Q. Why? A. It was not feasible in the circumstances.

Q. What wouldhappen to any gas which might come from the goaf? A. It could only escape into the working area.

HIS HONOR: Q. Would that be obvious to those who were charged with the duty of vetilating this area? A. I would say yes, Your Honor.

Q. Assuming that no alternative plan could be put forward for removing the difficulty does that mean it was unsafe formen to work there? A. Not necessarily unsafe at any particular time, but the possibility that an unsafe condition could develop.
Q. Such as the one we are dealing with here? A. Yes.

MR. LEE: Q. Again, forget about the ventilating system as we know it was, are you familiar with a practice of a bleed being arranged from the goaf into the return airway? A. Yes.

Q. To your knowledge has that practice been applied in various coal mines in New South Wales? A. Yes.

Q. Was it possible, reasonably possible, on the set up of the works as they were there - I do not mean with the existing ventilation system - but merely the possibility of having a bleed to the goaf? A. There is a possibility of having a bleed to the goaf put in in that particular set up but whether or not the actual operation of installing that bleeder could have been carried out without, once again, goaf gas entering the working area is problematical. In other words you could have had the same conditions arise while you were forming the bleeder.

Q.Coming back to the existing ventilation system, you have said it did not achieve the desirable feature you mentioned of ensuring the gases from the goaf were not emitted into the work area. Is there a way of altering the ventilation system to achieve that desirable situation? A. No.

Q.No way?A.No.

Q.You cannot reverse the flow of air?A. It will not prevent the gas.

Q.What?A.It will not prevent goaf gas entering the working area.

Q.You say even with reversing the air flow you do not get to the point of desirability of safety that you say ought at least to be sought? A. You get more desirable circumstances but not the complete answer.

Q. Had the airflow been reversed at least the tendency would have been for the goaf gases to find their way into the return airway?A. Yes.

Q.Would that reversal of airway in your view have involved much alteration in the workings? A. It would require considerable alteration.

Q.In what way? A. The air crossings would have to be erected somewhere in 8 Right area. The track would have to be re-routed and taken away from A Heading and put in, possibly, B Heading.

Q.Taken away from A Heading or C Heading? A. C Heading, and put in B. Heading.

Q. The air crossing would have been designed to ensure one lot of air going over the top of the other? A. Yes.

HIS HONOR:Q.Is that in the nature of an overcast? A. Yes.

MR.LEE:Q.You say that would have been quite an operation?A.Yes.

HIS HONOR:Q. Could you have overcast at the end of the goaf? A. Possibly, Your Honor.

Q.I was wondering if there was any possibility of ventilating the goaf itself so as to prevent the gases from coming into the working area? A. Ventilate the goaf itself?

Q.Yes? A. Yes, there is, by having your bleeder system installed at the back of the goaf.

Q.What system? A.The bleeder at the back of the goaf which you are forming and that bleeder going straight into the return and all gases formed in the goaf would then go straight to the return and the direction of the air flow would be acrossthe goaf from the working face and return, and preclude all possibility of the gas from the goaf entering the work area.

Q.How big a problem is that? What sort of an undertaking would it be to install that system? A. That requires a considerable amount of advance planning to form.

Q.You mean before you actually start? A. Before you actually start.

Q.But that could have been done? A. In this case it is possible.

Q.How successfully? How effectively? A.I can only put some examples I have read about.It has been very successful in dealing with gases in goafs in great quantities. It has been very successful in keeping the gas away from the working areas.

Q.Is it a very costly method provided it is installed at the proper time, provided you are not altering something already developed? A. It is costly in the developmental stages.

Q.Would you mind telling me: When a development such as this is planned is the plan submitted to the Department for approval?A. No.

Q.Would it be an advantage for future planning, for plans such as this, plans of development, to be submitted to the Department for approval and suggestion? A. I think it is a possibility, Your Honor, but the managers of that mine are endowed with the same qualifications as I have and I expect him to be able to carry out the same sort of ideas that I would have. I have nothing against it but I do not want to manage the mine for the management, my job precludes me from managing the mine.

Q. Your job is to supervise a mine for the public? A. Yes.

Q. Surely the supervision should start at the stage of planning, in case something goes wrong in future. Would you agree with that? A. Once again, I can see possible advantages in it. Once again, I think I am interfering too much with the right of the colliery management.

Q. Mr. Menzies, let us compromise. Do you think it might be a useful suggestion that the method of development, the planning, be discussed with the Mines Department so that you might get a joint opinion on this? A. In many cases it is.

Q. In many cases it is, but is that an advantage when it is, do you think? A.Yes.

Q.Then do you not think it might be wise to make it a mandatory matter so that that advantage could accrue to every mine? A. It might have advantages, Your Honor. I can see lots of disadvantages in it; I can see advantages.

Q. I suppose the disadvantages are personal disadvantages, are they?A.Not so much personal as - well, to my mind, the right of the manager to manage his own mine.

Q.I still think that is a personal thing, don't you? (no answer).

MR.LEE: Q.Perhaps if I could just narrow the thought that His Honor is putting a little, and ask you this question: Whether you think it would be a good idea in all cases of pillar extraction where goafs are to be formed, for the management to let the Department know of the ventilation system as the works progress?A. Yes.

HIS HONOR: Q. That would not be of any use of course unless the Department had some power of vetoing it? A. We have, Your Honor.

MR.LEE: Q. That in fact is something that you feel ought to be done when the ventilation system should, per medium of the management, be kept under the eye of the inspector? A.Yes.

Q.And that does not involve the management in anything more than a mere notification and a short sketch plan? A.That is right.

Q.If we could carry on now, you say the situation as it was was not desirable. You say that if it had been reversed it was more desirable but still didn't completely satisfactorily solve the problem? A. Yes.

Q.What do you say is the basic reason why you cannot do it really satisfactorily either way? A. Well, in this particular case there is no other way for the gases to escape from the goaf than through the working area.

Q.And do you see anything in the ventilation system as it applied to the original three heading development? A.No difficulty at all.

Q.Not in that? A. No.

Q.How did the difficulty come up? A. The difficulty arose when the goaf was put down in the left hand side.

HIS HONOR:Q.On the left hand side? A. Yes.

MR.LEE: Q. Taking the system, however, as the colliery had it with the air going in along C Heading and back through A Heading, apart from the fact that you say that is undesirable and if you can put that factor to one side for the moment, was there anything in the way the management dealt with the situation on the plan that they devised which could have been improved upon?A.You mean ventilationwise?

Q. Yes, on their existing set up?A.Yes.

Q. What was that? A.Well,the improvement could have been made by

(1) Leading a vent tube line from the floor inside the brattice at the back of the shunt and taking that line direct to the return airway without passing through the fan. In other words, establishing an air crossing across the intersection so that all gases which were made there could be drawn straight across the intersection without mixing with the air going to the face.

Q.This is a system which is not connected to the fans? A. No.

Q.You have got some tube through the brattice into the goaf bleeding into the return airway in A Heading? A. Yes.

Q.What sort of a tube would that be or could it be? A. Well, once again, in the light of what has transpired, a 22½" tube.

HIS HONOR:Q. Where would the mouth of that tube be; inside the brattice?A. Inside the brattice, on the goaf side of the brattice.

Q.Just inside?A.Yes.

MR. SULLIVAN:Q.That is on the goaf side inby?A.Yes.

MR.LEE:Q.Would the presence of that tube in your view necessitate in any way the use of the bleeder attached to the fan at the brattice? A. Possibly,yes.

Q.And that bleeder attached to the fan working at the brattice, we are told and I think it is common ground, is designed to assist the ventilation? A. The ventilation of the shunt, which is a dead end.

Q.Is that one about which you could say it would ventilate the shunt, the system of the bleeder tube into the brattice? A. The bleeder tube in association with the tube I have just described has a better chance of keeping the shunt clear than the arrangement that existed on the 9th November.

Q.I was not asking you quite that. I am asking you now about the bleeder tube being there and attached to the fan. I mean, as a system that does have the effect of ventilating the shunt area, does it not? A. Yes.

Q.It does achieve that purpose? A.Yes.

Q.Leaving out the tube which you have suggested might also go through a brattice and over to the return airway, in your view what was the effectiveness of the bleeder tube as a ventilating device at the brattice? A. Omitting the tube I put there?

Q.Yes, omitting that, just give us your opinion on that? A. In circumstances, certain circumstances it was successful, proved it was successful, and it kept the shunt clear of gas, but it had this inherent failing: it was not capable of dealing with any excess gas given off over the normal produced.

Q.In other words, given normal circumstances, this system devised was adequate but it could not cope with the abnormal? A. Correct.

HIS HONOR:Q. That answer - you see, after the pre-fire conditions were simulated here, this area was tested and certain quantities of gas were found. Were they abnormal conditions? A. Your Honor, I think I can refer to my answer - I referred to the conditions particularly before the incident and where all the evidence of deputies and so on seemed to indicate that a condition was being dealt with. I excluded from my opinion the findings of the set up which happened last week.

Q. In other words, you assumed that the deputies' reports accurately portrayed the position and they were the normal conditions? A. I must accept them.

MR.LEE:Q. All you are saying is this, is it not, that if the deputies were accurate, that conditions were as they seemed to be, this tube was adequate to deal with the situation? A. Yes.

Q.But if things were not as they seemed to be, what then? A. Well, the tube was obviously inadequate to deal with the situation.

Q. Apart from the tube system that you suggest here, was there any other addition that might have made the existing ventilation more effective to deal with the situation as we know it existed- that is with regard to gas? A. Well, the solutionI am going to outline now is not without its implications and I do not want to be considered as advancing this as the ultimate in this, but in the situation as it stands we have the section developed,we have the section working and we have recovered a considerable amount of coal and there is still a considerable amount to recover. There could have been a method used to install a bleeder tube which turned into the return airway outby the working area. As I said, that is not without its possibilities - there are conditions I can visualise that would cause, could cause some trouble.

Q.Would you mind going over to the map and showing us where you say the bleeder on this present notion would be installed? A. (Witness proceeds to Exhibit "A").It would really mean stopping the work at this position as it stands now and coming out through the No. 1 cut-through.Then, at this heading, installing the brattice which I have mentioned or the stopping - not necessarily a brattice stopping, it couldhave been a rigi seal - and then with that rigi seal near the floor insert the 22½" diameter vent tube and taking it straight into the return airway. Now that would tend to look after the gases coming from the goaf area.

HIS HONOR: The witness indicates in all those comments A Heading.

MR.LEE:Q. How would it look after the gases coming from the goaf area? Would they have to pass across the working areas? A. (Unmarked plan handed to witness) At this point here, this stopping, fairly airtight but not necessarily completely air-tight, and from there running straight to the return.

MR. SULLIVAN: Could the witness write each of those over the top on his little diagram - stopping, vent outby?

HIS HONOR:Q.Would you mind doing that?A. I hope you can read my writing.(Witness marks) Then we have the position that any gases which are tending to be given off from the goaf are picked up at this point here and taken straight to the return, and then driving here.This is where we come to the condition which I am a little bit scared of and this is where we could run into trouble. To be effective we have got to get that through into there. We have to get that bleeder heading through into there, the working area, to be any use. That could be - well, in the position we have got here now this area here is available for inspection and by the use of ventilation tubes we may be able to clear this area of blackdamp which may accumulate when we are down here driving this.

Q.You are now pointing to the area ofthe working place that you said may be cleared of black damp?A.Yes, cleared of black damp and any gases that may be in that area.Once we have done that, if I may take it another little step forward, we drive

that beyond the limits of the original driving. When this was cleared here and this was driven up here, pull all the machinery out of it and take down this brattice stopping, this one here, this stopping here. In other words return the section to what it was originally with the exception that this here had been driven. We replace our fans here, but in this case I think we would use a blower fan. It would have to be replaced here and have to be replaced back here. It could possibly be placed here, a blower fan blowing here and go down here and break through here.

Q. What problems would the blower fan create for the men working on the face? Would there be dust problems? A. There would - this is a very limited operation. When this is broken through here, then we have a connection from this place to the heading to the return airway and this is the critical point (indicating). When we are breaking through here because on my assumption this area is full of gas, this is a critical area but this is the reason for using the blower fan. By using the blower fan on the brattice, as soon as the goaf was broken into the blower fan would take the air round that side of the brattice straight through the goaf here to the bleeder heading where it would exhaust into the return. Now that is the way out - whether it is practicable or not I don't know, but it could not be said to be completely free from possibilities.

MR.LEE: Q. To break through from the goaf, how does that situation relieve the situation in the shunt area? A. This should have been put in here - the same system as there now.

Q. Would that system prior to the break through into the goaf, or after, even, if you like, relieve the likelihood of gas coming through into the shunt area? A. When this is broken through here all the gas in this area would tend to move in this direction because this is the region of low pressure.

Q. But what about before you broke through into the goaf? A. That is a critical point where considerable care would have to be exercised.

Q. I think there was some suggestion in these proceedings that the extension of No.2 cut-through might in certain circumstances be regarded as a bleed from the goaf. Now what do you say about that? If they broke through into the goaf from the extension, could you ever use the cut-through as a bleeder? A. Never.

Q. You would have to get out, wouldn't you? A. Yes.

Q. Unless you got some system such as you have mentioned to cope with what was going to occur when the goaf was broken into? A. Yes.

HIS HONOR: Q. So in any case you have the critical point in this situation as soon as they break into the goaf? A. Yes.

Q. As a matter of fact you would flood the extension of No.2 cut-through with gas when you did that, would you not? A. Not necessarily, with the blower fan here, and I have got in my mind -

Q. That is on your method, but assuming the fire had not occurred and they continued to work and they broke through into the goaf, you would really still have a critical situation there with no means of relieving it? A. That is right.

MR.LEE: Q. But as you understand the layout of the workings, would it be in your view that there was to be a breakthrough into the goaf or would that be avoided at all costs? A. I can't read people's minds, I can only read the plan. My impression is

that there were no indications of breaking through into the goaf.

Q. But the extraction, the working, would then come back down towards A Heading? A. Here (indicating).

Q.Just taking the situation again as it existed as arranged by the management, to deal with the gases which might come from the goaf, in your opinion was there an absolute necessity or was there not an absolute necessity to put in a bleed tube where they had it? (No answer).

MR.REYNOLDS: You do not leave him much room to move.

MR.LEE: Q. I withdraw the question and I think you can answer this, Mr. Menzies: Supposing the bleed tube had not been where it was and supposing there had not been the abnormal concentration of gas behind the brattice but the position as to gas was in fact as the deputies thought it was; would you have taken a view that the bleed tube was none the less desirable or would you say it was quite unnecessary or what is the position? A. Once again you have got to bring the working conditions into it. It is most undesirable to have a brattice across a wheeling road.

HIS HONOR.Q.It is not desirable? A. Not desirable. In this particular case if you wanted to use any method other than a bleed tube you wouldhave to have a brattice across the wheeling road at the intersection of A Heading and No.2 cut-through to divert some of the air into the shunt.

MR.REYNOLDS:Q.I suppose the wheeling road is No.2 cut-through? A. Yes.

MR.LEE: Q. Was there any other place where the shunt, on the plan of ventilation that was in fact put into operation by the management, might have been better located, in your view? A.Yes.

Q.Where was that? A. B Heading.

Q.And why do you say that it might have been better located there? A. Well, it is a higher point than A Heading. It is not so close to the actual low point in the goaf where the gases were coming off. I am referring now to the corner of the goaf and A Heading. That is the lowest point where the goaf obtains access to A Heading and it was the obvious bleeding-off place for black damp or Illawarra bottom gas. If the shunt had been in B Heading then the danger was removed, or any possible danger was removed in this case.

Q.In that circumstance would there have been, as a matter of desirability, a brattice in B Heading? I am sorry, I mean in the shunt area in B Heading that you are hypothetically considering, on the goaf side; would there have been a brattice there in approximately the position it was in A heading? A. Whether a brattice was used directing air into it would have been a matter for determination by the deputy, as to whether it was required or not.

Q.I wanted to understand whether putting the shunt there you needed a brattice -

HIS HONOR:Q.There is probably a simple answer to this, but it escapes me. Why would you need to have used the right hand side shunt? A. None at all.

Q. You would not need to? A. No reason why you can't use it.

Q.But why couldn't you, assuming you used the opposite side,

across the intersection for the shunt area; why could you not do that? A. It may have been a matter of cables.

MR. REYNOLDS: Did he mean the shunt could have been the right hand side or the left side of B Heading?

WITNESS: The right side.

HIS HONOR: Q. You say it may have been a matter of cables? A. Yes.

MR. LEE: Q. I will try to get that clearly. If you had used B Heading as the shunt and you had shunted in towards the goaf as was done in A Heading - that is what you had in mind when you talked about B Heading being used for the shunt? A. Yes.

Q. Would it have been desirable to have a brattice behind the shunt in B Heading or would you not need it? A. It would depend to a large extent on the deputy, and I would think if it was not required then he would not put it there.

Q. May I leave that aspect of ventilation and ask you these few short questions. It has been suggested that there might be some virtue or advantage in having oxygen bottles with the continuous miner particularly in circumstances where the miner is operating in a working where there is only one access for the men. Now, what do you say about the presence of oxygen bottles? A. Well, in this particular case oxygen may have proved useful. I cannot agree that the supply of oxygen bottles should be required on continuous miners because I think we are introducing a hazard which is as great if not greater than the position we are dealing with at the present time. Oxygen bottles when subjected to a hard knock, which they can get in the region of the working face, are liable to explode and when they explode they have been known to ignite oil in the vicinity and for that reason, in the circumstances prevailing in this particular case under concern, I cannot see where I could agree to the installation of oxygen bottles on continuous miners at the coal face.

HIS HONOR: Q. Assume it is not on a continuous miner; could there be a safe place on the coal face where an oxygen bottle could be installed? A. You couldn't find a safe place possibly anywhere, Your Honor.

MR. LEE: Q. It is your view, is it not, in regard to this - a self-rescuer it is called, is it not? A. Yes.

Q. That that should be a necessary piece of equipment for the miner? A. Yes.

HIS HONOR: Q. Do you mean they should carry them all the time or do you mean they should be readily available? A. Carry them all the time.

Q. So the miner would be carrying - not the deputy but the miner - his headlamp, or actually he does not carry it, does he? A. On his cap.

Q. And he would carry one of these as well? A. Yes.

Q. The deputy, would have one of these, a head lamp, a flame safety lamp and a methanometer? A. It is well known in the mining industry that the deputy is the pack horse.

MR. LEE: This self-rescuer belongs to the Department and I hand it up to Your Honor.

HIS HONOR: Q. What is this here (indicating) - the mouth piece? A. That is the mouth piece. You slip that over your mouth.

Q. These are nose plugs? A.Yes.

Q.And this hangs around your neck?A. It is strapped on the head.

Q.This is not a moving part - I am now referring to what looks like a self-seal on a lemonade bottle? A.That is where the air is drawn in.

Q.We have been told that the sole purpose of that is to enable the person wearing it to go through smoke without breathing; is that the position?A.Not particularly smoke - they are developed for persons to go through carbon monoxide.

Q.In other words,this filters off carbon monoxide?A.Yes.

Q.Will it filter off any other noxious gas?A.No.The reason for developing these things was in a large number of explosions overseas, a number of people who have died in the explosions have died from carbon monoxide poisoning and it was felt that some such device might have enabled some of those men to escape.

Q.One such man in this case died of carbon monoxide poisoning? A.Yes.

Q.I do not know whether this might have enabled him to escape, but would it have assisted? A. I cannot say, Your Honor,but after a passage of time he had to pass through the fire zone- at that time it is my opinion he could not have passed through the fire zone.

Q.Assuming the fire started at about 9.15., for how long afterwards would it have been possible for a person to have passed through the fire zone? A. Nobody actually passed through the fire zone until the early hours of the Wednesday morning.

Q.In which case the man wouldhave been dead anyway? A. Yes.

MR.LEE: Q.I have no doubt you have given it a lot of thought, and you say that they have got wear it on them; that is your view, is it, that unless they wear it on them it is not going to be of any value to have it stored nearby? A. No.

(Luncheon adjournment).

MR.LEE: I was requested by one of the counsel appearing to let Mr. Menzies have a copy of the report of Mr. Donegan, the Chief Analyst, and I have decided that it seems to me it would probably be in the interests of the speedy conclusion of this inquiry if I were to make available Mr. Donegan's report to all counsel with this in mind: If that were done this afternoon counsel may be able to inform me, say by tomorrow morning, having glanced through it and it may not require much more than that, that they would admit that report as evidence, Mr. Donegan of course still being called to the witness box to explain various aspects of it. I think it would shorten the matter very considerably andalso if counsel could do that I would then tender the report immediately although we may not tomorrow morning have reached that actual stage of evidence, with this in mind: before we had reached that stage of the evidence, Your Honor may have a chance to appreciate the major aspects of it, anyway, and thus we would all have Mr.Donegan in the box in circumstances where we know what he is going to say; it would then be a matter of clearing up any doubts that may be left, he of course being open to cross-examination on any aspect.

HIS HONOR: I cannot see that any injustice would be occasioned from that course and it would certainly save a lot of time.

MR.LEE: Might I point out that the document which I hope will ultimately be tendered will exclude from the actual report the first three pages only because they mention various features of evidence which was available to Mr. Donegan and which he got from the inquiry and so forth which was conducted and which have been given in evidence from the witness box. I will simply delete those and ask Mr. Donegan whether he has heard anything from the witness which would in any way alter the views he has formed. Mr. Donegan has been in Court the whole time for that very reason. If counsel would be kind enough to have a look at it, we may be able to take a day off the hearing time. (No objection by counsel) I have no further questions.

HIS HONOR: Q. You are still on your former oath. Before I ask counsel to cross-examine, something has been put to me which I put to you for your consideration. You will recall that before the luncheon adjournment you put a possible alternative scheme for ventilating this working place by driving a cut-through in a single cut-through, coming ultimately to the working place? A. Yes.

Q. Do you think this is practicable, and if so do you think it is as good as, better than or not as good as the system which you have demonstrated, whereby instead of driving one cut-through you drive, just as has been done here, towards the goaf; there are three headings and you drive three, as it were, still with one off to the left so that you can then use one of them as an intake airway and ventilate the work as you go and ventilate it all the way through from the existing ventilation system? A. That would perhaps have been desirable, perhaps had we started this in the beginning. My postulation was only in the position as it stood at this time where a district is nearing its completion.

CROSS-EXAMINATION:

MR.MURRAY: Q. Of course, it is your view that the basic plan, the development plan, had deficiencies, is it not? A. No.

Q. Well, several times you have been careful to point out that your answers are based upon the workings being in the position that they were. Now why have you made that so carefully clear? A. The development plan was the driving of the three headings.

Q. I see; it was the development plan which was all right but the way in which the work was done did not even comply with the mine's own plan? (No answer).

MR.REYNOLDS: He did not say anything of the kind.

MR.MURRAY: Q. Well, I am putting it to you. (Question read by Court Reporter; objected to by Mr.Reynolds).

HIS HONOR: Q. Are you acquainted at all with any plan of the mine as set down for working the mine? A. Not of this particular area, no.

HIS HONOR: He does not know of any plan for working this particular area.

MR.MURRAY: Q. When you said a moment ago that the original plan did provide for something different, to what were you referring? A. The original development.

Q. The original development? A. The development as shown on the plan now, not as a projected thing but as a thing which has actually occurred, and when the three headings were driven out to the fault, then that was a development plan or a development project if you like to call it that way, and it was completed successfully in driving out to the fault.

Q.Then the extension of No.2 cut-through in your opinion is not sound? A. Not particularly the extension of No.2 cut-through, but the attempt to remove coal from the left hand side of the development headings.

Q.That was not good mining practice? A. It does not appear to me to be at the present time.

Q.Well, in the light of your experience will you agree with me that it was not good mining practice? (Objected to by Mr. Reynolds; question pressed; ambiguity to be cleared up).

Q.What is your position again? A. Senior Inspector of Collieries, South and West.

Q.And is one of your functions to ensure that proper mining practices are carried out in the collieries in your district? A.Yes.

Q.In your understanding of the term "proper mining practice", was it in your opinion on 9th November a proper mining practice to be working to the left hand side of the three headings? A. MAy I answer your question in this way, that in certain circumstances I would find nothing wrong with the practice. In other circumstances I would disagree with it. There are collieries where gas is not a problem, never has been, and where such a practice might quite easily be acceptable.

Q.But at the Bulli Colliery it was known to be gaseous wasn't it? A. Yes.

Q.So therefore you would say that in that colliery, the Bulli Colliery, it was not a proper mining practice to drive off to the left? A. I would agree.

Q.I beg your pardon? A. I would agree.

Q.Now, it is part of the Department's responsibility in the community, in your understanding, to make recommendations for Regulations for the proper introduction of safety equipment; is that so? A.Yes.

Q.You have said that you are expecting - I forget the exact phrase you used - as it were momentarily, something from England which is going to be a valuable assistance in the use of the Davies Safety Lamp; is that right? A. I don't remember saying that.

Q.IN your evidence you referred to something, and my note was that it had come forward in the last few months? A. Yes.

Q.What was it? A. An extension to the flame safety lamp.

Q.Which would enable it to test near the roof?A.Yes.

Q.And you say that is something new?A. Yes.

Q.Which was not developed in Australia but has been developed no doubt overseas? A. Yes.

Q. Due to research, I take it? A. Yes.

Q. Have you seen examples of this device? A.No.

Q.You yourself taught at Wigan at the school there, did you not?A. Yes.

Q.What is it called?A. The Wigan Mining Technical College.

Q.Is that the Science and Art of Mining Office in Wigan ?A. That is distinctly different from the Technical College.The Science and Art of Mining is a publication published in Wigan by an independent publisher.

Q.Certainly Wigan is noted for other things than Rugby League? A.Yes, its beer.

Q.Do you remember Mr. McTrusty in your day? A. No.

Q.Before your time, was it? A. No, I don't remember him.

Q.Now, I am suggesting to you that the inadequacies of the Davies Safety Lamp - you will agree that perhaps as long ago as when you were lecturing at the Wigan School - were known and recognised throughout the industry in England? A. No.

Q. Fifty years ago they were known and recognised throughout the industry in England? A. I have recently -

Q.Well, do you know that or not? A. - read a publication by Mines Research Board No.208 which I think was published in 1962, I may be wrong for a year or two, and in that paper it was explained why, and to my knowledge that is the only time it has been explained why the flame safety lamp proved inadequate for testing at or near the roof.

HIS HONOR:Q.How long has this safety lamp been in operation? A.The original Davies Safety Lamp was about 1842.

Q.Do you mean that over a century has gone by without it being realised that this safety lamp was inadequate for testing for methane gas near the roof? A. It would appear to me to be that way, Your Honor.

MR.MURRAY:Q.Would you listen to this and see whether you agree with it as being a statement of your knowledge today: "In mine air containing less than 2% of firedamp the safety lamp in its ordinary working condition and without special fittings is not sufficiently sensitive to give to the average fireman, examiner or deputy definite and unmistakable indications of the small amounts of gas present." Do you agree that that is a statement of our knowledge today? A. No.

Q.Why don't you? A. Because I think you can go lower than 2% on a flame safety lamp.

Q.Do you? Well, what I read to you was in a book published at Wigan in 1913? A. That may be so.

Q.You disagree with it, do you? A. I will give one reason for disagreeing with it: That is that in the years between 1913 and 1965 there have been improvements in the flame safety lamp to -

Q.You said you were expecting, as it were, or I put it to you that you are expecting almost daily a new addition to the flame safety lamp which will enable it to test near the roof; is that right? A. No, I did not say that.

MR. LEE: He did not say he was expecting it, but he was aware of the probe which had been formed in England and had been on the market for a few months.

MR.MURRAY: Q. This is a device which is used to make up for the inadequacies of the safety lamp to test near the roof; is that right? A. Yes.

Q.I suggest to you that there was in existence in 1913 a device which enabled that to be done. Do you know that or do you disagree with that? A. I have no knowledge of it.

Q.You have no knowledge of that, so that you as the Senior Mining Inspector for this district were not aware of any device which could be used with the safety lamp to enable it to test near the roof? A. Not -

Q.Would you have a look at that photograph and the one on the previous page -(Objected to by Mr. Reynolds; allowed).

Q.Would you have a look at those two photos and that diagram? (Shown to witness). It would be, would you not agree, a simple thing to devise an object which would withdraw air or gas from the vicinity of the roof and then squeeze it out into the holes of the safety lamp? A.Into the holes of the safety lamp?

Q.Yes, the intake holes that have been demonstrated to us earlier? A. There is no criterion that you are going to get a proper result if you are going to do that. That is too much of a hit-and-miss method.

Q.And certainly it appears from the pictures I showed you that a device has in the past been produced which enables air from the roof or even from a crack or crevice to be introduced into the flame safety lamp? A. Referring to the picture I have just examined, if you had referred me to the Hebblewhite Gray Safety Lamp, I probably would have recollected the name. I have seen that type of lamp in a museum. It was found most ineffective in practice.

Q.Was it really? Well, what about the Cunningham Cadman device- what museum is it in? A.Probably in the same one.

Q.Certainly you did say that the lamp can be used to detect CO2? A. Yes.

Q.Do you mean in the same way that Mr. Longworth demonstrated? A.Yes.

Q.That the lamp flame reduces in a characteristic way? A. Yes.

Q.There is no way that you can with the safety lamp detect the quantity of CO2, is there - the percentage in the air? A. No, you can only determine a percentage below which it exceeds - in other words, the lamp goes out at a certain percentage of oxygen and you assume there is a certain percentage of carbon dioxide present.

Q.And of course once you have lost your light you cannot test for methane? A. No.

Q.It is true that the significant thing as far as the inflammability of methane is concerned is that it is the proportion in which it is present compared with the proportion of oxygen that is present? A. Yes.

Q.And the presence of carbon dioxide in that it displaces other gas to come into the mixture is relevant to the

question as to what percentage of oxygen is present in the air? A. Yes.

Q. And until you know how much carbon dioxide is present you have no means of knowing what the methane/oxygen proportion is, have you? A. I cannot agree with you there. There is, if you have -

Q. With the flame safety lamp? A. Yes. As I explained this morning there is a way of detecting the percentage - perhaps not in the full mixture, but in the percentage at the top of the mixture which contains a certain percentage of methane. That can be done with the flame safety lamp.

Q. But you see that only gives you the percentage of methane, it does not give you how much oxygen is in the mixture, does it? A. The amount of oxygen is determined by the carbon dioxide effect. You know that there are certain minimum quantities of carbon dioxide present. You do not know the exact percentage but you know there is a certain minimum because your light has gone out.

Q. You see, it is possible, is it not, for a percentage of methane, measurable by the flame safety lamp, to be in the explosive range because of the proportion of oxygen present; that is right, is it not? A. Detected by the flame safety lamp, yes.

Q. You can detect methane on the flame safety lamp, say at 5% and - A. You are battling at that percentage.

Q. You are battling to detect it? A. Yes. It spirals and goes out.

Q. But that is the percentage round about which a mixture of methane and air is explosive? A. Yes.

Q. So that the flame safety lamp, do you tell me, is not adequate to test percentages of methane at the lower end of the explosive range? A. I don't think it is required to.

Q. Well, we have been told that your colleague found 5% odd of methane in this mine last Monday week? A. Yes.

Q. And I think you have just agreed with me that in certain circumstances, a 5% or a little bit more of methane present can form an explosive mixture? A. Yes.

Q. Then surely it is important for mine safety for the deputy or anyone else to be able to know they are working in an explosive mixture? A. A deputy's job is to withdraw the man when it reaches 2½% - to withdraw workmen when it reaches 2½%.

MR. REYNOLDS: That is general Rule 7, page 92.

WITNESS: 1.25% switch off electricity. 2½% withdraw workmen.

MR. MURRAY: Q. Well, can you detect 1.25% with the flame safety lamp? A. Many people claim to have done it.

Q. But surely you would regard it as pretty hard, would you not, to detect 1½%? A. Once again I have to resort to this, that an experienced observer should have no trouble.

HIS HONOR: Q. Let me show you Exhibit "U", page 5. Would you have a look at those illustrations, the effect of percentages of methane on the flame oil safety lamp, and tell me whether you agree they are an accurate representation of what should be seen? A. I would say so, Your Honor. They are.

Q. Would you look at the one for 1.5%? A. Yes.

Q. Would you say that to a deputy in the mine, who is the man charged, the ordinary deputy in the mine, the man charged with detecting methane by that device, that is a reliable test in conditions such as that? A. Yes.

Q. You do say so, do you? A. Yes.

Q. You think we could rely upon the ordinary run-of-the-mill deputy to say "Oh yes, there is 1.5% of firedamp there" when he sees this on his safety lamp? A. Can I preface my comment that an experienced observer should be able to say that, by experience meaning a man who works in a mine or district where gas is not unknown and where he is finding gas at times and sees it on the lamp - it might be in areas we have deputies who have never seen a cap outside the gas chamber, there is no gas found - with that reservation, I still think that.

MR. MURRAY: Q. Is this correct: Presumably the machinery and electricity, it is ordained, shall be turned off when the percentage gets to 1½? A. 1¼.

Q. Because of the safety factor? A. Yes.

Q. And that is why it is in the Regulation, in your understanding? A. Yes.

Q. Therefore it is important that the man responsible have equipment which can detect that level with certainty, is that right? A. Yes.

Q. Surely it would be practical for them to have a device which would warn them that he is getting towards the level of danger, would you agree? A. Well, condition of danger has not been reached when 1¼% is reached.

Q. Well, the position where some precautionary measures are laid down to be taken? A. That is 1¼%, but the condition of danger has not then been reached.

Q. Well, the machinery has to be turned off? A. Safety factor.

HIS HONOR: Q. Would you say it is a position of potential danger if not actual danger? A. Yes.

MR. MURRAY: Q. Because the percentage of gas, the concentration of gas, changes, does it not? A. Yes.

Q. And you have to anticipate that it will change under certain circumstances, have you not? A. Yes.

Q. One of those circumstances is where there is likely to be a change of barometric pressure? A. Possibly, yes.

Q. Well, would you expect that anyone with experience in mining would realise that the barometer goes down when it has been level for a certain period of time? A. Not necessarily. It sometimes goes up.

Q. But sooner or later it will go down, won't it? A. Yes.

Q. And when it goes down gas will come from the goafs? A. One expects it to.

Q. It is true also that there can be 1% in this corner and through a process of diffusion or layering there can be 5% in that corner (indicating), academically? A. I find it very

difficult to imagine the circumstances where I will get 1% in one corner and diffusion or layering will get 5% in another corner.

Q. Let us look at layering. You know that the gas, particularly when moving in a slow-moving current of air, does have a tendency to layer, to remain in the one strata, like a seam in the ground?A. Yes.

Q. So that, depending on where you were making the test, you could be making the test in a layer of fresh air and above it there could be a layer of methane, could there not?A. Yes.

Q. Therefore, is it not important for the tester to be given the warning of small concentrations so that he can be particularly conscientious and check the whole of the current of air?
A. Well, 1¼% is a small concentration as far as the danger level is considered. 1¼% leaves a safety factor of somewhere around four - rather more than four. The dangerous condition does not arise until you reach 5.4, and 1¼% leaves a safety factor of four or slightly over four when we take 1¼%.

HIS HONOR. Q. But you pull your men out at 2½%?A. Yes.

MR. MURRAY. Q. And are you able to be warned when using the flame safety lamp when the percentage is above six, or do you know it is merely above 5% and spiralling? What is the position?
A. You know when it goes above probably 4½% it will tend to spiral. Then you can't go beyond that - it is the highest percentage you can detect on a flame safety lamp.

Q. Is the flame safety lamp approved by the Mines Department?
A. Yes.

Q. Is it recommended by the Mines Department?A. Yes.

Q. Does it have your personal endorsement as an adequate instrument?A. Yes.

Q. And it has been your belief for many years that it is the best device, is that so?A. It has been a good friend for many years.

Q. Yes, but is it the best device A. It might not be the best device for detecting methane in all circumstances, but remembering that methane is only one of the gases we meet in mines, the flame safety lamp is the only device which will give me an automatic warning of the presence of gases which might be dangerous to my life. I refer to methane and I refer to black damp. It gives me a positive indication when these gases are present.

Q. In 1964 when the last explosion was at Bulli, the lamp had failed - (objected to by Mr. Reynolds; question withdrawn).

Q. In 1964 when there was a methane fire at Bulli, you know, do you not, that the lamp had failed to detect the presence of the layer of the gas?A. Yes.

Q. So, certainly since 1964 it has been known to the Department that this device had deficiencies which could lead to very serious accidents?A. Yes.

Q. How can you then say that that is the best device?A. Up till the present - and I refer to up to the present - we have nothing available in this country which will incorporate the great advantages of the safety lamp in a device that will allow us to

find concentrations of methane at or close to the roof.

Q. Nor to enable you to determine the level of methane in Illawarra bottom gas?A. I consider the flame safety lamp, properly used, can tell me the level of methane in Illawarra bottom gas.

HIS HONOR. Q. It may tell you, but what about telling the man who is employed by the management - the deputy, for example? A. As is said in my earlier evidence, an experienced observer should be able to use the lamp in such a way as to find indications of firedamp and the Illawarra bottom gas.

HIS HONOR:Q. I think that rather begs the question, does it not? A. I am sorry, I did not set out to do that.

Q. You are asked do you consider whether an experienced person should be able to doit? A. An experienced or skilled observer.

Q. An experienced or skilled observer: if I ask you what degree of experience and skill would be required you would tell me what would be the experience and skill necessary to be able to detect it on a safety lamp -

MR.REYNOLDS: It may be the deputies have an examination to see if they can do it, Your Honor, I don't know.

HIS HONOR: I don't know. One must be realistic.

MR. REYNOLDS: He may know, Your Honor.

HIS HONOR:Q. The management employs deputies who, in the absence of anybody superior are the servants of the management to detect these things? A. Yes.

Q. All sorts of things can upset deputies, I suppose: one would be that on that day he doesn't feel too much like work - the fact that he is a deputy does not make him the best worker - so he may go about his business in a slip-shod fashion? A. Yes, that is possible.

Q/. Another thing that may affect him is, I suppose, you get some dishonest deputies who say "We have to win as much coal as we possibly can on this shift, it is true it is dangerous but I will fail to report this because it means the men have to be pulled out." And I suppose you have the type of deputy who is highly skilled and may be relied on at any time to detect methane and estimate its percentage on the flame of the oil safety lamp? A. Yes, Your Honor.

