.

272. Have you ever seen any other explosive used?—Gelanite, roburite, dynamite.

273. Is roburite, in your opinion, a better or worse explosive than powder?—I did not like roburite on account of the fumes.

274. Does it produce any flame?—I never saw any used.

275. With reference to the firing of shots, do you not think they could be fired by electricity?—I do not think it is necessary.

276. In view of coal-dust being such a dangerous explosive as we are told it is, do you think it is safe to use any ordinary light to fire shots?—Yes; but I am not of the opinion that coal-dust is such a dangerous thing as represented, and especially in this mine.

277. Why should it not be so dangerous in this mine?—It is not a dry mine; it is damp.

278. Do you mean by that, simply damp over the surface or damp all through?—It is damp in most places.

279. In most places is it thoroughly damp?—Not thoroughly damp; some parts have water running down, and some parts are only damp.

280. What was the ventilation of the mine like when you worked in it?—Not very good where I was.

281. What was wrong with it?—The smoke used to hang there.

282. Was the ventilation sufficiently good to clear out the gas?—Not at all times; that is the reason we used the lamps.

283. Did you use lamps all the time?—No.

284. Was the ventilation at that time the same as it was shortly before the explosion?—I was not working in the Brunner Mine previous, and did not know what changes were made in the ventilation.

285. There was the same intake, and the same fan?—Yes; they did not change them.

286. Have you been through the air-return?—Yes.

287. Do you consider that widening that return would have made the ventilation better?—I think if it was wider in places it would make it better. I would have given it more room overhead.

288. Was the air always led round the faces when you were there?—Yes; and the brattice was run up close to the face. If it was required, they would brattice close to the face—that was, if you had gas in your place.

289. In all cases when there was indications of gas in your time, did they put the brattice close up?—Yes.

290. From the fact of safety-lamps having been found in Brislane and Roberts's bord, would you say that there was gas there for some time?—Yes.

291. Assuming that there was no report in the time-book of gas having been found there previous to the 26th, do you consider that gas was found there on the 26th?—Yes; I never knew Morris to give lamps to anybody unless there was gas. He was a very reliable man.

292. Did you ever know lamps to be given where gas was not found?—No.

293. Of course you cannot say whether the miners always reported gas?—I did myself; I do not know about other miners.

294. Do you think it is safe to use safety-lamps in one bord and in the bord immediately below use naked lights?—Not in Brislane's bord. I think he was not coming to fresh coal.

295. Your answer is that you considered that it would be safe if safety-lamps were being used in Brislane's bord to use naked lights lower down?—Yes.

296. And there would have been no danger at all?—There has been danger there as it appears.

297. Was it always the case, when you were working in the mine, in bords joining the air-course, to use naked lights?—I have worked in that part of the mine with a naked light when the men above me were working with lamps.

298. Do you think that would be a good precaution?—I am not prepared to say.

299. What was done with the slack when you were working in the mine?—It was filled into the trucks.

299A. And the coal-dust?—It would accumulate by travelling backwards and forwards.

300. Did it ever cover the rails?—Occasionally it did. Close to the rib-side in the middle bord it was very seldom covered. It was quite possible the truck of coal would not get down, and then the dust would be shifted to either side.

301. What did they do with the dust from the flat sheets?—They threw it down the incline. We did not take it out of the mine.

302. You have examined this mine since. Did you find any large body of gas in it?—Yes; I found a good deal of gas about Pattinson's place, on top of a fall in a bord in Pattinson's place. We got 2ft.

303. Anywhere else?—This was after the explosion and after the ventilation was restored, from two to four days after we got all the men out. I was in Pattinson's place, and we got gas in the top or the sump-level, about 2ft. of it, tailing back for 3 or 4 yards. I saw a little gas on top of the fall about Worthley's place. There was only just a "draw" there.

304. You know the air-regulator over the dam?—Yes.

305. Do you think that is sufficiently good for the purpose intended?—Yes, if there is enough force behind it.

306. Do you think under ordinary circumstances there is enough force behind it?—I am not a judge of fans.

307. Do you not think it would be better to have the air-regulator made larger?—I said I am not a judge of fans.

308. Did you ever see the Inspector going round the faces when he was in the mine?—Yes.

309. Do you know if he ever measured the air at the faces?—I never saw him do that.

310. *Mr. Park.*] You say that it was safe enough in your opinion to use naked lights in Hunter's bord, although they might be using safeties in Brislane's bord because they were doing pillarwork?—Yes.

311. I think in taking out the pillars there is not nearly the risk from gas that there is in driving in the face when working the bords?—That is so. They are not cutting any fresh feeders.

312. If there had been feeders they would have blown out during the working of the bords?—Yes.

313. Then the mine had practically passed the dangerous stage—if it ever had any—is that so?—The most dangerous stage in my opinion.

314. It has been stated here that when safeties are once given they are not withdrawn for a good while afterwards, until the gas was thoroughly cleared out. Is that statement correct?—Yes.

315. Does the fact that the miners had been at work in the mine over an hour indicate that the fireman had been round and examined the faces?—Yes.

316. And from your knowledge of Roberts and Morris, you think they had done their duty that morning?—Morris had been round that part of the mine that morning I know, because I saw him there.

317. In reference to this air-regulator, is it not used for the purpose of splitting the air and distributing on either side?—I did not know it was an air-regulator at all. I thought there was just a dam there, and that the regulator carried the air over the dam.

318. If the hole were not there, would there not have been too much air taken from one side and allowed to get weaker on the other?—Quite likely.

319. Your opinion was that shot was fired when the bord was being driven. You said it was most likely put in when the bord was being driven, and the manager or overman most likely prevented its being fired?—No, I did not say that.

320. When they chalked that shot off, would they have stopped the men from firing it?—It was quite likely they would.

321. It is quite likely when the bord was being driven that the hole was left without the shot being fired?—That is more than I can say. My opinion is that the hole was fired when the bord was being driven. The hole has been fired to a certainty, because there is a part blown off on the collar—about 2ft., from the look of the hole.

322. To a certainty it has been fired, you say. Can you say when?—No.

323. Have you noticed the ventilation of the mine since the explosion?—Yes; it is very good since the explosion.

324. And you say that the ventilation is sufficient to carry away all the gas, but not the powder-smoke?—That was eighteen months ago.

325. Eighteen months ago it was able to clear away the gas, but not the powder-smoke?—I did not try to see if the gas was carried away or not. I know that the smoke would still hang in our place.

326. You think the ventilation is better now than it was eighteen months ago?—Yes.

327. Have the management ever refused to put up brattice?—No; it was put up the time it was asked for. If a man put up brattice, and if he had not air, he would keep it well up the working-face.

328. *Mr. Guinness.*] Have you ever had any experience in coal-dust explosions?—No; I have seen small gas explosions in the Coalpit Heath.

329. Did you make any observations after the gas explosions? What were the effects on the roof or walls?—I never saw a gas explosion severe enough to show any effects.

330. Had you any fault to find with any of the bratticing in this mine?—I never examined it.

331. While you were working there?—No.

332. As far as your experience goes, was it put up in a workmanlike manner?—Generally.

333. Did you examine that blown-out shot minutely enough to say whether that piece around the collar showed that it had been fired? You say some coal was knocked or blown out?—Yes.

334. That would be blown out, in your opinion, when the shot was fired?—Yes.

335. Did you examine the fracture that would be left at the collar to see whether it was a recent or an old shot?—It was all charred, excepting just at the mouth of the hole.

336. From what you could observe there was nothing to indicate whether it was recent or of some distant date?—Yes; it was charred all round the mouth of the hole, but not in the hole—close to the hole, as close as could be.

337. That was recent charring?—Yes.

338. *Mr. Beare.*] How many men were employed in the sump-side eighteen months ago?—There are about ten faces working in that side, two men in a face; driving on the level.

339. You said a miner would take with him his fuse, tamping-bag, and scraper?—A stamper and scraper.

340. Suppose a scraper had been found in his slit, what inference would you draw from that?—It is quite likely a scraper would be left in the bord.

341. Would you say a miner had been working in that bord—had been taking something off that hole?—I do not think that hole was fired that morning at all.

342. Do you think a scraper would have been left some time ago—say, twelve months—since the hole was fired?—Oh, yes; I found a scraper that may have been left ten years ago in the mine only yesterday.

343. *Mr. Joyce.*] There is a canvas stopping down the middle level, below the dip, for taking the air round. Do you know where that is?—[Witness indicated the place on the plan where the canvas stopping was situated.]

344. Is that canvas stopping there now?—It was the last time I was in the mine.

345. Do you consider that was a good way of taking the air round?—I do not think it could have been done in any other.

346. Could you not have used any other kind of stopping?—Not very well where trucks are going up and down.

347. For the reason that there would be considerable loss of air?—There would be a loss of air at the stopping.

348. Would not a door have been better?—You would have a certain loss all the same.

349. Would it not be better if you had a door than canvas, which is constantly being knocked about by the trucks?—With canvas we can repair it at once.

350. If anything went wrong in the stopping, would it not be impossible to get the sump-level clear of gas?—Not so clear as it is at present.

351. If anything went wrong with the stopping, could you get your air down the sump-level?—No; if anything went wrong with it the gas would be in the sump-level, and it would not stick to the workings. I do not think it would get through very quickly, however, because the canvas stoppings are very quickly repaired.

352. If anything went wrong with the canvas stoppings, would it not interfere seriously with the sump-level?—I do not think so.

353. Say it was not repaired?—In that case it would.

354. *Mr. Proud.*] I think you found the ventilation ample when you were employed in the mine?—It was not very good where I was working, in the level below there [indicated]. We had lamps there. There was a little gas found where we had the lamps.

355. Did you blast the coal when a little gas was found?—No, we did not fire the shot when we had the lamps; the fireman used to fire the shots.

356. Do you think the deputies ought to always fire the shots?—Where there is gas.

357. You think it has only been a firedamp explosion?—A gas explosion.

358. You think it took place in the lower part of the mine?—All the force seemed to come up from the low side.

359. You consider that was an old shot, fired some time ago, at the time the bord was driven?—Yes.

360. *Mr. Skellon.*] In your opinion, was the explosion caused by gas?—Yes.

361. You also said you had no knowledge of a coal-dust explosion?—I never saw any.

362. Would that cause you to come to the conclusion that this explosion was caused by gas?—Yes.

363. How long did the smoke hang about after you fired the shots when you were in the mine before?—A day.

364. About this blown-out shot: there was a lot of coal lying there, looking as though it had been fired that morning. Is that so?—I do not think there was much.

365. Do you often find scrapers lying in old bords in the mine?—Yes.

366. *Mr. Park.*] Could you suggest any better stopping than brattice-cloth for such a place as below the cabin in the main haulage-road?—I think brattice stoppings are very good temporary stoppings.

367. Do you think it is the best?—I think slack stoppings are better.

368. I mean for the haulage-road, where the trucks are constantly going down?—I think they are very good. I do not know of any better.

WILLIAM SHEARD examined.

369. *Mr. Joyce.*] You are a coal-miner, residing at Brunnerton, Mr. Sheard?—Yes.

370. I think you have been a deputy-roadsman in the Brunner Mine for some time?—Yes, for eleven or twelve years. I have been twenty-five years in the Brunner Mine.