Q. And then you get the deputy who, whatever training he has, is not very good at his work, as for example, there are some judges, some barristers and some mine inspectors who are not good at their work? A. Quite possible, yes.

Q. You have to take an average run of the mill deputy, and on the thing depends the safety of the work. Surely it is not enough to say - and I will put this as a question: do you think it is enough to say, well, the oil safety lamp is an efficient device in the hands of a skilled operator, skilled and experienced operator, and therefore we will rely on that and not go any further? Do you think it is enough to say that? A. No I do not go as far as to say that,

HIS HONOR: I did not think you would. I thought we might get the issue cleared.

MR.MURRAY:Q. It is possible to have such a presence of carbon dioxide for the mixture to be extinctive and yet for a dangerous level of methane to be present? A. The mixture to be extinctive?

Q. Yes. A. You take it - if I can put it this way: if you put a mixture in a jar and put the lamp in it it will go out quite definitely but you do not get such limits, close limits underground, there is an area between the fresh air I am

breathing here, the air I am breathing here and which I can breathe normally. There is a fringe area where the mixture is neither extinctive nor inflammable. In other words as you go down you reach a fringe area where the mixture is neither inflammable nor extinctive.

Q. Say at the top of that fringe area all you can detect is 1%. Can you detect 1% in your opinion on the safety lamp? A. It would be difficult.

Q. It would be difficult? A. Yes.

Q. Let us say the mixture is 2% on the fringe area, you have no way of knowing with the safety lamp what the percentage is below the fringe area, have you? There is no way of telling? A. I would not be interested in finding out.

Q. If it is 2% you just call the men out? A. I would conclude that there was a mixture down there that could possibly be explosive and I would take steps to have the condition removed and the men put in a place of safety, yes.

Q. Say you only detect a little over 1%, would you make the same deduction? A. It would depend on the height this was obtained from the floor. In other words if you obtained this six inches from the floor you would have to have a close look at it. If you obtained it three feet from the floor I do not think there would be much doubt.

Q. It would be quite possible to find a mixture and to find methane below it? A. No.

Q. Not possible? A. No.

Q. Not even when there is this layering effect? A. No.

Q. Why isn't it possible? A. The methane, if it is given out by the seam on its own, immediately goes to the roof.

Q. This safety lamp in the present form, the one which has been exhibited, has been in that form for many many years, hasn't it? A. There have been modifications and improvements over the years.

Q. How long has that model been in use to your knowledge? Twenty five years? (Witness shown safety lamp).(Question objected to by Mr. Reynolds.

HIS HONOR: I thought it was a lead-up question of the type which of itself is not very relevant but may produce something.

MR. MURRAY: Yes,Your Honor, I want to establish that it has been used like that for some years. Twenty five years is just a figure I took.

Q. I will say five? A. It probably has been used for twenty five or thirty years, I would say, that model.

Q. It has certainly been in use since 1964? A. Yes.

Q. It was known in 1964 that this lamp for the safety tests in mines was not the complete answer? A. Yes - (Objected to by Mr. Reynolds: argument on the objection ensued and as to His Honor's powers of inquiry.)

Q. Would you like to confirm your answer that has just been read as being in the affirmative? A. The answer is Yes.

Q. What research, to your knowledge, has been carried out by the Department or elsewhere directed to the question of producing the perfectly adequate mine safety lamp? A. As a result of the incident at Bulli in 1964 extensive inquiries have been made overseas which the Chief Inspector visited with a view to obtaining equipment which will be satisfactory for this particular purpose. The Chief Inspector did obtain information about the safety lamp fitted with a probe which is now undergoing tests and which is probably ready for production now in Great Britain.

Q. What about the other devices that have been mentioned, the methanometer, the one Mr. Longworth was using, the Toka? A. They are quite suitable for the purpose.

Q. Would you speak up, traffic outside makes it hard to hear you? A. They are quite suitable for the purpose.

Q. Do you agree with the opinions that have been expressed hitherto that they are, for some purposes, better than the safety lamp? A. I will agree that used as an adjunct to the safety lamp they have advantages.

Q. Has there been to your knowledge any recommendation through the Mines Department that the regulation be changed so that methanometers or Tokas be compulsory? A. Certain legislation has been changed to make methanometers compulsory in certain circumstances.

Q. Does that appear in the Act? A. Yes.

Q. What are your views on the use of automatic gas detecting devices? A. They have their job in industry.

Q. They have enormous advantages for use in coal mines? A. They have, if they work properly.

Q. Provided they are supplemented with an individual device such as the lamp or something like a methanometer? A. Yes.

Q. To your knowledge has there been any recommendation by or through the Mines Department to introduce legislation or regulations to make automatic gas detectors compulsory at the work face, for instance? A. At the present time there is an automatic monitor, methane monitor, I think it is on its way to this country for examination and testing with a view to its use on mining machinery at the coal face.

Q. Did you say "on a compulsory basis"? A. "At the coal face".

Q. On a compulsory basis? A. I am afraid I cannot have any indication what the Minister will do with the legislation.

Q. I mentioned to Mr. Longworth a number of devices which I found in a book at the local library: Are you familiar with those or would you like me to read them again? A. I did not hear them. I was not here.

Q. Naylor's Automatic Spiral Arm Gas Detector? A. Never used it. I have heard of it.

Q. Do you know whether it has ever been tested or adopted for use in mines in New South Wales? A. I would not know.

Q. To your knowledge before the fire at Bulli in 1964 was anything done by the Department or any of its agencies to have investigations made in relation to automatic monitors? A. We have had men overseas who have investigated these problems overseas.

Q. Have you read their reports? A. Yes.

Q. Have you any knowledge that monitors are used in mines, say, in Germany? A. I cannot answer for any particular country or any particular machine but I have seen it mentioned in some of the reports that monitors are being used in certain circumstances in certain countries.

Q. For the detection of mine gas? A. Yes.

Q. And being used successfully? A. Yes.

Q. I suggest to you the Department's investigations have revealed that these monitors have been used in some other countries of the world for years now? A. The types that are in use just now are conpletely new to the mining industry.

Q. Do you know of the Ringrose Automatic Firedamp Alarm?A.Yes.

Q. That is a device which makes a noise when the methane gets above a certain level? A. Yes.

Q. It would have been very valuable if one had been hanging in the shunt? A. I found it useless.

Q. The M.S.A. - we have heard about the methanometer - what about the Mont Lucon Detector? A. I do not think it is an automatic detector. At least, the one I am familiar with was not an automatic one.

Q. Is Naylor's all right? A. I had heard comments - it seems to me to be all right. I have never used it and do not express a personal opinion.

Q. You have to look at it? A. You have to use it.

Q. Do you know whether the Mines Rescue Division or any other instrument of the Mines Department have been carrying out any research or investigation into the production of a device which will automatically detect mine gas and make a noise? A. In New South Wales?

Q. Yes? A. No.

Q. You would agree, as a matter of principle, to have an efficient device of that nature would be a very valuable aid? A. I agree.

Q. You agree with the remark that learned senior counsel for the Minister made in response to a comment by His Honor that a fair and accurate appraisal is that the flame safety lamp is not the complete answer. Do you agree with that? A. Yes.

Q. And that has been the case now for years, hasn't it? -

HIS HONOR: I suppose if it is so today it must have been so in the past.

MR. MURRAY: I should have said it has been known to be the case, I'm sorry.

Q. It has been known to be the case for years, hasn't it? A. When you use the expression "years", that is rather a wide thing, that could be 100 years or 2 years.

Q. It has been known to departmental officials since, I suggest, 1950 at least? A. My first knowledge of it was in the report from Britain in 1957.

Q.Was it? A. Yes.

Q.Was that following the disaster at Auchangaech in Scotland? A. No, from my memory it was an explosion at Chanters Colliery in Lancashire. I would stand to be corrected on that.

Q. You know this device (indicates) or the one that has been tendered on your behalf? A. Yes.

Q. What is the correct name? A. A self-rescuer.

Q. Do you know this one I have an example of? A. Yes.

Q. It is basically the same as the one that has been tendered? A. Yes.

Q. They are used widely overseas, are they not? A. In some countries they are used, in others they are not.

Q. For instance you know this one is approved for use in Germany by the Mines Rescue Service?A.Yes, the A.U.E.R.

Q. Do you know of any submission which has been made by the Department or the officers of the Department for the compulsory introduction of this device? A. Yes.

Q. When were they made? How long ago? Since the 9th November? A. Oh no. No. When I was in Newcastle, probably about 1960 or 1961 - somewhere in that year.

Q. Although I suppose it is impossible to say with any certainty, these devices would have been very valuable in the situation just inby of the intersection when the men, that is the group of four, reached the fire, wouldn't they? That is the very situation in which it would be useful, where you are required to go through a short distance containing smoke and carbon monoxide? A. No that is not the purpose.

Q. What is the purpose? A. The purpose of the self-rescuer is for use in a colliery where an accident has occurred and where the men are uninjured but are cut off by a region of the mine which contains carbon dioxide.

HIS HONOR: Q. Carbon dioxide? A. Carbon monoxide, I am sorry, Your Honor - to pass through an area which contains carbon monoxide and the presence of enough oxygen to keep life going. They cannot be of any use where there is no oxygen.

MR.MURRAY: Q Do you know that this device and its container weigh 2.2 lb.? A. I would accept that, I do not know exactly.

Q. And it can be used to survive for at least one hour where the oxygen percentage is as low as 14%? A. Yes.

Q. Would you agree with those figures? A. I would accept those figures, yes.

Q. And provide protection against concentration of carbon monoxide? A. Yes.

Q. Carbon monoxide is given off, is it not, as one of the by-products of mine fires? A. Not necessarily from an open fire, it is given off as a by-product of spontaneous combustion but in open fires the amount of carbon monoxide given off is limited - I am not saying it is not given off, but it is limited.

Q. Do you know that men who work in coal mines over any length of time develop a very sensitive sense of smell - they become

conscious about odour? A. It is possible, I would say.

Q. Do you agree or don't you? I am not pushing you to it? A. In some people it is very highly developed, in other people it is not developed. I have no sense of smell myself - no great sense of smell.

Q. Certainly you would expect mine men to detect the smell of burning wood, wouldn't you, or wood smoke? A. Yes.

Q. That would be a very atypical odour in a mine? A. I can't say it would be a typical odour.

Q. Very atypical I said - one you would not find in mines if circumstances were normal? -

HIS HONOR: Q. Very unusual? A. A new word on me.

Q. The opposite to typical? A. I am sorry, that's a new one to me. It is not normal in a mine and as you said would be detected fairly easily.

MR. MURRAY: Q. Were you present when the reconstructed circumstances of the fire were carried out last Monday week? A. No.

MR. REYNOLDS: Before we adjourn, I might state that my clients have put me in possession of a report made only last month to the Ministry of Power in the United Kingdom concerning an incident at the Crambrian Colliery, Glamorgan, in May of this year and it has several matters of interest in it - not as proving anything - but it deals with the same sort of problem that we have been applying our minds to a great deal today, firedamp detection and monitoring. I thought I might get the relevant parts photostated so that they could be made available as I think it would assist Your Honor. It shows the stage they have reached in the United Kingdom concerning this problem. It was only published last month, probably after this incident here. It does deal with the state of knowledge in the United Kingdom about this very thing and if my friends are agreeable that Your Honor should have this they may look at it in the meantime and I will have it photostated, as showing the thinking that is going on about this very problem in the United Kingdom.

MR. PARKINSON: What method of production?

MR. REYNOLDS: I don't know.

MR. PARKINSON: Don't you think that might be important?

MR. SULLIVAN: I would like to have a look at it before Your Honor, in consultation with my experts.

HIS HONOR: I would be very pleased to have anything of that nature if it will assist me. Would you gentlemen please consider it, it may well be of some use.

MR. LEE: It might be material and probably will become material if not in evidence, certainly in addresses, to see what the authorities in England have done with regard to the use of methanometers and the like and for the benefit of the Bar table the relevant reference will be found in the Statutory Instrument of 1956, with some very very minor and unimportant amendments since and you can say, generally, there is no requirement in England for methanometers, or no greater requirements there than there are in our regulations although the devices seem to be more available over there than here.

(Further hearing adjourned till 10 a.m. on Wednesday, 15th December, 1965).

IN THE COURT OF)
COAL MINES REGULATION) No. 1 of 1965
HOLDEN AT BULLI)

BEFORE HIS HONOR JUDGE GORAN

ASSESSORS: MESSRS. MAHON and BUCK

WEDNESDAY, 15th DECEMBER, 1965

- - -

IN THE MATTER OF AN INQUIRY IN PURSUANCE OF THE COAL MINES REGULATION ACT INTO AN ACCIDENT WHICH OCCURRED AT THE BULLI COLLIERY ON 9TH NOVEMBER 1965 AND ITS CAUSES AND CIRCUMSTANCES.

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(PART HEARD)

MR. LEE: May I deal shortly now with the tender of Mr.Donegan's report and inquire whether any of my learned friends have any objection to that report, copies of which have been supplied, being tendered. (No objection). Mr. Reynolds has very properly pointed out that at p.10 of the report one finds some observations by Mr. Donegan which he himself concedes are not within his province. They may just be read and rejected; we do not rely on them.

HIS HONOR: If this is tendered I will not have it transcribed as part of the evidence unless there is some special reason for transcribing it. I understand the Minister is receiving a copy of the transcript. Would you have a copy report available for the Minister?

MR. LEE: Yes.

(Report of Mr. Donegan admitted and marked Exhibit "X")

ROBERT ADAIR MENZIES,
On former oath,
cross-examination continued:

HIS HONOR: There are two questions I think I should ask at this stage to enable counsel to deal with any matters which may arise out of them. I propose to do this now rather than later.

Q. Mr. Menzies, once gas has been discovered in the shunt prior to the fire - assuming gas had been discovered - was it or was it not a proper practice to use the shunt for the shuttle car? In other words, to allow a shuttle car to work in the shunt, until that gas had been removed? A. If gas had been found in quantities which precluded the working of electrical equipment in the shunt, it certainly would have been desirable to exclude the use of the shunt from that time on.

Q. There is some rule covering the question of electrical equipment, is there not? A. Yes.

Q. Leaving apart any breach of such rule or any possible breach of such rule, what about as a matter of ordinary safety in the mine; was it a wise matter or not to allow a shuttle car to work within a shunt once gas had been discovered? A. I can only refer to the shunt, this particular shunt, not taking a general opinion about any place in any mine; but in this particular shunt, in my opinion, because of the circumstances, it would have been inadvisable to continue using the shunt for the purpose for which it was beingused.

Q. The other matter I want to deal with is this: You will recall yesterday there was some question of whether the opposite side, that is the left-hand side looking down No.2 cut-through to the working place, could have been used as a shunt, and I think you poined out that there was a question of cables being there? A. Yes.

Q. Now I take it you do bear in mind that there are two shuttle cars in operation? A. Yes.

Q. Would it have been possible to use that side as a shunt, that is the opposite side as a shunt, by letting the alternative shuttle car shunt andletting the shuttle car No.40, the one involved, run straight through? A. Yes, Your Honor, it would have been possible.

MR. LEE: I did not quite follow the significance of the answer Mr. Menzies gave to Your Honor's question about whether the finding of gas before the accident meant it was advisable or inadvisable to use the shunt. Mr. Menzies said it was inadvisable. I wonder whether Your Honor or I can make it clear as to whether it is to be understood that the finding of CO2 which was the finding that was made before the accident of gas in that area was what made it inadvisable or whether Mr.Menzies had something else in his mind.

WITNESS: I accepted the fact that CH4 was found in the shunt.

HIS HONOR:Q. You based your answer on the assumption that CH4 had been found in the shunt? A. Yes.

Q. Assume a deputy Had found CO2 in the shunt, should he then have started a series of tests for CH4? A. From my knowledge of Bulli Colliery and from my information regarding the finding of Illawarra Bottom gas in the Bulli Colliery at that time, he would automatically have assumed it was black damp. He had no reason to think it was Illawarra bottom gas but it has been revealed in evidence here by two witnesses that Illawarra, or bottom gas had been found in Bulli Colliery at some time in the existence of the colliery and from that knowledge I think it would be fair to say he should have accepted the possibility of the CO2 - black damp - being in fact not black damp but Illawarra bottom gas.

Q. And therefore have tested for it? A. Yes, Your Honor.

HIS HONOR: Mr. Murray, had you finished?

MR. MURRAY: Yes, Your Honor.

MR. PARKINSON: Q. Who informed you the rescue stations were officially advised and apparently called upon for assistance at 9.55 a.m. on Tuesday November 9th? A. The rescue station Superintendent.

Q. Have you heard any criticism of the rescue teams' efforts from any source? (Objected to by Mr. Reynolds; allowed) A. None whatsoever.

Q. You have only heard the highest commendation? A. Yes.

Q. You stated that the Under-Manager at Old Bulli Colliery was on the job at 8 Right supervising, I take it, fire fighting operations at 9.43 a.m.? A. At that time fire fighting operations had not commenced insofar as they were unable to approach the fire under fresh air conditions because of the smoke and at that time he was organising supplies of material required for fire fighting operations.

Q. At the 8 Right Section? A. At the 8 Right Section.

Q. That was at 9.43 a.m.? A. Yes.

Q. Who supplied you with that information? A. The Under-Manager.

Q. The Under-Manager himself? A. Yes.

Q. Did the Under-Manager indicate to you where he was when he was notified of the incident at 8 Right? A. I cannot remember him saying positively where he was but from other knowledge I know he was in that split somewhere, not the 8 Right split but on the 2 North Main split somewhere, inspecting another district somewhere.

Q. To the best of your knowledge he was in another part of the mine? A. Yes.

HIS HONOR: Q. This was at the time of the fire? A. Yes.

MR. PARKINSON: Q. Have you any idea as to what distance the Under-Manager would have to travel from the other portion of the mine to 8 Right Section? A. If my assumption is correct as to the section he was in, probably a mile to a mile and a half.

Q. What would that entail in minutes travelling? A. On his feet, in a hurry, and knowing the Under-Manager, quarter of an hour.

Q. So he would proceed to 8 Right Section as a result of some information received? A. Yes.

Q. If it was 9.43 when he arrived at the 8 Right Section and in your assessment it would take him approximately 15 minutes that would be somewhere in the vicinity of 9.28 when he would be notified? A. Yes.

Q. Did he indicate to you how he was notified and who notified him of the incident at 8 Right? A. No.

Q. Do you think that there was a length of time from the time the Under-Manager was notified at 9.28 to 9.55 when the rescue stations were notified?-

MR. REYNOLDS: I do not understand that.

HIS HONOR: I do not understand it myself. Would you please clear that up, Mr. Parkinson?

MR. PARKINSON: Yes, Your Honor.

Q. If the Under-Manager was notified at approximately 9.28 that this incident had occurred at 8 Right have you any explanation to give as to why it was not till 9.55 that the rescue stations were notified? A. If the surface was informed at the same time it appears to me to be some delay in the message being passed from the surface to the rescue station.

Q. AND of course in incidents like these the rescue station, or at least the team from the rescue station, are key personnel? A. Yes.

Q. And every minute counts in a situation such as had developed at Bulli, such as the one on November 9th? A. Yes.

Q. Evidence establishes that the 8 Right Section commenced operations some time in May this year? A. Yes.

Q. Mr. Longworth established the fact that he visited this particular section on 29th June this year? A. Yes.

Q. And that they were still working solids - three headings? A. Yes.

Q. And he also indicated that from his point of view as a Government Check Inspector the ventilation system at that particular time was satisfactory? A. Yes.

Q. When were you first acquainted, as the Senior District Check Inspector that pillar extraction had commenced in this area? A. Not until 9th November.

Q. Not until 9th November? A. That is so.

Q. Does that mean that you were not acquainted with the method of ventilation obtaining during the course of pillar extraction in this section until 9th November? A. Yes.

Q. The Mines Department has certain powers relating to safety and health in New South Wales coal mines, haven't they? A. Yes.

Q. For instance, is it an offence against the Coal Mines Regulation Act to take into any mine an ordinary electric torch? A. AN ordinary electric torch?

Q. Yes, an ordinary electric torch? A. Yes.

Q. Why is that an offence? A. It is not a flame-proof design.

Q. And it is not certified? A. Not approved by the Department.

Q. And has not received the Department's approval? A. Correct.

Q. Would the Department say that would be an unsafe practice to take an electric torch, ordinary electric torch, into the coal mine, into any mine? A. Yes.

Q. Any new type of machinery not having been used in any mine in New South Wales before, can it be introduced by any management without the approval of the Mines Department? A. No.

Q. Is this because that particular type of machinery has to be tested by the Mines Department to see that it measures up to the standards, minimum standards of safety required? A. In some cases where a certificate of flame-proofness is forthcoming from a recognised Departmental body, a Government body overseas, we sometimes do not carry out the test, we accept the certificate.

Q. But in the main is this testing of machinery or any appliance before it is allowed to go into a mine primarily to see that as the result of the tests the equipment measures up to minimum standards of safety as set down by the Coal Mines Regulation Act? A. Yes.

Q. Had you ever discussed with the Government Mines Inspector in this district, or the Chief Government Mines Inspector this method of ventilation that was being used during the course of the pillar extraction in 8 Right? A. Before or after 9th November?

Q. Before 9th November? A. No.

Q. Do you know from your own knowledge that this method of ventilation was not approved of by the Mines Department? A. Before or after 9th November, again?

Q. Before 9th November? A. No.

HIS HONOR: You don't know? You say you don't know whether or not it was approved or do you know it was not approved, or what do you say? A. I don't know whether it had been approved or not, your Honor, I did not know it existed.

MR. PARKINSON: Q. Since the 9th November you have had an excellent opportunity, have you not, to have a look at this ventilation system that was in operation prior to the fire? A. Yes

Q. Would you approve of that particular system? (Objected to by Mr. Reynolds; question allowed in the form "Do you approve of it?" that question also objected to by Mr. Reynolds).

HIS HONOR: Q. Do you approve of it? A. No.

MR. PARKINSON: Q. Would your disapproval of this method be motivated by the fact that in your opinion there were inherent dangers to this particular system of ventilation? A. There were possibilities which would appear on a look at the ventilation system as used in the section.

Q. But you would not be prepared to say that there were, or would you say that there were potential inherent dangers? A. In Bulli Colliery, yes.

Q. Would you expect the manager of Old Bulli Colliery to have reached a similar conclusion, being a mining man? (Objected to by Mr. Reynolds; rejected).

Q. Well, as the line of pillars retreated, this automatically extended the goaf area, did it not? A. Would you repeat your question please?

Q. As the line of pillars in that pillar extraction retreated, that automatically extended the goaf area? A. Yes.

Q. And with this method of ventilation did that in itself lay the basis for the build-up of gases? A. No.

Q. Is it elementary mining practice - just elementary mining practice - to have goaf emissions to travel the shortest distance possible into the return? A. Yes.

Q. But this particular method did not carry out that elementary practice? A. The nature of the goaf gas was such that the goaf gases did take the shortest way to the return airway.

Q. But in the process - A. Passed through the working area.

Q. And that is not considered good mining practice? A. No.

Q. Now, this seam at present being worked at the Old Bulli Colliery: What is its number? A. No.1.

Q. Is it a common occurrence in pillar extraction to experience what is known as floor heave? A. In many cases you do have floor heave associated with pillar extraction.

Q. Would you like to explain now this question of floor heave to His Honor? A. Floor heave is caused in the working areas of the pillar extraction district because of the weight of the superincumbent strata acting upon the pillars and that weight being transferred to the floor which, being more plastic than the coal, tends to flow and in flowing it flows into the roadway itself and we have the phenomenon known as floor heave.

Q. Is it only pillar pressure that can create floor heave? A. In instances overseas I have known where floor heave was caused by the pressure of gases from seams below. That phenomenon, however, is rather rate in my experience.

Q. But it is still a possibility? A. Yes.

Q. To your knowledge was there any evidence of floor heave in the preceding goaf area or the area that is the subject of this particular inquiry? A. I didn't see any.

HIS HONOR: Q. You did not go through the goaf area? A. No. I am referring to the edge of the goaf, the working area.

Q. Mr. Parkinson, did you intend your question to refer to any part of the goaf or only the edge?

MR. PARKINSON: Any part of the goaf at all, from the commencement of pillar extraction and particularly in the workings where they were working at the time of the disaster.

HIS HONOR: Q. Would you have to go into the goaf to see whether there was any evidence of that? A. No.

Q. You would have seen it, would you? A. Yes.

Q. But you saw no evidence at all? A. No evidence.

MR. PARKINSON: Q. And did you inspect this section at any time? A. No, not until after the 9th November.

Q. Could you tell me the thickness of the bottom strata from No.1 seam to the No.2 seam? A. On that particular area I would not know it from my own knowledge, but I have been informed it is 30 feet. But I wouldn't know it of my own knowledge.

Q. If at some time floor heave had occurred is it possible that gas from the No.2 seam could be emitted from the floor in No.1 seam? A. Very possible.

Q. And what type of gas would you expect in that emission? A. Well, No.2 seam, I have no idea what its main gas would be but it could be only two things or three things- methane, black damp, bottom gas.

Q. On Monday of this week, I think Mr. Reynolds posed the question to Mr. Longworth at p.238 of the transcript at the third last paragraph and Mr. Reynolds' question to Mr. Longworth was this: "Q. Let me put this to you: There are more problems in mining engineering than ventilation? A. Yes, that's right." Now would you agree with that particular point of view? A. Yes.

Q. The inference of this particular question is that there are more things to be considered in mining than ventilation? A. Yes.

Q. Would you agree with me that unless there is an adequate and correct system of ventilation there can be no coal production whatsoever? (Objected to by Mr. Reynolds; allowed). A. Will I answer the question, Your Honor?

HIS HONOR: Q. Yes please? A. Would you please repeat the question then Sir?

MR. PARKINSON: Q. Would you agree with me, if there was not adequate ventilation in a mine then there could be no coal production whatsoever from the point of view of the Coal Mines Regulation Act? A. Yes.

Q. Therefore while it is true to say that there are more mining engineering problems than ventilation it is also true to say, is it not, that ventilation is the main problem for the successful working of a coal mine? A. It is a prime consideration.

Q. Would you say that ventilating a mine today, bearing in mind the intensive mechanisation that has developed in the coal mining industry, would you say it is an easier problem today to ventilate than it was in the old pick mining days? A. It is easier.

Q. And is this due to the fact that instead of 80 to 90 pairs of miners being spread over acres of ground underground, we have a form of concentrated mining? A. Yes.

Q. In this particular instance we had a form of concentrated mining, did we not? A. Yes.

Q. And we had ten to twelve men employed in this particular area? A. Yes.

Q. And yet the management was not able to evolve a system of ventilation that you would approve of? (Objected to by Mr. Reynolds).

HIS HONOR: Mr. Parkinson, the main reason for rejecting that question is that it is a matter of inference for me. You can submit these matters to me later as a matter of comment but it is hardly a matter of evidence. I will certainly be prepared to listen to your arguments in due course.

MR. PARKINSON: Q. Let us assume that the management had been forced to withdraw the men in this particular section and stop the place as a result of gas concentration; would this have had to have been reported to you as senior inspector? A. No.

Q. It would not have had to be reported? A. No, I don't think so.

Q. From your own personal experience do you know of any occasion when the management at Old Bulli Colliery have voluntarily stopped a place as a result of gas concentration? A. Not of my own knowledge.

Q. How long have you been senior inspector in this district? A. Two years.

Q. Do you know from your own experience as the senior district inspector where in your opinion coal production has taken precedence over safety in any mine? (Objected to by Mr. Reynolds; rejected).

Q. Now, a person must pass certain examinations to qualify for a third class ticket, known as a deputy's ticket? A. Yes.

Q. Once he has qualified what is the procedure for an appointment as a deputy to a colliery; say as a deputy at Old Bulli Colliery? A. The manager obtains his deputy's certificate and his number, obtains a medical certificate indicating that his eyesight and hearing are in order, and the medical certificate being dated no more than three years previously. If these are in order the manager appoints him, in writing, and retains his medical certificate at the colliery along with the number of his deputy's certificate.

HIS HONOR: Q. What do you have to do to get a deputy's certificate? A. There is an examination - the syllabus is set down under the Coal Mines Regulation Act. Examinations are set

by three men experienced in themining industry, and first of all it is a written examination in which the candidate must obtain a certain percentage to pass. That is followed up by an oral examination and practical examination of the successful candidates in the written examination.

Q. So, at any rate at least in theory, it sounds like a very adequate examination? A. Yes.

MR. PARKINSON:Q. Has the Mines Department as such any say in the appointment of a deputy? A. No.

Q. Have the unions any say in the appointment of a deputy? A. Not that I am aware of.

Q. So the management has the sole right of appointment? A. Yes.

Q.Now you would agree with me that a deputy is a very important employee in a mine, relating to safety in particular? A. Yes.

HIS HONOR:Q. I understand there is a qualification to that question of whether the mine management has the sole right to appoint a deputy. Their hands are tied to some extent, are they not, by the fact that if there are any deputies who are out of work they get preference? A. I believe that position exists in other coal fields but it does not exist in this coal field. I see adverts. in the local papers for deputies.

Q. Apparently there is nobody out of work? A. Yes.

MR.PARKINSON:Q. But you agree he is a very important employee? A.Yes, I do.

Q.But he is subject to managerial control?A. Yes.

Q.Can you give me one cogent reason why the Mines Department should not appoint, become the employers, of all deputies in New South Wales? A. I do not feel competent to answer that question.

Q.You did say yesterday, or at least this is the way it appeared to me, that you did not think it was the intention of the management to hole into the goaf in the pillar that was being extracted? A. I said that.

Q.Now when you say you do not think it was his intention,what are the factors leading up to this conclusion of yours? A. My postulation as to what events and what conditions led up to the incident on the 9th November led me to the belief that that goaf to the left of A Heading contained noxious and/or inflammable gases and to hole into the goaf in the position there might lead to unfortunate conditions developing at the coal face.

Q.A very serious situation could develop?A.Yes.

Q.Well, if they did not hole into the goaf, would they have a fender 100 yards long? A.Yes.

Q.Would the Department approve of that?(Objected to by Mr.Reynolds).

Q.Well,would you approve of that as the senior district inspector? (Objected to by Mr. Reynolds).

HIS HONOR: Q. Do you approve of it now; that is the same thing? A. There are two sides of the fence for me in this regard,

Your Honor. I am also entrusted with the object of seeing that coal is conserved for the nation and coal is utilised to the best advantage, and in that regard I would probably agree with Mr. Parkinson that I would look unkindly on wastage of coal. But there are conditions which outweigh that wastage of coal when one must have a balance of the two things: Conservation of coal and safety matters.

Q. Would you not agree that safety is the consideration rather than conservation of coal? A. It is predominant.

Q. Is there any principle that operates in either the industry or the Mines Department that coal can be won in unsafe conditions? A. No.

MR.LEE: I do not think he answered Mr. Parkinson's question.

HIS HONOR: There was an answer, that he had to have a balance.

Q. I take it that what you have said is this, that while you do not like to waste coal you would have to approve of such a thing in the interests of safety? A. Yes.

MR.REYNOLDS: Approve or disapprove?

WITNESS: Approve.

MR.PARKINSON: Q. And would you approve of such a method even after making allowances for the very inherent dangers that you had already just previously described? A. I would approve because the barrier or the fender left is of such a thickness that it would stand for as long a time as was necessary for the part of the pillar that was being extracted to be extracted.

Q. So it would withstand any roof weighting? A. It would not withstand any roof weight, but as I postulated before, there was no evidence of any massive weight on 8 Right Section and in the conditions I could not see a massive weight developing to such an extent that it would destroy completely the ten yards fender that was being left.

Q. But isn't it considered good mining practice to extract pillars on a straight line as quickly as possible and all coal if possible? A. It is.

Q. Now we would not be doing that here, would we? A. No.

Q. Had they done this previous to that in this particular section? A. Well, examination of the working plan of the section as it progressed seems to indicate there was considerable amount of coal lost in the pillar extraction process.

Q. And to your knowledge how was this coal lost - was it lost as a result of this particular type of fender system or was it lost as a result of roof weight? A. In my opinion - and it is only an opinion because I was not there to see it - but I know that these workings were in close proximity to a fault and it is quite often found that in close proximity to a fault, roof conditions are abnormal and one cannot expect the men to work under the roof conditions that prevail, and it is quite often necessary to take what coal you can and pull out in the interests of safety of the work-men.

Q. But the point I want to get to you is do you know if the coal that you are referring to that was left in the goaf was left as a result of a fender or left as a result of stooks due to roof pressure? A. Well, I have no indication. As I said I was not there, and as I previously said, my impression

from the working was that it was due to inherently bad roof.

Q. Let us assume then that this form of fender that we are discussing now had not been used prior to this particular pillar. Would that indicate anything to you as to the reason why it was being left there, the fender? (Objected to by Mr. Reynolds; allowed if relevant directly or indirectly to the fire.)

Q. First of all, you said you did not think it was the management's intention. Had the management told you of their intention in relation to this particular pillar that was being extracted, as to whether they were going to break into the goaf or not? A. In 8 Right?

Q. Yes. A. No.

Q. I refer to page 135, the second paragraph under "cross-examination". Mr. Ackerman is in the box and was asked this question: "Were you at any time given any instructions what you had to do in the event of a particular work place holing into the goaf?" The answer was "Yes". The next question was "What were those instructions you were given?" the answer was "That the minute we holed into the goaf, to move back as fast as possible to let the fan draw out as much gas from the goaf as it possibly could." My next question was "Who gave you those instructions?" the answer was "The deputy". In the light of that evidence, Mr. Menzies, would you say that it was the intention to hole into the goaf? (Objected to by Mr. Reynolds).

MR. LEE: The witness could be available within a reasonably short time if the Court thought it was necessary.

MR. PARKINSON: It would be a simple matter to call him back into the box.

HIS HONOR: If you would like him called I will have him called. I would like some indication where this is going to take us before I decide finally on that. Ask your next question.

MR. PARKINSON: Q. Just let us sum up this situation: Mr. Longworth has indicated that the method of ventilating, to use his term, was "inadequate". You have already given evidence that there was a build-up of goaf gases? A. Yes.

Q. And if it is accepted now, that holing into the goaf, which Mr. Ackerman talks about, which was apparently accepted by Deputy Cambourne, that there could very definitely be a build-up of gases at that particular end of the goaf also -(Objected to by Mr. Reynolds).

HIS HONOR: I do not think you can get that from this witness, you may get it from Deputy Cambourne.

MR. PARKINSON: Q. Would you say as a result of your investigations that there was an emission of gas from the floor in the shunt? A. No.

Q. You do not think there was any emission of gas from the floor in the shunt? A. No.

Q. Where do you say the gas Mr. Longworth found in the shunt was coming from? A. From the goaf, behind the goaf.

HIS HONOR: I do not think any counsel, and I include in this counsel for the company or counsel for the deputies, will quarrel with the proposition that the gas came from the goaf

and gas in fact had previously collected in the goaf and that that gas included blackdamp, bottom gas, methane.

MR. McNALLY: We understood certain tests were being carried out. I am not familiar with what the tests actually were. I do not know whether they have been completed. I understood a search was being made to ascertain this.

HIS HONOR: As to the tests, Mr. Parkinson is speaking about the gas coming from the floor.

MR.McNALLY: We cannot commit ourselves until we heare all the evidence.

HIS HONOR: Until I have positive evidence before me that gas was coming from the floor of the shunt I am at the moment, and you would not argue to the contrary, I think, left with no other conclusion on the evidence that these gases came from the goaf, that they were goaf gases that came into the shunt, wherever else they went. That is the position I am in. If that is of any assistance to you, Mr. Parkinson,it may lessen your burden.

MR.McNALLY: As I understand it there is a distinct possibility.

HIS HONOR: Theyhad better hurry and find it.

MR.LEE: I did not hear what Mr. McNally said - that there was a distinct possibility of --

HIS HONOR: Of gases coming from the floor of the shunt.
MR. LEE: I see. Maybe that is his case and we will hear evidence.
HIS HONOR: I am inviting the evidence.

MR. McNALLY: Your Honor has misunderstood me and Mr. Lee has misunderstood me and Mr. Lee has assisted Your Honor in the misunderstanding. We are not making any tests. How can we? Surely no one suggests we are in a position to?

HIS HONOR: Mr. Reynolds has indicated the company is giving every assistance. I am certain if the deputies want to make tests to see if there is gas coming from the floor the company would assist them.

MR.McNALLY: Do not understand me as saying that our case is the gas came from the floor.

HIS HONOR: You want to make certain where it came from?

MR.McNALLY: If possible thatmatter should be looked at.

HIS HONOR: If there is any evidence that the gas came from the floor then I would ask that the evidence be produced. That is as far as I will go.

MR.REYNOLDS: I think I can say this fairly, that no evidence has been placed before me to this point of time that the gas came from anywhere but the goaf.

HIS HONOR: I realised that from the way you were conducting the case. That is the position as I see it, without coming to a final conclusion on the whole of the evidence, but it seems to me on the evidence at the moment it is inescapable. I say that so we can crystalise the issues in this matter and perhaps save time on matters which are not relevant.

MR.REYNOLDS: If some material does eventuate Mr. Parkinson can re-litigate the matter but it does seem a little unnecessary to go into it now when there is no question really being raised.

HIS HONOR: Yes, Mr. Parkinson.

MR. PARKINSON:Q. I think it was Monday, you indicated earlier in your evidence, that you had looked at four reports immediately prior to the morning of the 9th November and I think the reports you referred to were the three reports of the Monday, the deputies' reports on the Monday, and the one on the dog watch on the Friday night? A. Yes.

HIS HONOR:Q. You have looked at the reports that were made then? A. General Rule 4 reports,yes.

Q.MR.PARKINSON: You stated in one of those reports it was indicated that gas had been found? A. Noxious gas had been found.

Q. Did it state in the report where? A. It was not very clear from the report as to where it had been found.

HIS HONOR:Q. What reports were they you looked at? A. These are rhe reports, I think they have been submitted in evidence, or subpoenaed, General Rule 4 reports which are made out by the deputies.

MR.REYNOLDS: Can we get them now, Your Honor?

HIS HONOR: I think that would be advisable. These are Mr. Walker's reports.