371. Did you ever work in the dip-workings of the Brunner Mine?—Yes, ever since it started.
372. When did you last work there?—Yesterday, and the day before the explosion. I came out the night before at 6 o'clock.
373. During the period which you were working there, did you personally ever find gas in the dip?—Only in small quantities.
374. You know during the period you were in the mine that gas had been found there often in dangerous quantities?—Not in dangerous quantities. Some that would perhaps burn a man.
375. I think there was enough to kill a man on one occasion?—There was at the time they were going through the fault. He died from the effects of the explosion.
Sir J. Hector: In the dip workings?—No; at the time they were going through the fault.
376. *Mr. Joyce.*] Do you know the tramway in the fourth board?—Yes.
377. Did you lay the rails?—I laid the rails close up to the slit about a fortnight or three weeks before the explosion.
378. Did you know if any working-place was going to be made there?—Not in that bord; the first working-place would have been the bord above it, I should have thought.
379. You say that from your experience as a roadman?—From my experience as a deputy.
380. Therefore, in No. 4 bord there would not have been likely to be any place where a man would come in to work within a day or two?—I do not think they would put a man to work there for some weeks to come.
381. While you were laying the rails in this bord, did you make an examination of it?—I did not make any examination—only to see what line I should take the road in the construction of the face.
382. Did you find any blown-out shot?—I never examined it closely. I just looked forward, and saw the coal on the side. I laid the road straight with it. I did not know whether there was a blown-out shot or not.
383. Was there much slack in the bord where you were laying the line?—No, very little.
384. Or dust?—Very little, mostly odd bottom.
385. Were there other parts of the mine which were more dusty?—Yes, No. 2 incline.
386. Was No. 4 bord dry or wet?—Pretty dry.
387. Was there any moisture about it at all?—A little. If the tools were left in for a little while—say a couple of days—they would be mouldy when you went back again.
388. So that there was a certain amount of dampness?—Yes.
389. Do you think if a man were going to fire that shot-hole on the morning of the 26th, he would have brought his tools with him?—If he had wished to fire it he would do so, but I do not think any one would want to fire that shot.
390. Why?—Because it is in the solid.
391. *The Chairman.*] Why would any one bore it?—I should imagine it is the remains of a hole since the time the bord was driven.
392. *Mr. Joyce.*] And if this shot was put in, it was not put in the proper position?—Not to fire it.
393. And it has been stopped by the deputy?—Yes; the shot would have been fired at the time the hole was driven; and after the shot was fired the deputy stopped the workman, and made him go narrower, the bord being too wide.
394. Therefore, the reason was that he was going too wide there, with a danger of striking the roof?—No; but of the bord getting too wide for ventilation. The bord was only supposed to be taken about 18ft. wide, and it was getting too wide for the length.
395. Then, your opinion, as a miner, is that the hole was bored at the time the bord was being made?—Yes.
396. How far down were you?—Only to the mid-level. I was at work there that night.
397. Was the ventilation good?—Yes.
398. Did you leave any one in the mine when you came out at 6 o'clock?—There was no one in then. Some went in afterwards. Two men went in baling water after that.
399. Did everything seem to be right when you came away?—As far as we could see, everything was all right when we came away.
400. Was the ventilation all right in the mine?—Yes.
401. At times did you see it bad?—Occasionally.
402. When did you see it bad?—Odd days.
403. On those odd days would it be gas that was making?—A little gas, but it would be cleared away with the battrice.
404. Was there always battricing done up to the face?—Wherever necessary. There was a pretty fair current of air round the working-faces. I have not made an examination of the mine since. I have been down it, but have made no examination.
405. Did you notice the various forces?—No; I took no notice of the force or the direction it came, excepting in odd places.
406. Have you formed any theory as to the cause of the explosion?—I have had no experience of gas or coal-dust, and therefore cannot say anything on either subject. I have seen gas in the lamp but have never seen any fire when we were examining for gas.
407. Have you seen them doing anything with the coal-dust?—The coal-dust, if it was left on the track, would be scraped off to the side. I have seen it covering the rails, when it would be thrown to the side, or wherever we could find room for it.
408. Was there much accumulation in any place?—Not very large.
409. What was the depth of it in No. 2 incline?—I could not say. There is rough coal and stone amongst it.
410. Did you ever go through the air-return?—I have been through it once only.

411. Do you know whether it was inspected regularly?—It was inspected every week, I believe. It has been for some time back.

412. Before the explosion?—Yes.

413. You know the canvas stopping down below the cabin?—Yes.

414. Do you consider that a good stopping for bringing the air down the sump?—I consider it is a good stopping where the trucks have to come through.

415. Do you not consider a door there would have been better?—If there had been a door it might be a little better, but it would be necessary for some one to attend to it; and I do not know that it would be any better, as long as the canvas was kept in good order.

416. Is there any possible chance of the canvas getting out of order?—No. There is always a man there when the trucks are running, and it could not have remained open long enough to be of any danger, unless the man who was baling neglected it. He would not be doing his duty if he did.

417. They could not neglect it if there was a door, could they?—They might even leave the door open.

418. *Mr. Skellon.*] The doors are supposed to shut themselves in a mine?—Mostly. I believe there are cases where they will not shut; they get jammed.

419. A door then would be better?—The brattice will shut, but the doors get jammed.

420. But you should have some one to attend to the doors in the Brunner Mine?—We have only one—on the level in the pony-drive. The pony-driver is going through it every few minutes.

421. Have you been in the habit of using powder all your time?—Yes.

422. Have you ever seen a blown-out shot?—I cannot say never. I have known them to be blown out, but I cannot say I have seen them.

423. What kind of tamping did they use?—Damp slack and fireclay.

424. *Mr. Park.*] Did you ever report any accumulation of gas in the mine?—No, I never did.

425. Have you never found any?—I never found any big accumulation—only a small quantity where I have known it to be.

426. Do you know that there was a quantity of coal found on the rails you laid in No. 4 bord after the explosion?—Yes.

427. Where would that come from?—It would come off the face. There was some loose coal on the face on the rib-side. I went in along the rib-side, and I saw that the coal was rather "drummy." The coal found on the rails was the loose coal from this.

428. And not out of the shot hole?—No; I did not see it at all.

429. Was there any possible place where the gas could accumulate in any quantity in the mine?—I could not say. There was a little in Brislane's place, but I have not seen any. There was a little in No. 4 bord on top of a fall before the explosion. That is over six months ago. There has been a little on top of that fall in No. 4 bord, just by Brislane's bord, but not in any large quantity.

430. *Mr. Guinness.*] You say you put in those rails about a fortnight before the explosion?—A fortnight or three weeks.

431. When you put the rails in, did you visit the place again?—No; I never went through that bord until after the explosion.

432. And you noticed after the explosion that there was a quantity of coal lying on the rails?—Yes.

433. Did you say you had a look at the hole where the blown-out shot came from since the explosion?—I just saw it, but never examined it closely.

434. Did you notice the coal there—whether it was knocked off the hole or seemed to have been blown out?—I did not notice it. I was in Duncan's one morning, but did not examine the shot-hole.

435. *Mr. Beare.*] You have accounted for the fact of the coal being on the rails by saying that in all probability it came off the face of the bord?—The side and face.

436. Have you seen the other shot-holes there?—Yes, along the side.

437. How do you account for the shot-holes still being visible if you say the coal came off the side of the bord?—It came from lower down, and those holes are higher up. Lower down, where the coal was "drummy" or scaley, you could pull it off easily with a pick, leaving the coal up above, because it was of a harder nature.

438. *Mr. Joyce.*] Do you know why Brislane and Roberts had taken to using safety-lamps?—No.

439. Why did they not work with naked lamps?—They had been when the bord was driving. They have been working with safeties for some time.

440. Do you know if they were working with naked lights in the gas?—There was no gas there when they worked with naked lights.

441. How long is it since gas was known to be there?—A fortnight before the explosion.

442. That would be about the time that Morris found it?—I could not say when he found it. About a fortnight before the explosion the men were drawn out of the place, and a fence was put round the mouth of the bord.

443. You say a fortnight before the explosion?—Yes; the men were shifted lower down.

444. The same two men?—Yes.

445. Were they working with safeties in that bord before they were drawn away?—I could not say. They were shifted down for a couple of days, and when the brattice was changed they were put back in again.

446. Were you working at it?—I was the first one to put the fence across one part of it. Morris put a fence across the bord, but left the low side without a fence.

447. *Sir J. Hector.*] Can you explain exactly what were the duties of these two men who entered the mine after you left on the night of the 25th?—They had to draw water out of the sump,

below the sump-level. The water was just up to the edge of this top board, below the level, that night.

448. How long did it take them to make a trip?—Up and down in five minutes. That is what they were doing all night.

449. Their duties did not require them to pass through the brattice-door that turned the air?—It was only the trucks that went through all night from the sump-level to the mid-level. They discharged the tubs into the sump, which ran into the dam.

450. How was the air turned down in to these lower workings?—The air was stopped lower down. One part went along the mid-level, and the other along the sump-level.

451. Where was the air checked going down the incline so as to get into the sump-level?—[Witness explained on the plan.]

452. Then these men worked all night. Did they pass constantly through this brattice?—Through a swing-door.

453. Is there much trouble in opening this door for the wagons to pass?—Not at all. They run through it, and it falls back again into its place.

454. Would it be an advantage to the men if the door were held back or folded out of the way? No; it would be the worst thing of the kind. It would take the air back, because the current would just go down, and not along the bottom level.

455. *Mr. Proud.*] What did you prepare this road for, into the No. 4 bord?—I prepared the road simply to have it ready by the time it was wanted. There was no hurry; and I was sent to do it, as there was no other work for me to do.

456. You do not know if it had been arranged for any one's working-place?—No, it was not arranged for any one's working-place. The place up above would have been the place, if any place was required.

457. *Mr. Skellon.*] Before the explosion, was there a stopping in the top part of No. 4 bord?—The stopping was close to the slit—close to Brislane's end—and one on the slit, on each side of the bord.

458. Then there were stoppings across the slits?—[Position of the brattice-stoppings at the time of the explosion indicated by witness on the plan.]

459. Then there was no stopping at the top of the bord near this fall [indicated]?—Not that I am aware of.

460. What did you do with the bits of small coal and dust when you lifted your roads?—Just shovelled it to the one side.

461. Did you report direct to the manager after each shift?—No.

462. Do you not know that you are supposed to?—I was not aware of it. [Special rule 28 of the Act shown to witness.] If we noticed anything unusual we reported, and if we noticed nothing we did not report.

463. Rule 28 of the Act says you must report at the termination of each shift. You say that the tools left a couple of days in No. 4 bord got mildewed?—Yes.

464. It must have been a damp bord?—If a man was not working a couple of days his tools in most parts of the mine got damp and mouldy.

465. *Mr. Proud.*] Did you observe anything unusual the last night you came out before the explosion?—No; everything seemed to be in fair order, and the ventilation seemed to be as good as usual.

466. *Sir J. Hector.*] Did you put up brattice in No. 4 bord?—It was put up.

467. You have seen it?—Yes. [Witness was examined with reference to the brattice, and he explained the position of the brattice on the map. In reply to a question as to where the brattice had come from that had been found driven into a fall, he said he thought the material had been left lying on the floor of the bord.]

468. *Mr. Park.*] Was there any coal on the floor of the bord when you laid the tram in?—No.

James Rooney examined.

469. *Mr. Joyce.*] You are a coal-miner, residing at Brunnerton?—Yes; I am not coal-mining now. I worked in the Brunner Mine, eight months ago, as a roadman.

470. Have you ever seen any accumulation of gas in the mine?—Yes, sometimes. In several places there was from 1ft. to 5ft., and I have seen 7ft. This was in the rise-workings, right-hand side, in No. 2 or 3 incline. All the precautions were taken. This part was stopped by putting a board across it, marked with the word "danger."

471. That was the only way of keeping the men out of the works?—Yes.

472. Under ordinary circumstances the gas used to be cleared away by bratticing?—Yes.

473. Was the gas always cleared away?—Sometimes they succeeded in clearing it, and sometimes they could not.

474. If they did not succeed in clearing it, did they give the men safety-lamps?—In some places.

475. Did you see safety-lamps given in places where gas was not showing?—Yes.

476. For what reason?—Because there was gas in some place next to them.

477. But there was always gas for a start somewhere before safety-lamps were used?—Yes.

478. The fireman used to inspect every morning, did he not?—

479. *Mr. Park.*] Do I understand you to say that you worked in 5ft. of gas?—I have worked in it at one time.

480. How long is it since you saw gas in the Brunner Mine?—Off and on, and during the whole time I was there.

481. Did you see this 7ft. immediately preceding the time you left off work?—No, years ago.

482. What was the heighth of the board or incline?—Seven feet. It was full to the floor.

483. What effect did it have on you? Did you suffer any inconvenience?—I reported, and then the place was stopped.

484. Did you work in it?—No.

485. Did you say at the inquest that you worked in it?—No.

486. *Mr. Skellon.*] When you reported the gas, did you sign the report-book?—We had nothing to do with it. There was the underviewer and deputy there, and we reported to him. No road-man had anything to do with the report-book. We told the deputy verbally, and the deputy signs the book.

487. *Mr. Proud.*] Was the gas 7ft. from the face?—From the roof. When she blew out, she blew very hard, and I knew at once it was gas and water coming together; so I ordered my mate to get back, and get the lamps, and call the deputy.

488. *Mr. Skellon.*] At the inquest, did you not say that you worked three days in 5ft. of gas?—Yes; that was in another sump.

489. Where did you have your lamp?—Hanging on the side.

490. *Sir J. Hector.*] Do you mean that you were in gas 5ft. deep?—I was not working in the gas.

491. How much "cap" did it show in your Davy lamp?—The lamp went out.

492. You mean you were working while the gas was in the air?—No. There was very little air. The place was narrow. We could get room enough to fetch the brattice-cloth up to clear it away. We gave a wave of the pick to shift the gas, and as soon as that was cleared away we would start until it gathered again.

493. What part of the mine was that?—The rise-workings and the dip; but, as far as I recollect, I think it was in 5 and 6.

494. *Mr. Beare.*] Who was the underviewer at the time you were working in this 5ft. of gas?—John Roberts.

495. And he knew you were working in this 5ft. of gas?—Yes, or else I would not have been there.

JOSEPH HERD examined.

496. *Mr. Joyce.*] You are a coal-miner, residing at Brunnerton?—Yes.

497. I think you were in charge of the Coolgardie rise-workings?—Yes.

498. Have you ever worked in the dip?—I worked in the old dip on this side of the fault.

499. Was any large accumulation of gas there?—No.

500. Did you go into the mine immediately after the explosion?—Yes. I was first in the head of the dip.

501. Did you notice what the gases produced in there were like?—No. We always kept back in the air.

502. Did you have your lamp in the gas at all?—No.

503. Did you see any of the rescuing-party with their lamps in the gas?—No; the lamps were burning in the air all the time, that was the reason they kept alight.

504. Did you explore No. 3 incline?—Yes.

505. Did you find any gas there?—No.

506. Where you in Brislane's bord?—Yes.

507. Did you find any gas there?—No; it was quite clear; the brattice was up. I did not go any further than the mouth of the bord at the time of the rescue-work.

508. Did you examine the blown-out shot?—Yes.

509. Did you come to any conclusion as to when it was fired?—I could not say.

510. As a practical miner, what is your opinion as to the blown-out shot?—I could not say whether it was fired on the morning of the accident or not.

511. You think it might have been fired when the bord was being cut? Is it the position a shot would be in if it had been fired when the bord was being cut?—Not for getting the coal, or for making the bord, because it is too wide for the bord. It is more like as if somebody had gone to take the pillar out, for the rails were laid in that position—to take a lift from the side of the pillar, to bring the pillar back in the far end, or, in other words, to take a strip off and fetch the pillar back.

512. Do you think that the miner was negligent in putting that shot in?—He showed very bad judgment at the start.

513. Did you notice any undercutting?—Very little, from 9in. to 1ft.

514. Do you think it was a place any two men would be likely to be put to work in?—I dare say if the overman thought he had more men than he had places for, possibly he might put two men in to finish that place. It was a good size pillar.

515. If that shot-hole had been drilled in the morning, is it not probable the tools would have been found?—It is not necessary it should be so, although it is possible. Supposing there were two workmen in some other place, and one had a bit of coal loose, his mate might go with tools to drill his hole to get ready, while the other finished the place they were in.

516. While exploring, did you find any places that were nearly finished and to which men would be likely to be sent next day?—I did not take that particular notice of it.

517. I think there were four bords in No. 3 incline, and only three places. Did you see the new place being opened up by Geoghegan?—I only saw three places.

518. There are three places, and one being opened up outside the brattice-cloth. Is that not so?—I did not notice that one.

519. *Mr. Beare.*] Having heard Rooney's statement, that he worked in 5ft. of gas, do you think it is likely a man could live in that quantity?—He could not live in it.

520. Your opinion, as a practical miner, is that he has made a mistake?—Yes. I have had that experience myself; no one would live in 5ft. of gas. I was in Wallsend at the time.

521. *Mr. Joyce.*] As a fireman in Wallsend, at what time did you make your report?—After I came out at night, or after the shift was over.

522. *Mr. Proud.*] Do you think that No. 4 bord would be a likely place to put two men into, or one man, if they were short of working-places?—Yes, I think it is a likely place; they could do no damage to the pillar; it is a big one.

523. *Mr. Skellon.*] Where the air is split at the cabin, there is a three-cornered piece of coal. Do you know that place?—I do not know it, as I did not work down there.

524. *Mr. Skellon.*] I want to know if there is a stopping in the stenton below that triangular pillar?

Mr. Bishop: I can tell you that. There is a stopping below the sump; there was no stopping in the stenton below the pillar referred to.

EDWARD MOORE examined.

525. *Mr. Joyce.*] You are a coal-miner, Mr. Moore?—Yes.

526. I think you worked in the dip-workings of the Brunner Mine?—I did.

527. When did you work there?—Last Christmas.

528. Did you find any accumulation of gas?—Yes.

529. Where?—In the bottom place, sump-workings, now covered by water.

530. What height was the gas you found?—There might have been from 6ft. to 7ft. of gas in the high side of the bord—the last bit I was in.

531. What length did it extend?—It might have been 20ft. from the face.

532. Were there any steps taken then to brattice it out?—There was water in the place.

533. In other portions of the mine did you see gas making?—Yes, in the sump-level—in two places below the sump-level; that is where I saw the 7ft. of gas.

534. What was the height of the wall on the high side?—Between 12ft. and 13ft.

535. *Sir J. Hector.*] Was there any hole there?—There was a hole there—the bottom went down.

536. *Mr. Joyce.*] Did you say you saw gas accumulating in the sump-level?—I did not find it. I saw men working with safety-lamps in it.

537. How were you informed there was 7ft. on the high side?—That was in my place—in the bottom place. I was not working in the 7ft. of gas. I went for my tools and found it there.

538. Was any one with you when you found the gas?—John Roberts, the fireman.

539. Did Morris test it?—Yes; that is the reason I know there was 7ft. We were driven out by the water.

540. When you saw the men working in the sump-level with their clannys, the gas being there, was the brattice right up to the face?—I did not take any notice of it.

541. Did you ever work with safeties in any gas?—Yes, in different parts of the mine.

542. Was there gas present when you were working with safeties?—When we started it was cleared by the air.

543. When the gas was there, was it not the custom to allow the men to work below you in the air-course with naked lights?—Yes; I have seen them working above and below with naked lights.

544. Have you ever seen a gas explosion?—No; I have never been burnt or scorched.

545. With reference to the ventilation, how did you find it?—In some places it was bad, and in some good. I do not know where they split the air.

546. *Mr. Park.*] Do you think a person could work in 5ft. of gas?—I do not know.

547. Have you any idea what quantity of gas there was in the sump-level where they were working with safeties?—No; in part of the drive they were working with safeties.

548. How do you know there was any gas there at all?—The men said it was there. I do not know whether there was any there or not.

549. *Mr. Guinness.*] You say you went and took out your tools when you were working the lower level. Who ordered you to do that?—The deputy.

550. Why?—Because they were frightened we would not get them again, on account of the water rising.

551. Was it because the water was rising, or because gas was discovered there?—The deputy did not tell me. He told me to get the tools out, as I might not get them again.

552. Did you notice if the gas showed a "cap"?—I had it not in the lamp.

553. Nothing more took place about it?—No.

553A. *Mr. Beare.*] Are you prepared to state that the height of the outside wall was between 12ft. and 13ft.?—I would not swear to an inch, but I think it was very near to that.

554. Was there any coal there at all?—I could not say. There was coal when I was working.

555. Twelve feet to the top?—I would not swear to an inch. I reckoned about 12ft. back on the high side.

556. *Sir J. Hector.*] When you talk of 7ft. back, you mean 7ft. measured down, so that if the bord were 13ft. high the gas would not have been within your reach?—Yes, it would be if you went along the middle of the road.

557. If it were 13ft. high, and the gas stood 7ft. down from the upper side, it would run level from there till it came to the roof. It would be 6ft. clear of air underneath?—I was in the middle of the bord.

558. *Mr. Proud.*] Did you always find the brattice and doors in a good state?—Yes, they were always kept good.

559. *Mr. Skellon.*] When you went to get your tools, did you have a naked light?—Yes.

560. You went into a place where the men were working with safeties?—No; I left it a long way back. I had a Clanny with me.

GEORGE GEOGHEGAN examined.

561. *The Chairman.*] Mr. Geoghegan, you know the place where the blown-out shot is?—Yes; I worked in that place, in No. 4 bord. I worked in the bord up to the driving of the slit past it. I know the two men who drove the slit. I was sick at the time, and they drove a good deal past where the blown-out shot was supposed to be. The mine was worked by a double shift at the time. My son and I were together, and Boyd and Langdon were our back mates. I was sick one day, and my son came to me and told me——

The Chairman: We cannot receive as evidence what your son told you.

Witness: I have seen the same thing done in the Wallsend Mine as in this case, where the gas set the coal on fire and coked the place all around. I worked in the Wallsend Mine seven years and a half ago. The same thing happened there as happened in the case of what is said to be the blown-out shot in the Brunner Mine. The deputy—who was killed—in the Wallsend Mine examined this place of Binney's in the Wallsend Mine. The bord was making gas. Binney put his shot in all right; but, before firing it, he said to me, "You had better come out of that slit." The shot was successful, but it set the gas on fire. The coal was coked on the roofs, side, and bottom. Precisely the same appearances were shown as in the present case.

562. Can you tell us anything about this place where the blown-out shot is? Do you know who bored that hole?—Only from what my son told me. He said it was bored by our back mates when the work was commenced there that morning. I made only one complaint about a hole being bored in the solid.

563. Well, your back mates bored this hole in the solid?—They bored this hole in the solid, and part of the coal came off.

564. Did you see the hole yourself?—No. I was very much concerned about it, because I had a bord fired that morning. My son worked with me five years and a half. I had only three blown-out shots all the time I was working. That was through inferior tamping. My youngest son was an experienced miner, and a good young man. He was working in my own place with his elder brother, and did exactly as he was told. He would not bore a hole without his brother was with him. It was my back mates who bored that hole.

JOHN MOSELEY examined.

565. *Mr. Park.*] You are a coal-miner, residing at Brunnerton, and work in the Brunner Mine. Do you remember the explosion?—I was at home at the time.

566. You had been down the mine the night before, baling?—Yes.

567. Where were you baling?—Out of the lower sump.

568. And the water was pretty well up to the top of the upper bord?—Yes.

569. Did you bale all night?—Yes. I went down the mine at 10 o'clock, and came out at 6 o'clock on the morning of the 26th.

570. And you took the water in tubs up the sump-rise, into the main rise, and emptied it into the dam?—Yes.

571. Did you see anything unusual down that part of the mine that night?—Nothing there that night.

572. Did you see any gas?—I never tried for any.

573. You were using safety-lamps, and you did not find any appearance of it?—No.

574. If there had been any, would you have noticed it in any quantity?—We did not get far enough in; we were just at the canvas door at the upper one of the two lowest bords. We were baling on the straight down road.

575. *Sir J. Hector.*] The buckets went through the door, and were hauled up again?—We did not go down ourselves, and I am quite certain the door was closed and all right when we left it. The ventilation was very good when we were in the mine.

576. Had you to pull the buckets through another canvas door as they came up to the top?—Yes.

577. Do you remember where it was situated?—I think about 4 chains below the sump, below the mid-level.

578. Did that door always close itself?—Yes. We put the door on new that morning at 1 o'clock.

579. Why was that?—The old door was a little torn, and we renewed it.

580. When you left the mine in the morning, was the door thoroughly tight?—Yes; we stopped the buckets and got out to see if the door was all right as we were coming up that morning. We did that every morning.

581. Then, this door between the mid-level was all right, and therefore the air would be passing through the east side?—Yes.

582. *Mr. Proud.*] When did you come through that door last?—About 6 in the morning. It was twenty minutes past 6 when we got out of the tunnel mouth. [Mr. Bishop explained that the canvas door referred to was shifted temporarily to allow the men who were baling to work, and when the mine resumed work on that section it was replaced in its usual position; it was simply a temporary arrangement.]

583. *Sir James Hector.*] Did you always have good air when you were working in the dip-workings?—Yes; those were the deepest workings in the mine. I was on the night-shift, and we never saw smoke at 10 o'clock at night.

584. *Mr. Joyce.*] Did you ever have a flare of gas down there?—Slightly.

585. Some time ago?—Before Christmas; I could not give the exact date.

586. That is why you used safeties?—Yes.

587. Whereabouts did you have those lamps?—In the stone drive.

588. How far down?—I suppose about 4 or 5 yards from the slit [indicated].

589. Did you get burnt?—Very slightly.

590. Was that the only gas you have seen since you have been bailing?—Yes; we got the safeties when we had the flare up.

591. Do you know where the present door is?—Yes, just below the mid-level.

592. Do you know that in the next slit behind that there is a wooden stopping?—Yes.

593. Does not that wooden stopping and the present canvas door afford very much better ventilation than you had with the previous canvas door?—There was a partition then in that slit. The air went up the high side of the cabin, and down the right-hand side of the opposite workings.

594. Was there anything to prevent it going through the hole and nearly all down these workings [indicated]?—No.

595. Does the air not go up the nearest course?—It could do so; it has always been like that.

595A. And the nearest course would be the return-airway?—The ventilation has been always pretty good.

596. *Mr. Proud.*] You cannot say where the air was going in the bottom places?—The air was going away along the level when we were baling.

597. You saw nothing unusual that night?—No.

598. *Mr. Beare.*] Did you see Morris entering the workings that night and going his rounds?—I saw him in the morning, but not to speak to. He came in about 5.30 o'clock, which was his usual time.

599. *Sir J. Hector.*] Where did you actually pass him?—I saw him but a short distance away. He went through the slit above us, to the westward, to inspect that first. He went around both sides of the pit before the men went in.

600. He was found in the east side, so that he must have gone right round the mine?—Yes.

JAMES THOMPSON examined.

601. *Mr. Park.*] You are engine-wright for the Brunner Mine?—Yes.

602. Did you inspect the engines and machines on the Brunner Mine on the 26th of March?—Yes, a few minutes before 8 o'clock in the morning. It was then in its usual working order.

603. *Mr. Guinness.*] Who was driving?—Pender at that time. Bainbridge had been on until 6 o'clock in the morning on the night-shift. Pender relieved him then, or ought to have done, and he was in charge when I made the inspection.

604. Did you see or hear any explosion that morning?—I never heard anything of it.

605. Did you see any smoke coming out of the mine?—After I went on I saw a little coming out of the return, and after I saw that I was told that something had happened.

606. Were the fans kept going?—Yes; the fan was put a little quicker when we knew the accident had occurred. Up to that time we were going our usual rate.

607. *Sir James Hector.*] Did you notice the time you first noticed smoke coming out of the return?—I took it to be about 9.30. I go by the school-bell.

608. How long after you saw the smoke?—A very few minutes after I got to the mouth of the mine I saw the smoke coming out of the return.

609. Did you observe how long the smoke took to come out?—No; I was attending to other things and seeing the fan was kept going as fast as possible. I could not tell exactly.

610. What was the smoke like that came out?—A brownish colour.

611. *Mr. Joyce.*] Did you ever order the fan to be slowed down at night?—No.