Q. Do you remember who made them? A. There should be two from Walker, one from Stewart and one from Cambourne.

Q. This purports to be made at 5.55 a.m. on 8th November by Mr. Walker? A. Yes.

Q. He finds no noxious or inflammable gas. On the night of the 9th November - I will have to check that - the night shift, date, 9th November, but it is signed in the a.m., it does not say what hour, made in the a.m. of the 9th November and the inspection had been completed by 5.40 a.m. and there is no noxious or inflammable gas. Mr. Walker, on 5th October, reported on his 12.10 a.m. to 2. a.m. inspection or round that time, reported in his 3 a.m. report, inflammable gas on the edge of the goaf area, very dilute" - it looks like --

MR.REYNOLDS: "Being diluted".

HIS HONOR: "Others clean". And, in his later report, "Inflammable gas on the edge of goaf area being diluted, others clean".

MR.LEE: That is another goaf. That is not the edge of this goaf - it is the same goaf but somewhere else.

HIS HONOR: It did not say precisely where on the edge. On 6th October there are Mr. Walker's two reports, "Inflammable gas on goaf edge in centre heading, others clean".

Q. The centre heading, I take it to be B Heading? A. B Heading, Your Honor.

HIS HONOR: This is not the shunt area.

MR.REYNOLDS: We do not know where the shunt was at that time. B Heading was used as a shunt earlier.

WITNESS: It could have been. I cannot say at all.

HIS HONOR: It is not the same heading.

MR.McNALLY: It is not the same cut-through.

MR.LEE: No, it would be further in somewhere.

HIS HONOR: That really has nothing to do with it.

MR.LEE: Only to the extent that it shows it was there.

MR.SULLIVAN: That was raised when I produced it. I was thinking of this goaf, that that edge meant this goaf.

HIS HONOR: It is really not the same goaf.

MR.SULLIVAN: It is the same goaf but a different part.

MR.REYNOLDS: If we go to 8/10, "Noxious gas in miner place holed at 12.05", so this indicates at that time one of these holings was being made.

MR. PARKINSON: I am not concerned with those inspections, I am concerned with the four inspections, three on the Monday previous and the Friday night, when that was the situation on that plan.

HIS HONOR: True, but I may be concerned with those other inspections. We will leave the earlier ones alone. There were probably different areas. There is one dated, or made after the fire, 11th November, when Deputy Stewart - "9th" - "Noxious gas found at goaf area of previous lift and A Heading".

MR. REYNOLDS: "In A Heading".

HIS HONOR: "And A Heading", it says. "At goaf area of previous lift and A Heading". In other words Mr. Stewart reported after the fire was over that before the fire in fact in an inspection which commenced at 7.45 a.m. and was completed at 9 a.m., which would be within 10 or 15 minutes of the fire, during that inspection he found noxious gas at the goaf area and the specific part was "of previous lift and A Heading".

(Mr. McNally went to the plan and indicated).

HIS HONOR: That is the previous lift? A. Yes.

HIS HONOR: That is not the goaf area.

MR.McNALLY: There is a goaf area there also, Your Honor.

MR. REYNOLDS: Because that had been mined out it is technically goaf. This was explained in the evidence.

HIS HONOR: It is not really the goaf we are talking about.

MR.REYNOLDS: This is a different sort of thing because there has been no cave-in but it is mined out and I am instructed therefore it is technically goaf and this was explained in the course of Mr. Sullivan's cross-examination of Mr. Stewart.

MR. SULLIVAN: I HAVE no doubt that was the place.

HIS HONOR: "Goaf area of previous lift and A Heading".

MR.McNALLY: Your Honor remembers the evidence in relation to that report was that Stewart stopped and fought the fire till that night and was sent home and the report was put in.

HIS HONOR: He could not have made the report that shift, that was the shift of the fire. That is clear. The date of the report

is 11th November, for 9th November. What Mr. Stewart said in evidence, if I recall, and also said in his report, was that he had, within a reasonably short time before the fire, found noxious gas in this area. That is what he says. He does not say methane - he thought it was black damp.

MR.PARKINSON: Which area was that?

HIS HONOR: In the area near the shunt, as well as at the bottom near the face.

I think we ought to have the other deputy's reports, that is Mr. Cambourne's reports. I had indicated earlier that at some stage I would ask Mr. Reynolds - they are available in answer to a subpoena?

MR.REYNOLDS: Yes.

HIS HONOR: I will ask Mr. Reynolds to tender them at some stage.

MR.PARKINSON: I would like to draw attention to Deputy Stewart's evidence at p.113, the fourth last paragraph approximately in the middle of the paragraph: I asked him "Did you examine in B Heading adjacent to the goaf edge? A. B Heading, I did not go past, more than two yards past the crossed sticks."

HIS HONOR: I remember him saying that, yes.

MR. PARKINSON: Then I said "You did not?" he said "No, not at that time but later on in the day I would have gone round that area".

HIS HONOR: He went on at p.114 where he was asked whether he had found noxious gas, to which he said "Yes". He was then asked "Have you ever found inflammable?" he said "In that area, no, but I have reported it inby of the goaf area, I don't know exactly how far inby but it was in-by".

It does not carry it very much further because we do not know when it was. The report shows it was not on this day.

(Short adjournment).

MR.PARKINSON: Q. The fans that were installed in 8 Right Section, were they installed, operated and maintained in accordance with the provisions of the Coal Mines Regulation Act? (Objected to by Mr. Reynolds: Allowed). A. No approval would be given for the operation of the fans in question.

Q. Is that in itself a technical breach of the Act? (Objected to by Mr. Reynolds: question rejected).

Q. Is there evidence that adequate precautions were taken to ensure there is no re-circulation? A. Yes.

Q.Is there any evidence that the stonedust mechanism of the fan was being used? A.I cannot answer that question.

Q.Have you any evidence to indicate any stonedust was being used in this area prior to November 9th? A. Yes.

Q.Stonedust was being used? A. I saw evidence of it myself on the roadways.

HIS HONOR:Q.Of stonedust?A.Yes.

MR.PARKINSON:Q. Whereabouts on the roadways? A. In A Heading particularly - in C Heading, I am sorry. In C Heading particularly.

Q. In C Heading in particular? A. Yes.

Q. Would you have expected in the circumstances that the shunt would have been stone dusted?A. It is reasonable to assume,yes.

Q. Would you have expected the area surrounding the fans to have been stone dusted? (Objected to by Mr. Reynolds). A. ALl areas, regardless of where they were should have been stone dusted outside of five yards from the working face should have been stone dusted.

Q.Is there any evidence this was done? A. I have none.

HIS HONOR:Q.Have you any evidence it was not done? A.No.

HIS HONOR:You don't know either way.

MR.PARKINSON:Q.When you made investigations did you see any store of stone dust anywhere in that particular area? A.Yes.

Q. Whereabouts was it? A. Somewhere round the transformer area.

HIS HONOR:Q. What is the purpose of stone dusting the area? This may sound a silly question because it should be obvious? A. To prevent the propagation of coal dust explosion in the event of ignition or fire.

Q. Has it anything to do with preventing the spread of the fire or preventing the occasion of the fire? A. Preventing the occasion of the fire, no. Preventing the spread of the fire, it could have some influence.

Q. What influence could it have? A. The generation of the CO2 from the stone dust would help to reduce the intensity of the fire.

Q. Is that one of the purposes of putting stone dust down? It is quite obvious from your answer that it is to prevent the explosion of coal dust but is one of the purposes of putting stone dust down to prevent the spread of the fire in the event of fire? A. No, Your Honor.

MR. PARKINSON:Q. Is there a possibility that there could have been a coal dust explosion as a result of this ignition? A. In the light of the circumstances which I have investigated my answer to that must be No.

HIS HONOR:Q. When would you get a coal dust explosion and ignition? A. When you have an inflammation of fire damp - it must develop a certain amount of violence so that the coal dust is raised into suspension in the mine atmosphere and when it is raised into suspension the flame is propagated through the coal dust cloud formed by the violence - raised by the violence.

Q. When you speak about the violence, that is the violence of the fire? A. The violence of the explosion.

Q. In other words you cannot get a coal dust explosion unless you get an explosion from the gas? A. I have no record of any coal dust explosion occurring unless there has been some violence associated with the fnflammation.

Q. What was the possibility in those circumstances, taking into account all the evidence that has been discovered since the fire, what was the possibility of there being an explosion of gas in these circumstances? A. Well,without going into the exact technical details, from what I have elicited from Mr.Donegan's report the possibilities of a violent explosion occurring were non existent.

MR.PARKINSON:Q. Do you remember answering some questions to His Honor on Monday in connection with the incident that occurred in May of last year? A. Yes.

Q.With the electric welder? A. Yes.

Q.To your own knowledge do you know of deputations that have been led by the Miners' Federation about this particular type of practice? (Objected to by Mr. Reynolds).

HIS HONOR: What particular practice?

MR. PARKINSON: The practice of using electric welders, oxy burners, that is with a naked flame, underground.

HIS HONOR: What has that to do with the particular cause of this fire into which I am holding an inquiry. That might be getting out of my jurisdiction.

MR.PARKINSON: You asked some questions of Mr. Menzies and they finish up I think with the last words of the day's proceedings, in relation to this particular matter of an amendment and Mr. Menzies referred to the Seventh Schedule.

HIS HONOR: You are referring to the fact that there was an amendment of the Rule which compelled the use of a methanometer if one of these pieces of equipment was to be used?

MR.PARKINSON:Yes.

HIS HONOR:You are asking whether there have not been deputations from the miners seeking further amendment?

MR.PARKINSON: I want to find out that something had been endeavoured to be done about it. I am not going to say anything --

HIS HONOR: I will allow the question.

WITNESS: To preface my answer I feel I must refer to the question you asked me, when I said nothing else had been done I referred only to the legal sense, in other words, not to anything outside the requirements of the Coal Mines Regulation Act- not to all conditions or all matters.

MR. PARKINSON:Q. Following the incident last May did the Miners' Federation lead a deputation to have this practice abolished? A.I believe so, yes.

Q. And did we then raise the question of methanometers?A. I believe so, yes.

Q. Do you remember reference being made to methanometers being used in the Soviet Union at that particular deputation? A. I am afraid my memory cannot go back to everything that was said at that particular deputation.

Q. Have you any knowledge at all of what obtains in the Soviet Union in the mining industry? A. No.

HIS HONOR: I will accept this from you, Mr. Parkinson, and there will be no need for evidence: When was this deputation?

MR.PARKINSON: The deputation was almost immediately following the incident last year.

HIS HONOR: What was the month?

WITNESS: May, Your Honor.

MR.PARKINSON: May 1964.

HIS HONOR: The deputation was to whom?

MR.PARKINSON: TO the Minister for Mines. The Chief Government Mines Inspector was in attendance and Mr. Menzies was also in attendance.

Q. Have you any knowledge of any similar deputation from the Colliery Proprietors to have this practice abolished? A. No.

Q. There is still a large amount of coal to be extracted in this 8 Right Section? A. Not a large amount when you consider the resources of the colliery. I am prepared to say a considerable amount of the resources, of the reserves, in that particular section.

Q. Have you any approximate estimate of the number of tons that still has to be extracted? A. Before I could answer that I would have to have a knowledge of just how far the management intended to go back with the pillar extraction. At this stage I have no knowledge how far they had intended to go back with pillar extraction.

HIS HONOR: I suppose this question could be better answered by representatives from the colliery.

MR. PARKINSON: Q. Irrespective of the tonnage, is it the type of coal that has a high economic value to the Australian economy? A. Yes.

Q. Is this due to its coking qualities and its use in steel production?(Objected to by Mr. Reynolds).

Q. Would you agree that this should be extracted? A. I can see no reason why it should not be extracted.

Q. Would you agree that it should be extracted with the ventilation methods being similar to those that were being used prior to November 9? A. No.

Q. Is this one of the occasions that the Mines Department would use its power to veto? (Objected to by Mr. Reynolds: rejected).

Q. Can you correctly describe to His Honor the procedure that must be followed to have any amendments, additions or deletions to the Coal Mines Regulation Act? -

HIS HONOR: I can't allow that. I am prepared to listen to your argument.

MR. PARKINSON: If I can argue it that's all right, I just want to point out to Your Honor that you can bring down recommendations following this hearing and unless the Federal Government concurs they cannot be implemented.

Those are all my questions.

MR. CRANE: No questions.

MR.McNALLY:Q. Prior to coming in contact with the mining industry in this area had you had any contact with gas similar to Illawarra bottom gas? A. No contact.

Q.In your experience is this the only area where this type of gas predominates? A.In my experience, yes, but not to my knowledge, I know it occurs elsewhere.

Q. When did you yourself first have personal experience of this Illawarra bottom gas? A. Round 1955/6.

Q. Where was that? A. Metropolitan Colliery.

Q. Prior to 9th November had you had any personal experience of Illawarra bottom gas in the Bulli Colliery? A. No.

Q. Did you know from any other source that it existed in that colliery prior to 9th November? A. No.

Q. Do you know whether prior to 9th November the management of the colliery knew Illawarra bottom gas existed in the mine? A. In the evidence given by two men its existence must have been known to the management.

Q. To which two men do you refer? A. Mr. Longworth and Mr. Stewart.

Q. Would you agree that it is only comparatively recently it has been known Illawarra bottom gas was in Bulli Mine? A.Would you repeat the question please?

Q. It is only comparatively recently it has been known that Illawarra bottom gas was present in the Bulli Mine? A. Once again, I refer to Mr. Stewart's evidence where he indicated he had been shown Illawarra bottom gas in his period as Assistant Surveyor. Beyond that I have no knowledge of when it was found.

Q. TEll me this: Has much of your knowledge of Illawarra bottom gas been gained from this fire on 9th November 1965? A. It is possible.

Q.Is it a fact? A. I will go so far as to say I know a lot more about it nowthan I did do.

Q. Just how much more now do you know about it than you knew before 9th November? A. Well, I knew the limits of the various gases, the two gases concerned in Illawarra bottom gas, the limits which would decide whether an inflammable or explosive mixture could be formed from the Illawarra gas as found in the seam. I knew the relationship between the carbon dioxide and the methane. I knew it was a completely diffused gas and was given off as a seam gas. I knew it could be detected at the flame safety lamp both as to CO2 content and as to the CH4 content. I knew it was always found near the floor of the seam. I knew that it was heavier than air and I could go on with a few more things I knew -

HIS HONOR: Mr. McNally, are you suggesting that bottom gas in the Illawarra area was not known until recently, or only in the Bulli Colliery?

MR.McNALLY: I am seeking to ask that this particular gas was a bit of a mystery to mine inspectors and other such people and an even greater mystery to deputies.

HIS HONOR: One of my assistants, Assessor Mr. Buck, who I am told has a great wealth of experience in the mining industry, informs me that he has known of the existence in this district of Illawarra bottom gas for the best part of half a century.

MR.McNALLY: The questions were directed initially to the Bulli Colliery.
HIS HONOR: That is why I am asking you whether you are limiting

your question to whether it was known in the Bulli Coll ery. If it is that, that is of course another matter; but as to whether it is a gas which has just become known in the area, that is different.

MR.McNALLY: I do not suggest that no one prior to 9th November knew of the existence of Illawarra bottom gas but I do suggest much more is known about it now, since the fire, than was known before the 9th November.

Q. You referred to limitations or inadequacies of the safety lamp which were set out in a report of 1962 or thereabouts? A. Yes.

Q. Just what were the inadequacies to which you were referring? A. The flame safety lamp when used to detect methane at or near roof level sets up around itself convection currents which, instead of drawing air through the top feed from near the roof, will draw its air from a position five to six inches below the top of the lamp.

Q. Would you agree that when testing near the roof, one cannot be sure with any degree of certainty that one is testing closer than ten inches to the roof? A. I reject the ten inches.

Q. You would accept five or six? A. Five or six inches.

Q. You referred to the benefit of the lamp in that it detects automatically gas when someone walks into it. Would you agree that this only applies of course to carbon dioxide? A. No.

Q. Then would you agree with this proposition, that the manner in which a lamp is carried around a mine is that the flame is turned up? A. Yes.

Q. And would you agree that if a person whilst carrying the light walked into an area of methane, the light would automatically detect methane? A. If he walked into an area where there was an accumulation of methane, the light would detect the methane by going out. The flame would go out.

Q. I think that applies only in a percentage above 5%, is that so? A. 4½ to 5%, yes.

Q. So if one walked into an area of methane below 4½ to 5%, with a safety lamp, it would not be authmatically detected? A? Well, being a mining man, I can't visualise anybody who is a possessor and an operator of a safety lamp walking into an area which contained 4½ to 5% or somewhere in that vicinity of methane and not be aware of it.

HIS HONOR: Q. On his lamp? A. On his lamp.

MR.McNALLY: Q. But what of 2½%? A. I think the same argument applies.

Q. Well, what would happen to the lamp if it was turned up and the carrier of the lamp walked into an area of methane which represented 2½% of methane? A. Once again I cannot visualise a circumstance where I would walk into an area where I have 2½%, consistent through the whole of the area. With all gases we have fringe areas where the perdentage is low and your argument might hold, but as one progresses into the accumulation the percentages become greater and eventually, in the circumstances postulated, the lamp would react to the excess quantities of methane.

Q. Perhaps it is unimportant, but it could happen that someone walked into an area where there was no more methane than say 3% and with a lighted safety lamp, and to walk out of there and

not know that the methane was there? A. That could be done.

Q. And there could be no registration at all upon the safety lamp in those circumstances?A.That is correct.

HIS HONOR:Q.Do you mean no registration? A.No registration that would be visible to the Deputy if he were just carrying his lamp, or the person who was carrying the lamp.

MR.McNALLY:Q. And it is only when you get up to four or five per cent that the light goes out? A. Yes.

Q.And unless the light goes out one would fail to detect the methane?A.If one were carrying the lamp.

MR.LEE:Q.If one were carrying the lamp and not looking at it? A.Yes.

MR.McNALLY:Q. Do you suggest that the presence of methane could be detected by the flame on a safety lamp turned up to the height that it would be turned up when testing for carbon dioxide? A. No.

Q.Do you suggest that you can detect methane lower than 4% by using the lamp with a flame as high as one would have the lamp when carrying it? A. No - I would not try to do it, anyway.

Q.But you would not detect it, would you? A. But I think in my evidence as regarding the detection of gases I referred to methane, that in detecting for methane you have a reduced flame but not fully reduced and you pick up the fringe area of the accumulation with your reduced flame by the increased luminosity and the increased length of the flame and that indicates the presence of firedamp but does not indicate the percentage.

Q.Would you not agree that in testing for Illawarra bottom gas you would have the flame turned down to the low blue flame that you test with for pure methane? A. Not in the first operation.

Q.It would go out? A.Yes.

Q.So that if one were to turn the flame down to the blue flame and test from the roof down towards the floor,lowering the light slowly, if one came into contact with Illawarra bottom gas the light would invariably go out? A.It must go out.It is the wrong method.

HIS HONOR:Q. What is the right method? When Mr. McNally asked the question, he himself demonstrated? A. When ILLawarra bottom gas is being detected for the presence of methane, you are actually standing in the position you are going to detect and you are breathing and living, so therefore the concentrations at that point must be reasonably low. But as you approach the floor, approaching the fringe area, the concentrations gradually increase.Now we are using the flame safety lamp with a reduced flame but not with a small blue testing flame - with a reduced flame, carefully lowering the flame safety lamp towards the floor and watching the flame very closely. At some point when the percentage is reached which in my opinion will be in the order of about 3 or 4%, there will be an increase in the length of the flame and in the luminosity of the flame. Now, that position then is established and you know that beyond that point you are going to be in trouble if you go with a reduced or testing flame. So having established that level, you take the light back up into the fresh air you are still breathing and lower your flame to the testing flame. And once again approaching the fringe area which you have already determined, approach-

ing it very carefully, you will find evidence of the CH4 showing up as a cap on the flame safety lamp.

MR.McNALLY: Q. Of course, all of what you say in answer to His Honor's question presupposes that there is sufficient oxygen in the area that you test to enable the safety lamp to operate? A. Well, if there is not enough for the safety lamp to operate, there is no room for the operator to be there. He should be out too.

Q.Do you suggest that the amount of oxygen content in an area close to the floor covered by Illawarra bottom gas is the same as the oxygen content in the atmosphere above that bottom gas? A. I never suggested that. I referred to the air which I was breathing which was breathable, and the fringe area as you approach the floor where the percentage of CO2 and firedamp are increasing as you go down towards the floor. My first test was to establish the area or the level where a fringe area was. My second test was to determine the percentage of gas in that fringe area.

Q.Both of those tests must be carried out at the fringe area? A.Yes.

Q.You cannot test for methane in Illawarra bottom gas below that fringe area?A.You would probably lose your light.

Q.Well, you will lose your light, I put it to you, in bottom gas that was found in a recent test? A. Yes.

Q.That fringe area to which you referred: Is that the point or a horizontal plane where the oxygen and the Illawarra bottom gas meet? A. No. There is no plane you can determine where they exactly meet.

Q.There is none?A. There is no plane you can determine where they exactly meet. There are two planes between which the percentage will increase from an undectable quantity of firedamp to detectable quantities of firedamp. In other words, two levels - they may be that distance apart at this level (indicating) and you detect nothing; at this level you can detect firedamp.

Q.That is firedamp? A. Firedamp.

Q.You are not referring to the mixture? I mean you are distinguishing between firedamp and Illawarra bottom gas, are you? A. Well, unfortunately, Illawarra bottom gas is not detectable as Illawarra bottom gas unless you carry out two separate and distinct tests, one for carbon dioxide and one for methane.

Q.Pausing there, the two tests would be better carried out in relation to carbon dioxide by using a safety lamp, and in relation to the methane by using a methanometer? A. In the light of the circumstances that prevailed, yes.

Q.That would be so because if only the lamp were used, the tester may discover only the existence of carbon dioxide and miss the methane? A. If he is not looking for anything else but blackdamp, then he will obviously find nothing but blackdamp.

Q. I think various theories have been expressed to you in the last few weeks, particularly the last few days, as to the correct method of testing and finding Illawarra bottom gas? A. Yes.

Q. And on this subject would you agree with me that there is a large variety of theories and opinions? A. There was a consistent streak through them - they may have varied in detail but I think the method was consistent throughout.

Q. Would you agree or disagree with a method of testing for Illawarra bottom gas which involved the tester, with a light in the safety lamp higher than that used in testing for methane but lower than that used for carrying the lamp or testing for carbon dioxide, and the tester then scooped the lamp into the area of gas and pulled it out again, would you say that that would be a method of testing? A. It would show the percentage picked up by the lamp through the mixture, but I cannot imagine it would be an indication of the exact percentage where the lamp went.

Q. You may well finish up with less methane in the lamp than 1¼% or 1½%? A. You could finish up with anything in the lamp.

Q. You miss the methane altogether? A. Yes.

Q. You have indicated that you disagree with the manner of testing demonstrated by Mr. Longworth when he demonstrated testing for Illawarra bottom gas? A. No.

Q. And were you present when he demonstrated? A. I think so, yes.

Q. Do you remember that he used the low blue light and lowered the lamp slowly from the roof to the floor; would you agree that that is what he did? A. I can't remember the exact detail. He may have done. I am not going to say he did not do it.

Q. Assuming that is what he did do, then that in your opinion would be wrong? A. Not fundamentally wrong.

Q. Not fundamentally wrong? A. No, provided he lowered it slowly enough.

Q. But he had a very strong possibility of losing the light? A. Yes.

Q. In fact inevitably he would lose the light in those circumstances? A. Well, it is possible.

Q. It is probable? A. Yes.

Q. You mentioned there was a man overseas who was carrying out certain observations in relation to gas detection, I think; they are the facts you provided to the Court, are they? It is a man overseas, is it? A. It is not a man, it is an establishment - Safety of Mines Research Establishment.

Q. When was this procedure set in train? A. I think possibly following a paper that was published in 1962 about the inadequacy of the flame safety lamp because of the convection currents around it.

Q. Certain inquiries have been made through some agency overseas, is that the position? A. Well, the Chief Inspector has taken up that matter in England when he was there, and when he saw it five months ago the roto type I believe was ready for testing.

Q. That is the type of lamp with the attachment? A. The probe, yes.

Q. I think you did say that if more than 4½% of methane is present in the air the effect on the lamp would be the same as the effect of carbon dioxide? A. Unless you have got a very rapid movement. It is possible to retain your light but quite often you lose it.

Q. Yes, but the effect it has upon the lamp is the same or almost the same as carbon dioxide; it tends to put out your light? A. Yes.

Q. I wonder if you would care to explain a little more about these upper limits of inflammability -

MR.LEE: It is in Mr. Donegan's report.

WITNESS: Well, I may say that when mixed with air, and I refer now to pure air, it has been established for many years in laboratory experiements that when 5.4% of methane is present in the mixture, that mixture will ignite and will propagate flame throughout the mixture. As the percentage of methane increases to a percentage which is somewhere close to nine, the greatest violence of the explosion is reached. When it passes nine it rises - the violence of the explosion decreases until the percentage of methane reaches somewhere in the neighbourhood of 15% when it ceases to be inflammable and will not propagate a flame throughout it.

MR.McNALLY: Q. So I suppose if there is more than approximately 15% of methane in the atmosphere it will not ignite? A. No.

Q. And I understand that is because of the lack of oxygen? A. Yes.

HIS HONOR: Q. It would be very difficult to breathe that air, would it? A. It would be.

MR.McNALLY. Q . I suppose you could have again the situation where the methane was mixed with carbon dioxide on the floor with insufficient oxygen content within that mixture for that mixture to become inflammable as it lay on the floor ? A. Once again I have to refer you to this testing area that we are going back to - there is always this fringe area from a low percentage of methane and carbon dioxide until you reach the high percentage of methane and carbon dioxide which, in the case of Illawarra bottom gas, would be close to the floor. So I cannot visualise the man using the lamp being in such a position and in such a way that he would have his light extinguished by the presence of 15% of methane.

Q. In an area - take the shunt area, assuming that the Illawarra bottom gas was on the floor, some height from the floor: Do you suggest that throughout that mixture itself, from top to bottom, the percentage of methane and carbon dioxide would vary, one against the other? A. The percentages?

Q. Of carbon dioxide and methane? A. No, the relationship between the percentages would remain constant.

Q. Do you suggest that the amount of oxygen in relation to those other two gases, the carbon dioxide and methane, would vary? A. Must vary.

Q. What is that? A. It must vary.

Q. Right at the floor could you have a situation where you had no oxygen at all, just carbon dioxide and methane? A. It is not impossible.

Q. And then as one rises, the amount of oxygen present in the gas would increase? A. It increases, yes.

Q. Until a stage comes or the height comes when the amount of oxygen present is sufficient to reduce the percentage of methane below the upper limit of inflammability? A. Yes.

Q.And then as one goes still higher one would reach the stage where the amount of oxygen would reduce the percentage of methane below the bottom limit of inflammability? A. I am not quite sure that your argument is sound. If you would refer to the amount of methane present in the mixture rather than the amount of oxygen present in the mixture, then we have a relationship which is directly known and, as I said earlier, 15% the higher limit, 5.4% of methane the lower limit, and obviously the percentage of oxygen in the atmosphere contained within these limits must vary if there is nothing else varying.

Q. But you have said that in your raising your lamp from the floor you go from the stage where there is no oxygen? A. That is possible.

Q.Or very little? A. Yes.

Q.And you reach the stage where there is sufficient oxygen, you reduce the percentage of methane below 15%? A.Yes.

Q.At some stage similarly you must reach the stage, I put it to you, where because of getting higher, the increase of oxygen, the methane must be reduced below 5% unless you had the whole area full of methane? A. Yes.

Q. So does it not follow from what you say that there is an area where methane will be present above the area that you can test in Illawarra bottom gas and you will not be able to test in that area? A. I think we should get this clear,that once this gas has been detected, methane gas has been detected in Illawarra bottom gas and detected at 2½% of methane, I am not concerned about going any further to see how much is there. It is necessary and required that that gas be then removed and diluted to such an extent that 2½% does not remain in the area, so to go further in testing beyond what is the statutory limit is only going somewhere where there is no need to go.

Q.I appreciate that, but when lowering the lamp in the manner you have demonstrated in testing for methane, you do go through an area where methane is present but there is so much oxygen there that it will not register on the safety lamp? A. No, I can't agree with that, unless you reduce your methane to a percentage below around 1% or 1¼%.

Q.Well, would you agree with this proposition, that starting from the floor and working upwards and assuming that Illawarra bottom gas is present in the particular place that we are referring to, from the floor we would have initially Illawarra bottom gas, a gas made up of methane and carbon dioxide with very little oxygen in it; do you agree with that? A. It is possible in those circumstances,yes.

Q.So your first area would be an area near the floor where your oxygen was so little that the upper limit of inflammability or the percentage of methane would exceed 15%? A. If the nature of the seam gas was such that that was possible,yes.

Q.So that that section of the gas area is non-inflammable? A.Non-inflammable,yes. Non-inflammable as it stands.

Q. And if we could somehow exclude that from the upper layers, no safety lamp would detect methane? A. No.

Q.I realise it is impractical, but then we have an area where the oxygen present in the gas is sufficient to reduce the carbon monoxide content to below 15%? A. Methane,yes.

Q. And in that area you say you can detect methane with a safety lamp?A.No, I did not say that. I never said that.

Q.Well,could you? A. No, I could not. It is impossible.

Q.That is in an area where the methane content of the gas and air present in that area is between 5 and 15%? A. If I may put it this way: If such a thing as you postulate was possible - in other words if you formed a mixture containing 14% of methane and instead of reducing the oxygen proportion you extracted the nitrogen and built up your volume by the addition of oyxgen and you put a flame safety lamp into that, there would be an explosion within the lamp if it was reduced below 15%. But to postulate that you can have 15% methane in a mixture, in an actual mixture containing enough oxygen to be detected just cannot be done.

Q.So in this second area from the ground you cannot detect it in that second area? A. With a flame safety lamp, no. You would lose your light automatically.

Q.You would detect it on the methanometer?A. Unfortunately,no.

Q.Well, do you say that because of the lack of oxygen? A. Can I re-phrase that answer: I could detect the presence of methane but I could not indicate its percentage.

Q.We appreciate that; I think Mr. Longworth explained that?A.Yes.

Q.Above the area we have just dealt with you would have an area where the oxygen content was such that the percentage of methane would be below 5%? A.Yes.

Q.And that area would not be inflammable?A.It would not be inflammable.

Q.And then we get up into the oxygen. Now, at what precise level do you suggest methane can be detected? A. In the area below 5.4%. In other words, between 5.4% and zero.

Q.That is the top layer?A.Yes.

Q.SO unless one was able to place the lamp in that area, one would either find nothing above or get a carbon dioxide registration on the safety lamp? A. I think I have already stated that before you do this testing you must establish where this fringe area is and once you have established its position then you can make finer, more delicate tests with the flame safety lamp once you know the position. But you must establish its position.

Q.Dealing for the moment with the possibility of gas coming through the floor, I suppose you would agree that is a possibility?A. It is a possibility, yes.

Q. Just how does the gas get through the floor area, assuming that to have happened? A. In many ways. It permeates naturally through the strata. It percolates naturally through the strata or if floor heave has taken place, comes up through the cracks in the floor. Those are the two main ways.

Q.You have mentioned cracks in the floor? A. Yes.

Q.Do you suggest that those cracks would be cracks that could be found or would there be - A. Well, where floor heave is present it is usually pretty easily seen.

Q. It is possible there could be cracks through which gas could come which could not be found? A. If the cracks were very fine, as you are suggesting, then it would not be found unless you scrub the floor and had a look at it after you had scrubbed it.

Q.THE bleed tube - have you seen these instruments in operation previously? A. Yes.

Q.They are a recognised method of ventilating areas, headings? A. No, I have never seen them used for ventilating the heading before.

Q. What have you seen them used for? A. I have seen them used for ventilating cavities which contain - have contained methane.

Q. What did you say? A. For ventilating cavities which have contained methane.

Q.Have you seen the bleedtube used for that purpose with a 12" tube? A. In one instance yes, I think.

Q.Did these bleed tubes come in two sizes, apparently? A. I think more than two sizes from my knowledge.

Q. Is it reasonable to assume that this bleed tube in this instance was sufficient to remove the gases that were coming, assuming they had come from the goaf, in the initial periods of working in this place? A. Such could have been the case.

Q.I think it is common ground that the workings in this No.2 cut-through started on the 2nd November? A. Yes.

Q.Would it appear from the information you have that up until such time as the barometric pressure changed from midnight till 9 a.m. on the 9th November, the bleed tube was doing the job properly? A. I have got to assume that it was because there was no indication given in reports that even although noxious gases had been found, there was no indication given that accumulation had occurred and if such being the case, I would assume that although noxious gases were detected they were diluted as made.

(Luncheon adjournment).

Q. Just to clear up one thing that you answered to a question from His Honor this morning - A. Just before the adjournment I was interrupted by the siren and before I left the Court I told the shorthand writer my final sentence. (Last question and answer before luncheon adjournment read by Court Reporter).

HIS HONOR: Q.You speak about accumulations. Where do you mean? Where are you assuming those accumulations occurred - outside the goaf area? A. Outside the goaf area.

Q.And you are not concerned with accumulations in the goaf itself? A. No.

Q.That answer is based on the fact that you have accepted the deputies' report as indicating the truth? A. Yes.

Q. You will recall from the evidence the fact is that under the simulated conditions there were some concentrations of gas, on the evidence, found by Mr. Longworth and his assistants in the very areas where the deputies had searched, had tested and reported no gas - where Mr. Walker had? A. Yes.

Q. Do you recall that Mr. Walker was in the dog-watch shift which is the shift immediately before the shift during which the fire occurred? A.Yes.

Q.And Mr. Walker's reports and Mr. Walker's evidence is that when he tested these very areas he reported that they were free from gas. Now I am not going to pass any opinion on Mr. Walker's evidence or his reports; you understand that. Assuming the conditions were precisely similar when the tests were made by Mr. Longworth and his assistants after the fire, could you advance any theory as to how gas might have become present in those areas after the fire under the simulated conditions that were not there almost immediately before the fire? A. I can find no answer to that.

Q.No answer at all?A.No.

MR.McNALLY.Q. I think, on that for the moment, you would agree that the fire itself would attract goaf gases into the No.2 cut-through, A Heading and the intersection area or into the shunt? A. By the very nature and the location of the fire and the evidence available as to the area of heating, the amount of heating of the goaf gases that took place would I consider be small and therefore the expansion of gases into the shunt by reason of the heat from the fire would be small.

Q.But the fire itself would eat up any oxygen that was in the shunt area during the course of the fire? A. Yes.

Q.And this would not create a vacuum but would cause gases to come from other places to fill the area where the oxygen had previously been?A.Yes.

Q.And whilst these other gases may come up from both ways, No.2 cut-through, they would also come both ways towards the shunt area along the A Heading? They would come from all possible directions? A. It is possible, yes.

Q.And they would also come from the goaf area? A. Yes.

HIS HONOR: Q. Would you expect the attraction of gases as a result of the fire into this area to be still occurring some weeks after the fire occurred? A. No, Your Honor.

Q. You do understand that that is when Mr. Longworth made his final tests?A.Yes.

MR.McNALLY:Q.I think there had been a cave-in at the fire; we have been told that? A. Yes.

Q.And this itself could affect the amount of gases, both noxious and inflammable, that were subsequently to be found in the shunt area? It could affect the area? A. The amount of the roof fall that occurred would have no really serious effect.

Q.Would you agree with this proposition, that it is very very difficult to say with any degree of certainty that the exact conditions which existed on the 9th November before the fire can or have been re-created since? A. They were re-created as nearly as possible as we could do it. We could not re-create the natural conditions which existed on that night or on that morning - by that I refer to the position of the barometer and the movement of the barometer - but we re-created the district as all our information led us to believe that it was on the morning of the 9th November.

Q. When was this done? A. It was done, it was ready for testing on, I think it was last Wednesday, a week today.

Q.Last Wednesday?A. Yes.

HIS HONOR:Q. Was there any fall in barometric pressure at that time? A. The barometric pressures were obtained over the period. Your Honor, may I refer to my notes? (Permission granted) I have got them here. No, I haven't got them in my pocket, but over the period prior to and during the test the barometer was remarkably steady around 30 inches.

Q .And during the period that Mr. Walker was testing, the barometer was falling? A. Yes.

Q. And would that create a greater tendency for gases to come out of the goaf, if anything? A. Yes.

MR.McNALLY.Q. When were the tests carried out?A. During the day of last Wednesday.

Q.That is the 5th? A. It could be the 5th. A Week today - I will accept that.

Q. The day the circumstances that existed before the fire were created, the tests were carried out? A. Would you say that again please?

Q. The tests were carried out on the same day as the area of the A Heading, No.2 cut-through, was placed in the same position as it was before the fire? A. Well, I can't say exactly when the preparation was completed. I was informed on the Monday prior to the Wednesday that the section would be ready for testing on the Wednesday morning and I made arrangements accordingly. Now it was not ready on the Monday and at some period between the Monday and the Wednesday the preparation was completed.

Q.You do not know how long before the tests the preparation had been completed?A. No.

Q.But you do know that the fans had been off for some time before the tests were carried out last week? A. The fans were out of operation for a considerable period.

Q.And would you agree with this, that for some time after that situation was re-created, the time lag would have to be allowed so that the gases could adjust themselves to the condition they were in before the 9th November? A. I cannot visualise it. I can't visualise such a thing happening. To my mind as soon as the set-up was restored to as near to what it was on the 9th November, the conditions would be, if not instantaneously, re-created in a very short time - an hour or so.

Q. Not the same two fans but a similar two fans were installed, is that the position? A. Yes.

Q.And a similar bleed tube was installed? A. Yes.

Q.And all the other ventilation, the other 44 gallon drums similar to the ones used, was restored? A. Yes.

Q.DO you say that immediately that happened , those systems installed would remove any noxious or inflammable gases that were present there, if they were sufficient to do so? A. But

it didn't drive out the gases, there was no inflammable or noxious gases found there when -

Q. But would you not agree that some of the inflammable or noxious gases would be removed by that system? A. Yes.

Q. And would you not agree that that removal of inflammable and noxious gases would not be an instantaneous happening, it would take some period of time?A. Well, up to the restoration of the original conditions, that area was travelled regularly, inspected regularly, and we never at any time found any excessive accumulations of gas even although the fans had been out of commission for some time.