612. *Mr. Proud.*] You observed nothing unusual about the fan that morning?—Nothing at all.

HENRY BAINBRIDGE examined.

613. *Mr. Guinness.*] You are an engine-driver employed by the Greymouth and Point Elizabeth Coal Company?—Yes.

614. You were in charge of the engines of the Brunner Mine on the night of the 25th of March and the morning of the 26th?—Yes; I was in charge of the fan; that was the only engine that was going. I went on at 10 o'clock at night, and continued in charge until 6 o'clock of the morning of the 26th of March, when John Pender relieved me.

616. Did you keep the fan going all the night?—Yes; it was going all night at a regular speed.

617. Did you observe anything unusual?—No.

618. You were not there when the explosion was reported?—No.

619. *Mr. Joyce.*] Did you ever slow down the fan at night?—No.

JAMES BISHOP re-examined.

620. *Mr. Joyce.*] I want to know, Mr. Bishop, how you split the air in the Brunner Mine, and how the mine was ventilated?—The air is split above the middle level, and a portion is taken into the west workings, and the remaining portion is taken towards the east. [Witness indicated on the plan particulars as to the air-course, as shown by the arrows on the plan.]

621. *Mr. Beare.*] You heard the evidence given by Mr. Rooney as to his having worked in 5ft. of gas. What have you to say to that?—That statement is inexplicable to me. I do not think any man could have worked in 5ft. of gas. I really cannot understand a man making such a statement.

622. What evidence is there as to there ever having been 7ft. of gas in the mine, as stated by Edward Moore?—About the middle of December there was a breakdown of the electric pumping-gear, and the ventilation of the bords referred to by Moore was allowed to flag, and the air-current worked uncertainly. He was taken off by the fireman to bring out his tools, as his bord was not likely to be worked again. There is no coal there 12ft. high. I do not say there was not a hole in the floor, making up that height from the roof, but there was not 12ft. of coal there.

The Commission adjourned at 3.30 p.m.

BRUNNERTON, 15TH MAY, 1896.

NEIL DUNDONALD COCHRANE re-examined.

1. *Mr. Joyce.*] What part of the mine did you measure the air passing through, Mr. Cochrane? —In very many different parts—in the main level, in the return, in various parts of the main dips, and in the different splits.

2. Did you ever examine the air at the working-faces? Did you take the quantity by an air instrument?—I examined the air at the faces with a safety-lamp, but to try to measure the quantity right at the face would be absurd. The anemometer will not record a very low velocity.

3. What distance from the working-faces would it reach?—That depends on the sectional area of the place affecting the velocity, and the distance varies in different faces, according to where the brattice is led forward.

4. Do you think a special measurement ought to be made at the working-faces?—No anemometer will give a reliable measurement of the regulation quantity for one face in such large places as in the Brunner Mine.

5. Is it the fact that you cannot test the amount of air which is going along the working-faces?—I measured at the inclines and near the faces, but you cannot measure the quantity for a single-bord face unless the place is small.

6. If you cannot test along the working-face, could not you make some other test along the return?—Yes; I have done that, and found the quantity to agree with that in the splits. Speaking from memory, 5,000 cubic feet per minute passed round the sump-side, and 9,000 round the pillar-workings.

7. In your opinion, there was enough air going through the mine?—Yes. I have already told you there was double, or more than double, the quantity provided for by the Act; but at times places would get ahead of the air, and I would request brattice to be put up, and it would be done. When I thought the powder-smoke was not clearing quick enough some two years ago, I spoke about it, and the undercast was put in, which kept it away from the men ahead.

8. Do you think the lamp-cabin is in a safe place in the dip?—When there are only two or three lamps used, I consider down the dip all right.

9. But if you have to use a large number of safeties in the future, you consider the lamp-cabin should be outside?—I would have it outside.

10. Did you order safeties to be used after the explosion, or by whose instructions are they used in the mine now?—I have already told you (in my examination in chief) that after the explosion, with so much to do in order to insure safety, and to get "breathing-time," and before deciding what the cause of the explosion was, I requested that none but safety-lamps be used, and no blasting with powder be done in the dip-workings section.

11. But why are safety-lamps to be used in the future if there was no indication of a gas explosion in the mine?—Because I think the mine was shaken by the explosion.

12. Cannot naked lights be substituted without your permission?—No.

13. Then you do not think the mine safe to be worked now without safety-lamps?—Not at present.

14. Why?—Because at two or three of the falls we found gas in small quantities, but more than before.

15. Have you ever doubted that safety-lamps should always be used in a mine after an explosion?—No.

GREYMOUTH, MONDAY, 18TH MAY, 1896.

JAMES BISHOP re-examined.

1. *Sir J. Hector.*] What was the cause, Mr. Bishop, of the closing down of the mine on the 25th March?—Owing to the want of shipping, caused by the state of the weather, the steamers not being able to get in. We had only worked one day from the 20th to the 26th March—namely, on the 24th.

2. How old was the youngest of the lads Geoghegan?—Nineteen years.

3. Had he had much experience in coal-mining?—A good many months' experience with his brother. He had been working as a hewer.

4. *Mr. Park.*] His father said he was under the instructions of his brother at the time, and that he would do nothing without his brother's sanction?—I dare say he would not.

5. *Sir J. Hector.*] What kind of weather was it on the morning of the explosion?—Very fine weather.

6. Do you remember if the barometer was read and noted that morning at 8 o'clock?—I believe the barometer read about 30 degrees.

7. Has your barometer been compared with other standard barometers?—Not recently.

NEIL DUNDONALD COCHRANE re-examined.

8. *Mr. Proud.*] Kindly state the duties of an Inspector under the Coal-mines Act, and inform the Commissioners how you discharged those duties?—Of course I have duties as a Gold-mine Inspector as well as a Coal-mines Inspector, and many other duties I am instructed to perform by the Under-Secretary of the department. My duties under the Coal-mines Act are to inspect the coal-mines, and see that the Act is carried out.

9. *Mr. Park.*] Is there anything you would like to add to your previous evidence?—I have already in my evidence shown you how I have carried out these duties. I take it the most requirements are good ventilation and timbering. The ventilation has been shown to be more than double what the Act provides for, and to be fairly well carried round the working-faces. The freedom from accidents by falls from the roof and side shows that the timbering is attended to.

10. Have you made any notes you would like to mention?—There are one or two points that were not brought out previously that I would like to refer to. The question of tamping is one. Long before the accident, I suggested that each man should be supplied with a tin in which there was suitable tamping-clay, so that there would be no doubt as to what he was tamping with. After consideration, I thought that if a man were determined not to carry everything he would leave it, and it would be only a farce. Therefore, I think the tamping ought to be provided by the mineowners, because the miners have their picks to carry and their powder, and quite enough without carrying any tamping in each morning, possibly from the mine-mouth, or going back into the workings for it. I also think that it would be a good thing to make the inspection by the workmen, which is at present permissive, compulsory. They should sign a book—the ordinary underviewer's report-book—so that the management could not plead ignorance. A copy should be sent to the Inspector.

11. *Mr. Joyce.*] What about the question of cost?—I think it ought to be paid by the department—not necessarily monthly, but every three months, or whatever might be thought advisable.

12. *Sir J. Hector.*] Which would be the best thing, do you think, monthly or three-monthly?—I would not like to give my final opinion upon the matter, but I should think possibly three months. Then, with regard to the fuse that was found. I have had occasion to look at old fuses; and I say that fuse when it was found had the appearance of a fuse which had been fired a short time previously. I did see the prop standing in the section of the blown-out shot-bord, and I saw no other such prop in the whole mine. I refer to the prop standing opposite the one that is lying down in No. 4 bord east. Although the main coking was on the low side, the force was partly from the rebound on the corner of the pillar on the other side of the stopping. There was blistered coal there, but it was not an even coating. I refer to that side next the shot. It was in blisters or patches, as if the coal-dust had been blown on to it. It was given in evidence that the blast had been spent in this lower sump-level on account of the water. I was in the sump-level, and I waded through the water with Mr. Bishop. I went in as far as the slit, below the blown-out shot (No. 3) to the slit leading up to the blown-out shot. I took large bits of coal off the truck near No. 3, which showed that the force had not died out. I saw the props at the slit, and there was coking on both sides. The coking proved that the blast went eastwards, and up the slit. The coking was on both sides of the prop—that is, the top and bottom sides.

13. How were the coals drawn out of No. 3 rise?—They would be lowered by separate inclines to the sump-level, and then drawn out along the sump-level.

14. Not up No. 2?—No; they would have a separate incline. Each pillar-level was a separate incline.

14A. But No. 2 was being used as a jig?—I could not swear to that. I believe so.

15. No. It was not in the east incline, was it?—Not so far as I am aware.

16. Supposing the dust was carried away by shaking and blowing against the wagon-skips travelling against the air, where was the most likely place for dust to accumulate?—It was not in the main-haulage roadways that dust would accumulate, but in the inclines. That would be more likely to be dusty than other places. Then another feature I noted in regard to this explosion was that up here, where it showed the blast had come in and also come out of the slit, it was an entirely parallel condition of affairs to what occurred lower down. The force seems in each case to have run into the ends and then to have come out, which was parallel with the phenomenon observed in this place [indicated on plan]. The evidence given before the Royal Commission at Home showed that it is not necessary to have a light nor a flame to ignite the dust. Compression alone may be sufficient to cause an outburst of flame. Inspector Atkinson shows that in his evidence.

17. You say compression will ignite the gas?—Not necessarily the gas, but a mixture of gas and air, or air and firedamp. In any case, it might be desirable to have a law that no shot should be allowed to be fired in the main-haulage roads when the men are in the mine.

18. What is your reason for that?—Because it seems to my mind so exceedingly dangerous, on account of the accumulation of fine dust.

19. *Mr. Skellon.*] Do you remember the stoppings in No. 4 bord?—There are so many stoppings that I would not like to particularise any one of these temporary stoppings, because the current is altered as the workings progress. Speaking from memory, I think they were blown out towards the main incline, while the floor on the opposite side of the blown-out shot was shown the opposite way. There was coke-dust blown into the fall—that is, on the west side. On the east side the dust was blown the other way. I examined that fall very carefully, and there was not a great deal of brattice blown in amongst the stoppings. I was searching through these cracks for the body of Worthley.

20. *Sir J. Hector.*] I think you said in your evidence that this fall existed before you were committed to the blown-out shot.

Mr. Bishop: There was a low fall there, and more has fallen since.

21. *Mr. Beare.*] You have recommended that the inspection of the mine by the men should be made compulsory. Would it not also be well if it were done, say, once a week?—That would mean that the responsibility would be thrown on the men rather than on the manager.

22. *Mr. Joyce.*] With regard to the inspection of the mine, I think when you make your inspection you are always accompanied by the mine officer?—I am always accompanied by a mine officer. That is necessary in the case of an Inspector going through once in three or four months. He is necessarily more or less a stranger in the mine.

23. Do you not think that it has a tendency to prevent the men making any complaint?—No The men are surely able to see me afterwards, or to write a letter to me if they cannot see me at the time. I know in other cases that it has no deterrent effect, because I have been in free communication with men by other means.

24. Do you not think it would be better to have one of the working-miners accompany you rather than the mine officer? Would it not have a tendency to make the men speak more freely?—There is no provision in the Act for any such thing.

25. Do you not think it would be better if there were?—If their complaints are so trivial that they will not take the trouble to write a letter, I think they had better keep them to themselves. I think that there is something in what you say all the same, but the matter must be looked at fully. It is only fair that the mine management should be represented at such an inspection, and I should object to a large number going round the mine, because, in a small bord—say of 18ft.—if there were two miners, and two officers and myself, any fault would be the easier hidden than if I go round with the mine-manager alone, or, say, the underviewer.

26 *Mr. Park.*] In respect to these verbal communications, it might happen that you would have a miner saying he had made a complaint, when he really had not done so?—I think that is a legal objection, which is a very valuable one.

Mr. Bishop: I should like to say that I concur with most of the suggestions made by the Inspector, and more especially with regard to the one relating to the inspection of the mine by the workmen. Since the accident occurred, owing to certain rumours and reports that the mine is in a dangerous state, or certain parts of it, I paid the workmen to go round and inspect all the old workings, in order to see that they were in a safe condition.

The Commission adjourned at 9.40 a.m.

WELLINGTON, 9TH JUNE, 1896.

ALEXANDER MACDOUGALL examined.

1. *Sir J. Hector.*] We wish to get a few particulars from you, Mr. Macdougall, as to the tenure under which the Brunner Mine is now held. You are the managing director of the Greymouth and Point Elizabeth Railway and Coal Company (Limited)?—Yes.

2. Can you produce the lease of the Brunner Mine?—Yes, this is the lease [produced] under which the mine is now held; it is dated 31st December, 1894.

3. Was it under this lease that your company originally got the property?—We got an assignment of that lease, which the Government approved of. We bought the property in October, 1895. The extent of the leasehold is 1,280 acres, and is part of the Grey Coal Reserve. The original lease was granted for a term of twenty-two years, from the 1st January, 1874; it was transferred in 1875 and 1879, and was surrended in 1886 by Mr. Martin Kennedy, who in January, 1887, obtained a new lease for a term of sixty-three years. That lease was transferred to the Grey Valley Coal Company on the 31st December, 1894. It was then transferred to my company on the 19th October, 1895, by the deed I produce.

5. Can you tell us what are the actual terms under which the lease is held?—I can give you them from memory. We pay £1,000 a year as acreage or dead-rent for fifty-six years, from 31st December, 1894, which merges into a royalty of 6d. per ton. Our minimum output is fixed at 75,000 tons a year.

5. What does that mean?—It means that under the conditions of our lease, we are bound to turn out a minimum of 75,000 tons of coal per annum. We have to pay the acreage or dead-rent in advance. At the beginning of each quarter and each half-year we settle up the quantity of coal we have turned out, and pay the royalty accordingly. As soon as we have turned out 40,000 tons of coal the £1,000 we have paid as dead-rent will stand for the 6d. per ton royalty on that output. In other words, the amount we pay by way of acreage or dead-rent in any one year is taken as paying *pro tanto* the royalties payable for the same year, so that the royalties for any year are thus actually paid in, so far only as they exceed the amount we pay as acreage or dead-rent. Our output now is more than 100,000 tons per annum, and 6d. royalty on 100,000 tons would give £2,500. We have to pay £1,000 rent whether we turn out coal or not, and that merges into a royalty of 6d. per ton as stated.

6. Do you know the total area that has been worked—I think about 230 acres?—It is somewhere about that, I cannot say definitely. About 1,307,942 tons of coal have been raised to the 26th of March last. The coal left in the ribs and pillars is about 800,000 tons, of which one-half will be extracted. The Inspector of Mines advised the department towards the end of last year that in two years the coal in the mine would be exhausted at the rate of production then going on.

7. In view of the probable closing of the mine, have you ordered any economies to be practised in its working?—So long as there is sufficient coal there to work it at anything like a profit, we will continue to work the mine, taking all precautions as we have done in the past. The protection of life will be our first consideration and care, and we will not curtail expenses in the direction of working the mine safely.

8. Could you give us the number of men employed at the time of the disaster?—I have here Mr. Bishop's return, which may be taken as perfectly correct. I endorse the number he gives: "Underground dip section, 72; rise, 76; surface hands, 54: total, 202." The total number of employés at the present time is 260, showing an increase of 58. This is due to the fact that we have a larger output of coal since the explosion took place.

9. What is your average output now?—Over 2,000 tons per week. We have an outlet for 3,000 tons; in fact, for over 4,000 tons per week, but we cannot get the shipping to take it away. The Union Steam Shipping Company, who have contracted to take our coal to the different parts of the colony, have lately greatly disappointed us with tonnage. We are in consequence largely in arrears with the supply of our orders.

10. *Mr. Skellon.*] When do you expect to have the Point Elizabeth works ready?—We expect to be able to turn out coal in a small way at the end of the year. Our bridge will not be finished for about nine months; but we intend to bring coal over the present Cobden Bridge as soon as our railway is completed, which will be some months before the bridge is opened; but we do not intend to close the Brunner Mine. We will work it as long as there is coal there to be worked at a profit.

We are bound to do so under the conditions of our lease. The Government has taken a bond from us for £1,000 that we will continue to work it for five years if there is any coal in it which can be profitably worked.

11. I suppose when you open up Point Elizabeth, preference will be given to the Brunner men?—Certainly; but as we did not propose to close the Brunner Mine as long as there is sufficient coal there, the opening of the Coal Creek and Point Elizabeth Mines will not affect all the miners at Brunnerton, as most of them, or an equal number, will be kept working there.

12. *Sir J. Hector.*] How will the expense of moving them be provided for and building new homes?—We asked the Government to give us land either on lease or by purchase, in order that we might put up houses for the miners; but they refused to give us any land for the purpose, or to give us permission to put the miners upon any land that is there.

13. For what reason?—I think the Government purpose opening up a township of their own near our property, and leasing or selling land to the miners. I hope, if the Government will sell or lease the land to them, that they will also advance them money at a low rate of interest to build their houses with, as I am of opinion that very few of the miners have any money to build with.

14. What was done at Blackball?—I could not tell you; they may have a freehold there. We have got no freehold, and the Government have refused our request for land. Our works will be on a new reserve we are getting from the Government, as the side of the lease facing the town is rather steep and not suitable for building purposes. We have applied to the Government for a reserve close to our lease there for works and tramways, and they have agreed to give it to us. We made this application under the Coal-mines Act of last session, not for land for the miners, but for land for works, tramways, and machinery sites.

15. *Mr. Skellon.*] If you got land from the Government, I suppose you would build houses?—We have got plenty of timber on our land, and we are going to erect a sawmill, and would build houses for the miners' accommodation, providing we got the land.

16. *Sir J. Hector.*] I suppose at Brunnerton the men own their own houses, and bought the land from the Nelson Government?—They are mostly freehold.

APPENDIX.

LIST OF EXHIBITS.

1. Ten books of underviewers' reports on the mine.
2. General plan of mine.
3. Plan of mine, dated 4th November, 1894.
4. Samples of coal-dust taken from cap in main level in 1894.
5. Plan of mine, dated 2nd September, 1895.
6. Tracing (required by law to be sent to the Inspector half-yearly) showing progress of works since previous inspection, dated 3rd December, 1895.
7. Plan of dip-workings, prepared by Mr. Young.
8. Sectional plan of No. 4 bord, prepared by Mr. Bishop.
9. Plan of mine, prepared by Mr. Young.
10. Sectional plan showing blown-out shot-hole, prepared by Mr. Hayes.
11. Five report-books of mine-manager.
12. Plan showing position that bodies were found in, prepared by Mr. Bishop.
13. Collection of coking, coal-dust, and coal, taken from blown-out shot-bord.
14. Notice to miners regarding the rules in force in mine.
15. Fuse found near blown-out shot-bord.
16. Sketch-plan showing accident to Maddox in 1894.

EXTRACTS FROM AUTHORITIES *RE* COLLIERY EXPLOSIONS.

WHITE-DAMP.

Carbonic-oxide gas (Carbon-monoxide).
Symbol, CO; specific gravity, 0·975.

	Atoms.	Weight.	Volume.	
Oxygen	1	57	0½	} =CO
Carbon	1	43	1	} =CO
	1	100	1	condensed.

One per cent. produces giddiness and faintness, 2 per cent. may cause death, and ½ per cent. breathed for any length of time is fatal.

Candles burn well, on the whole a little brighter in air containing this gas than in pure air, but flame is not elongated till 12½ per cent. is present.

Produced by imperfect combustion and especially spontaneous ignition.—*Hughes.*

An inflammable gas, but does not support the combustion of other bodies. Burns with a blue flame, being transformed into carbonic acid by the process. Found in mines as the result of the explosion of gunpowder, or the combustion of wood or coal.

Obtained in purity by heating yellow ferrow-cyanide of potassium with eight to ten times its weight of sulphuric acid.—*Atkinson.*

This gas is the result of imperfect combustion. When a body containing carbon is burnt in air, each atom of carbon will combine with two atoms of oxygen to form carbonic-acid gas; but if there is not sufficient air to provide two atoms of oxygen for each atom of carbon—*i.e.*, if the combustion of the carbon is incomplete carbonic oxide is formed. It has been detected in rare cases amongst the occluded gases, and is also produced by the combustion of coke, charcoal, and gunpowder; and must, in many cases, be one of the constituents of after-damp.

It has neither colour, taste, nor smell, but is exceedingly poisonous: ½ per cent. in the air, if breathed long, producing fatal results. It does not support combustion, but itself burns with a blue flame, forming CO_2 carbonic-acid gas.—*Professor Merivale.*

Carbon-monoxide as an Explosive Agent.

A theory advanced by Professor Lewes, of London, if correct, furnishes an explanation as to the cause of many mysterious mine-explosions. The poisonous effect of carbon-monoxide, or "white-damp," has been recognised by miners for years, but its explosive characteristic has not been commented on because it was universally supposed that its poisonous effect was made apparent before a sufficient quantity of the gas to make, with the air, an explosive mixture could accumulate.

In commenting on ordinary black powder as an unsuitable explosive in gaseous or dusty mines, Professor Lewes calls attention to the fact that carbon-monoxide is the one resulting constituent of its explosion. It has been conclusively proved that when firedamp is present in such minute quantities as to form a mixture very far removed from the point of explosion under ordinary circumstances, it does form, when coal-dust floats in the air, a highly explosive mixture. He states that traces of carbon-monoxide will do exactly the same thing when the air is laden with coal-dust. Besides, the temperature necessary to ignite a mixture of carbon-monoxide and dust-laden air is lower than that required to ignite a mixture of firedamp and dust-laden air.

Professor Lewes therefore concludes that, when the air of a mine is charged with coal-dust, the probabilities are that a very large volume of explosive mixture is formed by the rapid escape of the products of combustion into the dust-laden air, and this (being ignited either by the flame or by red-hot solid products driven out into it by a blown-out shot) initiates a considerable area of explosion.—*Professor Vivian B. Lewes*, Royal Naval College, Greenwich, in the *Colliery Engineer*, February, 1896.

Memorandum.—The above seems to explain a large explosion at an American colliery about 1889—where T. Roe was killed—which was always said to be quite free from firedamp. The explosion was initiated by the accidental ignition of a keg of blasting-powder, and carried on by coal-dust. [See Analysis, page 5, and Mr. Wm. Seddon, page 12. See "The Cause of Mine-explosions," by Jas. Ashworth, *Colliery Engineer*, January, 1896.]

Blown-out Shots.

The combustion of powder produces large quantities of gaseous products, which, in the case of blown-out shots, are driven violently into the roadways, and at the point of discharge act like a piston, driving back the air flowing past the hole in both directions, and producing a partial vacuum, into which the gas contained in the coal is exhausted and diluted with the air-current until the firing point is reached. Clouds of dust may be raised at the same time, and if this mixture comes into contact with flame a serious explosion is readily produced. It has also been suggested that a sound-wave produced by a blown-out shot may cause sufficient pulsation in the atmosphere to force flame through an ordinary safety-lamp.—*Hughes.*

The foregoing may be read in conjunction with "Carbon-monoxide as an Explosive Agent." [See also Mr. W. Seddon, page 12.]

The flame resultant on a blown-out shot of blasting-powder is quite sufficient. There is also a rapid distillation of gas and volatile hydro-carbous from the coal with which the heat and flame of a blown-out shot come in contact; this in turn becomes another source from which the explosive element is (a) produced and (b) prolonged. Witness the evidence at Brunner Colliery, New Zealand, 1896, and the immense amount of gas and volatile matter distilled from the coal at St. Helen's Colliery, Workington, April, 1888, resulting (in conjunction with some C H4) in a disastrous explosion, which was further intensified by coal-dust. Both cases came under my personal observation.

Mr. James Ashworth, M.E., in an article in the *Colliery Guardian* [referred to in the *Colliery Engineer* of August, 1895], shows "That the blasting-powder at present in use is an inferior and cheap preparation, in which an excess of nitre is used in its composition, hence the dangers attending its use, for it is now an established fact, that, in the absence of firedamp, if the carbonic oxide and flame from a blown-out shot is projected into air holding in suspension only a little coal dust, an explosion ensues, which is the neuclus of a greater one, for, if the first explosion raises a cloud of inflammable dust, the second one fills the mine with flame."

Mr. Ashworth advocates the adoption of a more perfect quality of blasting-powder.

Professor Lewes gives analysis of resulting gases from blasting-powder, thus:—

	Per cent.	
Carbon-dioxide	32·15	51·18 per cent. incombustible
Nitrogen	19·03	
Carbon monoxide	33·75	
Sulphurated hydrogen	7·10	48·82 per cent. combustible
Marsh-gas (CH_4)	2.75	
Hydrogen	5·22	
	100·00	100·00

[See Mr. W. Seddon, p. 12.]

Mr. Ashworth gives the heat produced by the explosion of ordinary miners' blasting-powder when confined, at about 2·225° Cent. (4,038° Fahr.). An American writer gives this at 4,000° Fahr.

Explosion of Coal-dust.

Mr. W. N. Atkinson, Chief Inspector of Mines for North Stafford, Cheshire, and Shropshire, in a lecture before the Federated Institute of Mining Engineers, shows that the occurrence of explosions has diminished since the dangerous character of coal-dust became known.

He further states: "On the other hand, we must remember that the average depth of coal-mines is increasing, and this depth is accompanied by increased dryness, so that in the future a greater portion of mines will be subject to danger from coal-dust than in the past. Statistics indicate that since the time when the influence of coal-dust in colliery explosions was seriously considered there has been a great reduction in the loss of life from this cause."

Professor Lewes (lecture before the Federated Institute of Mining Engineers), in speaking of ordinary blasting-powder, says: "A shot weighing 1¼lb. gives off 3 cubic feet of combustible gas, which, when mixed with pure air, gives over 10 cubic feet of an explosive or rapidly-burning mixture."

The *Colliery Engineer*, commenting on this, says: "From this we learn that the flame of a blown-out shot does not only ignite coal-dust, but supplies a combustible gas that quickens the inert fuel, and makes it burn with explosive fierceness."

Castle Gate Mine, Utah, U.S.A.; dust explosion, 12th December, 1890: One shot-lighter and two miners only in pit at the time (7.30 p.m.) All killed; cause, blown-out shot. Mine very dusty; no gas. Explosion very severe. [See *Colliery Engineer*, June, 1895, page 250; letter by W. S. Carr.]