Q. But inflammable gas was found during that time, was it not? A.It was found, but I said no excess.

Q.Is this the position: I do not think during that time the system, the place, was ventilated properly at all, during the time you refer to? A. It was ventilated for particular purposes.

Q.With a blower, I think? A. Yes.

Q.But you see, the question is do you agree that for some time after the system is restored, a period must necessarily be allowed for that system to take effect? A. Could I answer in this regard, it was the second time I had conditions re-created to find out exactly what went wrong, and on the first occasion the conditions were re-created in a matter of three hours and that had to allow an accumulation -

Q. You are speaking now of another occasion? A. I am speaking now of another incident.

Q. Was that a fire or an explosion? A. That was an ignition. I am referring to the time which was three hours for the conditions to be re-created.

Q. Where was that? A. In the same colliery.

Q. That was the 1964 incident, was it? A. Yes, and I can see no reason why the conditions should not be re-created in this instance in the same if not less time.

Q. A d did you actually carry out any tests since the 9th November in this tost for safety? A. No.

Q. On the occasion previously, I think that was methane gas in 1964, was it not? A. I beg your pardon?

Q.It was methane gas concerned in May 1964, wasn't it? A.Yes.

Q.Did you carry out any tests then?A.Yes.

Q. When was the last occasion you carried out any tests for Illawarra bottom gas? A. I think I referred to that earlier somewhere, I said about in 1955 or 1956.

Q.You have not tested for that Illawarra bottom gas since then - I do not suggest you should have? A. No.

Q. On that occasion, was that shortly after you became concerned with this area? A. No - yes, I was appointed for Southern Collieries, yes.

Q.You had not been concerned with the Illawarra area before 1955? A. No.

Q.Amd I correct in assuming, and I only assume, that upon being appointed you went to test for Illawarra bottom gas to find out what it was all about? A. Yes.

Q.That is the only occasion you actually tested? A. Yes - not one occasion - I inspected that colliery on a number of occasions.

Q.Which colliery do you refer to? A. Metropolitan.

Q.You only tested for Illawarra bottom gas on the one occasion? A. Not on the one occasion, in the one mine at different times.

Q.Do you know the percentage of carbon dioxide present in that mixture of Illawarra bottom gas?A.Yes.

Q.What is it? A.It varies from 85 to 95. It is sometimes a bit lower.

Q. 85 to 95%? A. Of carbon dioxide.

Q. Is that when all the air has been removed from the gas? A. That is an air-free mixture.

Q. What was the percentage of methane? A. It varies from 5 to 10.

Q. You would agree, would you not, that if the ratio of carbon dioxide to methane in any air-free mixture is greater than three parts of carbon dioxide to one part of methane you will not detect methane. Do you agree? A. No.

Q.You disagree? A.Yes.

Q. Do you concede there is any ratio - you realise what I mean by ratio? A. Yes.

Q. At which you will not detect the methane? A. I have not personally done it myself but - (Objected to by Mr. Lee).

There is one thing I probably misunderstood there: He asked me, I think, was it possible to detect methane in an Illawarra mixture containing over 3.2% - a ratio of 3.2 of carbon dioxide. My answer was Yes. I assumed then I was speaking about any method of/detection - referring to the flame safety lamp.

MR.McNALLY: I presume Your Honor is allowing me to proceed?

HIS HONOR: Yes.

MR.McNALLY:Q. Then it is correct to say if the ratio of carbon dioxide to methane is 3.2 to 1 or greater, or roughly, 3 to 1, you won't detect it with the flame safety lamp? A. I would agree with that.

Q. You would detect it with the methanometer? A.Yes.

Q.And, perhaps, some other instruments? A.Yes.

Q.I think I understand you correctly: At the Metropolitan Colliery there is 95% carbon dioxide and 5 to 10% methane? A. 95% and 5 to 10% does not add up to 100. I have to get a variation somewhere.

Q. 85 to 95% carbon dioxide; is that correct?A. It can get up to 95% carbon dioxide.

Q. I understand, and you perhaps can correct me, that at the Metropolitan Colliery when you carried out your test it was 85 to 90% carbon dioxide? A. You could assume so.

Q. And 5 to 10% methane? A. Yes, you could assume so.

Q. So that the ratio of carbon dioxide to methane was greater than 3 to 1. Can we assume from that, that on the occasion, the only occasion you have tested for Illawarra bottom gas you failed to detect methane? A. I did not try to.

Q.You did? A. I did not try to.

Q. Can I assume you have never ever tried to detect methane in Illawarra bottom gas? A. You can assume that.

Q. Is that correct? A. There are special reasons for it.

Q. Understand I am not being critical - I have not tested for the gas myself. A. The answer to the question is Yes.

Q. When expressing your opinion as to the correct manner of testing for methane in Illawarra bottom gas, or, to put it another way, when expressing opinion as to the correct method of testing for Illawarra bottom gas you rely on theory only and not practical experience? A. Yes.

HIS HONOR:Q. Would you say the safe procedure when you find black-damp in mines in this area, particularly Bulli Colliery, is to suspect that it may be bottom gas? A. Not in all the mines, Your Honor.

Q. What about Bulli Colliery? A. Up till this incident Bulli was not included in my list where bottom gas was found.

Q. Not included ? A. Not included.

Q.Where is this list? How does it come about? A. Collieries have experience - colliery inspectors have experience in various mines and they record the findings and we become aware of the collieries where bottom gas has been found and is found on occasions.

Q. You mean it has never been reported to you in any way that bottom gas was found in the Old Bulli Colliery? A. That is correct.

MR.McNALLY: That is Bulli, I take it?

WITNESS: The proper name is Bulli Colliery.

MR.McNALLY:Q. I think it would be fair to say bearing in mind the fact that you have theorised in reaching your conclusion, and I do not say that critically, that whilst in theory you must necessarily have a situation when testing for Illawarra bottom gas where the oxygen content of the mixture is sufficient to

enable you to detect the Illawarra bottom gas, when you come to practical experience that may well not be the case? A. Do you mean that the practical experience may not exist?

Q. No, you have theorised that even when the Illawarra bottom gas lays on the floor as it does at a place it must be able to be tested at some point when the oxygen content is sufficient to enable it to be tested? A. Yes.

Q. In theory that is all right? A. It has been proved in practice.

Q.You have not proved it in practice, have you? A. No.

Q. You are not prepared to guarantee you would be able, here and now, to go to a place where Illawarra bottom gas exists in a percentage where theoretically it could be detected, and detect it? A. I am prepared to have a go at it.

Q. Without the practical experience you may well fail? A. I do not agree with that at all.

Q. Am I correct in assuming a chart of mine gases has been distributed to various collieries by the New South Wales Department of Mines in conjunction with the Joint Coal Board and the National Health and Medical Research Council of Australia? A. Yes.

Q. I think that chart is in current use? A. Yes.

Q. That is the chart which sets out the mine gases one would normally expect to find in the New South Wales area? A. Yes.

Q.I think it is to that chart that deputies and Under-Managers and other people refer in gaining their information as to what gases are found in mines? A. I will accept it for deputies but I do not accept it for Under-Managers.

Q. Incidentally, is that a copy of the chart in current use? (Shown to witness) A. Yes.

Q. That is the chart you say deputies, at least, refer to in ascertaining their information?A.Yes.

Q.You will agree that there is no mention on that chart of Illawarra bottom gas or any gas like that? A. I have not looked at it for a long time but I will accept your word.

Q.Will you have a look at it --

HIS HONOR: The witness said he will accept your word.

MR.McNALLY: I must confess there is some I do not understand but I think that is correct.

Q. The position is that when a deputy undergoes his examination, he is asked to test for gas; is that correct?A. I have never been on an examination board but I assume that would be so.

Q.You are familiar with the procedures for the appointment of deputies?A.Yes.

Q.You are familiar with the examinations and tests they are required to undergo? A. Reasonably well,yes.

Q. I think you will agree that the tests for deputies in this area are the same as tests for deputies in the northern and western areas of New South Wales? A. Yes.

Q. Will you agree that in the examination they are required to use the safety lamp and make certain tests? A. Yes.

Q. And are required to test for methane? A. Yes.

Q. They are not required to test for Illawarra bottom gas in that examination? A. I can't really answer that question because I have never conducted one of the examinations but from what I have heard of the examinations I would assume your statement to be correct.

Q. In any event five years ago or ten years ago that was the situation, wasn't it? Do you know or don't you? A. How do you mean, five years ago or ten years ago?

MR.McNALLY: I will withdraw the question.

(Gas chart tendered and marked Exhibit "Y")

HIS HONOR: Q. Do I understand from the evidence you are giving, Mr. Menzies, that you would not expect a deputy in Bulli Colliery to test for methane near the floor level - I am dealing with the period before the fire? A. As far as my knowledge goes Bulli Colliery was not associated with Illawarra bottom gas and therefore I possibly would not require or expect him to test for firedamp near the floor.

Q. Have you conferred with any of your local inspectors as to whether it was within their knowledge that the Bulli Colliery was associated with bottom gas? A. I have.

Q. And the impression you have gained is that it was not known to them? A. One inspector was here for five years and it was not known to him in Bulli Colliery.

Q. Who was that? A. Mr. Muir.

MR.McNALLY: Q. To clear up one point: I think if one detected inflammable gas in this shunt area one would automatically cease using the shunt areaM A? I would think so, yes.

Q. But that is not the situation if one detects noxious gas or carbon dioxide? A. There are percentages of carbon dioxide which you can reach at which you will have to withdraw your men as well.

Q. What percentage is that? A. I think it is related to the oxygen content of the air, in other words it is dependent upon the oxygen content of the air, the air available. The oxygen content of the air must not fall below a certain minimum value being replaced by black damp or carbon dioxide and that figure is 19%.

HIS HONOR: Q. What happens in practice if a deputy reports carbon dioxide present, say, in the shunt area? What is the next step? Can he say the oxygen content is below 19% or above 19%? A. He would be able to tell by his lamp - a fair idea from his lamp - whether his light kept burning or not. The light will go out when there is less than 17 - 18% of oxygen present in the atmosphere. If his light goes out he is below the oxygen limit and therefore men cannot work.

MR.McNALLY: Q. That is if it is less than 17 or 18% oxygen, is it? A. Yes.

Q. In normal conditions do you know what percentage of carbon dioxide would then be present? A. Take 18 - it would be 2.93.

Q. Can you read that on a safety lamp? A. Your light would go out.

Q. Below that would your light go out? A. Yes.

Q. At what stage would your light go out? A. As soon as you move it - as soon as it consumed the air that was in the lamp and the mixture that was in the locality went into the lamp your light would start to go out.

Q. In any event if your light did not go out in the shunt area even though there may be carbon dioxide present it would still be safe to work? A. Still safe, yes.

Q. If a person was able to smell blackdamp or what he thought was blackdamp but could not detect it on his lamp would you agree that it would be perfectly safe to use that area as a shunt? A. After certain elementary precautions were taken.

Q. What are they? A. Direct some air into the place.

Q.Or remove the blackdamp by a vacuum procedure using an elephant trunk? It is not laid down in the Coal Mines Regulations but it is practical commonsense, isn't it? A. It could be done.

Q. And then after perhaps testing with the lamp or smell on the floor there was found no evidence of it would you agree that it is all right to use it? A. Quite safe to use it.

Q. Not only is the safety lamp unable to detect gases up near the roof because of its design, it is unable to detect gases close to the floor. Do you agree with that? A. Close to the floor - within inches of the floor.

Q. Five or six inches from the floor: Because of the fact that the holes are that high from the ground? A. I would not like to estimate. If I can have the lamp I might give you an estimated number of inches. (Witness shown lamp). Four inches.

Q. In any event you would be unable to detect gas below the bottom inlet holes of the Davis safety lamp? A. Not unless the convection current brought them up and we can't depend on that.

Q. Are you familiar with the method of using the lamp when searching for blackdamp, of the operator holding the adjustment switch underneath to prevent his light going out? A. I am aware of the practice but ...

Q. This would be a commonsense manner to prevent your light from going out when testing for carbon dioxide? A. I can find a more commonsense one.

Q. What? A. Use of re-lighter lamps.

Q. You mean let the light go out and go and get another one? A. No, lamps are designed and used extensively overseas which can be re-lit in the main air body, you do not need to get a new lamp, you just re-light them.

Q. Is that one of these? A. Yes.

Q. Perhaps we should hear a little of this. Are these a new invention? A. No.

Q. Without those I suppose you have to take your own measures to prevent your light going out? A. Yes.

Q. A way of doing that is to hold your finger on the control button? A. Yes.

Q. Ready to increase your flame if it goes out? A. Yes.

Q. That practice itself would prevent you from even putting the lamp on the ground of the mine shaft? A. It would.

Q. Deputies, I think you will agree, are not the only people who test for gas in mines? A. Not the only people.

Q. I think the miner driver has a lamp and he tests at the face? A. Yes.

Q. The Under-Manager, when he comes into a mine, brings his lamp with him? A. Yes.

Q. The Assistant Under-Manager has a lamp? A. Yes.

Q. He tests wherever he goes, into various places? A. Yes.

Q. Do you know it is the practice at the Bulli Colliery for an Under-Manager to go into each place and each section each day? A. An Under-Manager?

Q. I am sorry, an Assistant Under-Manager? A. I would accept that, yes.

Q. Do you know it is his practice to test for gas each day when he goes in? A. I think possibly he would do.

HIS HONOR: Q. Does he make a report? A. He may make a report to his company.

Q. No statutory report? A. There is no statory report, he has no statutory authority.

Q. Is he then to check on the deputy? A. He cannot be a check on the deputy because he has no statutory authority.

Q. Is he a check as far as the company is concerned? A. I would say so, yes.

MR.McNALLY: Q. You say the Assistant Under-Manager has no statutory authority? A. No.

Q. But inthat he represents the Assistant Manager I suppose he does? A. In the way he represents the Under-Manager for the company.

Q. I mean, an Assistant Manager is provided when it is impossible for an Under-Manager to go to each place each day? A. Yes.

Q. And this is the function of the Assistant Under-Manager? A.Yes.

Q.Of course there is an obligation under the statute for an Assistant Manager to go to each part of the mine - I am sorry- the Under-Manager, to go to each part of the mine as often as possible? A. Yes.

Q. By way of mining practice this in fact happens in all mines? A. Yes.

Q. You went through certain Rule 4 Deputy Reports after coming out of the colliery. Did you go through the Rule 4 Reports for the week preceding the fire? A. Not at the time.

Q. Did you subsequently go through them? A. Yes.

Q. Would you agree that this No.2 cut-through extension commenced round about 2nd November? A. It would.

Q. Would you agree that noxious gas was reported on that day, on the day following and on the third day? A. The information suggests that.

Q. There had been repeated reports of noxious gas in the preceding week? A. Yes.

Q. By the deputy? A. Yes.

Q. Were you able to find any reports not in that week but previously for Illawarra bottom gas? A. I did find reports of methane being reported on at least three days in the month of October.

Q. Could you find any evidence of any report of Illawarra bottom gas? A. No.

HIS HONOR: Q. Could you find any evidence of any report of blackdamp? A. Yes.

MR. SULLIVAN: Q. I want your help on some of the figures you gave us. Do you need your report? I refer to the evidence you gave on p.286 of the transcript. If you would like it in front of you I think Mr. Lee would probably give you one. It is in the transcript at p.286. (Witness handed copy of transcript).

HIS HONOR: Q. Firstly, I asked you a question about your acquaintance with Illawarra bottom gas in Bulli Colliery and you said you had no knowledge of it and also said Mr. Muir, after discussing the matter with him, appeared to have no knowledge of it even though he had been here five years? A. Yes.

Q. Were you present in Court when Mr. Longworth gave his evidence? A. Yes.

Q. Do you recall this: This was in answer to Mr. McNally at p.213 of the transcript. Mr. McNally asked this question "When was it you first contacted or had anything to do with Illawarra bottom gas?" his answer was "My first introduction to this particular circumstance was at Bulli Colliery, this colliery." The next question was "By that do you mean your first contact with this Illawarra bottom gas was following upon this happening?" meaning the ignition here, and his answer was "No. This was in 1960."? A. I heard that said, Your Honor.

Q. The next question was this, "Before that you did not know of the existence of the gas, is that it? " his answer was "That is right. Not in that form anyway." It goes on "Q. I think people generally - is this your experience - are now only just beginning to understand what Illawarra bottom gas is? A. There has been considerable attention focussed on Illawarra bottom gas particularly since this incident." I then asked him to repeat the answer and he repeated it. I said "What about before the incident - was anything done or anything written about it before that to your knowledge, or any reports about it in your Department? A. Well, I had not come across them." Then, Mr. McNally said "Q. Is this the position, that anything you now know about Illawarra bottom gas in the main you have learnt as a result of this happening on 9th November? A. No, I learnt in the interval between 1960." Do you recall that evidence? A. Yes.

Q. From that evidence it would appear there was local knowledge about the existence of Illawarra bottom gas in the Bulli Colliery, this colliery, which did not reach your Department as such? A. Yes.

Q. But that the local inspector, Mr. Longworth, knew of its existence at the time because of something happening in the mine in 1960? A. It would appear so, Your Honor.

MR. REYNOLDS: He was not an inspector then, Your Honor, I don't think.

HIS HONOR: No, I am not suggesting he was, on his own evidence he was part of the management. The local inspector was, in 1960, aware of Illawarra bottom gas. I think unless submissions are made to me I should draw certain inferences as to the state of knowledge of the management.

MR. REYNOLDS: He said his first introduction was in 1960. He did not tell us what the introduction was, whether he heard about it or read about it. We could clear it up but no great inference can be drawn from it.

HIS HONOR: I merely mention it at this stage.

MR. SULLIVAN: Q. You say at page 286 that 8 Right, which is the first sub-split of the 1 North split was regulated and according to the October figures 28,600 cubic feet of air a minute were entering this split. Perhaps I may go to the map and refer to this matter: You have got 28½ thousand feet approximately coming up C Heading; is that right? A. C and B.

Q. Dividing at No. 1 cut-through? A. Divided further back at zero cut-through.

Q. So the 28½ thousand feet are coming up C and B, are they? A. Yes.

Q. They come into No. 2 cut-through? A. Yes.

Q. Then, there being at the time of the fire no brattice at B Heading, they go into the goaf, some of them? A. Could do.

Q. And the remainder, of course, goes down No. 2 cut-through, or up, if you like, in the direction of the face; is that right? A. Not all of it.

Q. Are you referring to some that may go into this shunt? A. No.

Q. Where would the rest go? A. Past the fan.

Q. There would go some go straight down that way through the brattice at the back of the fan which, I understand, was not tightly sealed? A. Yes, information leads us to believe that.

Q. Then it goes into the return airway and that 28 thousand odd feet is apparently at some stage analysed for the gas? A. Yes.

Q. Is that right? A. Not analysed - tested.

Q. Some sort of meter apparently, is it? A. Methanometer.

Q. It is analysed only for methane? A. No, it is not even analysed, it is simply tested for methane content.

Q. There is a reading on the methanometer of the content thereof the methane going back? A. Yes.

Q. Your colleague, Mr. Longworth, gave us some figures about those readings and they are at p.168. May I remind you you said the section was commenced in May 1965? A. Yes.
Q. That is correct, is it? A. That is the information I was given.

Q. Yes, I want you to assume that is correct. In May 1965, when you say the section was commenced, I just want to know what you mean. You do not mean the extraction of pillars? A.No.

Q. You mean the actual mining of solid coal? A. The driving of three headings and associated cut-throughs.

Q. Mr. Longworth's readings on the air analysis start from January 1964? A. Yes.

Q. What would be the reason for that if the section was not actually working? A. It was all 8 Right panel and they just carried on putting the readings down with the new one.

Q. There was air going through before they started working in May which was coming back through the return and being tested? A. No.

Q. If you will explain? A. If I could have the ventilation plan of the colliery I think I could explain that anomaly (witness shown plan: Indicates on plan).

MR. SULLIVAN: Q.The witness indicates an area which now appears to be mainly goaf; is that right? A. Yes.

MR. SULLIVAN: Which was at that time known as 8 Right.

Q. These readings obtained through 1964 would have nothing to do with the particular area now? A. No.

Q. We can start, I would think, with his readings for May? A.Yes.

Q. As being the significant time. The figures he gave us were May, June, July and August, 0.1 ? A. Yes.

Q. Would there be any other source - we are dealing now with the present 8 Right - would there be any other source of methane other than goaf gases? A. Not according to the figures obtained on the intake areas, no methane on the intake area, so the goaf must have been the only source.

Q. So the only origin for the readings up to September were goaf gas? A. The working areas, where they were working.

Q. The next reading, the September reading of 0.2 related to 27½ thousand cubic feet of air was, as you said, satisfactory? A. Yes.

Q. In fact the methane content of the return gas doubled in September? A. Yes.

Q. Is that right? A. Yes.

Q. And that was coincident with an increase in the goaf area? A.Yes.

Q. Would that have conveyed anything to a person like yourself, an expert in mining engineering, as to a situation that was developing there? A. Doubling of the quantity of methane being exhausted is indicative of something happening.

Q. These analyses or these figures are kept by the management? A. Yes.

Q. So we had the position that when the extraction was reaching the stage which is shown on this plan there was a significant doubling of the amount of methane? A. Yes.

Q. As you said, that could only have been coming from the goaf gases? A. Yes.

Q. We have got this situation then: That at some stage when we got back to here someone was responsible for putting fairly tightly - fairly tight sealing brattice across the A Heading? A. Yes.

Q. Do you know who that was? A. No, I can't say I know who it was.

Q. When that happened instead of this current of air that was coming up B Heading picking the goaf gases up and taking them back to the return airway it would inevitably cause them to bank up? A. I think so.

Q. The next thing was it was obvious to anybody who had the analyses coming through, and I am talking about the managerial section, who had these analyses coming through, that this goaf gas contained methane? A. Yes.

Q. The quantity of which had doubled in September? A. The quantity given off had doubled.

Q. Then we have this situation: We have this brattice put here and do you consider it good mining practice, as your colleague did, to ventilate the goaf, the edges of the goaf, I mean? A. If it is the only thing left for you to ventilate the edge of the goaf with a current passing along it, yes.

Q. You should do it? A. Yes.

Q. That was the only thing you could do there, wasn't it? A. Yes.

Q. Whoever put that brattice up or ordered it to be put up was stopping ventilation of the goaf, wasn't he? A. Yes, of the edge.

Q. And causing gas which contained methane to bank up behind that brattice? A. Yes.

Q. Do you know who was responsible for ordering that heading to be used as a shunt? A. No.

Q. Assuming that brattice had not been put up, the gases from the goaf passing down A Heading in the direction of the fan would to some extent have been taken into the return airway? A. Yes.

Q. And that would have been diluted also by the current of air coming down No.2 cut-through? A. Yes.

Q. Wouldn't they? A. Yes.

Q. The only trouble about that would have been that the operation of these tandem fans would have thrown some of them down across the working place? A. Yes.

Q. It is a fact, is it not, that if methane to an extent greater than 1.25 had appeared in the working face production would have had to be stopped? A. Yes.

Q. Whereas you could have the same percentage of methane in the shunt and production would not have had to be stopped? A. Not necessarily.

HIS HONOR: Q. What about the use of machinery in the shunt? A. I referred to the possibility of changing the shunt position.

Q. You were thinking about the possibility of changing the shunt position? A. Yes.

Q. But you can't change the working place? A. No, we can change a shunt position.

MR. SULLIVAN: Q. It would have meant a longer travel for the empty car if you changed the shunt, wouldn't it? A. No, I don't think it meant any longer travel. You have only got the distance to travel from the miner to the loading ramp and that distance can be altered.

Q. Did you know where the barometer was at the pit top on which that graph was taken? A. Prior to the incident?

Q. Yes? A. Yes.

Q. Where was it? A. Under-Manager's office.

Q. The same place as where these, or near to the same place as where these records of methane content in the return air were kept? A. I am afraid I did not see where the book was kept.

Q. I think the evidence is it was in the Under-Manager's office - from your colleague, Mr. Longworth? A. I did not see it.

Q. Why is a barometer kept at or near the pit top? A. To indicate to deputies and the other people concerned when there is a possibility of the barometer falling to such an extent that gas will be liberated from the goaf areas.

Q. A half an inch of mercury is a very significant fall? A. Considerable.

HIS HONOR: Q. To indicate to whom? A. Deputies and other officials.

MR. SULLIVAN: Q. Including the Under-Manager? A. Including the Under-Manager.

Q. It appears from the record that was kept at the colliery that a fall of half inch was apparent for about nine hours before the explosion? A. The fall was apparent, yes.

MR. REYNOLDS: Q. There is one matter I would like to tidy up initially: You gave a lot of evidence about events on the morning of the 9th from information you had received from various sources? A. Yes.

Q. You said that the rescue station was contacted at 9.55? A. Yes.

Q. Who told you that? A. The rescue station superintendent.

Q. Did he tell you that in writing? A. No.

Q. Do you have a note of what he told you? A. No.

Q. If I suggest to you the rescue station was rung at 9.30 a.m. and Mr. Stone spoke to Mr. James at that time would that be within the information you got? A. That was not contained in the information I got.

Q. Mr. Hammond is the superintendent, is he?A. Yes.

Q. And if I told you that he actually arrived at 9.50, would that be contrary to the information you got?A. Yes.

Q. I am aware of what is the source of the possible confusion.
A. In the light of what you said, there must be some confusion.

HIS HONOR. Q. What is the source of the information?A. Mr. Hammond told me.

MR. REYNOLDS. Q. There is another time; it was 10.55 when the rescue team arrived at the -- A. Fresh air base, yes.

Q. Now, could you have been confusing the 9.55 with the 10.55?
A. No, Mr. Reynolds.

Q. At any rate, you cannot help me any more than saying that is what he told you?A. That is what I was told, yes.

Q. And you did not examine any records?A. No.

HIS HONOR: If evidence of this kind which would normally be excluded under other rules is accepted by common consent as a means of proving something, of course I rely on it; but if it is challenged as you have just challenged it, obviously I cannot.

MR. REYNOLDS: I thought I should bring matter to the surface now rather than waiting till Mr. Stone is called, but we do have an actual log of all the telephone calls and the precise times of them, and the arrival of people.

Q. I want to come now to a statement which you made.

MR. REYNOLDS: Perhaps before I do that, there appears to be a correction required at p.301 in this witness' evidence, the fourth question from the top:"Q. Apart from the tube system that you suggest here, was there any other addition....A. Well, the solution I am going to outline now is not without its implications...". I thought he said "complications".

WITNESS: Implications.

MR. REYNOLDS. Q. Did you mean implications?A. Yes.

Q. I want to take you to an answer which you gave at p.307 and I can assure you I shall not be long. You have been in the box a long time. You said this when you were asked this question: "Q. Then the extension of No.2 cut-through in your opinion is not sound?A. Not particularly the extension of No.2 cut-through, but the attempt to remove coal from the left hand side of the development headings. Q. That was not good mining practice?A.It does not appear to me to be at the present time." Now, I notice that you said, and I have no doubt advisedly, "at the present time", and I suppose you said that because to your knowledge this type of development had been undertaken for some years in the Bulli Colliery?A. Yes.

Q. And it had been undertaken and carried out with the knowledge of your Department?A. Not in the particular form that it takes at the present time.

Q. Well, that was not the question. The question was developments to the side, wasn't it? You were asked about the attempt to remove coal from the sides of the development heading?A. Yes.

Q. That type of development had been done on a number of occasions

at this colliery in recent times?A. Not in the way it was done here.

Q. Are you referring to ventilation?A. Yes.

Q. Well, leave ventilation out of it and we will come to that; it was done, was it not?A. Yes.

Q. And it was on how many occasions that you know of?A. Personal knowledge?

Q. Yes. A. Nil.

Q. But you can, I suppose, indicate them on the coloured map? Would you be good enough to have a look at this? (Shown to witness) You are familiar with this map to some degree, I suppose?A. That is right.

Q. Do you know the green panel?A. Only by name.

Q. Would you have a look at that development there which has ML5 written on it?A. Yes.

Q. Does that indicate to you a development to the right of two headings?A. It does indicate that, yes.

Q. Would you have a look at the yellow panel; does that indicate to you a development on both sides of three headings?A. To the left and right, yes.

Q. You see to the left and right there, unless you reverse the air intake and return there you would have had a situation not unlike this, wouldn't you?A. Would you repeat that question please?

Q. Unless you reverse the air circulation you would on one side or the other have had the identical situation on one side to this?A. Not necessarily.

Q. Not necessarily - but why not necessarily?A. Two returns in one intake.

Q. Two returns in one intake?A. Yes.

Q. Well, would you have a look at the red panel; do you see another situation there where there has been a development on both sides?A. Well, I would - are you referring to this red panel here?

Q. Yes. A. Once again, yes, possibly.

Q. Do you see the violet panel?A. Yes. Development there, yes.

Q. And that is a development to the right of three headings?A. Yes.

Q. So we may take it that it was known to the Department of Mines that this colliery had in recent years carried out this form of winning coal?A. Yes.

Q. And you yourself, I gather, would not be able to comment on the particular ventilation arrangements that were made for those developments?A. No.

MR. LEE: Of his own knowledge.

MR. REYNOLDS. Q. Of your own knowledge?A. Of my own.

Q. I suppose Mr. Lee by his interjection wants to suggest that you have read some correspondence. Have you read some correspondence? A. I have looked at it.

Q. And I think it has been made perfectly clear by some of those appearing in this case that your department has very considerable powers of veto?A. Yes.

Q. And to your knowledge, this type of exploitation of a coal seam has not attracted the veto of your department hitherto?A. It has not.

Q. Of course, when this unfortunate occurrence took place, the attention of you and I suppose most of the senior inspectors of your department has been focussed upon the problem?A. Yes.

Q. Am I right in understanding that you now say, as your considered opinion, that this method of mining coal to the flank of driven headings is not very satisfactory?A. No, I never said that. I do not propose to say it, either.

Q. You do not say it?A. No.

Q. Well then, let me understand you. Do you say that it is satisfactory provided you deal adequately with ventilation problems?A. Yes.

Q. In answer to Mr. Murray this morning, I thought you said the opposite and I would like to clear this up. You see, I thought you said to Mr. Murray yesterday that it was not a proper mining practice. One reference is p.307. Perhaps I should qualify your answer. Was this it, that you do not regard it as proper practice in mines which have a gas problem; is that what you meant?A. This method of working?

Q. Yes. A.Well, I didn't intend it.

Q. So we may take it now that whatever you may have said on this aspect of the matter to Mr. Murray yesterday, you do not regard this method of winning coal as being wrong in mining practice? A. No, I don't.

Q. You do not? But you say, however, as I understand you, that it brings in its train problems of ventilation?A. Yes.

Q. And I also understand you to say that the problem of ventilation cannot reasonably be solved by having the intake airway on the side of the exploitation; it makes it better but it does not solve all your ventilation problem. Is that a fair summary of your evidence?A. Yes.

Q. And the reason of course is that whichever way you come and go, you are going to get to the situation where it is inevitable that you have to deal with the problem of goaf gases passing through the working places, some of them?A. Yes.

Q. Agreeing with what you said this morning that ventilation was a prime consideration, you would also agree that roof safety is likewise a prime consideration?A. Yes.

Q. I suppose you would also agree that, like many industrial operations, the industry of winning coal cannot be made entirely free from some element of danger?A. I agree with that.

Q. In giving full weight to the necessity to safequard the health and lives of the men, I suppose you would agree there must be some element of compromise in the solution of the problem?A. There has to be.

Q. Otherwise you would not get any coal?A. Just stop.

Q. If we come now to look at the particular conditions which we believe to have existed on 9th November, I understand you to say -

HIS HONOR: Q. May I ask this question in view of your last answer: If there is an apparent danger, has there to be a compromise between the winning of coal and safety? A. No.

MR.REYNOLDS: I will come to that and face those questions in due course, Your Honor.

Q.It could never be denied that if you know there is a situation of danger you must deal with it then and there? A.Yes.

Q. But I take it this is a different problem from laying out a particular system of work and system of ventilation? A. This?

Q. The problem of a specific known danger is a different problem from the problem of devising a reasonably safe way of winning coal? A. Yes.

Q. If we deal with the situation as it existed on the 9th November, I understand you to say, do I not, that there was then no discernible danger to the men in the working place near the face? We know of none, do we? A. On the morning, no.

HIS HONOR: I have to be clear on what the witness is saying, bearing in mind he is an expert witness. When you say there was no discernible danger to the men working near the face, do you mean that there was no source of danger which could be ascertained? A. I am sorry, have you directed your question to me, Your Honor?

Q. Yes. You see, your answer to Mr. Reynolds was that there was no discernible danger that morning to the men at the working face. By that answer do you mean there was no source of danger which could be ascertained? A. No, I do not mean that.

Q. I think the word "discernible" taken literally means "able to be discerned". What do you mean by the answer, Mr. Menzies? A. Well, my impression was the question was directed to the conditions which existed at the working face as reported by the deputy on that particular morning.

MR. REYNOLDS:Q.Well, what danger was discernible at the working place of the early morning of the 9th November? A. Am I expressing an opinion now or am I -

Q.YEs, at the working face? A. At the working face where the machine was, black damp was reported in the old pillar left. That presented no problem. Black damp had been reported in the A shunt. That in itself presented no problem, but in the light of investigations that had been carried out and in the light of what happened on that particular morning it would appear to me that -

Q.That is not what I have really asked -

HIS HONOR: You asked him to express an opinion.

MR.REYNOLDS: Discernible on that morning, was the question. No one appreciates more readily than I do that there was something wrong because this happened.

HIS HONOR: The question is whether it should be discernible to those whose duty it was to discover it.

MR.REYNOLDS: That may be, but the answer is "In the light of what happened afterwards" and that cannot touch that question.

HIS HONOR:The evidence in this case surely is that the witnesses have tested the conditions under simulated circumstances. It is of no assistance to have questions answered which to me are ambiguous, and where ambiguity exists it is my duty to try to remove it.

MR. REYNOLDS:Q.In your opinion was there any discernible danger to the men working on the face on the morning of the 9th November?A.Yes.

Q.What was it? A. Gas accumulation in the A shunt and a further gas accumulation behind the brattice in A shunt extending a fair way at least towards C heading.

Q.And you say that in the light of what has been found since? A. And in the light of evidence that that goaf edge had not been inspected on the pre-shift inspection.

Q. You say that the deputies should have done more, do you? A. Yes, Mr. Reynolds.

Q. I understand you to say that if they had found that gas, steps should have been taken to dilute it? A. Yes.

Q.Is there any reason to suppose that the gas found at the face and reported by Mr. Stewart was not diluted? A. I assume it was being diluted as made.

Q. I think that is what his report said, is it not? A. I am afraid I have not had the opportunity of seeing that report made by Mr. Stewart on the 11th. I haven't seen it.

HIS HONOR: Show it to the witness. (Exhibit "G" handed to witness).

MR. REYNOLDS: Q. To what does it refer by way of - A. The old pillar split at the bottom end of the working area there.

Q. And it says nothing about it being diluted? A. Noxious gases - there was no condition of danger apparent at that stage in that place, according to that report.

Q. In answer to one question I think you said that this heading or extension which was being driven could never be used as a bleeder? A. Not in the present set up.

Q. Supposing that it was holed into the goaf, you could of course then come inby and split that pillar, the pillar so created, could you not? A. Yes.

Q.And in that way it could be used as a bleeder for the goaf? A.Yes.

Q.As I understand your evidence,although you have no direct knowledge of it, you have made the assumption that it was not intended to hole that? A. Yes.

Q.But of course there could have been another intention?A. There could have been.

Q.For His Honor's information you might tell us when you do hole the goaf in circumstances like that, what size hole is made in the first instance? A. Usually pretty small.

Q. What is that? A. Usually fairly small.

Q. And when that is done, is it the practice for the miner crew to withdraw rapidly, pull the miner back? A. I reckon it would be.

Q.Would you not agree that if the miner crew evacuated that place, the extension auxiliary fan and tubing could then exhaust any gases that might come from the goaf at that point? A. That would depend to a large extent on the amount of gas.

Q.On the quantity of it? A. On the quantity.

RE-EXAMINATION:

MR.LEE : Q. Just to finish off that last matter, Mr. Menzies: From the point of view of good practice, if you were going to hole into the goaf in that situation would there have been anything else required other than the existing set up or any alteration in the system of working in any way? A. If this existing driving was going to hole through to the goaf - can I have your question again to make it clear?

Q.Perhaps if I withdraw it and put it this way: If you were going to hole into the goaf there, were any dangers created by that situation? A. Yes.

Q.Were the dangers that were or might be created from that situation capable of being dealt with adequately by the set up as it existed? A.Not completely because one could not estimate the amount of gas that was going to come from that goaf when you holed through.

Q. A-nd if it were intended to hole through into the goaf, what do you say would be needed in the way of additional requirements in the set up or additional safety measures being taken? Would you give us a full opinion on it? A. Well, on holing into a goaf of such a nature containing gas, it is not compulsory by law but it is recommended and I think inherent in the requirements of Regulation 13 of the 6th Schedule that holes be bored in advance into the goaf to drain off gases before the holing is made into the goaf.

Q. Just before you give the Regulation, what is your opinion from your experience as to the dangers involved in this holing into the goaf and how that set up there could deal with it, if it could, with safety to the men? A. The system could fall down.

Q.It could what?A. The system could fall down and put the men in danger.

Q. What part would the accumulation of gas in the goaf, the actual accumulation of gas in the goaf, play in the system falling down? Would it determine whether it fell down or not depending on the quantity that had accumulated? A. If at the moment of the hole-through, in stead of getting a small hole which is always attempted you get a break-through of large dimensions, you could have an outflow of gas from the goaf which would be found to be completely inadequate to deal with.

Q.And what would happen then? A. Men would be caught, could be caught, in the gas from the goaf and asphyxiation would follow.

Q.Have you had to do or had experience of goafs being holed into? I mean, that is something that has come into your ordinary experience, is it? A. Yes.

Q. When that is done, is it usual practice for special precautions to be taken? A. It all depends on the goaf.

Q. In your view would it be usual practice for the deputy to tell the men that if they holed through to get out of the place as fas as they could? A. It would not be usual but I think it is a good warning.

Q.It is a good warning, but I suppose you would take the view that some other safety precaution than fleetness of foot would be in existence? A. I would hate to be in that position myself though.

MR. LEE: May I go to the map?

HIS HONOR: Yes.

Q. Do you feel capable of giving further evidence? You have been in the box a long time? A. Yes, Your Honor, I am all right.

MR. LEE: Q. Mr. Sullivan asked you some questions: Do you remember Mr. Sullivan spoke of the introduction of the brattice in A Heading? A. Yes.

Q. He suggested prior to that the air could come up No.2 cut-through? A. Yes.

MR.SULLIVAN: I suggested it could have --

MR.LEE: Q. That it could have come up No.2 cut-through, could have gone round into A Heading and ventilated the goaf edge? A. Yes.

Q. That was a practical possibility? A. A small quantity would go that way.

Q. He asked you some questions about the positioning of the brattice? A. Yes.

Q. From the point of view of the work, working this face, which do you think would be the most desirable way of doing it of those two ways, either taking the air down No.2 cut-through, letting a small amount go through into A Heading with the main body going straight through, or putting the brattice in A Heading. If you had a choice between those two possibilities which one would you say? (Objected to by Mr. Sullivan).

HIS HONOR: Leaving out any other way.

MR. LEE: Q. Which is the most preferable if they were your two? A. I consider to ventilate the goaf edge most preferable.

Q.You consider that would be most preferable? A. Yes.

HIS HONOR: Mr. Buck has drawn my attention to General Rule 13. Mr. Buck says if you are within ten yards the General Rule says you must bore a hole.

Q. Are you acquainted with that? A. Yes.

MR. LEE: He did mention that, as a matter of fact, in his evidence, Your Honor.

Q. I was just putting that to one side, the existence of the rule. Some questions were asked by Mr. McNally in a context which at one stage he conceded himself was impractical but some questions and answers were given which may be misleading: When you did say that methane below a certain percentage, 5.4% and above 15% would not burn, you did not mean it would not ignite?A.No,I meant - what I meant was that flame would not be propagated through the mixture of its own accord.

Q. You mentioned further that all areas outside five yards from the work face should have been stone dusted for the reason you attribute to stone dusting; the reason you attribute stone dusting is necessary? A. Yes.

Q. And there are precise regulations covering that proposition? A. Yes.

MR. LEE: As it is not to do with fire prevention I will not take any more time on it at this point but we can refer Your Honor to it.

HIS HONOR: Very well.

MR.LEE:Q. On the safety lamp, I think it is your knowledge that the safety lamp is in use in the United States of America? A. Yes.

Q. Great Britain? A. Yes.

Q. Belgium? A. Yes.

Q. Germany? A. Yes.

Q. And some other European countries? A. Yes.

HIS HONOR:Q. When one does these tests with the safety lamp there is an interval of time between the taking in of the gas by the safety lamp and the response of the flame to the gas taken in? A. Yes.

Q. How long is the interval of time? I suppose it depends on the concentration of gas, or is there something else? A. No, it doesn't depend on the concentration of gas, if the gas is there, it is the time it takes the air to flow into the lamp and get around the flame and react on the flame.

Q. Is that a matter of seconds? A. Yes seconds.

Q. A few seconds or longer? A. 5 to 10 seconds at the very most - I have never timed it.

Q. Particularly when testing for black damp, by the time you know what is happening is not it quite likely you will lose your flame? A. It is quite likely if you don't know you are going into it, if you are completely unprepared for the presence of gas you could lose your flame or light, very easily.

Q. Are there any instructionsto deputies about what to do in this case? A. It forms part of the syllabus set out for deputies in their training.

Q. Firstly, do you lift the lamp in, suck up the air, and then whip it straight out? A. No, you must retain your light and you might lose it = in most cases the deputies are pretty well aware of what they are looking for and where it is

Q. I am thinking about a deputy testing for methane in bottom gas, he would lose his flame nine times out of ten? A. If he was not aware it was there he would lose his flame.

(Witness retired.)

HIS HONOR: My attention has been drawn to the local arrangements for the Stipendiary Magistrate who sits in this Court on Fridays and does a call=over list. I have been asked to sit not before 1o.30 on Friday, and on this coming Monday in the circumstances I have been asked not to sit before 11 a.m.

(Further hearing adjourned to 10 a.m. on Thursday 16th December 1965.)

IN THE COURT OF)
COAL MINES REGULATION) No. 1 of 1965
HOLDEN AT BULLI)

BEFORE HIS HONOR JUDGE GORAN

ASSESSORS: MESSRS. MAHON and BUCK

THURSDAY, 16th DECEMBER, 1965

- - -

IN THE MATTER OF AN INQUIRY IN PURSUANCE OF THE COAL MINES REGULATION ACT INTO AN ACCIDENT WHICH OCCURRED AT THE BULLI COLLIERY ON 9th NOVEMBER 1965 AND ITS CAUSES AND CIRCUMSTANCES.

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(PART HEARD)

MR. REYNOLDS: Before the proceedings and Mr. Lee's calling evidence begins, one afternoon last week or it may have been early this week I mentioned the existence in this country of a very recent report made by the Chief Inspector of Mines and Quarries in the United Kingdom. I do not think it is generally available in this country because it was only issued last month and I had photostated those portions of the report which have any bearing upon the problems which confront Your Honor, and those appearing here have a photostat copy.

I propose to make available to Your Honor the full report which is irrelevant except where it touches on the matter of firedamp detection and monitoring. The report would indicate to Your Honor how this type of inquiry is done in the United Kingdom, which may possibly be of some assistance in that respect. Would Your Honor wish that I should read those paragraphs which are reasonably short which bear on this problem?

HIS HONOR: Would there be any advantage in reading them?

MR. REYNOLDS: Only for the purpose of those in the Court. Your Honor might note they are paragraphs 76, 77 and 78 and recommendation No. (2).

HIS HONOR: Would you read them?

MR. REYNOLDS: Yes. This inquiry concerned a mine explosion which bears no similarity to the present problem but there was consideration of the means of detection. This is what paragraph 76 states: "In the course of submissions, reference was made to the shortcomings of the flame safety lamp in the detection of thin layers of firedamp; however the National Coal Board has proposals for the introduction of lamps of the Garforth type or lamps modified to accept a probe.

77. It was also put to me that there was a need for instruments which would continuously monitor the firedamp situation in a district. I quite agree with this view for this explosion has shown that the time is now overdue for a reappraisal of the methods used in mines today to detect firedamp. I certainly do not envisage the use of instruments which have to be carried in and out of a district every shift. I have more in mind the kind of instrument to which I referred in my recent Annual Report, namely a methanometer designed to operate a suitable alarm system and to isolate automatically the electricity supply into a district. So far as I am aware there is nothing to prevent a further development of this so that a number of such instruments are installed at potentially vulnerable points in a ventilating district and then

coupled together to provide continuous monitoring of the firedamp conditions there.

78. I am aware that, apart from the instrumentation of automated faces, research and development is proceeding in this matter; I most earnestly recommend that it be accorded a high degree of priority."

Recommendation No. (2) reads: "a high degree of priority be accorded to the development of instruments and systems for the continuous monitoring of firedamp."

This does appear to indicate that the problems which have been discussed here have not yet been solved in England but are being given consideration.

HIS HONOR: It seems to me at this stage to touch upon the crux of the matter here and I am obliged to you, Mr.Reynolds. I will not have the report itself marked as an exhibit but I may use it as a matter of interest if it may assist me in any way in framing my own report.

MR.LEE: I propose now to call Inspector Muir and what I propose to do in the first instance as far as Mr.Muir is concerned is to hand to him a file which is the file of the Mines Department in relation to auxiliary fan use in the Bulli Colliery. That file comprises a number of letters and then also some reports by Mr.Muir of inspections he made and in relation to other related matters. The course which I think would be the most desirable if Your Honor and my learned friends concur is this: I will ultimately tender the whole file. True it is that there are reports in there but they are in respect of events and circumstances which took place at the time the reports were made and would be admissible in evidence provided the witness is called, but apart from that I would like to tender the whole file as one. This is what I suggest, that I do so, that I give to my learned friends - and I am sorry I am short of copies. I can give Your Honor one, the witness one; I will then have one for myself and two over. That will mean if I can give Mr.Reynolds one and Mr.Sullivan one, Mr.Murray has one but I do not think he is here. He might be good enough to share it with or give it to Mr.McNally because Mr.Murray has read it.

That will mean we can start from the front and work through and everybody will know what is being spoken about. I tender the original file starting with a letter dated 25th August 1959 from Australian Iron and Steel Limited to Mr.J.Muir, Inspector of Collieries.

(File admitted and marked Exhibit Z).

MITCHELL JAMES MUIR
Sworn, examined as under:

MR.LEE: Q. Your full name is Mitchell James Muir? A.Yes.

Q.You reside at 35 Wilkinson Lane, Telopea? A.Yes.

Q.You are an Inspector of Collieries, special duties? A.Yes.

Q.You hold a mine manager's certificate of competency? A.Yes.

Q.You are a Bachelor of Engineering, mining, New South Wales University? A.Yes.

Q.You have been an inspector since 1957? A.Yes, November 1957.

Q.You are a member of some institute? A. The Institute of Mining and Metallurgy - the Australian Institution of Mining and Metallurgy.

Q. You were the inspector for the Bulli District at some stage? A. Part of the South Coast District from late 1957 for a period of approximately six years.

Q. In that period the Bulli Colliery came under your attention? A. Yes.

Q. In fact you were the one who dealt with the installation of auxiliary fans in A.I.S. Collieries and other collieries on the South Coast? A. Yes.

Q. May I hand you a photostat copy of a file the original of which has just been tendered. Prior to 1959 were auxiliary fans in use in Bulli Colliery? A. No.

Q. Were they in use in any collieries? A. They may have been but I would not be aware of it.

Q. The file begins on 25th August. The company asks to know your requirements for the operation of an auxiliary fan for face ventilation in cream and fawn panels? A. Yes. Might I add that prior to this there was one fan installation in Bulli Colliery, the original one in purple panel. That was - I am not sure of the date - but probably early 1959.

MR. REYNOLDS: I have the correspondence relating to that, if you want it.

HIS HONOR: Can you summarise this, Mr. Reynolds, as to when this fan was installed?

MR. REYNOLDS: I have a letter written by Mr. Muir to Mr. Grierson on the 9th May 1958 enclosing a list of requirements for the use of a ventilation fan for face ventilation of the continuous miner panel, which is probably what Mr. Muir had in mind.

WITNESS: Yes, that is the original thing.

HIS HONOR: May 1958?

MR. REYNOLDS: That is so, Your Honor.

MR. LEE: Q. (Approaches witness). Is that the one? (Witness shown file) A. Yes.

Q. It is a short letter and I might read it on to the notes. It is dated 9th May 1958 and headed "Office of Inspector of Collieries" and addressed to Mr. J. Grierson, Superintendent of Collieries, A.I.S. Limited. "In reply to your letter of the 24th March requesting my requirement in regard to the operation of a panel ventilating fan in conjunction with 21 inch spira-tube for face ventilation of a continuous miner panel, a list of such requirements is attached. A proving period will be necessary in order to determine the effectiveness or otherwise of the proposed system. It is stressed that any subsequent installations shall each be the subject of a separate application." That installation there, is that a pillar extraction work or solid work? A. No, first workings.

Q. Then we come to the letter of the 25th August 1959 and there is a plan on the next page. Was that plan forwarded with the letter? A. Yes.

Q. Does that project involve pillar extraction? A. No.

Q. I will pass quickly over the earlier ones, Your Honor. Then

came your letter of 26th August 1959 to which you attached a list of requirements? A.Yes.

Q.You say in the last paragraph: "Should it be necessary to move a fan to another section of the colliery or another fan introduced a separate application shall be necessary in each case."? A.Yes.

Q.Then we come to your report of 26th August 1959 headed "Bulli Colliery: Application for requirement for the operation of two auxiliary fans"? A.Yes.

Q.I will not read that through at this point because as you have pointed out this is in relation to auxiliary fans in solid workings? A.Yes, first workings, this deals with.

Q.That does not really touch the problem with which we are concerned? A.No.

Q.The next letter of 9th September 1959 which gives some detail, it is a letter from the A.I.S. giving some detail of the type of fan being used? A.Yes.

Q.And then comes an inter-departmental note. Then comes your report of 21st October 1959. I might refer you to the central paragraph headed: "Cream panel"? A.Yes.

Q.Where you say "A three heading drivage. At the time of inspection a cut-through was being driven between B and C headings, the previous portion of this cut-through between A and B headings having holed"? A.Yes.

Q."Separate ventilation was being provided across B to A heading as shown in the sketch"? A. Yes.

Q."The branch tubing into A heading was still exhausting 1550 cumins although this was unnecessary at the time of inspection"? A.Yes.

Q."The quantity entering the face end of the tube in the place being worked was 7500 cumins. Under standage conditions, a quantity of 1150 cumins was measured entering the face end of the tube. Conditions with regard to atmospheric dust quite good. No inflammable or noxious gas was detected"? A.Yes.

Q.You went on to give a report on the same basis for fawn panel? A.Yes.

Q.Where these fans were in use? A.Yes.

Q.And everything was quite satisfactory? A.Yes.

Q.Once again we have not arrived at a point of time where we are concerned with pillar extraction? A.No.

Q.Then comes the company's letter of 22nd February asking for your requirements for face ventilation in green panel? A.Yes.

Q.And going on, "a simple two-heading layout is being used and it is intended to extract some coal to one side and later retreat work". That is 22nd February 1960 and this reference in the last paragraph, what does it mean? A. It means they were driving two headings in solid work and that at some point of time they intended to extract coal from one side in the retreat.

Q.You made a note which I do not think I need read - I will read it - "as stated a two heading drivage is to be used which presents no problems and has previously been reported in purple panel"? A.Yes, that is so.

Q. Then comes the letter of the 1st March 1960 from you to Mr. Ryan? A. Yes.

Q. And it refers to face ventilation of green panel? A. Yes.

Q. You say "I have attached a revised list of requirements for the operations of auxiliary fans"? A. Yes.

Q. "In use in purple, cream, fawn and green panels and is dated 1st March 1960"? A. Yes.

MR. LEE: That is the document which is already in evidence, Your Honor.

Q. You make an ovservation about the nature of the drivage? A.Yes.

Q. And, the final paragraph on 1st March 1960, "Before any pillar coal is removed from green panel or from any other section ventilated by means of an auxiliary fan information regarding the proposed system should be submitted for my approval of requirement for its use"?A. Yes.

Q. It goes on. There is the letter from the company of 8th April requesting information as to your requirement for face ventilation in violet and yellow panels? A. Yes.

Q. Your note there was "Fan layout is the same as those operating in other sections and already reported"? A. Yes.

Q. That was solid workings? A. Yes.

Q. Going to the letter of 5th May 1960 from yourself to Mr. Ryan: You replied to that letter and referred to the general conditions? A. Yes.

Q. Previously made known? A. Yes.

Q. As at the 1st March 1960? A. Yes.

Q. Then we come to your report of the 3rd June 1960 and once again we are only concerned there, are we not, with solid workings? A. Yes, solid workings.

Q. To get the position quite clear, up to that point the company has faithfully observed all the requirements of the Department and the Department has been unable to discover any defect in the workings in any way or any matter which it itself wished to improve upon? A. Yes, that is true.

Q. We come to the letter of the 15th July 1960 where the company then advises that they propose to begin extraction of pillars in green panel where face ventilation is by auxiliary fan? A. Yes.

Q. A sketch was enclosed? A. Yes.

Q. You can see the sketch attached to the original file. That is the one that came with the letter? (Shown to witness) A. That is the sketch with the letter.

MR. LEE: The sketch is with the original file only. I do not think it has been photostated. I will detach it and put it in the back of the file.

Q.On that plan would you just tell us in your own words, as an expert on this matter, what ventilation arrangements were in fact made as you read it? A. Well, the air intake is of course on the left hand heading, the return is on the right hand heading and the fan is located adjacent to the line of pillars being extracted and extraction commences from the right hand side and retreats across that line of pillars and whilst the fan is in operation the other adjacent roadways to the goaf are stopping it off.

Q.And you can see that with the curly pencil line across those headings? A.Yes, they indicate brattice stoppings.

Q.So that so far as the goaf is concerned, what is the effect of that ventilation arrangement upon a withdrawal of the goaf gasses? Where do they go? A.Well, the purpose there was that they didn't go anywhere, but subsequent events proved that to be not the case.

Q.So, just to get it clear and to be quite fair to everybody, that ventilation system does not deal with the problem of gasses coming from the goaf? A.No.

HIS HONOR: What was the date of that?

MR.REYNOLDS: 15th July 1960.

HIS HONOR: I notice, if you come to the letter that follows, dated 15th July 1960 - I was particularly interested in the last paragraph, but you deal with it in your own way, Mr.Lee.

MR.LEE: Let me remind Your Honor of some words I used in my opening address: In the early stage it was a matter of trial and experiment, and I say that advisedly.

Q.The company's letter of 15th July 1960 was answered with great expedition by yourself by letter of 15th July 1960? A. Well, I probably received the letter from the manager on that day and I went home and prepared the reply.

Q.It is very encouraging to see a government department acting with such alacrity. In fact there had been a lot of oral discussion, had there not, about pillar extraction and the use of auxiliary fans ? A. Oh yes, the whole matter had been thrashed out prior to this.

Q.Before I go to your letter of 15th July 1960, was that plan that is put there, that system, in fact operated at least for some time in this panel we are concerned with, green panel? A.Yes.

Q.And it was done with your approval? A.Yes.

Q.At that stage I think your experience or knowledge was of this order, that it was a case of trying out that ventilation system to see if it was satisfactory? A. Yes. Can I go further than that?

Q.Yes. A.I would say that at that time that was the first application of an auxiliary fan in pillar extraction; I did not know exactly what problems we would encounter.

Q.I want to come now to the letter of 15th July 1960 and there is a paragraph in it which might be quite misleading in its context unless you explain it, Mr.Muir. You say "it is required that the ventilation be maintained as for solid workings . That is that ventilation around or through the goaf edge is to be avoided at all times"? A.Yes.

Q.Now, in the light of your knowledge now, would that requirement have been there? A. Not in that fashion, no.

Q. In fact was your mind directed specifically in that paragraph to the problem of the goaf gases escaping from the goaf into the working areas? A. Yes. I had - I envisaged the possibility of fas moving out of the goaf under the action of that auxiliary fan.

Q. You see, you say that the ventilation around or through the goaf edge is to be avoided at all times. Briefly now, what is the position about ventilation around or through the goaf edge? A. Well, from the working place to the return it would be quite satisfactory.

Q. We will develop that further later but I thought I ought to put that in its context -

HIS HONOR: Your idea at that time was that all these gases should be contained in the goaf and not allowed to - A. No, I did not anticipate we could contain them in the goaf, but I felt at that stage that we could dilute anything that moved out of the goaf into the working area quite satisfactorily, but there was a possibility of gas moving from the goaf into the working area outby of the working place.

Q. In other words, it was contained, to ventilate the working place? A. Yes.

Q. And any gases that did move out of the goaf and got to the working place would be ventilated - would be diluted and carried away? A. Yes.

MR. LEE: Q. Then comes your report on that of 15th July 1960? A. That was a report to the Chief Inspector advising merely on the application itself.

Q. I think we can pass over that for the time being and come to the letter of the 29th July. You put in that letter addressed to Mr. Ryan some additional requirements relating to the flow of air and in paragraph 12 of that letter have stated "All accessible places leading to the goaf other than the place being worked shall be closed by means of sheet iron or other type of ventilation stopping approved by the Inspector"? A. Yes.

Q. Was there some experimentation going on in this question of stoppings? A. No, not at that stage.

Q. Not at that stage? A. No. I can't be sure of times here, but probably at that time the pillar extraction in green panel had not commenced or was only due to commence - in the very early stages.

Q. Then your report of 5th August 1960 refers to those two matters of additional requirements -

HIS HONOR: Q. Before going on to that, coming back to the 29th July and the letter to Mr. Ryan, the last paragraph, "In pillar extraction all accessible places leading to the goaf other than the place being worked shall be closed by means of sheet iron or other type of ventilation stopping approved by an inspector" - what was the purpose of closing those accessible places? Was it more than to allow the work men to get to the goaf or come into the danger areas? A. No, Your Honor, it was to guard against the possibility of additional air being drawn up around the goaf edge and back into the working area.

Q. In other words, it is still the same principle as you had enunciated in your previous letter? A. Yes.

MR. REYNOLDS: He expressed the reason in his report as to Requirement 12.

MR.LEE: Q.Then we may pass on to the report of 25th November 1960? A.Yes.

Q.It is headed "Auxiliary fan ventilation green panel" and you refer there to the fact that you had made an inspection of 1 North Area of the above colliery on the 19th October? A.Yes.

Q.And you say "Green panel had recently commenced pillar extraction and had extracted some four to five pillars"? A.Yes.

Q."An auxiliary fan and tubing is in use to ventilate the fan area"?A.Yes.

Q."The position on inspection was as shown," and then your report shows a plan of the ventilation system as you saw it in green panel? A. Yes.

Q.You go on "up to 2% of inflammable gas was found in the vicinity of the brattice stopping erected in No.2 heading," and that is where you have got the words "infl.gas" with a cross on the design you have drawn? A.Yes.

Q."Steps were immediately taken to run a brattice line into the cut-through to provide positive ventilation. Whilst this has corrected the situation I pointed out to the manager that it was only a temporary measure and the use of brattic for such stoppings was unsatisfactory. He stated that such use was a temporary measure and that bricklayers were working at that moment in No. 1 heading to erect brick wings prior to the use," and you noted that the bricklayers were erecting two brick wings in No.1 heading? A.Yes.

Q."The manager requested that cement washed brattice be allowed instead of flat iron as it was believed it would provide a more flexible and therefore more air tight stopping. I stated that this appeared satisfactory provided two to three layers of brattice were used and partly cement washed"? A.Yes.

Q.Your report goes on "further inspection revealed no discernible air flow around the pillar", and you stated "it is my belief that the bleed-off of inflammable gas is due to the low pressure zone created by the fan despite the fact that the majority of water gauge is absorbed in overcoming the resistence of the tubing." I will come back to some of this. "However, there is no guarantee that such a condition might not have existed under brattice ventilation due to the parallel air path."A.Yes.

Q.In other words, without the fans? A.Yes.

Q."The manager stated that steps were being taken and would be intensified to ensure air tight stoppings. I stated that this was an important requirement of the fans and unless complied with would result in the removal of the fan. However, no stoppings can be made really airtight and discussion took place about the possibility of providing a bleeder return for the goaf in order to keep it under low pressure"? A.Yes.

HIS HONOR: Q.What is the bleeder return for the goaf? A. Well, it is a working heading air driving which connects the goaf to the return airway.

Q.In other words you make a connection ventilation passage, so to speak? A.That is right.

Q.So that the goaf bleeds off through that into the return airway? A. Yes.

MR. LEE.: Q. Stopping on the front page for the moment, I just want you to tell us a little more about the thinking that was going on between you on this matter at that point of time when you say "However, there is no guarantee that such a condition might not have existed under brattice ventilation due to the parallel air path," and then you go on to refer to the bleeder tube. Would you just tell us what was the matter that was concerning you there at that time? A. Well, at that time the return of course was directly opposite No. 2 Heading on my sketch and there was a possibility, I thought there was a possibility, that air could circulate up No. 1 around the goaf edge and out No.2 and in the process pick up some inflammable gas from the goaf area.

Q. So at that point of time it was present in your mind that quite apart from any effect the fans might have, the actual layout of the ventilation system was one which would or could permit the goaf gas to come into the working area? A. Yes.

Q. Am I correct in saying in that plan there is a very close similarity to what was done in Section 8 Right, in just somewhat reverse order? A. I think with the exception of another heading it is more or less a mirror image of 8 Right.

HIS HONOR:Q. That is the same thing with the removal of the middle heading; is that the position? A. Well, the outside heading or you could have a heading in between the two.

Q. That is what I mean; there would be a heading between the two? A. Yes.

Q. B Heading is cut out? A. I would rather say that No. 1 was in fact B Heading No.2 was in fact A Heading and C Heading existed to the left of B.

Q. The only point about that comparison is that you have here the identical intake and return airway as you would have with C Heading and A Heading in 8 Right? A. Yes.

Q. So the middle heading is not really an airway in that sense at all, is it? A. No.

Q. It is not part of the return air? A. No.

Q. So from the point of view of ventilation in a ventilation circuit, it is the same thing with the B Heading removed? A. Yes.

MR. SULLIVAN: Except that B Heading was unstopped in the present one and allowed air to go up, so it is not exactly the same, if I may say so, with respect.

HIS HONOR: Yes. Q. And the cut-through to the working face is to the right of the plan instead of to the left of the plan as it is in the present 8 Right Section; that is the position? A. Yes.

MR. LEE. Q. It is on the return side, the extension of the cut-through?A. Yes.

HISHONOR: That is as it is at present?

MR. LEE: Yes.

Q. You then found the inflammable gas at the brattice stopping? A. Yes.

Q. Which would be, as applied to the design in Section 8,

the inflammable gas at the brattice in A Heading? A. Well, in this case further inby, almost near a goaf edge.

Q. Quite so, further inby? A. Yes.

Q. But in the co-relative position of the design as in Section 8?A. Yes.

Q. And you therefore suggest, you then suggested the bleeder return and your report goes on "The manager subsequently informed me that a satisfactory arrangement appeared to have been made and I made a further inspection on the 24th Instant", and you say "A place had been driven on the return side as shown in the sketch? " A.Yes.

Q. So that you have got a bleed from the goaf into the return airway? A. Yes.

Q. And in other respects was the ventilation system the same as previously? A. Yes.

Q. There seems to have been some slight alteration. I may be wrong on this, but it is just a visual impression I get. Some slight alteration in the arrangement of the brattice up near the goaf where the pillar has been partly removed; is that so? A. There was only some brattice located between the remnant of the pillar, the stook as we call it, and the solid area. There was no other brattice erected.

HIS HONOR:Q. Where is that on the diagram? Is it on this diagram? A. There should be - this one (indicating).

MR. LEE: Q. That arrangement then was one which the manager, Mr. Ryan, himself devised? A. Yes.

Q. I think the position is that you left it with him after you had discovered the inflammable gas and in effect said, "Well, now we can't have that and you put some-thing before me which might be satisfactory"? A. Yes. I had contemplated the possibility of driving a place from the left-hand side across the main return. .

Q. From the left-hand side looking at the design? A. Yes. The main return was only two or three chains away.

Q. In other words, you would pick up the goaf and bring it down the left-hand side of the design? A. Oh well, we would have connected actually the whole of the goaf area to the main return system.

Q. The main return system being somewhere adjacent? A. Adjacent to the left-hand side.

Q. However, that was a thought you had and Mr. Ryan got round it this way? A. The manager was naturally reluctant to reach the barrier under those circumstances and subsequently devised this system.

Q.Then, having devised it and put it into operation - that is so, is it not? A. Yes.

Q. You made a test? A.Yes.

Q. And your report goes on "An examination of the whole line of goaf edge failed to reveal any inflammable gas"? A.Yes.

Q. "However a trace of gas was noted inthe bleeder heading along which there was a discernible flow of air?"A. Yes.

Q.Did that latter discovery indicate to you that the system was a good one and taking the goaf gasses into the return airway? A.Yes.

Q.Then you go on "I have no doubt that the inclusion of such a bleeder creates a low pressure area in the goaf area due to the action of the main fan and this low pressure which will remain correspondingly below any atmospheric pressure fluctuations will serve to keep the immediate goaf edge in the working area under a negative pressure thus any leakage will be into the goaf"? A.Yes.

Q.Would you just explain that a little more fully? A. Well, the pull of air under the action of the main fan is via the bleeder heading into the return so that any movement of air must be into the goaf from the working area.

Q.You have an outward movement from the working areas into the goaf? A.Yes.

Q.And then the goaf itself drains off into the return airway? A.Yes.

Q.In your opinion that had to do, to some extent anyway, with the positioning of the fan, that system? A.Well, this system had to be adopted where the fan was located in the return airway.

Q.Where it was located in the return airway? A. Yes, and another factor of course is that where there is a possibility that the fan, the back pressure of the fan, may overcome the difference in pressure created between the intake and the return, then there is a possibility of re-circulation.

Q.You go on to say "on the sketch immediately the next line of pillars is extracted a further bleeder will have to be driven and so on"? A.Yes.

Q.In other words, you took the view,it was your view that this system would be re-created from time to time as circumstances required? A. In sequence, actually - not as circumstances required in sequence of extraction.

Q.And you said "I have asked the manager from time to time to take positive steps to stone dust the return heading,that is to say following a fan shift in order to render inert the deposition of dust in the return heading"?A.Yes.

Q.I do not think that had much to do with our immediate problem? A.No, nothing to do with it.

Q.I will pass over it. Now your final paragraph is "The arrangement appears to be an excellent step towards safer working conditions?" A.Yes.

Q.Then in 1961, on 14th February Mr.Ryan wrote asking or saying that pillar extraction had been commenced in violet panel where a 32 inch fan is in use for face ventilation. The layout of the panel is as sketched , attached, and it is oonsidered that any gas make in the goaf will be kept from the working places by the separate bleed of air to the return"?A.Yes.

Q.And there is Mr.Ryan's sketch with what looks like his signature on it? A.Yes.

Q.Does that sketch firstly show a bleed of air from the goaf to the return airway? A.Yes.

Q. Does it show that if there are any gases in the goaf they are not likely to get into the working places? A. Yes.

Q. Is the positioning of the fan on that sketch as drawn by Mr. Ryan the proper and ideal position for the fan in those circumstances? A. In my opinion it is, yes.

Q. In other words, your view both now and then was that you and Mr. Ryan were both thinking very much along the same lines as to the proper way of dealing with the goaf gases? A. Yes.

Q. And that plan received your approval? A. Yes.

Q. Your report of 23rd February 1961 refers to it and you say in paragraph 2 "This arra gement was discussed and inspected with the manager whilst in the section on another matter on the 14th instant. Here the return airway from the section is to the extreme left of the pillar extraction work and it is proposed to direct some of the air from the goaf edge into this return at all times"? A. Yes.

Q. Then you refer to the erection of brattice and you go on "No inflammable or noxious gas was detected at any point on the goaf edge"? A. Yes.

Q. You say "The system appears to be satisfactory in providing a direct connection with the return airway thus maintaining the goaf area under a lowered pressure"? A.Yes.

Q."The amount of accessible goaf edge does not become greater than two pillars wide which also tends to assist the system"? A.Yes.

Q.You go on "The possibility of re-circulation due to the action of the auxiliary fan has been examined in green panel in a similar circumstance but it was found that the action of the main fan was adequate to ensure proper directional flows at all times"? A. Yes.

Q.In other words you were satisfied at that stage that this system with auxiliary fans was not going to have the adverse effect of causing re-circulation? A. Yes.

Q.Then you talk about the stone dusting. If I may pass on to the letter of 23rd February 1961 from yourself, you say "The continued use of the auxiliary fan appears satisfactory provided an opening to the return is maintained as indicated on the sketch supplied to me"? A. Yes.

Q. "For this purpose it will be necessary to site the auxiliary fan in the left-hand side cut-throughs"? A. Yes.

Q.Then in May 1961, Mr. Ryan wrote to tell you that the company was extracting pillars in purple No.2 panel at Bulli Colliery, with a 32 inch fan? A. Yes.

Q. And he said "The panel layout is a simple three heading arrangement and it is anticipated that goaf edges can be kept clear by keeping an opening to the return inby the fan?" A. Yes.

Q."This latter arrangement has proved successful in violet panel? " A.Yes.

Q. And of course, to your knowledge violet panel had been successful? A. Yes.

Q. As a result of that I think you wrote to him on 2nd June 1961 and commented "The continued use of the fan appears satisfactory subject to the usual conditions and provided an

opening to the return is maintained in a similar manner to that provided in violet panel"?A.Yes.

Q.Then you made your report in June 1961 on purple panel and I do not think there is anything of relevance there except the - A. That was a report on the application at the time.

Q.Then if we move to the letter of 26th October 1961, Mr.Ryan writes to ask you for the requirements with regard to western returns in 1 North Section? A.Yes.

Q.That was solid workings? A.Yes, solid workings.

Q.And your approval was given on 3rd November 1961? A.Yes.

Q.A report of 7th November 1961 is included in the file? A.Yes.

Q.Then on 8th November 1961 he writes to know the requirements for face ventilation in a new panel to be established shortly and he refers to where it will be? A.Yes.

Q.And that again was solid workings? A.Yes.

Q.We will not stop there. Then followed your report and a letter from yourself to him in connection with that matter? A.Yes.

Q.I think that is the whole file, is it not, relating to the use in 1960-61 of auxiliary fans in ventilation pillar extraction? A.Yes.

Q.I think you said you were the inspector there until 1963? A.Yes

Q.And did you see any of these panels, green and violet and purple in operation other than at the times to which your reports refer? A. No - I could not answer that one, I am afraid, without reference to a diary.

Q.Well, I will put it to you this way : At any time when you did see any of those panels was the system proposed by Mr. Ryan being properly observed? A.Yes.

Q.And were you ever aware at any time during your period of inspectorship of this mine and the others in the vicinity, of any departure from that system of ventilation? A.No. I can't recall any instance of departure - not from the principles applied there.

Q.And has this system only been put into operation in Bulli Colliery? A.No.

Q.What other collieries have you had dealings with the management and seen that the system has been put in operation? A. In respect to pillar extraction or -

Q.Yes, pillar extraction is the vital one? A. Corrimal Colliery -

Q.Was that before or after Bulli? A.Some of them would have been about the same time or slightly after. The first fan in pillars was installed in Bulli Colliery.

Q.You say Corrimal? A. Corrimal, Kemira, Nebo, Wongawilli, Huntley. That is about the lot in pillars.

Q.Does the system of ventilation in 8 Right as at the 9th November accord with the scheme which Mr.Ryan and yourself discussed and which he proposed for your consideration on at least three occasions that you have mentioned? A.No.

Q. We probably know the answer by now but you had better tell us: In what way does it not accord with the scheme?A.Well, the system tends to bring the goaf gases across a working area. They have to cross at right angles into the working area into the return.

HIS HONOR:Q.Would you expand that? A.They actually have to cross the headings in order to get to the return.

Q.They have to cross the heading?A. Well, rather it is a cut-through in this particular case.They have to cross- I am not sure of the numbers (Witness requested to approach Exhibit "A")

Q.Would you come around the other side so that we can all see? A. Yes. Any movement of gases from the goaf has to enter this area here in order to get to the return. That is in fact across the No.2 Cut-through.

Q.Under your scheme and the scheme you discussed with Mr.Ryan, what is the actual difference in the layout?A. Here,Your Honor, the difference is the reverse of the ventilation and a fan location in the cut-through.

MR.LEE.Q.You indicate below the intersection of B Heading and No.2 cut-through?A.Yes - well, in the No.2 cut-through between B and C Headings.

HIS HONOR.Q.You mentioned in your discussion of the original plan the question of a bleeder from the goaf?A. Yes.

Q.You said this must be maintained at all times; you said so in your directions? A. Yes.

Q.Where in that plan is there a bleeder? A. This here to the return (indicating) represents a bleeder under those circumstances.

Q.Which? A. From the goaf area here,your return.

MR.SULLIVAN.Q. If you reverse the air? A. Yes.

HIS HONOR:Q.But under the system?A. Under this circumstance?

Q.Yes. A. There is no bleeder that I can see.

Q.No bleeder at all?A. No.

MR. LEE:Q.While you stay there for a moment, you have heard some other witnesses in this case give evidence as to what might have been done at the time Section 8 was created in that fashion and with the air flow being the way it was, to bring about a system which was not going to let the goaf gases get into the working areas? A.Yes.

Q.Would you make a comment on that as to what might have been done with the existing ventilation system?A.What might have been done?

Q.Yes,if you can. I am not saying you have to,but I want to get the benefit of your views on the matter? A. Well, it depends upon whether you intend to extract further in this area (indicating). If that is the intention then I would reverse the air.

Q.And what would that mean from the point of view of alteration in other aspects or systems?A.Can I answer it a little further before that?

Q.Yes. A. If it were wholly and solely left to me at this point in time, I would suspend any further work on that side of the A heading.

Q.You just would not carry on with the extension in No.2 cut-through? A.That is right.

Q.You would leave it where it was? A. But if I am forced to work it as it is, I would reverse the air.

Q.And when you reverse the air what alteration in other aspects or systems would be involved? A. Oh, there is an alteration on track work - overcasts to be built.

Q.And is that a large operation? A.No, it is not a large operation. It would be, I think, let us say a considerable nuisance at that time.

Q.My question may not have been quite clear. When I say is it a large operation, I am referring to both the alteration of the track and the overcast? A.Yes, that is what I was referring to too.

Q.I wanted to be quite sure we were speaking of the same thing. I will come now to another matter.

(Short adjournment).

MR.LEE: Q.One final question on this: In your opinion in November 1965 was it in accord with good mining practice to ventilate section 8 in the way in which it was done? A. No, in my opinion it was not.

Q.You went down into the mine after the fire? A.Yes.

Q.You made certain tests? A.Yes.

Q.If called upon you can tell us the result of those tests and what you saw? A.Yes.

MR.LEE: I hope this course has Your Honor's approval. It does seem to me that there is no dispute at all about the finding of the bottom gas and methane and so forth. If it is necessary we can have it.

Q.On the question of methanometers, I think you agree with Mr. Menzies that the use of methanometers for the detection of methane in bottom gas and in its ordinary individual state will overcome the problem of close testing at the roof and the difficulty involved in detecting it in bottom gas? A.Yes.

Q.I think however you would like it made clear that you take the view that the oil safety lamp in the hands of an inspector will detect methane? A.In the hands of any competent person.

Q.As far as the use of oxygen bottles is concerned I think you also agree with Mr.Menzies that whilst there may be advantages there are distinct hazards? A. Yes, there are a number of hazards associated with the use of compressed oxygen.

Q.However, like Mr.Menzies, I think you concur in the use of the self-rescue unit? A.Yes.

HIS HONOR: Q.One of the hazards of the oxygen bottle is, I understand, that if in fact you get too much oxygen you get a tendency to sponteneous combustion? A.Yes - might I add something further: We had what amounted to an explosion when a compressed oxygen bottle was punctured in the Wongawilli colliery and at the moment of impact apparently there was sufficient heat developed from the hole punctured in the bottle to cause the oxygen, as it blew out, to sponteneously combine with the iron of the bottle itself.

Q.To chemically combine with the iron? A.Yes, there was in fact an explosion as a result, or, that was the cause of a minor explosion in that area.