For summary of Mr. Ashworth's review of the coal-dust question, see *Colliery Engineer*, April, 1895, page 204.

Experiments in public by Mr. W. Galloway, M.E., at Merthyr, 1st December, 1894 (*Colliery Engineer*, January, 1895) :—

Cannon-shot.

1oz. gunpowder, stemmed in an ordinary way, produced flame 3ft. long;
" stemmed with 1oz. coarse coal-dust, produced flame 7ft. long;
" " 1oz. coal-dust and ⅛oz. heather-dust, produced flame 8ft. long;
" fixed into a tube, into 1lb. coal-dust (ordinary stemming), produced flame 12ft. long;
" " " (stemmed with 1oz. coal-dust), produced flame 15ft. long;
" " " (stemmed with 1oz. coal-dust and ⅛oz. heather-dust), produced flame 14ft. long;
" fixed into tube, containing ½lb. coal-dust (stemmed with 1oz. coal-dust and ⅛oz. heather-dust), produced flame 14ft long;

and nine other experiments, giving very similar results—the last one being 1oz. powder, more tightly stemmed than usual, fired into a tube 18ft. long, containing 2lb. of coarse coal-dust, made a flame 23½ft. long. The coal-dust was kept agitated in the tube by means of a small fan.

In a paper read before the Federated Institute of Mining Engineers, London, by Mr. E. Gilpon, Inspector of Mines, Nova Scotia, on "Explosions in Nova Scotian Coal-mines," one of the most important facts presented is that blown-out shots, dry and dusty roads, and coal-dust pure and simple, are the most potent factors in producing mine-explosions. [See *Colliery Engineer*, January, 1895, page 136.]

Summary of paper by Mr. W. C. Blackett, Federated Institute Mining Engineers :—

First a shot stirs up a cloud of dust and ignites it. The combustion causes air-disturbances in all directions, stirs up the dust in advance, and this fresh dust ignites and transmits the explosion, which travels both with and against the air-current, as long as there is dust to ignite. The amount of dust present in the mine must be much larger than that chemically required to combine with the air in order to produce a large surface of contact, and in order to transmit heat from one particle to the next. There must be enough excessive power in the shot to stir up the dust and to produce compression of the air. The dust must be fine and dry, and the flame from the shot must be large and hot. Possibly the shape of the road, the temperature and the pressure of the air may also be important factors. His explanations of the many-observed differences in dust explosions is that the in-rush of the air after the first out-rush produces secondary effects that hide the indications of the directions of the primary explosion.—*Colliery Engineer*, November, 1894.

This latter feature was noticeable in some instances in the inspection of the Brunner Mine after the explosion of 26th March, 1896.

Heat is generated in the air of the mine during its compression by an explosive force, this assists to volatalize coal-dust carried by the current in compression, making the atmosphere so laden more inflammable on expansion.

Coal-dust Explosion.

Summary of the report of the (British) Royal Commission on coal-dust explosions, 1894 :—

1. The danger of explosion in a mine in which gas exists, even in small quantities, is greatly increased by the presence of coal-dust.

2. A gas-explosion in a fiery mine may be intensified, and carried on indefinitely, by coal-dust raised by the explosion itself.

3. Coal-dust alone, without the presence of any gas at all, may cause a dangerous explosion if gnited by a blown-out shot, or other violent inflammation. To produce such a result, however, the conditions must be exceptional, and are only likely to be produced on rare occasions.

4. Different dusts are inflammable, and consequently dangerous in varying degrees, but it cannot be said with absolute certainty that any dust is entirely free from risk.

5. There appears to be no probability that a dangerous explosion of coal-dust alone could ever be produced in a mine by a naked light or ordinary flame.

Memorandum.—At the request of the Commissioners, Mr. Hy. Hall, Her Majesty's Inspector of Mines for West Lancashire and North Wales, conducted a series of experiments in a disused

mine, at Haydock Collieries, employing for the purpose coal-dust from all parts of the country, and the result went to prove that coal-dust, in any mine, whether fiery or not, where gunpowder shots are fired, is an element of danger.

With high explosives, Mr. Hall was able to proceed without firing the dust, but when gunpowder was used in conjunction with the same coal-dust, violent explosions sometimes occurred, and more than once flame issued from the top of the shaft. To the best of my recollection, the shaft used for these experiments was about 600ft. deep.—*J. Hayes.*

Altoft's Colliery (Pope and Pearson's, Normanton, near Leeds; explosion on 2nd October, 1886. The jury in returning their verdict found, "That the explosion was caused through the ignition of coal-dust, consequent on the firing of a badly-drilled shot."—*Colliery Manager*, January, 1887, page 3.

Messrs. W. N. and J. B. Atkinson, Inspectors of Mines, England, in their work on "Explosions in Coal-mines" (1886), which gives the result of their investigations of six large colliery-explosions in the North of England, from 1880 to 1885, give, among others, the following particulars:—

"In the Whitehaven Colliery explosion (1882) coal-dust could have played no part. It was one of gas and air, a large volume of explosive mixture, which was known to exist, being probably ignited by a defective safety-lamp; its effects, so far as violence was concerned, were confined to the immediate vicinity of the explosive mixture. The violence or force of the explosion was less than in any other of the five. The flame had not extended 50 yards from where the explosive mixture had been before ignition. The workmen in the field of the explosion had all been under some alarm before the explosion; and after it had moved about 100 yards, one of them escaped alive. Their bodies exhibited no signs of the severe burning and blacking in common after explosions in dusty pits. The part of the mine in which the explosion occurred was wet. Estimated quantity of explosive mixture, 32,800 cubic feet.

The other five colliery explosions (Seaham, 1880; Trimdon Grange, 1882; Tudhoe, 1882; West Stanley, 1882; and Usworth, 1885) all present the following features: In the absence of a knowledge of the danger of coal-dust, they could not have been expected. No accumulations of gas were known to exist approaching in quantity what would be necessary to cause the wide-spread destruction, nor were such accumulations considered possible. In all cases the violence and flame of the explosions were confined to those roads on which there was much coal-dust, the greatest force being on the intake- and haulage-roads, where gas could be least expected, and where naked lights were used daily. In many cases the explosions were arrested where the haulage-roads were wet or damp. In no case was there any evidence of alarm among the workmen prior to explosion. Carbonic oxide was evidently present in the after-damp, rescuers being overpowered while the lamps burned brightly. In some instances workmen's lights had continued to burn till all the oil in the lamps was consumed, the workmen having apparently died from the poisonous nature of the gas while the lights were still burning.

Mr. William Seddon (in a paper before the Western Pennsylvania Mining Institute, 29th October, 1887) states: "In firing a shot in our working-places, we do not always get complete combustion. Who is there that has not returned immediately after he has fired a shot and ignited the powder smoke? Now, if the result of an explosion of powder give us free nitrogen and carbonic acid, we have nothing combustible in the smoke: how is it that it flashed or burned when we applied our light, when we feel confident that there is no firedamp present? Answer: Incomplete combustion, which causes carbonic oxide to be present instead of carbonic acid."

Colliery Explosions.

Mr. James Ashworth, M.E., in treating on the effects produced by the sudden compression of the air in mines [see cause of mine-explosions, *Colliery Engineer*, January, 1896, p. 128], considers it conclusively proved that at the Albion Colliery explosion (June 23rd, 1894) the heavy coking effects noticed in some working-faces "were due to the spontaneous combustion of coal-dust in the presence of highly-compressed oxygen, and not actual flame."

Mr. D. M. Stuart, M.E., F.G.S. (lecture at Technical Schools, Derby), considers "that an explosion in a mine is characterised by numerous local explosions, each disturbance being isolated and preceded by a length of mine-passage in which the materials were practically in their normal state, or had not been subjected to violent forces. . . . Coal-dust, always and everywhere prevalent in mines, is capable of giving rise to explosions and of producing the phenomenon of subsidiary local explosions." Mr. Stuart is referring to explosions in bituminous coal-collieries. The *Colliery Engineer*, commenting on the lecture says: "The low percentage of volatile hydro-carbons in anthracite coal renders it freer from dust explosions than the various other classes of coal. In fact, this feature indirectly proves the coal-dust theory. Some of the anthracite-mines in Pennsylvania rank among the most gaseous in the world, and there has never been a gas explosion in one of them that has not been purely local in its effects. In both British and American bituminous mines, however, the case has frequently been different. Explosions of small accumulations of gas have frequently been propagated by dust, and carried with varying intensity throughout all or the major portion of the mine-workings. Sudden outbursts of gas, authenticated by positive proof, have occurred in anthracite-mines, and have caused disastrous explosions, but the limit of the explosive force was comparatively small. Such outbursts undoubtedly occur in bituminous seams, and are sometimes the origin of explosions, but we are of the firm opinion that the extent of the workings affected, outside a limited area, depends entirely on the quantity of dust present, and the chemical composition of the coal."

Coal-dust Explosions.

In an article in the *Colliery Guardian* of 14th February, 1896, Mr. James Ashworth, M.E., says: "It has been shown by quotations from Dr. Bedson's experiments that compression of the air may not only raise the temperature to 100°, cent., and thus increase the speed of the diffusion of the contained gasses, but that it will actually ignite the coal-dust with the heat developed by the sudden air-compression. When, therefore, a hot wave of sudden compression is set in motion by a blown-out shot or other cause, the instantaneous nature of the destruction of human life and property is clearly demonstrated. The chief thing necessary, therefore, to create an explosion in a dusty mine is the sudden production of sufficient energy at the point of initiation to produce a heat wave of high air-compression, say, 58lb. or more per square inch, and that even greater energy than this is always exerted may be calculated from one or more accidents of all large explosions, and has proved in one instance by Mr. A. L. Steavenson, who estimated that the mechanical force exerted had been equal to or exceeded 200lb. per square inch. . . . At Usworth, coal-dust from the roadway and near to the point where the explosion originated contained from 3·06 to 3·14 per cent. of moisture, and if we now compare this with the results of the spray-experiments at the Maybach Colliery, Saarbrucken, which proved that 3·64 was the maximum saturation which water-sprays could produce, and again note that Professor Dixon obtained the maximum explosive effects in his experiments with 5 per cent. of moisture, it becomes quite clear that the greatest saturation possible with water-sprays assists instead of retarding the progress of a coal-dust explosion. In conclusion, it must, however, be observed that water-sprays have some sanitary value in a dusty mine, although they have no protective value against gob-fire, or the flame of a coal-dust explosion."

The Prussian Commissioners, in the experimental gallery at Neunkirchen, demonstrated that a readily inflammable coal-dust was rendered harmless only by being moistened with about two-thirds of its weight in water, when in that condition the liquid could be pressed out with the clenched hand.

In the opinion of many of the objectors to the coal-dust theory, coal-dust in hot mines, being very inflammable, only greatly intensifies the force of the explosion for long distances in the main roads. The Messrs. Atkinson, after careful investigation at some of the most extensive explosions of late years, found that at Seaham Colliery, which is a dry and hot pit, the explosions had traversed some of the main roads for a distance of 7,500 yards, killing 164 men and boys and 181 horses and ponies. After investigations at Tudhoe in 1882, Usworth in 1885, and Elemore in 1886, experience taught them that the whole of these explosions were caused by the explosion or ignition of coal-dust by shot-firing on the main or intake air-roads, where there was no firedamp whatever. The impossibility of air being charged with gas when it comes direct from the downcast shaft without passing over any of the workings whatever, and the distinctive features in all the above explosions of the force and flame traversing the main intake-airway and haulage-roads, and not the return-airway, leaving the damp or wet roads untouched—clearly indicating that there was nothing in the damp roads to feed the flame on its forward motion—convince the author that coal-dust has been the sole cause of many disastrous explosions.

Heavy or blown-out shots and large falls of roof causing shocks in these warm and dusty mines, easily raise the dust, which is naturally of a high temperature and in very fine particles, into a cloud, the ignition taking place at the flame from the shot. The flames thus started, in their progress considerably raise the temperature of the dust in front and render it more inflammable, increasing the danger owing to the gases evolved.—[From "Transactions of the Federated Institution of Mining Engineers," Vol. vi., part 2.]

Gunpowder.

Gunpowder itself is practically never used; and the only word that can be said in favour of the blasting-powder is that it is cheap. It is absolutely unfitted for use in coal-mines, and its abolition would do away with more than three-quarters the number of deaths annually returned as being caused by mining-explosives. The great danger attending its use, however, consists in the combustible nature of the products evolved during decomposition, a factor in coal-mine explosions which the writer ventures to think cannot be overrated.

On firing a charge of 1¼lb. of blasting-powder, over 3 cubit feet of combustible gas, consisting chiefly of carbon-monoxide would be produced, and this, when mixed with pure air, would give over 10ft. of an explosive, or, at any rate, rapidly-burning mixture; and the experiments which have been made upon the effects of firedamp and dust combined in causing colliery explosions show conclusively that, even when firedamp is present in such minute quantities as to form a mixture very far removed from the point of explosion, it makes the mixture of coal-dust and air highly explosive. Traces of carbon-monoxide will do exactly the same thing when the air is laden with coal-dust, whilst the temperature of ignition is lower than with methane, so that when the air of the mine is charged with coal-dust, the probabilities are that a very large volume of explosive mixture is formed by the rapid escape of the products of combustion into the dust-laden air, and this, being ignited either by the flame or by red-hot solid products driven out into it by a blown-out shot, initiates a considerable area of explosion.

As the explosion takes place, and as the carbon-monoxide already produced is oxidised to carbon-dioxide by the action upon it of water vapour present, and also by its direct combustion with oxygen, the hydrogen of the water vapour is set free, whilst the heated coal-dust also yields certain inflammable products of distillation to the air, and partial combustion of the coal-dust gives a considerable proportion of carbon-monoxide once more, and this, driven rapidly ahead of the explosion, forms, with more coal-dust and air, a new explosive zone, and so, by waves and throbs, the explosion is carried through the dust-laden galleries of the mine.

In this way any explosion which generates inflammable products of incomplete combustion is unsafe and should never be used even in mines where firedamp is unknown, as such explosives are quite capable of setting up an explosion with coal-dust alone.

A still greater danger arises if any trace of firedamp exists in the mine, as this, together with dust, provides an already explosive atmosphere, whilst the products evolved by blasting-powder are capable of playing the same part as sulphur on a match, and causing ignition of the explosive mixture.—[From "Transactions of the Federated Institution of Mining Engineers," Vol. ix., part 2.]

THE COMBUSTION OF OXYGEN AND COAL-DUST IN MINES.

M. H. Hall (H.M. Inspector of Mines) wrote that he had had an opportunity of inspecting and attending the inquest as to the Albion Colliery disaster. This explosion was undoubtedly due to coal-dust, ignited by firing untamped dynamite shots, used to blow down roof-timbers in a main intake-airway (with 30,000 cubic feet of air passing per minute); this main intake was very dry and dusty, as were all the others in the colliery, with one exception. The explosive force and fire passed throughout the main intake-airways, travelling over four miles in length. In each district the blast travelled in-by with the wind, increasing in violence as it passed forward, until it was able to distribute itself in the working-places, and there apparently dying out. The one wet district in the colliery alone escaped the blast; and the men in that district would have been saved had they not attempted to escape and met the after-damp—the horses stayed near the faces and took no harm.—[From "Transactions of the Federated Institution of Mining Engineers," Vol. viii., part 1.]

SHOT-FIRING.

Report made by Messrs. Proud and Skelton, after visiting various coal-mines on the West Coast (referred to in minutes of the 28th May): "Since the Brunner disaster new arrangements as to firing shots having been made at the Blackball and Denniston Coal-mines—viz., 'That before any shots are fired the underviewer or deputy shall see that the coal is made ready and the shot-hole bored in a position to do its work, and that they (the officers) fire all shots.' Two of the Commissioners visited the Blackball, Denniston, Granity Creek, Cardiff, and Mokihinui Mines. To inquiries made of the miners as to whether they had been subject to any loss of time through having to wait until the official came to their working-places to fire their shots, the reply invariably was that very little time was lost through waiting, as the officials attended as soon as possible after being notified. The trouble, if any, seems to be that previous to the new arrangement in some of the mines very little preparatory work as to shearing or holing was done before firing the shot. Now that holing and shearing must be done, it, of course, takes a longer time and more labour before they can get a shot off, and the miners complain that they cannot earn as much as under the old system. But, as a set-off, the miners will certainly use less powder, have better shots, make larger coal, and there will be much less danger of blown-out shots. Our opinion as to the advisability of officials firing shots is already stated. The pecuniary side of the question, we understand, was to be considered by the Conciliation Board, which commenced its sittings at Westport on the 26th May."

(Copy of letter from John Hayes.)

SIR,— Greymouth, 14th May, 1896.

As desired, I have, in conjunction with Mr. T. Brown, marked a tracing to show the observed lines of explosion in Brunner Mine.

To avoid confusion, two places are pencilled, and Mr. Brown (who acted as my colleague in the inspection) will explain our views.

Yesterday I visited the mine to see whether, now that it has assumed a normal condition, it could be classed as a dry and dusty mine, as understood in the English acceptance of the term. In my opinion it would not be classed as such by English practice; but I would point out that there is a good deal of fine slack in the mine, which, if under the influence of great heat, would generate a large amount of gas by distillation. Of course the known rich quality of the coal for gas-making purposes explains this.

I measured the ventilating current, and found it to approximate very closely with my estimate when under examination.

I have, &c.,

Sir James Hector, Brunner Commissioner. JOHN HAYES.

LIST OF MEN WORKING IN BRUNNER MINE, DIP SECTION, ON 26TH MARCH, 1896.

NOTE.—All these men were killed.

Names.	Class of Work.	Names.	Class of Work.
		Sump Side.	
1. James Worthley ..	Hewing.	12. John Watchman ..	Hewing.
2. Robert Duncan ..	"	13. James McMinn ..	"
3. John Roberts ..	"	14. Paul Peillon ..	"
4. Michael Brislane ..	"	15. Charles James ..	"
5. G. Geoghegan ..	"	16. James Scott ..	"
6. James Geoghegan ..	"	17. Thomas Heslin ..	Trucking.
7. Thomas Moore, sen.	"	18. Richard O'Loughlin	"
8. Thomas Moore, jun.	"	19. Joseph Scoble ..	"
9. Henry Denniston ..	"	20. William Cunliffe ..	Pony-driver.
10. William Hunter ..	"	21. John Morris ..	Fireman.
11. John Pattinson ..	"		

Names.	Class of Work.	Names.	Class of Work.
	West Side.		
22. Edward Collins ..	Hewing.	44. Peter McMahon ..	Hewing.
23. Thomas Beeman ..	"	45. David Hooly ..	"
24. George Baxter ..	"	46. John Dunn ..	"
25. William Boyd ..	"	47. William Moonie ..	"
26. John White ..	"	48. R. W. Kear ..	Trucking.
27. John Allan ..	"	49. W. Henderson ..	"
28. William McLuskie ..	"	50. Thomas McIvor ..	"
29. Robert McLuskie ..	"	51. James McDonald ..	"
30. Robert Pascoe ..	"	52. Robert Pascoe, jun.	"
31. Mark Masters ..	"	53. John Roberts ..	Underground manager.
32. Thomas Clark ..	"	54. Josiah Masters ..	Deputy.
33. Humphrey Smith ..	"	55. Samuel Roberts ..	Attending haulage-rope.
34. Henry Dettert ..	"	56. Frederick Franklin	Pony-driver.
35. John Langdon ..	"	57. David Anderson ..	Trucking.
36. William Liddle ..	"	58. Patrick McDonald	Attending haulage-road.
37. Joseph McIvor ..	"	59. Benjamin Hill ..	Attending landing at dip-head.
38. James Rowe ..	"	60. Henry Julian ..	Hanging tubs on endless rope.
39. Alfred Williams ..	"	61. Charles Baxter ..	Attending tubs at curve.
40. John Tewart ..	"	62. David Hall ..	Attending pump.
41. Edward Kent ..	"	63. John Parsons ..	Attending electric motor.
42. Joseph Baxter ..	"	64. David Roberts ..	Hanging tubs on incline.
43. James Richards ..	"	65. William McKinnon	"

THE WESTPORT COAL COMPANY (LIMITED).

Instructions for Firemen, Deputies, and Shot-firers.

Destructive explosions sometimes occur from fine coal-dust in the mine being suddenly ignited by blown-out shots.

In every case where shot-firing is necessary, it is essential that the position and depth of hole, the quantity of powder, and the extent and nature of tamping, are such that the charge is sufficient, and that the force of the shot is all expended and spent in breaking down the coal.

The firemen, deputies, and shot-firers are, in addition, therefore, to their ordinary duties, responsible for personally attending to the following special conditions and duties:—

No shot shall be fired where the coal is not holed or undercut to a depth of at least 3ft., and more where necessary. The hole must not be bored into the fast or beyond the holing. The powder must be skilfully laid in sufficient quantity, but no more than is enough to throw down the undercut coal.

The shot-firer shall inspect every shot-hole before the charge is laid therein, and shall satisfy himself as to its direction and depth.

No hole shall be tamped with coal or coal-dust. In every case damp clay and sand, or non-inflammable broken stone, shall be used as tamping.

The shot-firer must refuse to allow, light, or fire any shot where there is reasonable doubt as to its being successful.

Where strong tamping is needed, the compression of air at the bottom of the hole should be avoided by pushing in the first part of the tamping in small portions.

Dated this . , Manager.

I, the undersigned, hereby certify that I have this day been supplied with a copy of the above conditions and duties relating to shot-firing and blasting in the Westport Coal Company's Colliery at , and agree to carry out these instructions.

As witness my hand this day of , in the year one thousand eight hundred and .

Witness:

Approximate Cost of Paper.—Preparation, not given; printing (2,050 copies), £105 2s.

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PLAN No 1.

GENERAL PLAN OF THE BRUNNER MINE.

SHOWING ALSO THE COURSE OF VENTILATION IN DIP WORKINGS.

Compiled from Surveys by Messrs J. Bishop, & H.W. Young A.M. Inst. C.E.

To Illustrate Report of Royal Commission re Brunner Disaster

March 26 1896

REFERENCE.

Areas worked-out

Ventilation { Intake / Return

PROSPECTING DRIVE

"COOLGARDIE"

DIP WORKINGS OF BRUNNER WORKINGS OF OLD BRUNNER

Pillars being drawn 30.4.96

End of Rails

Coal thinned

PROSPECTING DRIVE

About 17 Chains from Sump Plug

Stone Drift on Line of Fault

Return Air Course

Shaft 29 6 deep

Return Air Course

MAIN HEADING

FAULT

Stone Drift

Incline

Worked out

Edge of cliff

SHAFT No 1

TRENTLE-WORK

SHAFT

Partly Pillars

Edge of cliff

Boundary of Lease

COAL PIT HEATH

SCALE OF CHAINS.

0 5 10 15 20

100 0 500 1000.

SCALE OF FEET.

GREYMOUTH

C.H. Pierard. del.

BRUNNER MINE.

PLAN OF DIP WORKINGS.

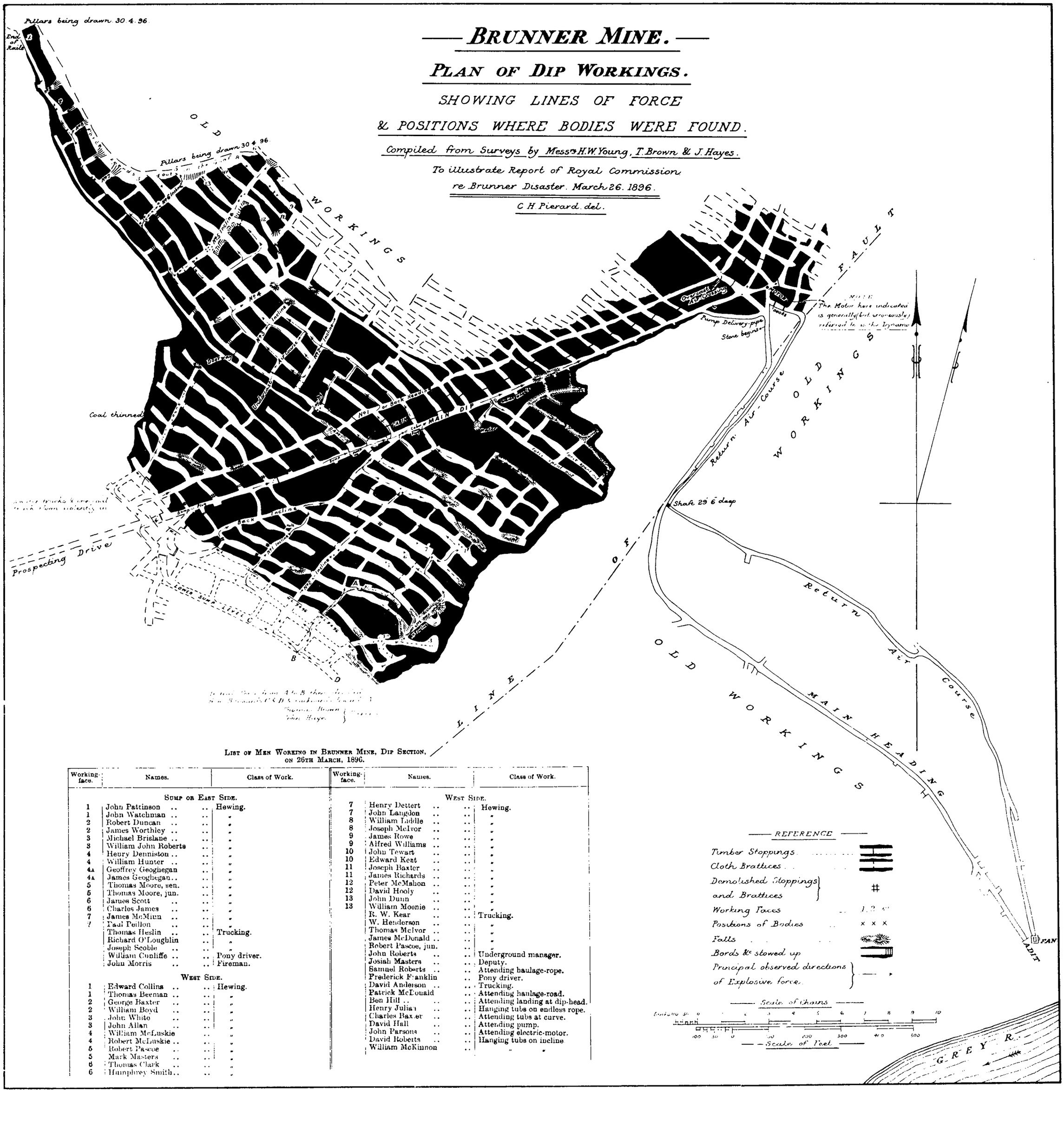
SHOWING LINES OF FORCE

& POSITIONS WHERE BODIES WERE FOUND.