Q.Mr.Buck has told me of an incident of an oxygen bottle being inadvertantly left in the goaf area, apparently left there by carelessness on the part of somebody and that caused some problem and was the occasion of some disaster, I think.

MR.BUCK: We suspect it was the cause of fire in the goaf.

HIS HONOR: Apparently by rusting through and causing a leak of oxygen which got to an oil area and caused the fire, without any actual ignition point or flame, spark or anything of that nature. One would think that that problem could be overcome by safety precautions but perhaps that is only speculation.

MR.LEE: Q. Proceeding with these short matters: While you were in the mine after the fire you took certain samples of the air and sent them along to Mr.Donegan? A.Yes.

Q.If you are asked you can give the positions from which they were taken and the day on which they were taken? A. Yes.

Q. Whilst you were in the mine you checked the hydraulic oil in the shuttle car, did you not? A. Only the level of the oil in the oil tank of the shuttle car.

Q. What level was the oil showing at that stage? A. It is an Irish man's answer - half full.

Q. To your knowledge had any oil been taken from it when you made that test? A. Not to my knowledge.

Q. You are aware, are you not, of a non-inflammable hydraulic oil which could be used in mines? A. Yes, well, I am aware of a number of non-inflammable hydraulic oils, the question of their use in mines is one which we have been investigating and we have not arrived at a satisfactory conclusion as to the possibilities of use as yet.

Q. But the matter is under consideration by the Department? A. Has been for some time.

HIS HONOR: Q. Before counsel start asking you questions: There is a matter which has been puzzling me for some time: Is there any method of controlling the supply of air in the system, that is supply of intake air? A. Only by completely enclosing the fan and thereby limiting the quantity of the fan capacity plus leekage, alternatively, the location of a regulator in the return airway.

Q. Do you know whether there is a regulator in the return airway here? A. I did not see it but I understand there was.

Q. That there was a regulator? A. Yes.

Q. Does that mean you, by controlling the amount of air in the return airway, you can then regulate the intake of air? A. Yes.

Q. What is the purpose of such a system? Is there any reason to control the intake of air? A. Yes, you have got to supply a reasonable amount of air to each split of air in the mine and this particular split would have been a relatively short one and unregulated it would have taken too much air away from the main supply or the main system.

Q. So there is a system whereby other sections of the mine, other splits, are supplied by air from this intake airway? A. From the same intake source but not from this particular airway. It is a separate split, what we call a separate split from the main ventilation circuit. The air from this section, once it leaves that section, goes via the return airway and is exhausted through the main mine fan.

Q. Is there any possibility, for example, of inadvertent or irregular use of the system by closing the regulator or manipulating the regulator in the return airway, of a sufficient supply of air to the section being cut off and diverted to some other split? A. Well, it is a possibility, Your Honor: It is against the law for any workman to interfere with the placement or seating of a regulator. It is the sole responsibility of the Under-Manager and Manager.

Q. Which were the nearest splits that fed off the same airway to this section on this day? A. I am not too familiar with the present circumstances of the colliery but I would tend to think-can I see the ventilation plan?

Q. Yes. (Plan shown to witness). A. The nearest split of air would have been into red-panel.

Q.Was that being worked at this particular time? A. Yes, from there, the other two main splits of air both traversed these two areas here (indicates).

Q.Were any of those being worked? A.Yes, they were both being worked, this area and this area (indicates). That one, of course, is a relatively short passage for the air to travel from intake source to return and up that shaft, so it would need to be regulated in order to control the quantity, otherwise it would take too much air from the general ventilating system.

HIS HONOR: Does anybody wish to ask a question on behalf of Mr. Murray. I see he is not here.

MR.CRANE:On the matters of the ventilation system and gasses referred to in the examination of the witness, I would like to ask Mr.Muir a question with regard to oxygen.

HIS HONOR: Very well.

MR.CRANE: Q. Pure oxygen in itself, is that a dangerous gas? A.No, not in itself.

Q.It is only when mixed with other gasses it is in a dangerous state? A. Oxygen as such does not become dangerous because it is mixed with other gasses, the other gasses then become dangerous because they are mixed with oxygen.

Q.Is it the fact that protomen, rescue men, take bottles containing oxygen down the mine? A.Yes.

Q.For respiration purposes? A.Yes.

Q.It is quite safe for that particular purpose? A.Yes.

Q.The incident you explained to His Honor was a question where oxygen under pressure,mixed with other substance, created an explosion? A.Yes, it was actually the oxygen combining with a red or glowing piece of steel at the moment that the oxygen bottle was punctured.

Q.So the oxygen fed on to a flame or a spark and more or less intensified that fire? A.Yes, it caused a rapid oxidisation of the steel.

Q.Just the same as gas would? A.No, I would not think the same, no.

Q.Is it your opinion that small bottles or small cylinders of oxygen would be worthwhile for breathing purposes? A.Worthwhile, yes.

(In the absence of Mr.Murray and Mr.Ross it was indicated that there were no questions to be asked of this witness on behalf of the Electrical Trade Union of Australia, New South Wales branch and Barry H.Kent.)

MR.PARKINSON: Q.When did you first become aware of the fact that the method had been changed from the understanding and arrangement that you have with Mr.Ryan? A.Which method?

Q.The method of ventilating - the allocation of fans for pillar extraction? A. After the incident of 9th November this year.

Q.You were not aware of the situation before? A.No.

MR.PARKINSON: That is all, Your Honor.

MR.McNALLY: Q.Are you still an inspector with the Department?A Yes.

Q.When did you first become an inspector in the Department? A. I am not sure of the exact day but it was November 1957.

Q.You were then, I think, the inspector for this district; is that the position? A. Part of this district. Well, I was an inspector of a district which was part of the Illawarra district.

Q.You still hold that appointment in the Illawarra district, do you, or are you appointed elsewhere? A.No, I am on special duty work now.

Q.When did your duties in the Illawarra area as an inspector terminate? A. Sometime late in 1963.

Q.So from 1957 to 1963 you were in this area? A. Yes.

Q.Did you personally, during that time, come across any Illawarra bottom gas? A.Yes.

Q.On how many occasions, approximately? A. Well, I could not answer that. I don't know how many occasions, but on a number of occasions,

Q.In what particular mines was it you came across the gas? A. Corrimal Colliery, Kemira Colliery, Nebo and my memory fails me a little on this one but, I think, Excelsior No.2.

Q.Were you at the time the inspector for Bulli Colliery? A.Yes.

Q.During the time you were the inspector were you aware that Illawarra bottom gas was present in the mine? A.No.

Q.When was the first time you ever became aware that Illawarra bottom gas was present in the Bulli Colliery? A. Following this incident.

Q.What was your reaction when you went into the mine on that day? A.My reaction?

Q.Yes. -

HIS HONOR: To what?

MR.McNALLY: Q.Reaction to the information that there was Illawarra bottom gas there? A. Well, I had no particular reaction, I knew to look for it.

Q.You were somewhat surprised when you learn Illawarra bottom gas was present in the Bulli Colliery? A.I was somewhat surprised when I learnt, but that was not at the time I went into the mine.

Q.Shortly before going into the mine you learnt of the existence of Illawarra bottom gas and you were surprised? A. Yes.

Q.And I think it is fair to say that was the reaction of not only yourself but the other inspectors concerned in the investigation? -

HIS HONOR: I do not know that you can ask it in that form but if you mean the apparent reaction I will allow it.

WITNESS: I understand it is, but I cannot answer that one with certainty.

MR.McNALLY: Q.What is your understanding? A.I understand it was a surprise, but I am not sure.

HIS HONOR: Q.In those people do you include Mr.Longworth? A. Yes.

Q.He appeared surprised there was a lot of bottom gas? A.Well, not really, I can't answer the question, Your Honor, I never - -

HIS HONOR: I suggest you do not try.

WITNESS: I never questioned him.

MR.McNALLY: Q.In any event, Mr.Menzies certainly appeared to be surprised? A.Yes.

MR.McNALLY: I have no further questions.

MR.SULLIVAN: Q.Nobody was surprised at the time you learned there methane there? A.No.

Q.You have still got your file there? A.Yes.

Q.Would you be good enough to turn to the report you made of 25th November 1960? A. 25th November,1960.

Q.Apparently an attempt was made on that occasion to virtually seal off the goaf gasses from the working; is that right? A.Yes, an attempt.

Q.By brattice stoppings?A.Yes.

Q.However, you found that up to 2% of inflammable gas was found in the vicinity of the brattice stopping erected in No.2 heading? A.Yes.

Q.That would be methane, I take it, would it? A.Methane,yes.

Q.It would seem to indicate, as it was found at No.2, that there was a pull of the air from the intake airway where the track is shown through the brattice there, I mean the brattice at the head of No.1? A.Yes.

Q.Collection of gasses from the edge of the goaf and then a subsequent leak through No.2? A. I could not discern any flow of air but it appeared to me there was a pull of air in that direction.

Q.(Proceeds to plan) Coming to this present one: Can you see the plan from there or would you like to come over here? (The witness left the witness box and went to the plan).

Q.This one seems to be the best to illustrate on, and it is sketch 2. (Indicates). Here we have an entry of air up C heading which splits at zero here and some comes up B heading, and C heading is blocked off? A.Yes.

Q.The intake comes through No.1 cut-through and No.2 cut-through? A.Yes.

Q.Then, if they sealed off B heading here with brattice -? A.Yes.

Q. - it would have reproduced much the same position as you tried way back in 1960?A.Yes.

Q.That would have been undesirable because the same effect probably would have been reproduced as was produced in that one in 1960? A.That is my opinion,yes.

Q.It was your view it was better to ventilate the goaf as far as possible, is that right, are that experiment? A.Well, I would not have - (interrupted).

Q.We are assuming - we know you don't like it at all. But, assume that it is the situation? A.Assuming this situation, I would have directed an adequate amount of air in and around. (Indicates).

Q.And to put a stopping up there is to defeat the whole purpose of the ventilation, is it not? A. It defeats the purpose of the ventilation around that area.

HIS HONOR: He is referring to the brattice in the shunt?

MR.SULLIVAN: In the shunt,Your Honor.

MR.REYNOLDS: Q.Was the system which you devised with Mr.Ryan back in 1961 a system of driving successive bleeds? A. There were two systems - - -

MR.SULLIVAN: Before Mr.Muir answers, I forgot to ask one question about air splits which might be conveniently asked before Mr.Reynolds cross-examines.

HIS HONOR: Yes.

MR.SULLIVAN: Q.You looked at the ventilation plan and spoke of the other parts to which the air was coming through the main ventilation system, that it could go to and be diverted from 8 Right? A.Yes.

Q.Look at the plan: Would you tell us if western returns is one of those? A. Yes, that is on a split from the main air supplied along the 1 North Area.

MR.REYNOLDS: Q.May I put it this way: One of the systems which was devised by you and Mr.Ryan in joint consultation was a system of driving successive bleeders from the goaf area into the return airway? A. Well, the bleeders were driven from the return airway to the goaf area.

Q.I am not making any point of where you started to drive?A. Well, you could not start from the other end.

Q.That was one of the systems devised? A. Yes.

Q.To by-pass the working places as far as possible with goaf gasses? A.Yes.

Q.Have you seen a copy of this document, one of which is on the board over there? A. I have only glanced at it.

MR.REYNOLDS: I do not think it is an exhibit, Your Honor.

HIS HONOR: I have had the use of one.

MR.REYNOLDS: I do not think it has been tendered yet. We all know the plan and it will be tendered shortly.

Q.This system involves, does it not that you are to - you have always driven a bleeder before you extract the pillar next beyond it? A. The system devised in green panel?

Q.Yes. A. Yes, before the actual pillar was formed and extracted you drive your bleeder.

Q.(Approaches witness). The system involves, does it not, if we look at this document, that you do not extract the coal in the area marked 11 until you have holed place 13 into place 9? A.Yes.

Q.What was done before 9th November so far as this plan is concerned is consistent with that system having been followed up till that point of time? A. I am not sure of that, I would have to study it in some detail.

Q.Have a look at it. They have all been holed into the goaf areas at some time? A.Yes, but - (interrupted).

Q.Is that right? A. They have all been holed into the goaf area at some time, yes.

Q.All I am asking you is: That is consistent with the method which was devised to which we have referred having been followed up till a point of time shortly before 9th November? A.I cannot agree with that unless I knew that this pre-dated this extraction.

Q.Quite. That is why I say it is only consistent with it. There is nothing there that is inconsistent with it? A.On paper,no, there is nothing inconsistent.

Q.That is all we have got, the paper, isn't it? A. Well, that is all you have got.

Q.There is no trap in it? A. I cannot answer that. The point I simply make is - (interrupted).

Q.You don't know whether it was done? A.I don't know. I say , there are no dates.

Q.I know you don't know, that is why I am asking you is it not consistent with it. Do our minds meet at this moment? A. Yes, in general terms anyway.

Q.What I am putting to you is that there was one obvious departure from your system if the places on this plan (plan shown to witness) marked 11 and 12 - do you see the places 11 and 12? A.They represent areas, yes.

Q.I am using the wrong word: The extracted areas, 11 and 12? A.Yes.

Q.There would have been then a departure from your system if those areas were the subject of pillar extraction before bleeder 13 was constructed? A.Yes.

MR.REYNOLDS: Does Your Honor follow that?

HIS HONOR: Yes.

MR.REYNOLDS: Q.To follow the system, according to the letter of it, it would have been necessary to hole 13 into 9 before turning 11 into goaf area. Do you agree with that? A. 11 and 12.

Q.And 12? A. Yes.

Q.If they had followed your system - not your system - you know the system to which I refer? A.Yes.

Q.In that document? A.Yes.

Q.You would still, when driving place 13 -? A.Yes.

Q. - would have had at that point of time the miners engaged in that task exposed to gasses from the goaf? A.I cannot agree that they would have been exposed to gasses from the goaf.

Q. Well, let us put it this way: They would be in a position where they would be working at a point unprotected by any bleeder? A. Unprotected by any bleeder?

Q. Yes, at that point of time while they are driving it? A. Yes. The goaf at that time was not provided with a bleeder.

HIS HONOR: Q. The goaf would not be provided? A. The goaf during the driving of 13 would not be provided with a bleeder.

MR. REYNOLDS. Q. You see, let us assume for the purpose of this question that when 13 was being driven, 11 and 12 had not been extracted. Do you follow that? A. Yes.

Q. Well, there would be still no bleed from the goaf to the return airway outby of the place in which the men would be working to drive 13? (No answer).

Q. There cannot be any doubt about that, can there? A. You are a little ahead of me there. This system is not -

Q. Never mind about the system, just my question. (Objected to by Mr. Sullivan).

HIS HONOR: Q. Have you an answer to that? (No answer).

MR. REYNOLDS: Q. Can you answer my question first of all? A. Would you let me have the question again please?

Q. Assume that at the time the place 13 is being driven - A. Well, before I go on I would like to qualify my previous statement -

Q. Never mind about your previous statement. I would just like the privilege of asking this question and having your answer. If it is necessary to qualify it I am sure His Honor will permit you to do so. I am not trying to trick you? A. Then let us have the question.

Q. The question is this: At the time the place 13 was being driven, if you assume for the purpose of this question that the areas 11 and 12 had not been extracted, there would still be no bleeder from the goaf to the return airway entering the return airway outby of the place where the men driving that were working? A. That is right.

Q. But the difference would be this, that they would be one pillar length further from the goaf? A. There are other differences as well, Mr. Reynolds.

Q. Well, let us take that one first? A. That difference, yes.

Q. What do you say are the other differences? A. Well, there would be a possibility of directing additional air around this area (indicating).

MR. SULLIVAN: Q. The area being below 12? A. Yes. It is a possibility.

MR. REYNOLDS: Q. Would you put that into words so that we understand it when we read the transcript. It is a little difficult for me? A. Well, additional air can be directed around the goaf edge -

Q. But this is not the goaf edge at this point? A. I am sorry, across what appears to be No. 3 cut-through on this plan. That is right, isn't it, No. 3?

Q.Do you mean you would short circuit some of the air or all of it? A. I would direct adequate air down and across No.3 and into A heading, I believe.

Q.And what about along below the figure 4 - would air go through there? A.That is a possibility.

Q.That would be goaf edge would it not? A.Yes.

Q.Would you ventilate that' A.Yes. I would attempt to ventilate that there,yes.

Q.Had you thought about that? A.No, it had not occurred to me until such time as you brought it up.

Q.Any other differences you can think of apart from the ability, as I understand you, if you thought fit, to direct more air through the nearer cut-through? Any other differences? A. Any differences?

Q.Yes. You said there were other differences and I have invited you to tell me what they were. You have told me one? A. Well, that is the principal difference, the ability to direct air around those areas. I don't know what possibility there is of air circulating around cut-through No.4 because you have got goaf adjacent to that pillar in the area marked 10.

Q.And does it follow from your answer that even if you do adopt this expedient of driving successive bleeder headings you still in a degree must expose your workers to goaf gasses? A. Expose them to goaf gasses?

Q.Yes. A. I would not agree that you expose them to goaf gasses.

Q.To the possibility? A. No. With adequate quantities of air I cannot see any difficulties.

Q.Well, are you saying then that with adequate quantities of air, men would not have been exposed to goaf gasses in the situation - A. I never said that at all.

Q.Can I finish my question? A. You are talking about the situation here, I take it, which you were outlining a moment ago?

Q.I am just pausing, but you answered the question, you see? A. I see.

Q.Do you say that with adequate quantities of air with the men in the situation in which they were on 9th November, they would not have been exposed to goaf gasses? A.With adequate quantities of air the goaf gasses from the air could have been diluted and rendered harmless.

Q.And this was a matter of divising a system to do it, was it? A. Yes.

Q.There were of course adequate quantities of air there? A.I don't know.

Q.You do not know? A.No. I took no part in the investigation of the actual occurrence of the fire and I have no real knowledge of the quantities of air flowing in that area prior to the incident.

Q.I take it that you have not investigated the practicability of reversing the air current, the intake and return in this particular location, having regard to the lie of the seam and grades and so on? A.Not in detail.

RE-EXAMINATION:

MR.LEE: Q.Even if you get what you describe as adequate quantities of air passing through the shunt area in A heading in section 8 so that any gas which did come from the goaf was diluted, would you say that that was a desirable system or not? A. It is not a desirable system.

Q.What dangers can be expected from it even with adequate quantities of air? A. With adequate quantities of air I think there are little dangers to be envisaged from the system. The dangers probably result from stoppages of main fans and things like that.

Q.Would you take Mr.Reynolds' plan - I think you have one there have you not? A.No.

Q.Would you take this (shown to witness) and make something perhaps a little clearer to some of us who may not be following as well as you intend us to.

MR.REYNOLDS: It will be explained in my evidence in complete detail,

MR.LEE: Q.On that plan does it appear to you, assuming the development continued inwards from the right hand side of the plan back, that the bleed system, if I may call it that as a sufficient means of identification, was available -

HIS HONOR: Do you mean could it have been implemented or was it in fact?

MR.LEE: Q. No, does it appear to you from that layout that the bleed system was being implemented?

MR.REYNOLDS: On the day of the accident it is conceded it was not. I thought I made that clear.

MR.LEE: If that is the case I will not press it.

Q.It is now understood that the bleed system was not available in the development back this way -

MR.REYNOLDS: No, That is not the question.

HIS HONOR: Ask your question, Mr.Lee.

MR.LEE:Q.Along the lines Mr.Reynolds asked you, I am asking you to take the piece of paper and asking you whether it appears to you from that whether the bleed system was used in this development? (Objected to by Mr.Reynolds).

Q.Can you tell me? A. No. Not without having the dates of drivage of each of the particular places, it is impossible to tell. But in any case the system is not exactly the same as that originally carried out in green panel in that a bleeder heading would have to be driven two pillar lengths behind the line of retreat.

HIS HONOR: Q. Two pillar lengths behind the line of retreat? A. Yes.

Q.From where you are, would you show me on that plan what you mean by that? A. Well, if the goaf edge were here, this bleeder would then have to be driven - not this one but this one. That is consistent with this system here.

Q.In other words there would have to be two pillars before you drove a bleeder? A. Yes,and further the design of the panel allow that being easily done, because the pillars are much longer

than they are wider and therefore your bleeder heading drive is considerably longer.

Q. Are these unusual lengths for pillars?A. Which pillars?

Q.These pillars that you see, which are being extracted, or these? A. The drive continuation from No.2 cut-through, not an unusual length.

Q.Do you see anything wrong in that length of pillar at all? A. No, not in that type of working.

Q.We know as a matter of hindsight that it could not have been avoided, possibly, but if the pillars on the right-hand side of No.2 cut-through had been shorter then there is a possibility that men could have got through the cut in those pillars?A.Yes.

Q.I was wondering whether this was quite a usual practice to have pillars as long as these or whether perhaps it was desirable in the event of a possible fire to cut passages through them? A. Well, I don't know that it is particularly desirable. I cannot see - it means to some extent you must cross a previously worked area. For Your Honor's information I might point out here under the bleeder heading system in green panel the pillars were in fact formed on the right. Two pillars were in fact formed and the lifts designed so that they came with the air to the back of the bleeder on the return side.

Q.Would you have a look again at the coloured plan. Assuming with No.3 in a kind of orange colour, there has been a bleeder there?A.Yes.

HIS HONOR: Am I right in making that assumption? I suppose it is a reasonable assumption that No.3 with the orange colour would have served as bleeder?

MR.REYNOLDS: It did not originally, Your Honor. When 4 and 5 were driven, only then could it serve as a bleeder because the orange did not hole. I think 3 plus 4 plus 5 could have served as a bleeder.

HIS HONOR.Q. Assume you have a system there where there is a bleeder in operation; the direction of the air flow is where? It must be away, over towards the left, is that the position? A.Yes. The pull of all air is around - well, I would say at the stage that 3 was a bleeder it would connect to 2 through 1 and 4 and again in actual fact under the green panel system the outby portions of No.1 could not have been driven at that stage.

Q.You say the air circulates in that direction. Do you then get a circulation of air over on the cut-throughs there? Do you get any; the air just coming across like this? A. No, the air would in fact come in here, around here or rather around here.

HIS HONOR: The witness says the air comes from the bottom of the plan around No.2 bleeder if I can call it that for the moment.

WITNESS: There would be a vent located here between No.2 and No.1 in the cut-through which would ventilate these places as they are being worked, ventilate the No.2 area, and any bleed of air would return through 1 or in 3. The main bulk of the return air traverses the main airway, the first of the main airways going vertically down the plan, return airways - all air exhausted by the fan plus additional air which would blow around here and past the fan itself.

STATEMENT

My name is HENRY ARTHUR JAMES DONEGAN of 18 Hillview Street, Sans Souci.

I am employed as Chief Analyst for the New South Wales Department of Mines in which I have served for over forty-five years, over forty-one as a professional officer.

My qualifications are:-

Master of Science, University of New South Wales, and Double Diplomate of Sydney Technical College.

I am a Fellow of the Royal Institute of Chemistry of London, a Fellow of the Royal Australian Chemical Institute, a Senior Member of the American Chemical Society, a member of the Australasian Institute of Mining and Metallurgy, a past President of the Royal Society of New South Wales, and a member of the University of New South Wales Chemical Society.

On 10/11/65 Mr. W. Anderson, Chief Inspector of Coal Mines, informed me that a preliminary inquiry into the fire in 8 Right Section of Bulli Colliery which caused four fatalities on Tuesday, 9/11/65 would be in progress on 11/11/65 and requested me to take samples on 12/11/65 of mine atmospheres in the vicinity of the fire area.

I was accompanied on 12/11/65 by Mr. K. Bunch, Acting Senior Analyst, and Mr. I. Hodges, Analyst of the Safety in Mines Section of the laboratory. When we arrived at the mine, the inquiry was still in progress and we were informed that the conditions in the vicinity of the fire were too dangerous for us to enter to obtain samples on that day, but the Chief Inspector of Coal Mines decided that he and Inspector Muir would examine the fire area forthwith and take the samples for us.

The Chief Inspector then arranged for me to attend the inquiry, which seemed to be conducted by Mr. C. Martin, Assistant General Superintendent, Australian Iron and Steel Collieries, assisted by Mr. Senior Inspector R. Menzies, to see if any facts were brought forward which would assist me to interpret the analyses and tests of the gases and other samples which might be taken as to their role in the fire. The Chief Inspector also stated that he desired further gas samples to be taken by officers of the laboratory personally as soon as conditions permitted, which should be the following Monday.

When the Chief Inspector and Inspector Muir returned to the surface, they stated that the conditions which prevented our entering the mine no longer existed when they examined the locality of the fire and that the ventilation conditions in that place had been altered from that prevailing when the fire occurred. (Vide sketch Nos.).

Since the evidence at the preliminary inquiry had by then concluded, Electrical Inspectors of Collieries, J. James and B. Robinson decided to enter the mine

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in endeavour to ascertain if the fire had electrical origin.

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I heard witnesses at the preliminary inquiry state:

1). Deputy Walker (Dog watch):- had found the "shunt" clear of gas when he tested at approximately 6.00 a.m. On his midnight inspection he had travelled the goaf edge but had found no gas or blackdamp. If firedamp and blackdamp had occurred together he would have reported it as inflammable gas.
Although he had not personally found blackdamp in the area where the fire occurred, the brattice cloth and elephant trunk (ventilation or bleeder tube) were put up during days while he was away, probably due to either blackdamp found seeping from the goaf area or a suspicion that this could occur. He warned men changing contacts on car No.40 during the night preceding the fire against sitting on the ground that in the event of gas escaping from the goaf they would be in danger.

2). Shuttle Car Drivers Hope and Mangles :- It was normal for the brakes on the cars both No.67 and No.40 to become reasonably hot when working on the grade 1-10 or 1-15 but never so hot as to render it necessary to spell or cool them. They would sizzle when spat on. At the time of the incident No.40 car had been running 1½ hours, the brakes had been used extensively and were beginning to "smell hot".

3). Periodically there had been a strong odour in the back of the "shunt" area, which had been mentioned to the deputy although the nature of the odour was difficult to identify. It was not noticed on the morning of, and prior to, the fire.

4). When the first flames were noticed, the driver of shuttle car No.40 had put the brakes on hard, jumped from the car and ran to safety.

5). The trailing cables had been functioning normally.

6). Barry Kent, electrician in the mine, survivor:- There had been no previous electrical faults in 8 Right Section during the day shift prior to the fire. There had been no evidence of sparking about the mine cable before or during the fire.

7). That the mine cable near the roof at the intersection had been involved in the fire and that balls of fire had been dripping from the roof. The only reason he had thought it was an electrical fire was because the mine cable (not the trailing cable) was involved.

8). That the fire had developed very rapidly and flame had involved, and been drawn into, the ventilation tube which also crossed the intersection at roof level and was tied in the "shunt", half way between floor and roof according to one witness, but Deputy Walker said the open end was at floor level between the last and second last prop before the brattice. The fire burnt along the casing of the ventilation tube towards the fans.

9). Seconds after the "bleeder" (ventilation) tube caught fire it collapsed and fell to the floor as the survivor, Barry Kent, and his four companions were running towards the fire. At this stage the fans were still on. After the fire had fallen, the flame was shot with pretty colours ("fairy fire") - blue, green,

yellow. It was very hot but there was no smoke while they approached the fire although the survivor after passing through the fire had to grope his way by means of the timber props for some distance through very dense smoke before he reached clear air.

10). All witnesses at the preliminary inquiry agreed that:

(a) there had been no blast or bang prior to the fire,

(b) a bright blue flame seemed to come from the floor at the back of the car on the driver's side changing to an orange-yellow flame as it rose to the roof on that side and spread rapidly across the intersection.

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I was informed by the Chief Inspector the next day, Saturday, 13/11/65 that Inspector James had found a piece of charred wood jammed against the disc of the brake on the shuttle car involved in the fire and partly coked fine coal thereon.

The gas samples obtained by the Chief Inspector and Inspector Muir together with samples of partly burned ventilation duct recovered from the fire area were taken back to Sydney by me on 12/11/65 and analysed in the laboratory with the results as shown in Tables four and five.

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Mr. Bunch and myself again visited the colliery on Monday 15/11/65 to obtain samples of the atmosphere and make observations in the fire area.

In view of evidence I had heard at the preliminary inquiry, I made the following observations:

1). The actual fire, in spite of its intensity, had been confined to an area immediately around the intersection shown on the sketches attached. There was evidence of the stone dust used to combat the fire. (Stonedust is normally used extensively in coal mines to combat explosibility of coal dust).

2). The piece of charred wood still jammed in position between the solid brake disc and a shaft. Some fine coal deposit in the brake enclosure.

3). Coked coal on top of the load in the shuttle car and in the coal ribs (sides of roadway in underground mines) of the fire area.

4). Timber roof supports charred to a depth of about 1½":

5). A roof fall at the intersection had been cleared away leaving some feet of the roof bolts protruding. (Roof bolts tie roof strata together and so strengthen the roof).

6). The ventilation arrangement on 15/11/65 was different to what I was informed prevailed at the time of the fire and also to that prevailing when the Chief Inspector of Coal Mines and Inspector Muir obtained the gas and ducting samples on 12/11/65. These differences are shown in the attached sketches and have some bearing on conclusions reached. The sketches also show the locations from which the samples were obtained and the air ventilation figures supplied me by the mines inspectors.

7). Shuttle car No.40 involved in the fire was in the "shunt" at the intersection where it had over-run or run part-way through the brattice which had been erected before the fire. (Vide sketch No.).

8). There were double fans in the roadway on the other side of the intersection,

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immediately opposite the "shunt".

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On 18/11/65 on returning from a visit to Huntley Colliery, I obtained from the Wollongong office of the Mines Department, samples of:

1). The mine cable which had crossed the intersection near the roof,
2). a sample of the wood which had been jammed against the brake disc,
3). a sample of the hydraulic oil from the tank of shuttle car No.40,
4). a sample of unused hydraulic oil as used in the shuttle car, (Ampol brake fluid),
5). a sample of the ducting material which had remained in the fire, unburnt.

I was shown a piece of melted aluminium alloy recovered from the fire area. Inspector James informed me that this alloy (Code No. AA160) had a solidification figure of 625-650°C and a casting temperature of 700°C.

I was informed by Inspector Menzies that the goaf area (goaf is the worked out and/or abandoned area in the coal mine) almost adjacent to the fire area covered about five acres, that the height of the workings in the goaf would be approximately six feet and that it took eighteen hours to put the fire out with water and stone dust.

Inspector L. Griffiths at my request later informed me that:

1). 51,749 tons of coal with an average specific gravity of 1.57had been extracted from the area,
2). the hydraulic oil tank of the shuttle car No.40 had a capacity of twelve to thirteen gallons and that the tank was over half full when Inspector Muir dipped it on Friday morning. The tank was in the centre of the shuttle car on the opposite side to the driver but the paint had been blistered off by the fire on the rib facing it,
3). there had been a barometric pressure drop of approximately $\frac{1}{2}$" of mercury between midnight on Monday and 9 a.m. Tuesday and that the pressure was still dropping on Tuesday night.

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A sample of the wood, Registered No. 65/3713, jammed against the brake disc was forwarded to the Division of Wood Technology, Forestry Commission, to ascertain the species of timber and its ignition point. Copy of letter and reply attached. (Appendices A and B). A sample of wood of the same species was tested in the brake enclosure of a similar vehicle to shuttle car No.40. A sample of this wood was also tested in the laboratory. Report of these tests and conclusions reached attached. (Appendix C).

A sample of the unburnt plastic ventilation tube material, Registered No. 65/3718, was tested according to standard ASTM test No. D568-43 and found to be self-extinguishing. However on applying a flame of about 900°C to the material, coated with a fine dusting of coal dust, it burnt with a bright yellow flame shot with glowing particles and with occasional flashes of clear greenish-blue flame. On removal of the flame the fire died out. However, the material would burn in the presence of sufficient heat.

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A sample of the mine cable, Registered No. 65/3717, was dissected into outer cover, separator pieces, and internal cables covered with black, red, white and blue rubbery material. The outer cover was found by standard ASTM test No. D635-44 to be self-extinguishing, but it also was combustible in a flame of about 900°C, burning with a yellow flame. The separator piece and the coloured rubbery coverings of the cables were not self-extinguishing and during burning intumesced and dropped pieces of swollen burning material. This would account for the balls of fire seen dripping from the roof.

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The hydraulic oil samples, Registered No. 65/3714 (Ampol brake fluid as used in the shuttle car No.40) and Registered Nos. 65/3715 and 3716 obtained by Inspector Muir from shuttle car No.40 on 12/11/65 were tested with results shown in Tables 1 and 2.

This would indicate that the oil, boiling under pressure in the shuttle car tank, was considerably cracked and that a large quantity of the volatile portion formed on cracking, in addition to what might have come from the original oil, had evaporated. (Cracking an oil under heat and pressure produces lighter volatile and heavier residual components than in the original oil).

Hydraulic oil fluids usually consist largely of diethylene glycol (dihydroxy-di-ethyl-ether, CH_2 OH. CH_2 O. CH_2. CH_2OH.) with lubricant and anti-rust additives. The diethylene glycol has a flash point of 290°F, boiling point of 244.5°C, and ignition point of 351°C. Boiling range not more than 20% below 240°C, not less than 85% below 250°C, not less than 95% below 270°C and an average weight of 9.3 lbs. per gallon at 20°C. It is miscible with water, alcohol, acetone and immiscible with benzene, toluene, carbon tetrachloride. It is extremely hygroscopic. Without cracking, four gallons would occupy about 2 80 cubic feet when vaporised at 340°C. If ten gallons were cracked so as to form four gallons of lighter volatiles which evaporated, these volatiles, ~~they~~ would occupy a considerably larger volume than 2 80 cubic feet and would burn if ignited with development of much heat. These volatile would have been given off under pressure over a period while the tank was subject to heat from the fire and would account for some of the localisation and continuing fire intensity.

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An area of goaf, approximately five acres, height of workings approximately six feet, would have a volume of 1,307,000 cubic feet. Not all of this volume would have been removed. On the other hand, the height may exceed six feet.

The actual coal won to produce the goaf was 51,749 tons which with an average specific gravity of 1.57 would constitute a volume of 1,183,000 cubic feet. The voids in the goaf amongst the fallen rock would still be the same volume.

A barometric pressure drop of ½" of mercury would increase the volume of the gases contained in the voids to 1,203,000 cubic feet. Thus gas, approximately 20,000 cubic feet volume, would be released from the goaf into the mine workings with such a pressure drop.

At the time of the fire there were only three headings running to this goaf,

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two of which were intakes and the other closed off by brattice to form the shunt area. In the third heading opposite the shunt were two fans in series drawing air from the dead end of the out-through. (Vide sketch No.). Thus there would be air pressure on the goaf at P1 and P2 headings which would give the gas greater tendency to come out against the brattice in the shunt area, apart from the section induced by the fans.

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MINE ATMOSPHERES

Mine atmospheres can contain several gases. It is only needful for this inquiry to deal with those which are major constituents according to the analyses. In all cases nitrogen will include minor quantities of inerts other than carbon dioxide.

In addition to the fresh air, which contains 20.93% oxygen and the balance of nitrogen and minor quantities of other inert gases including carbon dioxide, argon, neon, etc., mine atmospheres other than atmospheres of sealed-off areas contain varying quantities of carbon dioxide and methane.

Carbon Dioxide:- CO_2 Density relative to air 1.53. Incombustible and will not support combustion. Owing to density, tends to accumulate on floors and in lowest parts of workings, where will extinguish safety lamps (due to reduction of O_2 content of air). A constituent of "black damp" and "after damp". Sometimes called "carbonic acid gas" or "choke damp". Formed by oxidation or combustion of coal, timber, etc., and by breathing of men and animals. Can be given off by strata in some coal mines in almost pure form. A constituent of gases given off by mine fires and explosions and by blasting, of internal combustion engine exhausts, and accompanies smoke.

Methane:- CH_4 Density relative to air 0.55. No colour taste or smell. Non-poisonous but does not support life. At concentrations above 15% burns rapidly in air forming carbon dioxide and water. Forms violently explosive mixtures with air. Lower and upper limits of inflammability (explosibility) in air respectively approximately 5% and 14% CH_4 by volume. Most explosive mixture is about 1 volume CH_4 with 10 volumes of air. Safety lamp reduced testing flame with 1% CH_4 in air has a slight cap, visible to an expert observer. 1½% CH_4 gives a small cap, faint and incomplete, in shape of truncated cone; 4% CH_4 gives a pointed high triangular cap. At 5½% and more the burning gas flame fills the lamp and extinguishes the oil flame, due to the oxygen in the lamp enclosure being reduced below the level to support the flame, ie below 17%. Gas cap should not be confused with fuel cap. Owing to low density tends to rise to roof and highest parts of mine workings. Can issue from floor strata or from the seam itself. The main constituent of "fire damp". Given off from coal and oil-bearing strata in large quantities. Formed in the distillation of coal which occurs in mine fires and heatings. Some "natural gases" are almost pure methane. Also known as "marsh gas". In N.S.W. coal mines limiting average percentages of methane in the air under various circumstances are prescribed in the Coal Mines Regulation Act.

Black Damp:- An atmosphere depleted of oxygen by oxidation of coal and carbonaceous material, and containing variable mixtures of nitrogen and carbon dioxide. Also

formed by mine fires and explosion of fire damp or coal dust and hence forms part of the "after damp". Term sometimes applied to CO_2. Because it contains Carbon Dioxide it is usually heavier than air. Can accumulate in unventilated mine workings whence it issues when the barometer falls. Produced in mine fires by distillation of coal. Can be the principal constituent of outbursts and of issues from mine strata including floor. When formed by de-oxidation of air contains 87% N_2 and 13% CO_2. In coal issues or outbursts consists mainly of CO_2 and may be accompanied by methane.

In the second report of the British Explosions in Mines Committee, 1912, Appendix (1), "The Volatile Constituents of Coal", Dr. H.V. Wheeler and M.J. Burgess state:-

"Considering the undoubted vegetable origin of coal, it is natural to suppose that cellulose derivatives must enter largely into its composition. The precise form that these 'degradation products' take must, at present, be as much a matter of conjecture as is the manner in which they have arisen. There seems, however, to be strong presumptive evidence that micro-organisms have played an important part in the 'decay' of the plant structures. The extreme resolution of cellulose by the action of amylobacterium takes place according to the equation:-

$$C_6H_{10}O_5 + H_2O \rightarrow 3CO_2 + 3CH_4 \quad \ldots\ldots\ldots\ldots\ldots$$

Carbon dioxide and methane are, of course, the two gases most commonly met with in coal measures, and often issue in large quantities from the strata.