Compiled from Surveys by Messrs H.W. Young, T. Brown & J. Hayes.

To illustrate Report of Royal Commission re Brunner Disaster. March 26. 1896.

C H Pierard. del.



List of Men Working in Brunner Mine, Dip Section, on 26th March, 1896.

Working-face.	Names.	Class of Work.
	Sump or East Side.	
1	John Pattinson	Hewing.
1	John Watchman	"
2	Robert Duncan	"
2	James Worthley	"
3	Michael Brislane	"
3	William John Roberts	"
4	Henry Denniston	"
4	William Hunter	"
4A	Geoffrey Geoghegan	"
4A	James Geoghegan	"
5	Thomas Moore, sen.	"
5	Thomas Moore, jun.	"
6	James Scott	"
6	Charles James	"
7	James McMinn	"
7	Paul Peillon	"
	Thomas Heslin	Trucking.
	Richard O'Loughlin	"
	Joseph Scoble	"
	William Cunliffe	Pony driver.
	John Morris	Fireman.
	West Side.	
1	Edward Collins	Hewing.
1	Thomas Beeman	"
2	George Baxter	"
2	William Boyd	"
3	John White	"
3	John Allan	"
4	William McLuskie	"
4	Robert McLuskie	"
5	Robert Pascoe	"
5	Mark Masters	"
6	Thomas Clark	"
6	Humphrey Smith	"

Working-face.	Names.	Class of Work.
	West Side.	
7	Henry Dettert	Hewing.
7	John Langdon	"
8	William Liddle	"
8	Joseph McIvor	"
9	James Rowe	"
9	Alfred Williams	"
10	John Tewart	"
10	Edward Kent	"
11	Joseph Baxter	"
11	James Richards	"
12	Peter McMahon	"
12	David Hooly	"
13	John Dunn	"
13	William Moonie	"
	R. W. Kear	Trucking.
	W. Henderson	"
	Thomas McIvor	"
	James McDonald	"
	Robert Pascoe, jun.	"
	John Roberts	Underground manager.
	Josiah Masters	Deputy.
	Samuel Roberts	Attending haulage-rope.
	Frederick Franklin	Pony driver.
	David Anderson	Trucking.
	Patrick McDonald	Attending haulage-road.
	Ben Hill	Attending landing at dip-head.
	Henry Julian	Hanging tubs on endless rope.
	Charles Baxter	Attending tubs at curve.
	David Hall	Attending pump.
	John Parsons	Attending electric-motor.
	David Roberts	Hanging tubs on incline.
	William McKinnon	" "

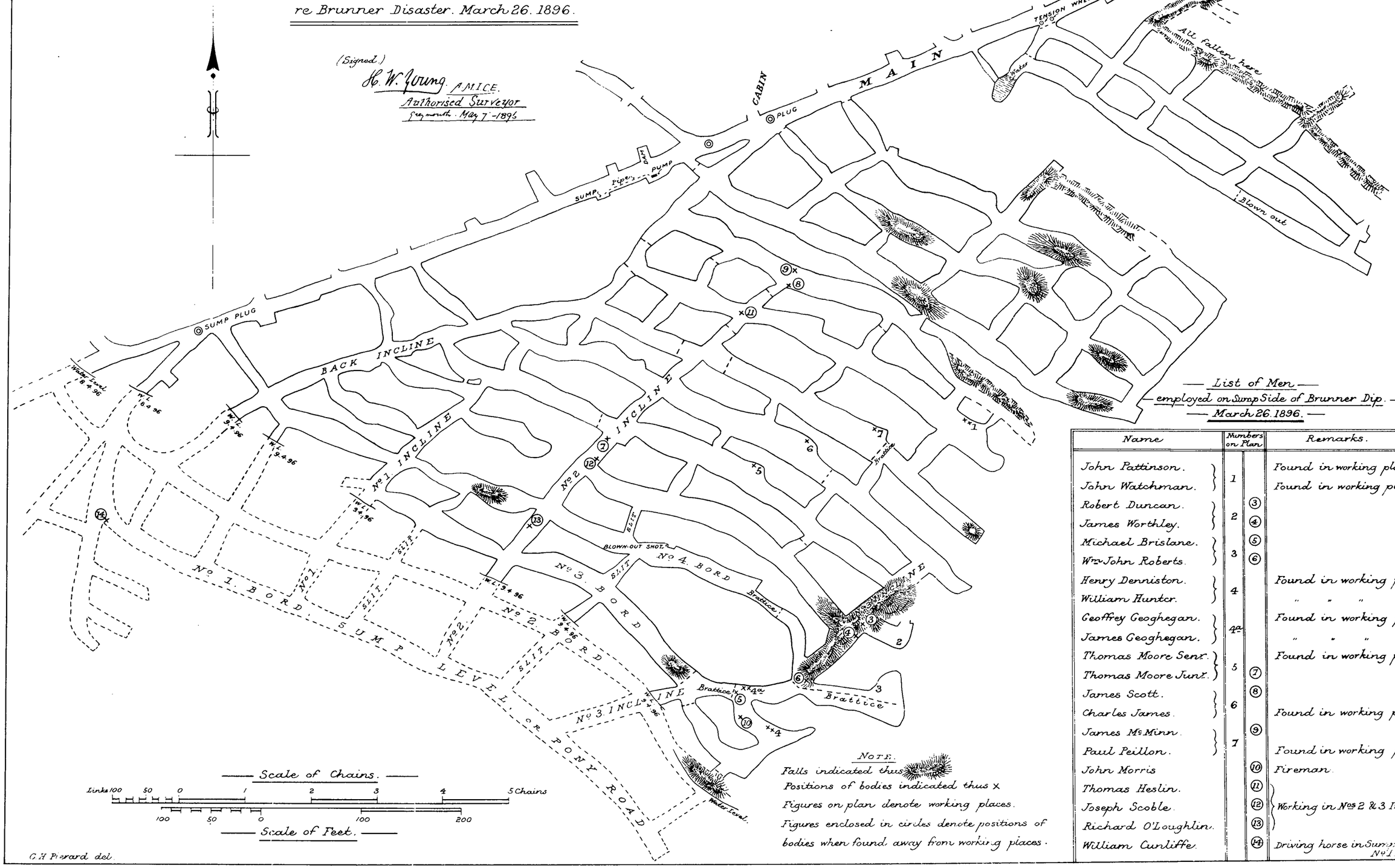
— PLAN No3. —

— BRUNNER MINE. —

PLAN OF SUMP PORTION OF DIP WORKINGS.

To illustrate Report of Royal Commission
re Brunner Disaster. March 26. 1896.

(Signed.)
H. W. Young. AMICE.
Authorised Surveyor
Greymouth. May 7th 1896



— Scale of Chains. —

Links 100 50 0 1 2 3 4 5 Chains

100 50 0 100 200

— Scale of Feet. —

C.H Pizzard del.

NOTE.
Falls indicated thus
Positions of bodies indicated thus X
Figures on plan denote working places.
Figures enclosed in circles denote positions of bodies when found away from working places.

— List of Men —
employed on Swamp Side of Brunner Dip. —
— March 26. 1896. —

Name	Numbers on Plan		Remarks.
John Pattinson.	1		Found in working place.
John Watchman.			Found in working place.
Robert Duncan.	2	(3)	
James Worthley.		(4)	
Michael Brislane.	3	(5)	
Wm John Roberts.		(6)	
Henry Denniston.	4		Found in working place.
William Hunter.			" " " " .
Geoffrey Geoghegan.	4a		Found in working place.
James Geoghegan.			" " " "
Thomas Moore Senr.	5		Found in working place.
Thomas Moore Junr.		(7)	
James Scott.	6	(8)	
Charles James.			Found in working place.
James Mc Minn.	7	(9)	
Paul Peillon.			Found in working place.
John Morris		(10)	Fireman.
Thomas Heslin.		(11)	
Joseph Scoble.		(12)	Working in Nos 2 & 3 Inclines.
Richard O'Loughlin.		(13)	
William Cunliffe.		(14)	Driving horse in Sump Level or No 1 Bord.

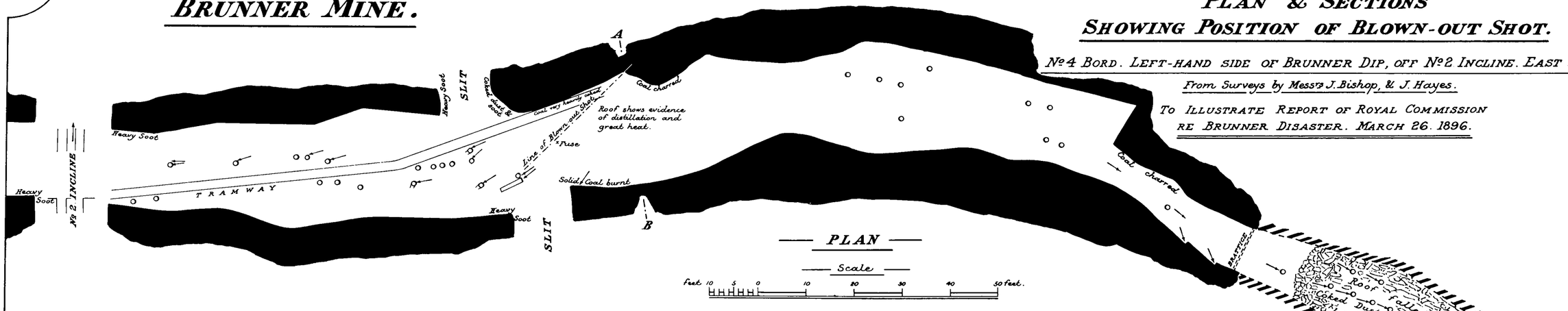
BRUNNER MINE.

PLAN & SECTIONS SHOWING POSITION OF BLOWN-OUT SHOT.

Nº 4 BORD. LEFT-HAND SIDE OF BRUNNER DIP, OFF Nº 2 INCLINE. EAST SIDE.

From Surveys by Messrs J. Bishop, & J. Hayes.

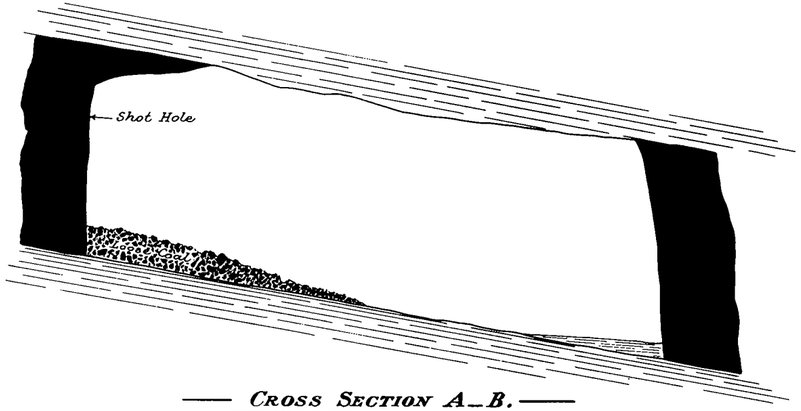
TO ILLUSTRATE REPORT OF ROYAL COMMISSION RE BRUNNER DISASTER. MARCH 26. 1896.



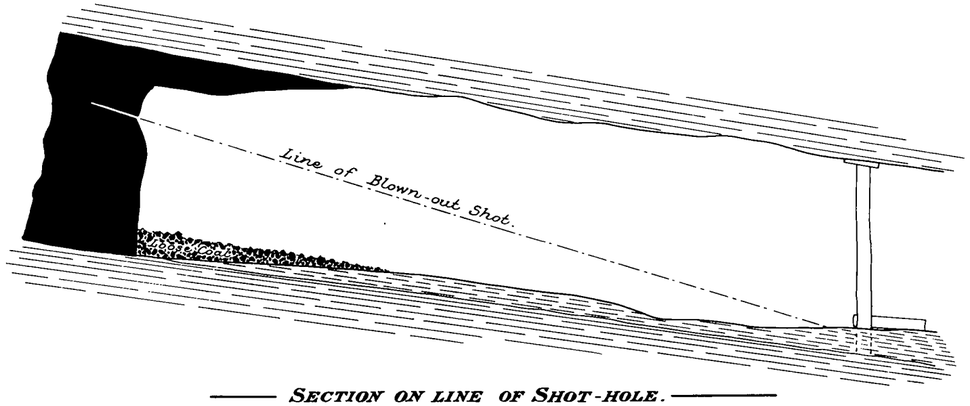
PLAN

Scale

feet 10 5 0 10 20 30 40 50 feet.



CROSS SECTION A_B.



SECTION ON LINE OF SHOT-HOLE.

Scale.

feet 10 5 0 10 feet.

C. H. Pierard. del.