In addition, however, to the tendency to complete resolution, as represented in the above equation, there is a tendency, as Cross and Bevan have shown ..... towards the condensation of the carbon nuclei to still more complicated forms, accompanied by the elimination of water".

The carbon dioxide and methane formed during coalification may largely escape from the coal seam in geologic time through overlying pervious or faulted strata, so that when the coal is being mined the contained gas issuing from freshly exposed coal faces does not constitute great danger with normal ventilation requirements. Under some geological conditions the lighter CH_4 which would diffuse faster than the heavy CO_2 is lost while much of the CO_2 still remains in the coal; under other conditions much of both CH_4 and CO_2 is retained in the coal. Under these circumstances it is possible over geological time for some stratification to occur , the CH_4 moving towards the top of the seam and the CO_2 towards the bottom and, when the coal is mined the seam gas issuing from the roof in mine workings is richer in methane than that issuing near the floor. However, gases once mixed do not stratify unless over considerable, geological perhaps, time. It is worth while noting that ordinary coal holds many times its volume of seam gas.

On the South Coast (Illawarra Area) there are mines where the gases contained within the coal seams range from almost pure carbon dioxide to almost pure methane e.g. Metropolitan has been as high as 99% CO_2 and Appin as high as 97.8% CH_4, but normally the gases are variable mixtures of CH_4 and CO_2 with a little N_2. Such gases are known by the generic term "Illawarra Gas", When the gas issuing from the seams is predominantly CO_2 and so is heavy and flows along the floor, the term "Illawarra Bottom Gas" is applied.

Metropolitan Colliery - Sample No. 1964/1632 , 99.6% CO_2, 0.4% CH_4, no O_2 (air) detected.

Appin Colliery - Sample Nos.

1963/3219 - CH_4 97.7%, CO_2 1.2%, O_2 Not detected, N_2 1.1%.
3220 - CH_4 97.8%, CO_2 1.6%, O_2 0.1%, N_2 0.5%
3221 - CH_4 97.7%, CO_2 1.4%, O_2 0.1%, N_2 0.8%.

The composition of the seam gas can even vary from place to place within the same mine. A sample of seam gas submitted by Dr. A. Hargraves of Sydney University Mining Engineering School from the West Intake V Heading of Bulli Colliery gave the following results: Sample No. 63/3038 -

CO_2	4.7%	5.8*
O_2	3.8	
CH_4	74.6	91.4*
N_2	16.9	2.8 (By difference).

* Calculated air free on O_2 basis.

As is evident, from Tables 4 and 5, the composition of the gas held within and issuing from the goaf in 8 Right Panel of Bulli Colliery under falling barometric pressure is about 40% CH_4, 58% CO_2 and about 2-4% N_2. The very small amount of nitrogen present would indicate that little oxidation had taken place in the goaf to form true blackdamp but the goaf has filled with Illawarra gas issuing from any residual coal left in the goaf - or from some pervious strata originally above and/or below the worked out coal seam which had taken up seam gas from the coal when the coal was still in situ.

GAS HAZARDS - (See Appendix).

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The gas samples were taken in half gallon glass bottles evacuated by pump to a pressure of about 30 mm. (760mm. is normal air pressure) immediately prior to entering the mine. This was done to avoid CO_2 absorption by water which could occur if the samples were taken by water displacement.

Samples taken by Inspectors Anderson and Muir - see sketch No.2 and 3, for locations:

No.3694 1a - in front of brattice as at 12/11/65 - floor level.
3695 2a - nearer brattice than 1a
3696 3a - at roof just inbye intersection at back of Shuttle Car No.40
3697 4a - at roof just in outthrough beyond Shuttle Car, far side of fall
3698 5a - at floor

Samples taken by Donegan and Bunch.

No.3699 1b - under lip in roof of goaf beyond brattice and towards intake headings
3700 2b - behind brattice 3ft. from floor
3701 3b - behind brattice near roof
3702 4b - behind brattice at floor
3703 5b - immediately in front of brattice at roof
3704 6b - 12 - 18" below roof in centre of intersection.

In taking sample 3699, a long rubber tube was held with a support so that the open end of the tube was at the sampling site and the gas drawn by pump at the other end through the rubber tube to displace any atmosphere in the tube before connecting the evacuated bottle to it.

The results of analyses of these samples and the calculations therefrom are given in

It will be seen that, with the ventilation flowing on the days these samples were taken, 8 of the 11 samples were over 96% air, 5 of which were in the vicinity of or exceeded 99% air while one (No.3697) was 99.8% air. With the exception of the last mentioned, all atmospheres however, were calculated to air free basis and all these air free gases with the exception of No.3699 (which contained 99.4% of air giving little margin to work with) were capable of forming inflammable or explosive mixtures with air with approximately the same upper and lower limits.

The percentage of oxygen in the original atmosphere was too high (contained too much air) to fall within the percentage of oxygen range between the upper and lower explosive limits in all samples except 3695 and 3697 and 3702. Sample 3697 was practically pure air. Sample 3694 was almost within the range, sample 3695 was explosive per se since the oxygen percentage in the original atmosphere lies within the oxygen range between the upper and lower explosive limits of the C.G.M. while sample 3702 contains too much gas and too little oxygen to lie within the oxygen range between the upper and lower explosive limits of the C.G.M.

It can also be seen that in spite of the alterations in ventilation in both volume and direction (see sketches) giving fairly good respirable air in all parts of the fire area except near and behind the brattice in the "shunt" on 12/11/65 and 15/11/65, the air free gas portions of that air had approximately the same composition as the air free gas portions of the samples near and behind the brattice ie. approximating gas free portion of sample 3702 (which contained only 30.6% of air) ie. about 40% CH_4 and 58% CO_2 and 2% N_2. Incidentally, sample 3702 was taken from a point only about 2ft. behind the brattice where fastened to the rib at the end of "A" heading ("shunt" area) while 6,000 cubic feet of air per minute was flowing in front of the brattice set back into the goaf on the opposite side of the heading. This then could be taken as the composition of the gas in the goaf which would move out with fall in barometric pressure. Such a gas would burn fiercely and not explode if ignited in air as it contains too little inerts to suppress inflammation. It would explode if <u>mixed</u> with air within the explosive range.

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I am of the opinion that:

1). There had been no explosion of gas or coal dust

2). About 2,800 cubic feet of gas in the goaf of approximate composition 40% CH_4, 58% CO_2 and 2% N_2 moved out largely into the "shunt" as the barometric pressure reduced about ½" mercury in the early hours of 9/11/65.

3). Some of this gas which had leaked through the brattice was ignited near the floor by a small flame from the friction of the wood jammed in the enclosed part of the brake assembly of Shuttle Car No.40. The presence of fine coal and oil in the brake assembly could also have generated spontaneous heating.

4). The brake assembly was hot due to 1½ hours running of the Shuttle Car on a fairly steep grade. This would have contributed to generation of flame.

5). The Shuttle Car did not actually stop before reaching the brattice in the "shunt" which was disturbed sufficiently to release the volume of goaf gas held behind it which immediately caught fire. Some of this burning gas was drawn into the ventilation tube which fired and collapsed to the floor; some

of the burning gas set fire to the mine cable.

6). Burning droppings of the mine cable assisted the fire on the floor.

7). The fire was fed by the air ventilation which had to be maintained for personnel rescue purposes.

8). The burning gases ignited timbers and coal in roof, ribs, and the loaded Shuttle Car.

9). The coal burning in the rib volatilised some of the oil brake fluid which contributed to the localised continuing fire, until the fire was put out.

.....

Although not within my province, I might venture the further opinions that:

(a) the CH_4 was more fiercely burning near the roof when Kent and his companions approached than the fire from the fallen ventilation tube,

(b) Kent, tripping on the wire of the fallen ventilation tube and bringing his head and body nearer to the floor may have assisted in saving his life as in getting up and moving forward out of the fire into the smoke he would not have been so long at an erect position in the fire area. Even then, the heat badly blistered his face. His hands were burnt also from the fire on the floor but his lower body seemed to have escaped serious burning,

(c) Kent's companions, who hesitated to follow him, seeing him fall probably assumed the worst and three of them endeavoured to escape via the "shunt" to the goaf where the flame enveloped them completely and killed them,

(d) the fourth companion found in the dead end of No.2 cutthrough had apparently run back safely to the dead end but by putting his head into the ventilation tube, had placed it in the very position where noxious gases from the fire would be concentrated and drawn while the fan was still operating. This fan normally sucked air into the return in "A" heading, via the end of No.2 cut-through.

APPENDIX "A"

Chemical Laboratory,
Mining Museum,
28 George Street.

The Chief
Division of Wood Technology,
Forestry Commission.

23rd November, 1965.

Dear Sir,

Further to discussion your Mr. Canaway with Mr. Bunch of this laboratory.

This is the largest sample obtainable (the rest is retained as evidence) of the piece of charred wood which was jambed against the hot brake dise of the shuttle car involved in the fatal fire at old Bulli Colliery, 9/11/65.

Could you please ascertain the species of timber and its ignition point and give me a report on the result. If you could also provide us with a 3" x 2" or 4" x 2" sample of timber of the same species about 12" to 18" long, we could place it in the position this timber was found, after running the brake dise hot as witnesses agree it was, and then running the shuttle car to see if we get ignition of the timber. If the ignition point of the timber is high enough to ignite methane, or a mixture of methane and blackdamp, in air and we find that ignition point reached by friction of the timber with the brake dise we could confirm an opinion as to source of ignition of the fire - one of the matters which must be cleared up.

Yours faithfully,

H. Donegan

H. DONEGAN,
Chief Analyst.

APPENDIX "B"

THE FORESTRY COMMISSION OF NEW SOUTH WALES
RKB:JB

DIVISION OF WOOD TECHNOLOGY
96 HARRINGTON STREET
SYDNEY

29th November, 1965.

In your reply please quote
No. 40/34

The Chief Analyst,
Chemical Laboratory,
Mining Museum,
28 George Street North,
SYDNEY. N.S.W.

Dear Sir,

We have identified the sample of wood found jammed in the disc brake of the shuttle car involved in the fire at Old Bulli Colliery as a stringybark (Eucalyptus sp.). Specific identification of the stringybarks is not possible on the basis of wood properties alone. Stringybarks are frequently used on the South Coast of New South Wales for constructional purposes.

There is no specific temperature at which it can be said that wood will ignite. At or about 270°C any species of wood will decompose exothermically. Decomposition commences below this temperature resulting in the production of mainly water vapour, carbon dioxide, carbon monoxide and methane. This mixture will ignite, provided the first two make up a sufficiently low proportion of the total, at about 600 - 700°C or when a particle is introduced which has sufficient temperature and mass to start the reaction going. However if the decomposition of the wood has proceeded so far as to form charcoal then self ignition can occur because the charcoal binds oxygen from the air with the liberation of heat. This in turn hastens the process of oxygen adsorption until the reaction becomes so fast that the charcoal is said to burn. This will then ignite the vapours and gases evolved from other pieces of decomposing wood and, of course any methane in the atmosphere.

Yours faithfully,

L. H. BRYANT,
A/Chief of Division.

APPENDIX 'C'

IGNITION OF WOOD AND METHANE

Ignition temperature of a substance is not a physical constant as values obtained, though comparable, depend on the method used. Thus the ignition temperature of methane determined by admission of inflammable mixtures to a heated vessel is given as 650°C. Townend and Maccormac "Inflammability of Hydrocarbon Air Mixtures" J.I.P. Vol.25, 1939, and as 675°C by International Critical Tables, Vol.2; (a)

(b) by concentric tube - ½ second lag, as 722°C by Dixon & Coward, J. Chem. Soc., Sept., 1934,

(c) by method unspecified as 537°C in "Fire Hazard Properties of Certain Inflammable Gases and Volatile Solids" published by the National Fire Protection Association - Boston, Mass. U.S.A.

In a coal mine the figure might thus range between say 650-675°C.

The most easily ignited mixture of Methane and air contains 7.5% CH_4 (Australian Standard C98, 1961). Heat of combustion 1016 B.ThU's per cubic foot.

Once ignited the flame temperature of burning methane in air would be indicated by its colour.

Timber Ignition Tests at Joy Manufacturing Co. Pty. Ltd., Mascot 30/11/65.

Tests were carried out on a 10SC Joy Shuttle Car disc brake to find the temperatures attained by the disc brake after heavy braking and the possibility of ignition of wood of same species as found in the brake assembly. Wood supplied by the Forestry Commission.

The steel brake was an air cooled modification of the type of disc brake used on No.40 Shuttle Car at Bulli Colliery. The brake disc was approximately 1 inch in thickness and contained a number of large radial holes, to promote faster cooling. The steel brake disc on Shuttle Car No.40 at Bulli Colliery was approximately ½ inch and contained no cooling holes.

The electric motor was used to drive the brake disc against the brake linings. The temperature of the brake disc was measured by using a contact thermocouple and thermochrom temperature indicating crayons. The temperatures of the disc were found to exceed the maximum scale reading on the contact thermocouple (500°F).

Result.

1st Run - Temperature at edge of brake drum 200 - 300°C (by crayon)

2nd Run - Temperature at edge of brake drum above 300°C (by crayon)

* 3rd Run - Temperature at edge of brake drum 410 - 500°C (by crayon).

* very heavy braking.

Because the temperature of the brake disc was above the ignition temperature of Eucalyptus species, stringybark type timber, pieces of this timber were jammed against the disc brake in an attempt to ignite the timber.

In the first test a piece of timber was driven in between the edge of the brake disc and the universal. This position was similar to the location of the jammed piece of timber in No.40 Shuttle Car at Bulli Colliery. Since the edge of the brake disc and the universal have opposite motions at the nearest point of their peripheries on running, the brake disc tended to eject the timber. During running brake fluid and coal dust were thrown onto the timber. No ignition was observed.

In the second test, a piece of timber was driven into a 4 ft. pipe and the timber levered against the spinning rim of the brake disc. Brake fluid and coal dust was again thrown onto the timber. A large amount of smoke was produced and the timber was quickly eroded at the point of contact. No freely burning flame was observed.

There were the following differences between the conditions applying to this test and to conditions on Shuttle Car No.40 when working in the mine:

1). The disc of the Shuttle Car tested was constructed to permit air cooling, being a double plate with connecting pieces and air gap between, whereas Shuttle Car No.40 had a solid brake disc.

2). The disc and brake assembly normally operated within a metal protective enclosure, the atmosphere in which would retain some of the heat radiated from the disc. During the test the enclosure was removed, permitting dissipation of the heat generated into the open air which would be assisted by the air current set up by the swiftly rotating disc and shaft.

3). Removal of the enclosure also permitted the wood to be more easily thrown out unless manually held in place, whereas on Shuttle Car No.40, the wood was firmly jammed in position.

4). Small non-luminous (blue) flames capable of igniting methane are not easily visible in daylight - if at all. At one stage, I obtained a fleeting impression of a small pale flame in the smoke near the wood, but could not definitely state flame was present.

In view of the above, the following test was carried out in the laboratory.

IGNITION AND GLOW TEMPERATURE OF TIMBER.

A Series of tests were made to determine the ignition and glow temperature of Eucalyptus species, stringybark type timber. This timber is similar to the species type found jammed against the disc brake of No.40 Shuttle Car at Old Bulli Colliery.

Splinters of timber were placed on dishes in a muffle furnace with the door raised approximately 1 inch. Observations were made as the temperature of the muffle furnace was slowly raised to 450°C.

Some splinters of timber were soaked in Ampol hydraulic Brake fluid (sample No.3714). This hydraulic brake fluid is the same type as that used in Shuttle Car No.40. One of the oil soaked timber samples was coated with coal dust.

The following results were obtained:

Test 1.

(a) Oil soaked timber started to froth at 100°C.

(b) Untreated timber turned blackish at approximately 280-300°C.

(c) Ends of both pieces glowed at approximately 340°C.

Test 2.

(a) Untreated timber blackened at 250°C.

(b) Oil soaked timber caught fire at 315-320°C.

(c) Untreated timber glowed at 430°C.

Test 3.

(a) Oil soaked timber blackened at 220°C.

(b) Oil soaked timber glowed at 420°C.

(c) Untreated timber glowed at 420° C.

Test 4.

(a) Untreated timber gave an ephemeral pale flame and glowed at 340°C.

(b) Untreated timber continued to glow at 360°C and blue flame was observed. The flame was visible only in the dark interior of the muffle and invisible in the light of an ordinary electric torch.

(c) Untreated timber had a blue haze around the glowing area at 380°C.

(d) The oil soaked, coal dusted timber glowed at 380°C.

Test 5.

Two oil soaked pieces of timber were placed into the furnace at 430-440°C. After a short time both pieces of wood ignited and burnt freely.

.....

These tests prove that at a temperature of 340-450°C, which could be attained in the brake assembly of Shuttle Car No.40 when in use in the mine, would ignite timber of the species found in the brake assembly of that car which in turn would ignite an atmosphere containing sufficient methane.

APPENDIX "D".

EXCERPTS FROM "FIRE PREVENTION & PROTECTION FUNDAMENTALS (COMBUROLOGY)" C.E. Stecher

Phenomena Producing Fire.

1). Direct contact with flaming or glowing material.
2). Application of a low degree of heat for a prolonged time.
3). Spontaneous heating and ignition.
4). Explosion or rapid flame propagation.
5). Lightning and lightning rods.
6). Dust explosions.
7). Electricity.
8). Chemical reactions.
9). Friction, pressure, shock, falls or concussions.
10). Static electricity.

Application of a low degree of heat for a prolonged time.

This classification includes the steampipe primarily, both live, saturated and exhaust steam; which may pass through a wood floor, a partition, roof or other combustible matter, without proper clearance (see Ignition point of woods); or be located in such a manner as to attract dust or. . . .

The degrees of heat necessary to ignite the so-called wood depend upon the kind of wood and its bulk or volume.

Wood which is slowly heated is more susceptible to a lower degree of ignition temperature than wood heated very rapidly. This is entirely due to volatization of the resins. In the former there is complete volatization, leaving the cellulose in a very dehydrated state; in the latter, there is brought to the surface the resins which burn at their ignition point but eventually ignite the cellulose structure, thus indicating the ignition points of resins, aromatics, and cellulose, which vary in considerable degree. At 110°C the water and aromatics are dispelled. At 150°C the carbon monoxide (CO), carbon-dioxide (CO_2) and resins are dispelled. At 230°C starts the external browning or carbonization. At 270°C pyrophoric carbon is formed. This is pure cellulose in punk form, pyrophoric carbon, which has a tendency to self-ignition when undergoing this heat process. At 300°C charcoal or carbonized cellulose is formed. At this point ignition is brought about by the rapid occlusion of oxygen.

There are a great many fine points to be drawn from the above explanation, but in ordinary practice this is the general process of ignition of woods under the described conditions. Where there is actual contact with flame, the process is very rapid but the cycle remains the same.

Spontaneous Heating and Ignition.

Heating and ignition, involving a combustible material, due to chemical action rather than a heat source, such as a flame, spark, radiation, a hot surface or friction, are known as spontaneous.

The process is known as spontaneous heating if the ignition point is not reached; and spontaneous combustion if the ignition occurs. Spontaneous heating starts with a slow oxidation or fermentation which generates heat. As the heat in-

creases, if the heat is not dissipated fast enough, the chemical action is accelerated until the ignition temperature is reached.

It is not always safe to assume that a material will not heat spontaneously because it has not done so under a given set of circumstances; variation of conditions to some extent may promote heating to a danger point in the same material.

Generally speaking, the tendency of susceptible material to heat is increased by elevated temperatures and by the insulating effect of the material alone or by surrounding conditions in storage. Spontaneous heating can and does progress in various materials without dangerous effects if the conditions are such that the generated heat is dissipated at a rate that prevents the mass from reaching a critical temperature. This critical temperature varies from different substances and, once reached, the heating is likely to progress to a danger point where fire may occur. Ventilation is thus an important factor in preventing many instances of potential dangerous spontaneous heating. On the other hand, complete lack of ventilation is a certain deterrent against fire in all cases where fixed oxygen is not present in the mixture.

.....

Flame temperatures - orange red colour 2012°F - 1100°C
orange yellow colour 2192°F= 1200°C

For comparison purposes, the luminous flame of a bunsen burner is 1328°C, the nonluminous 1533°C, with different lower temperatures for inner and outer cones of the flame. Luminosity depends on temperature and the presence of solids or unburned particles in the flame or the percentage of oxygen present.

APPENDIX "F".

GAS HAZARDS.

Gas hazards fall into three principal classes due to theri capacity to cause:

1). Burns or explosions,

2). Asphyxiation,

3). Poisoning.

A noxious gas is any gas that is directly or indirectly injurious or destructive to the health or life of human beings, if its presence in an otherwise respirable atmosphere presents a hazard from burns, violence, asphyxiation or poisoning. Nitrogen (N_2) belongs to Class (2); methane ("firedamp" CH_4) to classes (1) and (2) and carbon monoxide (CO "whitedamp") to classes (1), (2) and (3).

Gases such asN_2 and CO_2 (Carbon dioxide) are called inert gases only because they do not support combustion. They actually extinguish the flames of burning gases partly because of their heat capacity and partly because their presence contributes to oxygen (O_2) deficiency.

Burning of a gas is a chemical reaction which releases heat energy regardless of the amount of heat liberated or of the size of the flame involved. Every combustible gas burns when in contact with a flame, a spark or a heated material having a temperature equal to or more than the ignition temperature of the gas provided there is enough oxygen present by weight for combustion.

Some authorities regard explosive limits as being limiting mixtures within which flame is propagated throughout the mixture, pressure is developed and more or less violence produced while flammable limits refer only to the passage of flame through a mixture without regard to the development of pressure. It is impossible to distinguish an ignition or a burning from an explosion by the amount of violence produced. Mixtures just within the zone of explosive mixtures will propagate flame quietly and slowly throughout the mixture (usually uniform speed).

Mine Atmospheres consist of three portions: (1). a gas portion of mixture composed of combustible and inert gases; (2). air; (3). diluent - i.e. additional inert gas. An original atmosphere consists of (1) and (2) only and original air free atmosphere consists of (1) only.

Every original air free atmosphere that has explosive limits with air will form mixtures with inert gases (including blackdamp) and some of these will have explosive limits with air and others will not. Blackdamp is a mixture of nitrogen and carbon dioxide, usually 13% CO_2 and 87% N_2 but the CO_2 can range from 12-15%.

Experimental data has established the fact that the effect of inert gas in a mixture that has explosive limits with air is to reduce the possibility of flammation or to extinguish the flames of the combustible gases present. The severity of the extinctive effect depends on the inert gas itself; the combustible gases, and the percentage content of the inert gas in the mixture.

If an air-free mixture that has explosive limits is diluted step by step with additional inert gas, each of the new mixtures formed will also be air-free and will consist of progressively less (in per cent. of the whole) of the air-free original mixture and progressively more diluent.

One of the air-free mixtures so formed will be just incapable of forming an explosive mixture with air. Ash and Felegy have termed this air-free mixture the

"cri ical gas m cture". It contains a gas portion (in per cent.) that is the maximum percentage of the air-free original atmosphere that can be present in any possible air-free original atmosphere-diluent mixture incapable of forming explosive mixtures with a . It contains a diluent portion that is the minimum percentage of addi ional iner gas that can be admixed with the air-free original mixture to form a mi ture just incapable of forming an explosive mixture with air.

The crit al gas mi ture will, if diluted step by step with air, form new mixtures that are just incapable of forming explosive mixtures with air until the 'nose limit mixture" is formed.

The "nose limit mixture" can therefore be defined as that border-line extinctive mixture or atmosphere that is just non-explosive and cannot form an explosive mixture with air because it lacks just enough combustible gas or oxygen or because it contains just too much inert gas. It is seen from the manner in which the nose-limit mixture can be formed that the critical gas mixture is the air-free analysis of the nose-limit mixture.

Ash has termed the numerical value, signifying the gas portion content (in per cent.) of the critical gas mixture, the "critical-gas-mixture-value" (C.G.M.V.). The percentage of diluent in the critical gas mixture is therefore 100-the C.G.M.V.

If the air-free analysis of a mixture of the air-free original atmosphere, diluent, and air has a gas portion content that is equal to or less than the C.G.M.V. that mixture is non-explosive and incapable of forming an explosive mixture with air, regardless of the oxygen content of the mixture.

Figures as to the quantities of inert gases that must be admixed with combustible gases to render them non-explosive have been found experimentally by Jones and Coward of the U.S.A. Bureau of Mines, and by Hartwell of the Safety in Mines Research Establishment, Great Britain. (See Table 3).

The critical oxygen value of an air free original atmosphere having explosive limits is considered to be the oxygen percentage below which no mixture of the air free original atmosphere, diluent and air is explosive. It depends on whether N_2 or CO_2 is used as the diluent. For all practical purposes the critical oxygen value is 0.5% less than the oxygen percentage of the nose limit mixture calculated with N_2 as diluent regardless of whether N_2 or CO_2 is used as diluent.

The critical gas-mixture formula has been developed by Ash and Felgy for seven cases. In all these cases, except Case 2 the combustible gases include H_2 which was not present in the samples obtained on 12/11/65 and 15/11/65 for this inquiry.

Case 2 is when the combustible gases are carbon monoxide and methane, all the carbon dioxide is paired with part of the methane, and the remainder of the methane is paired with nitrogen; that is 3.2 times the amount of methane is greater than the amount of carbon dioxide.

Case 2.

$$C.G.M.V._{N_2} = \frac{10{,}000}{5.15A_1 + 7B_1 - 0.875D_1}.$$

where $C.G.M.V._{N_2}$ = critical gas-mixture value of the air-free original atmosphere.

A_1 = the volume of carbon monoxide in the air-free original atmosphere.

B_1 = the volume of methane in the air-free original atmosphere.

D_1 = the volume of carbon dioxide in the air-free original atmosphere.

Since there was no carbon monoxide detected, the formula simplifies to that used in and given at the bottom of Table 4.

If the C.M.V.$_{N_2}$ is found to be less than 100, the air free original atmosphere has explosive limits, if it is 100, more than 100, or has a minus value, both the original atmosphere and the air free original atmosphere are non-explosive and incapable of forming explosive mixtures with air.

.....

As stated before the explosive range of methane in air is from 5 to 14%. Mixtures richer than 14% CH_4 however may <u>burn</u> on contact with external air, for mixtures which contain less than 14% CH_4 are formed in the zone where the gases mingle.

When a source of heat of sufficient size and intensity is introduced into a weak mixture, some combustion occurs even when the mixture is incapable of self-propagation of flame. This is usually visible as a "cap" of flame which may be large if the source of heat is ample. The flame cap may be fixed in relative position to the source of ignition as in a miner's flame safety lamp burning in a gasey atmosphere or may become detached from the source and float for a limited distance in a moving atmosphere or may travel away for two or three feet from an initiating spark or flame in a still atmosphere. Such flames are not self-propagating for they are extinguished when the influence of the source of ignition is lost.

It can be seen from previous information that CO_2 suppresses flame of burning CH_4. It may be possible for CO_2 present in a mine atmosphere to somewhat suppress the CH_4 cap on a miner's safety lamp so that an otherwise visible cap would not be detected and so notpresence of gas be evident to report. This may possibly be why Deputy Walker did not detect gas prior to the fire.

On the otherhand there is a time lag and cusioning effect due to distance of travel and the effects of obstructions such as alterations in direction of ventilation underground, and mine timbering which affect the immediate transference of surface barometric differences to distant underground places in a mine. Therefore the effect of the barometric fall at the surface could have been delayed underground in 8 Right Panel. In addition, the barometric fall is not sudden and the insidious slow issue of the goaf gases might not have been detectable when Walker made his last examinations.

The lower limit of CH_4 air mixtures is not appreciably effective by small changes in the O_2 content of the air. The high limit is noticeably depressed by a small reduction in oxygen content because a corespondingly less amount of the combustible gas can burn. Thus a reduction of oxygen content of the air from 20.9 to 20.6% depressed the higher limit of CH_4 by about 0.3%.

The normal variations of atmospheric pressure have no appreciable influence on limits of inflammability, as has been shown both by direct observation and by deduction from the course of curves showing variation of limits over such wider variations of pressure than those of the atmosphere.

When a source of ignition, such as an electric spark or a flame is introduced into an inflammable mixture, flame tends to travel away from the source in all directions. In a very large volume of mixture the form of zone of combustion would be

a spherical shell of increasing radius, were it not that the hot expanded products of combustion tend to rise and hence introduce convection currents. Flame cannot travel downward when the upward movement of the gases, due to convection is faster than the speed of flame in a still mixture as happens in weak mixtures near the limits of inflammability.

To propagate flame the layer of unburned gas next to the burning layer must be brought to such a temperature that it will burst into flame rapidly. If the unburned gas is already at a temperature above that of the ambient atmosphere, less heat has to be supplied from the burning layer therefore the lower limit is decreased by increase of the initial temperature and the higher limit should be increased. In other words, the range of inflammability should be widened at both limits by increase of temperature.

TABLE 1.

The results of tests on hydraulic oil samples Reg. No. 65/3714 (Ampol brake fluid) and Reg. Nos. 65/3715 and 3716 obtained by Inspector Muir from shuttle car No.40.

Sample No.	Cleveland Open Cup.		Pensky Martens Closed Cup.		Remarks
	Flash Point °F	Fire Point °F	Flash Point °F	Duplicate Determination °F	
3714	215 220 *	215 220 *	180	180	Unused Oil
3715	460 460 *	485 480 *	340	340	Oil from No.40 Shuttle Car
3716	465 465 *	490 490 *	340	340	Oil from No.40 Shuttle Car

* Duplicate determinations

TABLE 2.

Distillation of Petroleum Products.

A.S.T.M. Test D86-62.

No. 3714 Ampol Brake Fluid (Type Used).		No. 3715 Hydraulic Oil from tank (No. 40 Shuttle Car).		No.3716 Hydraulic Oil from Tank (No.40 Shuttle Car).	
Volume	Temperature	Volume	Temperature	Volume	Temperature
rst drop	155°C	First drop	340°C	First drop	344°C
5 mls.	180	5 mls.	356	5 mls.	356
10	186	10	362	10	360
15	196	20	374	15	366
20	195	30	377	20	370
25	199	40	378	30	372
30	205	50	380	40	374
35	220	60	382	50	375
40	234	70	386	65	381
45	237	80	384	70	384
50	238	90	380	80	386
55	238			85	386
60	239			90	386
65	239				
70	239				
75	240				
80	241				
85	248				
90	222 *				
91	195				

* Decomposition of fluid (cracking) remaining in the distillation flask.

TABLE 3.

ombus ible Gas	Diluent or additional inert gas.	(1)	(2)	(3)			(4)
				(a)	(b)	(c)	
Methane (CH_4)	N_2	6.00	14.28	5.93	35.57	12.24	12.1
	CO_2	3.20	23.8	6.66	21.34	15.07	14.6

1. Volumes of inert gas (N_2 or CO_2) required per volume of combustible gas for extinction of the flame in combustible gas-air-inert gas mixtures.
2. Critical-gas-mixture-values (%).
3. Gases in nose limit mixture (% by volume).
   (a) Combustible gas
   (b) Additional inert gas
   (c) Oxygen.
4. Oxygen percentage below which no mixture is explosive, known as the critical oxygen value.

Table 4.

ATMOSPHERE SAMPLES

Taken By	W. Anderson and J. Muir					H. Donegan and K. Bunch					
Sample	1a	2a	3a	4a	5a	1b	2b	3b	4b	5b	6b
Date	12/11/65	2/11	12/11	12/11	12/11	15/11	15/11	15/11	15/11	15/11	15/11
Reg'd. No.	3694	3695	3696	3697	3698	3699	3700	3701	3702	3703	3704
Original											
CO_2 %	15.1	11.7	1.9	<0.1	2.2	0.2	0.4	0.5	40.1	0.6	1.3
O_2 %	15.4	16.7	20.2	20.9	20.1	20.8	20.8	20.7	6.4	20.7	20.4
CH_4 %	10.2	8.1	1.2	<0.1	1.4	0.1	0.2	0.4	27.5	0.4	0.9
N_2 %	59.3	63.5	76.7	79.1	76.3	78.9	78.6	78.4	26.0	78.3	77.4
Air %	73.6	79.8	96.5	99.8	96.0	99.4	99.4	98.9	30.6	98.9	97.45
Air free %	26.4	20.2	3.5	0.2	4.0	0.6	0.6	1.1	69.4	1.1	2.55
Air Free											
CO_2 %	57.2	57.9	54.3		55.0	33.3	66.7	45.5	57.8	54.6	51.0
CH_4 %	38.6	40.1	34.3		35.0	16.7	33.3	36.4	39.6	36.4	35.3
N_2 %	4.2	2.0	11.4		10.0	50.0	-	18.1	2.6	9.0	13.7
Case	2	2	2		2	2	2	2	2	2	2
C.G.M.V.	45.5	43.5	51.9		50.8	113.9	57.2	46.5	44.1	48.3	49.4
Explosibility	E	E	E		E	NE	E	E	E	E	E
Constituents) CO_2	26.03	25.19	28.2		27.94		38.15	21.16	25.49	26.37	25.19
Gas portion) CH_4	17.56	17.44	17.8		17.78		19.05	16.93	17.46	17.58	17.44
C.G.M.V. %) N_2	1.91	0.87	5.9		5.08		-	8.42	1.15	4.35	6.77
Diluent (100-C.G.M.V.)	54.5	56.5	48.1		49.2		42.8	53.5	5.59	51.7	50.6
Total N_2 in C.G.M.V.	56.4	57.4	54.0		54.3		42.8	61.9	57.0	56.0	57.4
Consts. in) CO_2	26.0	25.2	28.2		27.9		38.2	21.2	25.5	26.4	25.2
C.G.M. %) CH_4	17.6	17.4	17.8		17.8		19.0	16.9	17.5	17.6	17.4
N_2	56.4	57.4	54.0		54.3		42.8	61.9	57.0	56.0	57.4
L_{nose-N_2}	35.8	36.0	35.4		35.5		33.7	36.8	36.0	35.8	35.5
Nose Limit Mixture											
C.G.M. %	35.8	36.0	35.4		35.5		33.7	36.8	36.0	35.8	35.5
Air %	64.2	64.0	64.6		64.5		66.3	63.2	64.0	64.2	64.5
Oxygen in air %	13.44	13.40	13.52		13.50		13.88	13.23	13.40	13.44	13.50
Critical Oxygen Value.	12.94	12.90	13.02		13.00		13.38	12.73	12.90	12.94	13.00

C.G.M.V. = (see text) - Critical Gas Mixture Value
C.G.M. = (" ") - Critical Gas Mixture
E = Explosive if mixed with right proportion of air
NE = Non explosive if mixed with air
Case 2 = where there is no hydrogen present and three times the carbon dioxide is greater than the methane. Here the C.G.M.V. formula is:

$$C.G.M.V = \frac{10^4}{7B_1 - .875D_1}$$

L_{nose-N_2} = the nose limit mixture calculated with N_2 as diluent and is obtained from the formula:

$$L_{nose-N_2} = \frac{7B_1 - .875D_1}{\frac{7B_1}{41.5} - .0065D_1}$$

B_1 = percentage methane in the gas free portion of original atmosphere
D_1 = " percentage carbon dioxide in the gas free portion of original atmosphere.
< = less than

Table 5.

EXPLOSIVE LIMITS.

Sample No.	Air Free CH_4		Inert gas paired		Total	Ratio	Exp. Limits at I/C		Exp. Limits C.G.M.		%Air in Limit Mix.		% O_2 in Limit Mix.		Original Sample	
	Total	Paired	CO_2	N_2	CH_4 + inert	I/C	Lower %	Upper %	L_L	L_U	L_L	L_U	L_L	L_U	Air %	O_2%
3694	38.6	28.6 10.0	57.2 -	- 4.2	85.8 14.2	2.0 0.4	17 7	27 18	14.1	25.2	85.9	74.8	18.0	15.7	73.6	15.4
3695	40.1	29.0 11.1	57.9 -	- 2.0	86.9 13.1	2.0 0.18	17 6	27 16	13.7	24.8	86.3	75.2	18.1	15.74	79.8	16.7
3696	34.3	27.2 7.1	54.3 -	- 11.4	81.5 18.5	2.0 1.61	17 13.5	27 27	16.2	27	83.8	73.0	17.5	15.3	96.5	20.2
3698	35.0	27.5 7.5	55.0 -	- 10.0	82.5 17.5	2.0 1.33	17 12	27 25	15.8	26.6	84.2	73.4	17.6	15.4	96.0	20.1
3700	33	33.3 -	66.7 -	- -	100	2.0 -	17 -	27 -	17	27	83	73	17.4	15.3	99.4	20.8
3701	36.4	22.8 13.6	45.5 -	- 18.1	68.3 31.7	2.0 1.33	17 12	27 25	15.0	26.3	85	73.7	17.8	15.4	98.9	20.7
3702	39.6	28.9 10.7	57.8 -	- 2.6	86.7 13.3	2.0 0.24	17 6	27 16	13.7	24.8	86.3	75.2	18.1	15.74	30.6	6.4
3703	36.4	27.3 9.1	54.6 -	- 9.0	81.9 18.1	2.0 0.99	17 10.5	27 23	15.3	26.2	84.7	73.8	17.73	15.4	98.9	20.7
3704	35.3	25.5 9.8	51.0 -	- 13.7	76.5 23.5	2.0 1.4	17 12.5	27 25.5	15.7	26.7	84.3	73.3	17.65	15.35	97.45	20.4

(From table 13 U.S.A. Bureau of Mines Tech. paper 450)

Lower explosive limit is derived from the formula: $L_L = \frac{100}{\frac{a}{a_1} + \frac{b}{b_1}}$

Upper explosive limit is derived from the formula: $L_U = \frac{100}{\frac{a}{a_2} + \frac{b}{b_2}}$

a = total of paired CH_4 + inert (CO_2)
a_1 = lower explosive limit CO_2 to CH_4 at I/C ratio
a_2 = upper " " " " " " " "

b = total of paired CH_4 + inert (N_2)
b_1 = lower explosive limit N_2 to CH_4 at I/C ratio
b_2 = upper " " " " " " " "

Ratio I/C = ratio of inert to paired combustible.

HENRY ARTHUR JAMES DONEGAN
Sworn, and examined as under:

MR.LEE: Q.Your name is Henry Arthur James Donegan? A.It is.

Q.You reside at 18 Hillview Street, Sans Souci? A.That is correct.

Q.You are employed as Chief Analyst for the New South Wales Department of Mines, in which you have served for over 45 years? A.That is right.

Q.Over 41 being as a professional officer? A.That is correct.

Q. I think you hold the degree of Master of Science at the University of New South Wales and the double diploma of the Sydney Technical college? A.That is right. Excuse me, the Master of Science was in the Division of Mining Engineering and Geology.

Q.You are a Fellow of the Royal Institute of Chemistry of London? A.That is right.

Q.A fellow of the Royal Australian Chemical Institute? A.That is correct.

Q.A senior member of the American Chemical Society? A.Correct.

Q. A member of the Australasian Institute of Mining and Metallurgy? A. Correct.

Q. A past president of the Royal Society of New South Wales? A. Correct.

Q.And a member of the University of New South Wales Chemical Society? A.Correct.

Q.You attended at the mine after the fire for a certain period and I think you were present when an inquiry was conducted? A. That is right.

Q.Certain samples which had been taken by the officers were sent to you and other items also sent to you for analysis and testing? A.I collected the samples personally in the mine office from Inspectors Muir and Anderson, of the gasses, and I collected the other samples which are mentioned later from the mine office at Wollongong.

Q.I say those things, however, for this reason, that prior to this inquiry commencing you had before you the information which the Inspectors gave you which you had gleaned at the inquiry which was held shortly after the fire, and from your analysis and some of the tests you had made in respect of exhibits and material put before you ? A.Yes.

Q.You prepared a report which, as you know, has been tendered in evidence here? A.Yes.

Q.You have sat through the inquiry here ? A.Yes.

Q.There are some matters which have been drawn to your attention being matters upon which you drew certain conclusions which are correctly stated in the report? A. In detail, in some small details.

Q.However, I think that the ultimate conclusions you formed as to the source of the fire, the nature of the fire and generally why the fire took place still hold good as set out in your report? A. Absolutely,yes.

Q. I refer you and you may refer me if you would be so kind to any alterations to your knowledge that have affected any matters that are set forth. I do not mean now, but as we go through?A. Yes.

MR.LEE: What I intended to do was this, and once again I would appreciate directions from Your Honor. First of all I would assume that the report has been, shall I say glanced through by all of us. Otherwise the course I propose to take would not be practicable. I intended merely to pick out certain features of it and not read it through which may perhaps be wasting further time and to choose some aspect which I think ought to be cleared up and to leave it to Your Honor and my learned friends to question Mr. Donegan further. As it has gone in as an Exhibit I feel it would be a great pity to go through it all again.(no objection by counsel).

Q.May I go to page 4 and coming down it you mention certain features there. At the bottom of the page you refer to the sample of wood and the sample of unburnt plastic ventilation tube material. Do you remember that?A. Yes.

Q.You say there it was tested according to the standard A.S.T.M. Test No. D 568-43 and found to be self-extinguishing. However, on applying a flame of about 900 degrees Centigrade to the material, coated with a fine dusting of coal dust, it burnt with a bright yellow flame shot with glowing particles and with occasional flashes of clear greenish-blue flame. On removal of the flame the fire died out. However, the material would burn in the presence of sufficient heat. Now you heard the description of the fire starting near the shuttle car and going into the bleed tube and along the bleed tube and then the bleed tube falling down, and before it fell down fingers of fire, as one witness described it, dropping from it. Do you remember that? A. Not just exactly fingers of fire dropping from the bleed tube.

HIS HONOR: Q. Fingers of fire were licking around the wall. These were apparently drops of fire? A. Drops of fire.

MR. LEE: Q. I am sorry, drops of fire. Now, on your tests of the bleed tube? A. Those are the results of the test of the bleed tube.

Q. And the burning of it as described by the witnesses here was what you would have expected, was it? A. Yes. The only difference is that I give another explanation for the balls of fire seen dripping from the roof. I do not think that it was entirely due or might not have been even partially due to the burning of the bleed tube.

HIS HONOR: Q. What is the alternative explanation? A. It is on the top of page 5.

Q.This is the mine cable, is that right? A. That is right.

Q.A sample of the mine cable was dissected and you describe its various components. The outer cover was found by ASTM Test No. D 635-44 to be self-extinguishing, but it also was combustible in a flame of about 900 degrees Centigrade, burning with a yellow flame. The separator piece, and the coloured rubbery coverings of the cables were not self-extinguishing and during burning intumesced. What does that mean, intumesced? A. Swelled up to a considerable degree in a sort of moulten condition so that it was giving off bubbles of gas.

Q. You say "It dropped pieces of swollen burning material. This would account for the balls of fire seen dripping from the roof." That is what you mean, is it? A.That is right. Actually from the mine cable when we were testing it - the interior mine cable, all these pieces - pieces of burning moulten material, in globular fashion.

(Luncheon adjournment).

HIS HONOR: Concerning the sittings tomorrow: There is a statutory Judges' meeting tomorrow afternoon to be held in Sydney. I have consulted with counsel and it does seem that while we must lose some time tomorrow there is no need to lose too much. I have already said we cannot sit here before 10.30 and I propose to commence these proceedings at 10.30, there will be no short adjournment and we will continue till half past one and the sittings will end at half past one tomorrow and be adjourned to Monday at 11 a.m.

MR. LEE: Q. I was taking you through your report, and at the bottom of page 4 and the top of page 5 you refer to the ability of the bleed tube, the elephant's trunk and the mine cable to burn at about 900 degrees C. From the conclusion which you ultimately drew in this case, namely that gas, methane gas, was the burning agency of the fire, that methane gas was capable of causing these two items to burn, was it? A. It was.

Q. As far as you are aware it was the only agency present capable of bringing about that result? A. As far as I am aware.

Q. You went on at page 5 to deal with the hydraulic oil and you have given us a number of samples there and once again I think it is your clear opinion that only intense heat itself could bring about the conversion of the hydraulic oil into the volatile gases that you refer to? A. Not exactly intense heat, but heat and pressure. This hydraulic oil was confined to a certain extent. Certainly heat from a fire in a coal rib would be sufficient to cause cracking to occur.

Q. What do you say about the likelihood or otherwise of the hydraulic oil itself having been ignited, or igniting and starting the fire? A. No, I do not think that is possible, not itself, there has to be some igniting source.

HIS HONOR: Q. You did come to the conclusion, did you not, although you did not say it in these words, that it is probable that there would have been a giving off of volatile gas from the heating of the oil and that with the fire that already existed these would have continued the fire. They would have intensified the fire? A. That would assist in intensifying the fire.

MR. LEE: Q. You go on to deal with the goaf and you give us certain figures and you say, at the bottom of the page, "A barometric pressure drop of half an inch of mercury would increase the volume of the gases contained in the voids to 1,203,000 cubic feet. Thus gas, approximately 20,000 cubic feet volume, would be released from the goaf into the mine workings with such a pressure drop". I think we both made it clear at the commencement that this report was given to you from various sources? A. Yes.

Q. And it has been drawn to your attention that the precise drop between midnight on the Monday and 9 o'clock on the Tuesday was not half an inch in that period, although there is an half inch drop over another period shown, but it was in fact 0.2? A. 0.25.

Q. You re-made your calculations then to tell us what the gas released from the goaf into the mine workings would be, or probably be in that period? A. Yes, 10,000 cubic feet.

Q. So we reduce 20,000 to 10,000? A. Yes.

Q.Later on in your report you refer to the fact that the barometric pressure drop can be a little behind, the actual release of gas can be a little behind the actual barometric drop? A. There is a tendency to a certain cushioning effect between differences in barometric pressure on the surface being registered down below, which has been investigated by the United States Bureau of Mines but it still, although there is a cushioning effect, and a slight time lag, it still would not make a great deal of difference on the issue of gas from the goaf when there is a barometric pressure drop.

Q.So is this the position: That theorectically with the 0.25 drop in barometric pressure we get the 10,000 cubic feet figure and it may be that that figure has to be reduced a little? A. A little,yes.

HIS HONOR: Q.Might there not be other factors, or one other factor which might interfere with the accuracy of that figure? A.Yes.

Q.I put this proposition, although I am not certain of the proposition: Assume you have already started a flow of gas, a leakage or flow of gas from the goaf outwards because of the drop in barometric pressure, is there not then started a stream of movement, as it were, that might in fact intensify because of the very fact that you have got a tendency to flow? To put it another way : In liquids you get some effect of capilliary traction which may cause the flow to be greater than it is , than that which is merely caused by the relief of pressure. Does that apply to gasses, or is that just a fallacy? A. Not to the same extent, Your Honor. When you are dealing with liquids you have surface tension between the liquid and the body that it is flowing over which comes into force but in this particular instance the flow of gas would have been out from the goaf and although I have not got it in my report this particular gas there, that is the composition, would have a specific gravity of about 1. 15, as compared to air.

Q.We are speaking of bottom gas now? A. I have endeavoured to put this on a proper footing by defining Illawarra gas and bottom gas and black-damp in this. The gas would tend to flow on a front which would be down towards the flowand the steepness of that angle would depend on the rate of flow. That is what I would imagine. There would always be the front. If it was coming out quickly the gas would tend to come out on a higher front and come down - if it came out slowly. In this particular case a drop of quarter of an inch of mercury, which would be about three and a half inches water gauge would be a fairly rapid emission of gas.

MR.LEE: Q. You go on to say that at the time of the fire there were only three headings running to this goaf, two of which were intakes and the other closed off by brattice to form the shunt area. In the third heading opposite the shunt were two fans in series drawing air from the dead-end of the cut-through? A. Yes.

Q.I think you know now that that statement "two of which were intakes" is to be qualified to the extent that at one of them we now know there was a brattice erected, that is C heading?A. Yes - I am facing the sketches.

Q.You do go on, and I think this is still valid, "thus there would be air pressure on the goaf at P1 and P2 headings". And, that is the sketch you have drawn, over there? A.Yes.

Q.Those three sketches have been put in evidence and P1 and P2 headings are in fact B and C headings? A.Yes,that is right,I only used the terms P1 and P2 to sort of designate the place.

Q. You say that would give the gas a greater tendency to come out against the brattice in the shunt area? A. Yes.

Q. There was no air pressure there? A. No. There is air pressure due to the ventilating, naturally, down both B and C headings which would be stopped in C heading to a large extent by the brattice erected there but completely open to the goaf through B heading.

Q. I think your report does not say it but you were aware that the lay of the land is that the goaf dips towards the end of A heading and A heading dips down towards the goaf and the general lay of the land is from C down towards the end of A heading? A. Yes. I think I did put a rough indication of the angle of dip on each one of those sketches, I am not sure - if not, I intended to, but the dip is down towards the end of A heading.

Q. Does that factor also tend to bring about the result that the goaf gases find the end of A Heading a favourable place to which to gravitate? A. A more favourable place from which to issue.

Q. So that your conclusion was that the brattice at A Heading was the most favourable position from which the gas might issue? A. Yes.

Q. You went on and talked about mine atmospheres. You give us technical detail on carbon dioxide and methane. I shall not read the detail ---

HIS HONOR: Q. I notice there is a distinction made between carbon dioxide and black damp and this is the first time it has really come up in this inquiry? A. I thought that terms had been used in the past and I might take the opportunity to clear up the use of those terms.

MR. LEE: Q. I won't take you through the detail in relation to methane because it is easily discoverable there but I would like you to stop for the moment and tell us something about an instrument of which we have heard a lot, namely the methanometer, and sometests which you took with carbon dioxide and methane. It has been said, you see, that the methanometer will not give - is affected by the presence of carbon dioxide. I would like you to tell His Honor just what the effect is? A. As part of the duties carried out by the laboratory methanometers and various other instruments used in mining are tested. Methanometers have been tested for their accuracy of calibration by the Department. We had not thought to test a methanometer's accuracy in the presence of CO2 because for one thing they are only supposed to be calibrated for the gas which they are intended to detect but during the progress of the inquiry a senior responsible officer who is an authority in his field, a recognised authority, on my instructions re-calibrated a methanometer in the presence of carbon dioxide and he found no difference up to a synthetic mixture of 3% of methane and air, no detectable difference between a 3% mixture of methane and air and a mixture containing 3% methane, 10% carbon dioxide and air.

Q. That means the methanometer in both those situations gave the same reading of methane? A. Yes, gave the same reading.

Q. So that to that extent the presence of carbon dioxide did not affect the reading? A. It did not affect the reading.

Q. You found instead of it giving 3% methane it showed a slightly lower reading? A. It gave a reading of 2.65% which only goes

to prove the methanometer is not infallible and it should not, in my candid opinion, take the place entirely of the flame safety lamp which has at least three major advantages. The methanometer, being constructed the way it is, would need careful servicing and checking to always be sure its calibration is right.

HIS HONOR: Q.What are these three major advantages you say the safety lamp has? A. Its simplicity, for one thing. Other advantages have been enumerated by Inspector Menzies: The fact that it does not need human aid in ordinary circumstances to give a warning of dangerous conditions - I mean really dangerous conditions - if you are going into concentrations of methane above three or four per cent it would immediately let you know and if you were going into concentrations where carbon dioxide was sufficiently high you would know, if the oxygen was low, if that happened, you find using it - - -

Q.I suppose you would say the ideal thing is a combination of both? A. The ideal set-up would be a combination of both in the hands of the deputy.

Q.So that in fact if he found methane on his methanometer he should then check to see whether there is carbon dioxide which might affect the reading? A. Rather the reverse: I think if he found methane on his safety lamp he would check it on his metanometer. His safety lamp would give him his first and quickest intimation.

Q.We have heard evidence that it may be difficult for a deputy to detect methane on his safety lamp, certainly in the presence of black-damp and also to locate it when it is too close to a roof surface, so that he could get no indication on his safety lamp of the presence of methane? A. I realise those difficulties but he would be first of all notified by his safety lamp willy nilly.

Q. Of methane? A. Of a dangerous condition. I am not speaking of smaller quantities. It would be his duty in any case, I think, to use the methanometer whatever happened because the methanometer is calibrated in 0.1, or 0.2 of methane, per cent of methane, whereas the lowest reading that he could possibly get with the safety lamp would be, a very expert man might perhaps pick up 1 per cent or one and a quarter.

Q.An expert could pick up one and a quarter? A.I think the average deputy is sufficiently expert. That is when there is only methane to be considered.

Q.You see, I don't know what an average deputy is? A.No.

Q.At some stage I may have to consider deputies who may be below what you call average? A.Yes, I would still agree that both the safety lamp and the methanometer - that would be the ideal combination.

Q.I think we only differ then on the question of how you make your test and which you use first? A. Yes.

Q.What I was interested in particularly when I made that suggestion that you use the methanometer and test with the safety lamp for the carbon dioxide is that if you use the methanometer you could well be out because of the presense of carbon dioxide. If you use the safety lamp you could then detect whether carbon dioxide is present, which may affect the reading on the methanometer? A.Yes, that is correct.

Q.You say look for methane first on the safety lamp? A.No, not necessarily.

Q.I thought that was what you said? A. No, you would not look for it: if it became evident , if you entered a place which was definitely dangerous it would be evident on the lamp but in any case you would use the methanometer. There is one other point, a Toka or Riken, a similar instrument, for determining methane, determines not only methane but carbon dioxide.

Q.A Toka determines carbon dioxide. We have not seen the Toka. It is a Toka methanometer is it? A. A Toka gas indicator, I think.

Q.How does it show carbon dioxide apart from methane? A. It works on a different principle to the M.S.A. methanometer, it works by refractive interferometry. The method of using it would be to determine the methane - it doesn't matter which way you do it - you can determine the methane in the instrument by first of all testing the gas absorbence for CO2 and moisture. The next reading would be taken without eliminating the CO2. The difference then for all practical purposes would be CO2. Between the two readings you have got both methane and CO2.

Q.Rather like when you weigh something in a container, you weigh the two together and then weight the container and subtract? A. Precisely the same.

MR.LEE:Q.Is the test with the Toka easily performed? A. It is quite a portable instrument.

Q.You just look at it? A. I think Mr.Longworth mentioned it.

Q.He used it on one occasion? A.Yes .

Q.Just to get one thing clear: When you tested with the methanometer with the carbon dioxide present - ? A. Yes .

Q. - the reading you got there - ? A. Yes.

Q. - was the same reading as you got with the carbon dioxide not present? A. The same reading. There was no appreciable difference.

MR.LEE: I thought I should make that clear because Your Honor used the phrase, that the effect of the carbon dioxide on the methanometer - it would seem this witness suggests that can be disregarded.

HIS HONOR: Q.It certainly can at certain concentrations or percentages? A.Yes.

Q.But your tests do not go so far as to say that you get the same result at all concentrations ? A. The methanometer has a range from zero to five per cent. It was taken as three because that would be above two and a half per cent which causes it to react.

Q.And ten of CO2? A. Ten parts of CO2 to three parts of methane.

MR.LEE: Q.If you can get three per cent on the methanometer or, say, 2.65, there should be no difficulty in finding that with the oil safety lamp? A.No.

Q.You go on at page 7 with some material which perhaps should be read: The carbon dioxide and methane formed during coalification may largely escape from the coal seam in geologic time through overlying pervious or faulted strata, so that when the coal is being mined the contained gas issuing from freshly

exposed coal faces does not constitute great danger with normal ventilation requirements. Under some geological condidt ons the lighter methane which would diffuse faster than the heavy carbon dioxide is lost while much of the carbon dioxide still remains in the coal. Under other conditions much of both methane and carbon dioxide is retained in the coal. Under these circumstances it is possible over geological time for some stratification to occur, the methane moving towards the top of the seam and the carbon dioxide towards the bottom and, when the coal is mined the seam gas issuing from the roof in mine workings is richer in methane than that issuing near the floor. However, gasses once mixed do not stratify unless over considerable, geological perhaps, time. It is worthwhile noting that ordinary coal holdsmany times its volume of seam gas? A. Yes.

Q.In other words once you get bottom gas you are going to have it for very considerable periods of time? A. Yes.

Q."On the south coast Illawarra area there are mines where the gasses contained within the coal seams range from almost pure carbon dioxide to almost pure methane e.g. Metropolitan has been as high as 99% CO_2 and Appin as high as 97.8% methane but normally the gasses are variable mixtures of CH_4 and CO_2 with a little N^2. Such gasses are known by the generic term "Illawarra gas". When the gas issuing from the seams is predominently CO_2 and so is heavy and flows along the floor, the term "Illawarra bottom gas" is applied. You say the result of your testing of the sample from the Metropolitan Colliery showed 99.6% carbon dioxide, 4% methane and no oxygen? A. o.4% methane.

Q.What is it? A. o.4%.

Q.And, Appin Colliery gave you these very high readings of methane: 97.7%; 97.8% methane and very little carbon dioxide. You go on to a reference to something we will come to a little later on. You say "As is evident from tables 4 and 5 the composition of the gas held within and issuing from the goaf in 8 Right panel of Bulli Colliery under Falling barometric pressure is about 40% methane, 58% carbon dioxide and about 2 to 4% nitrogen." You then make a comment on the nitrogen -

HIS HONOR: Q. You did speak about the mixture of gasses issuing from the top of the seam. When they issue from the bottom of the seam and go to the bottom you call them "bottoming"; when they issue to the floor, you call them bottom gas? A.Yes.

Q.Do you mean a similar mixture can issue from near the roof? In other words could you get a composition of this gas which is heavier than air in this mixture - 1.5, is it? A. 1.15.

Q.Specific gravity. Could you get that up in the roof areas? A.It is possible. It is possible when there has been no opportunity for stratification to have occurred over geological time, you would get usually issues from the seam, from almost any part of the seam.

Q.From any part of the seam? A. Yes.

Q.And it may stay up in the roof for some time before it actually starts to descend and would become bottom gas, I suppose, at that stage? A. Yes. I think it would hardly be likely to stay up on the roof to the exclusion of issuing from the floor.

Q.I do not mean to the exclusion of issuing from the floor. Say it comes from up near the top, somewhere near the roof level, it can do that, you say? A. It is unlikely. It is unlikely to just issue from there and notfrom anywhere else.

Q.I do not mean from the one, I mean issuing from both? A.Yes.

Q.So you can get what we call bottom gas, or something very much like it, up near roof level as well as down below? A.Yes, but being a heavy gas once it issued it would tend to come down and the average miner, I won't use the term average, the miner encountering this gas normally near the floor would apply the term "bottom gas" to it.

Q.But in fact, in its state of recent emission that could be a mistake? A.Yes, it could be flowing down.

Q.In fact, it might even be present in the body of, say, a cut-through or working place? A. Yes.

Q.Before it reached floor level? A.Yes.

Q. MR.LEE: On page 8 you refer to samples taken by the different Inspectors. You might tell me at this point as to the first lot that were done, nos.3694 to 3698 - were they all taken on 12th November? A. All taken on 12th November.

Q.The next lot of samples, nos. 3699 to 3704, when were they taken? A. All on 15th November.

Q.You explain how you did it with a long tube, you analyse those results on Tables 4 and 5. I will leave those tables for separate treatment. You make the point at the top of page 5: "It will be seen that, with the ventilation flowing on the days these samples were taken, eight of the eleven samples were over 96% air, five of which were in the vicinity of or exceeded 99% air while one was 99.8% air. With the exception of the last mentioned, all atmospheres however were calculated to air free basis and all these air free gasses with the exception of 3699, which contained 99.4% of air, giving little margin to work with, were capable of forming inflammable or explosive mixtures with air with approximately the same upper and lower limits." A.Yes.

Q.You go on "The percentage of oxygen in the original atmosphere was too high, that is, contained too much air, to fall within the percentage of oxygen range between the upper and lower explosive limits in all samples except three." One of the samples mentioned there was practically pure air. Another was almost within the range, whilst one was explosive per se. You go on "Since the oxygen percentage in the original atmosphere lies within the oxygen range between the upper and lower explosive limits of the critical gas mixture while the other sample, 3702, contains too much gas and too little oxygen to lie within the oxygen range between the upper and lower explosive limits." -

HIS HONOR: Q.The explosive one, No.3695, was taken in front of the brattice, closer to the brattice than the one before? A.That is right, Your Honor.

Q.In front of which brattice? In front of the brattice in the shunt? Is that what you say? A.Yes.

Q.Close to the brattice in the shuht there is a sample taken of an explosive mixture? A. Yes, that is right, that brattice was the brattice that was erected right at the end of the shunt on sketch 2.

HIS HONOR: The brattic erected after the fire.

MR.SULLIVAN: Right near the goaf.

WITNESS: Yes.

MR.LEE: We will deal with this further later on.

Q.The changes in the ventilation system which have a significance, in your mind, you can tell us about later on? A.Yes.

MR.LEE: I want to get through the report at this stage and then come back.

MR.McNALLY: I think there is a misprint as to two numbers. In the first place, as I understand it, there is 3695, 3697, 3702, and, going on, it becomes 3694 and 3695.

MR.SULLIVAN: Would you repeat that?

MR.McNALLY: The samples are 3695,3697 and 3702. Then he goes on to speak of sample 3697, 3694 and 3695. I do not know whether he intended that or not. I am wondering whether 3697 should not be 3694 .

WITNESS: 3697 is practically pure air. If you look at the Table at the back it is 99.98% air.

MR.LEE: With respect, can we leave that for the moment?

HIS HONOR: Very well.

MR.LEE: Q. You go on to say "It can also be seen that in spite of the alterations in ventilation in both volume and direction (as the three sketches in evidence show) giving fairly good respirable air in all parts of the fire except near and behind the brattice in the shunt on 12th November 1965 and 15th November 1965, the air free gas portions of that air had approximately the same composition as the air free gas portions of the samples near and behind the brattice." Just make the point a little clearer for us, would you? A. I calculated all the samples which were taken to an air free basis and that air free basis, for purposes lying within experimental errors, the gas, air free gas, had approximately the same composition - that is in spite of any alterations in ventilation, which would tend to show that the whole of the gas in the goaf area had the same composition.

Q.If it were the fact that the ventilation on 15th November, by reason of it passing around to the goaf edge were diluting the gas coming from the goaf far more than the gas on 9th November was being diluted in the shunt, that would mean the samples you got on 15th, showing the quantities,were much less toxic in their toxic in their possibilities than the samples which might have been in the shunt on 9th? A.Oh,quite.

Q.You go on to speak about that? A.Excuse me - "Toxic"? "Dangerous".

MR. LEE: That is the word, yes, "dangerous".

HIS HONOR: Q.I want you to leave out the question of ventilation. A.Yes.

Q.The goaf gas is this mixture of carbon dioxide, methane and nitrogen? A.Yes.

Q.You have heard a lot of the evidence from some of the men who were working there and on previous days they had detected what they called black-damp? A.Yes.

Q.It may be the probability is that what they were detecting all this time while this area was being worked was bottom-gas? A. Was the gas of that composition.

Q.In other words, it contained methane? A.Contained methane.

Q.MR.LEE: Your opinion was, firstly, there had been no explosion of gas or coal dust? A.Yes.

Q.Secondly, and I think we have to alter this figure of 2,800 cubic feet, now, have we not, to 1400; is that proper? A.Well, that could be up to 10, 000 cubic feet of gas moved out.

Q.The figure of half an inch in front of the word "mercury" would have to be reduced? A. Quarter inch.

Q.We make that first figure about 10,000 cubic feet? A. Yes.

Q."Of gas in the goaf of approximate composition 40% CH_4, 58% CO_2 and 2% N_2 moved out largely into the shunt, as the barometric pressure reduced about quarter inch"?A.Yes.

Q."In the early hours of 9th November 1965"? A.Yes. Could I add something to that?

Q.Yes. A. That is the fact. If you look at the barometric charts there is a total drop of up to half an inch, up to, I think, it is midnight on Tuesday, speaking from memory, which would mean that gas was still issuing while the fire was being fought so that the total issuing of gas for half an inch drop would still be 20,000 cubic feet.

Q.In other words, the fire was being continually fed? A.The fire was being fed.

Q."Some of this gas which had leaked through the brattice was ignited near the floor by a small flame from the friction of the wood jammed in the enclosed part of the brake assembly of shuttle car No.40. The presence of fine coal and oil in the brake assembly could also have generated spontaneous heating". Just stopping there : I think you would make the point that the shuttle car coming into the shunt would tend to stir up the gas that was in there; is that so? A. It would tend to stir it up.

Q.You say, in your fourth opinion, "The brake assembly was hot due to one and a half hours running of the shuttle car on a fairly steep grade. This would have contributed to generation of flame. (5) The shuttle car did not actually stop before reaching the brattic in the shunt which was disturbed sufficiently to release the volume of goaf gas held behind it which immediately caught fire. Some of this burning gas was drawn into the ventilation tube which fired and collapsed to the floor; some of the burning gas set fire to the mine cable. (6) Burning droppings of the mine cable assisted the fire on the floor. (7) The fire was fed by the air ventilation which had to be maintained for personnel rescue purposes. (8) The burning gases ignited timbers and coal in roof, ribs, and the loaded shuttle car. (9) The coal burning in the rib volatolised some of the oil brake fluid which contributed to the localised continuing fire, until the fire was put out.". To that you add "The continuation of the flow of gas from the goaf"? A.Yes.

Q.I think also you could tell us this: When the bottom gas was ignited and began to burn would it tend to burn along the floor or tend to draw the gas up and burn it up at the roof? A. Flames tend to go upwards always and, consequently they themselves generate a convection current in addition to which if the gas is heated at all it then tends to expand, its gravity will drop

and it will rise and tend to keep the burning up near the roof, the upper confines.

MR.LEE: Q. Then you make some observations which you yourself concede are not within your province and I shall not, unless His Honor feels they are helpful -

HIS HONOR: These are really matters for comment, matters for submissions. I have been going into details of what happened to the men and why some got out and some did not. It may assist all of us if we know that these suggestions are made and some of the gentlemen at the Bar table may wish to make submissions and adopt some of these. On that basis I do not regard it as expert evidence since it is not within the province of the witness, but with that safeguard I will hear it.

MR. LEE: They did seem pertinent in any event but, as I say, I was not going to ask the witness to express the opinions as an expert on thesematters.

Q. You made these following further observations: That the methane was more fiercely burning near the roof when Barry Kent and his companions approached than the fire from the fallen ventilation tube -

HIS HONOR: Q. This is after the first two men had got out? A. Yes, when Kent and his companions approached.

MR.LEE: Q. Observation 2, that Barry Kent, tripping on the wire of the fallen ventilation tube - now there is no precise evidence that what he tripped on was the wire, but assuming that is what he tripped on? A. Yes.

MR.REYNOLDS: Could the witness say at this point why he made observation (a) at that stage?

HIS HONOR: Q. Yes.Can you tell us at that stage why you say the methane was more fiercely burning near the roof when Kent and his companions approached than the fire from the fallen ventilation tube?A.Well,the ventilation tube is composed of material which is self-extinguishing, for a start, and it could only have been ignited by a fire or a temperature above or in the vicinity of 900 degrees Centigrade so that there was a pretty fair flame and heat up near the roof when that was burning. And when that fell, when the ventilation tube fell, although it would still be alight, the heat from the fallen material would not be as much, from the nature of the material, as the heat from the burning gases near the roof.

Q.Would you say that when it fell,most of the gas it contained, assuming it had been burning, wouldhave gone out by then or would have been dispersed?A. If any gas was carried down with the tube as it fell it would burn because the tube in any case must have been punctured by the fire.

MR.LEE: Q. No.2, you say Barry Kent tripped on the wire of the fallen ventilation tube, as you assume he did, and bringing his head and body nearer to the floor may have assisted in saving his life as in getting up and moving forward out of the fire into the smoke he would not have been so long at an erect position in the fire area. Even then, the heat badly blistered his face. His hands were burnt also from the fire on the floor but his lower body seemed to have escaped serious burning. Observation (c); I think that is probably self-explanatory, the reasoning there. You say Barry Kent's companions, who hesitated to follow him seeing him fall, probably assumed the worst and three of them endeavoured to escape via the shunt to the goaf where the flame enveloped them completely and killed them.

HIS HONOR: Which is not, strictly speaking, borne out by the medical evidence.

Q. You are assuming the fire burnt them and killed them. The medical evidence is that they were asphyxiated in the first place?A. Asphyxiated before that. Then, I hadn't medical evidence to go on there.

HIS HONOR: Not at the time you gave that opinion, no. What surprises or puzzles me in this matter is how these three men got into the shunt area when two were at the side of the shuttle car and one at the rear. I suppose everybody suggests that at some stage they tried to get into the goaf through there, possibly because they knew of the exit or knew of that passage which was found later on. That is possible, but what surprised me is, to have got through the flame, as it were around the corner, and into the shunt area, and the evidence in fact seems to suggest they did, they were in the extension of the cut-through, the fire was right across that area, they did not follow Barry Kent through the fire, and yet they have turned the corner and have got in between the shuttle car and the rib. One of them is found behind the shuttle car. How they got through that has puzzled me and I have been asking some questions to see whether that flame was to the extent it was described by some witnesses. There is of course evidence from the two men who got through, and one of them anyway said that when he looked back he could see no fire. That is some distance away from the seat of the fire but, as I say, that may never be explained.

WITNESS: Could I add just a little to that, Your Honor. I stated that the first part of the fire was near the roof. It is common in fire rescues that the purer air is nearer the floor and it may have been - I should think that most men would know that and would tend to keep their heads down away from the fire which was raging above them and be able to pass by the shuttle car or try to pass by the shuttle car. One of them actually did pass by.

HIS HONOR: Q. That is not so much getting around the shuttle car as around the corner. The fire is right at the intersection, it is on that corner piece, and if it is coming right down to the floor as Mr. Kent suggests, you may have to go through. He said he went right through the fire? A. Yes.

Q. The other witnesses were there a second or two before him and they were able to dodge the fire by keeping their heads down as if it was not burning completely all the way down -

MR.REYNOLDS: We do not know when they did that.It may have been half an hour later when the fire situation may have changed.We have no idea when they got there.

HIS HONOR: That is true, the fire situation must have changed, the four men must have gone down the shunt; but unless something happened to them mentally, one would not think they would run back into the fire. This is speculation and it does tend to worry one at the time the evidence is being given. At times I have had doubts which I have expressed as to whether when Mr. Kent went through, there was a complete wall of fire even though it appeared so, because Mr. Kent burnt his face and a man who burnt his face may not be in a position to tell the extent of the fire, as to whether there was a wall, a complete wall of fire when he went through or not.

WITNESS:I thought there was some evidence as to the fire extending four feet down from the roof.

HIS HONOR: Q. That is the evidence of the first witness, but Mr. Kent says he went through a complete wall? A. Yes. It would have appeared to him that, if his face was in the flame.

MR. LEE: Q. Going on to your observation (d) on page ten: The fourth companion found in the dead end of No.2 cut-through had apparently run back safely to the dead end but by putting his head into the ventilation tube, had placed it in the very position where noxious gases from the fire would be concentrated and drawn while the fan was still operating. This fan normally sucked air into the return in A Heading, via the end of No.2 cut-through".

MR.REYNOLDS: In view of the time factor and the fan stopping -

MR.LEE: I will not press it.

Q. You are aware now, I think, that it would seem Mr.Stewart lived for some appreciable time after the fire started? A. This, as everyone knows, was long before this inquiry -

Q.This is no criticism.I just say that you accept the fact that observation (d) is no longer valid?A.That is right.

Q.Let me go on now through the report of your examination of the wood in the shuttle car and what you did to arrive at the result you obtained. The first thing you did was to send a letter off to the Division of Wood Technology sending along a sample of the wood and asking that Division to give you certain information about its ignition point? A. That is right.

Q. You received that information in Appendix B in a letter from the Forestry Commission of New South Wales dated 29th November 1965 which amongst other things informed you that there was no specific temperature at which it could be said that the wood would ignite but that at about 270 degrees any species of wood will decompose exothermically. What does that mean? A. With the generation of heat.

Q.Is that the point of ignition?A. No.

Q.When it starts to degenerate exothermically?A. No, not necessarily.

Q.It goes on to say that the decomposition so resulting gives rise to a mixture and that at about 600-700 degrees Centigrade or when a particle is introduced which has sufficient temperature and mass to start the reaction going the mixture will ignite. What does that letter tell us about the ignition point of this piece of wood that was sent in? A. It tells us that there is no specific temperature at which the wood will ignite, but what it does tell us is that when the wood starts to decompose, volatile matter will be given off which will ignite at that temperature of about 600-700 degrees Centigrade. The rest of the paragraph which you have not read-

Q.It goes on "However if the decomposition of the wood has proceeded so far as to form charcoal then self-ignition can occur because the charcoal binds oxygen from the air with the liberation of heat. This in turn hastens the process of oxygen adsorption until the reaction becomes so fast that the charcoal is said to burn. This will then ignite the vapours and gases evolved from other pieces of decomposing wood and of course any methane in the atmosphere." Does that get us closer to finding out the critical point at which wood may cause a fire or the ignition of wood may cause a fire? A. Yes it does because wood, it says earlier there, starts to decompose at or about 270 degrees Centigrade and it will ultimately form this

charcoal and the charcoal it-self can self-ignite and from the point of that self-ignition then the burning reaction is more rapid.

HIS HONOR:Q.Do you mean that the self-ignition point of the charcoal is a lower point than that of wood itself? A.Yes.

Q.What is charcoal? We talk about it and use it at barbecues; what is it? A. Charcoal is woody-tissue which has been heated to drive off the greater part of the volatile matter, the moisture it contains, so that its residue compared with the original wood is somewhat analogous to coke as compared with the original coal from which it was formed.

Q.In other words you have driven out all the volatile matter; it is not just burnt wood, it is not ash? A. No. True ash contains no carbonaceous matter. Charcoal is largely carbonaceous matter.

Q.You could call coke wood? A. Well, you could. It is not a term usually used.

MR.LEE:Q. Going on to Appendix C, page 13, headed "Ignition of wood and methane," you make the point in about the 12th or 13th line that in a coal mine the figure might thus range between 650 and 675 degrees Centigrade. That is the figure for the ignition of methane? A. Yes, that is right.

Q.And you say "The most easily ignited mixture of methane and air contains 7.5% methane and the heat of combusion is 1,016 B.Th.U's per cubic foot"? A. Yes.

Q. That figure I have just given, how does it compare with the flame, say from an ordinary gas stove? A. The gas stove in the reticulation inSydney is 550, or is supposed to be 550 British Thermal Units per cubic foot, so this is approximately double.

Q. "Once ignited the flame temperature of burning methane in air would be indicated by its colour." It might be convenient if you turn to page 17 where you indicate those colours, as they become topical now. You say there that flame temperatures - orange red colour 2,012 degrees Fahrenheit, 1,100 degrees Centigrade; orange yellow, 2,190 degrees Fahrenheit, 1,200 degrees Centigrade. For comparison purposes the luminous flame of a bunsen burner is 1,328 degrees Centigrade, non-luminous 1,533 degrees Centigrade, with different lower temperatures for inner and outer cones of the flame. Luminosity depends on temperature and the presence of solids or unburned particles in the flame or the percentage of oxygen present. So much for that, and your report then goes on to talk about timber ignition tests at Joy Manufacturing Company Pty. Limited, Mascot, on 30th November 1965 and I think on some other days after that? A. Yes, on one other day after that.

Q. The object of the exercise was to find the temperatures attained by the disc brake after heavy braking and the possibility of ignition of wood of the same species as found in the brake assembly? A. Yes.

Q.The wood was supplied by the Forestry Commission, is that right? A. That is right.

Q.Of the same species?A.Of the same species, as near as they could get it.

Q. The steel brake was an air-cooled modification of the type of disc brake used on No.40 shuttle car at Bulli Colliery. The brake disc was approximately one inch in thickness and contained a number of large radial holes to promote faster cooling. The disc on shuttle car No. 40 was approximately quarter of an inch and contained no cooling holes? A. That is right.

MR.LEE: It might be appropriate if Your Honor were to look now at those photographs if that observation there is not self-explanatory. Exhibits "B1", "B2" and "C" should be sufficient. Exhibit "C"is the one with the fresh piece of wood jammed in. Your Honor will see in the disc brake is this series of holes all around the edge which has a cooling effect on the disc itself. It is a wider disc and the air can get in. Exhibit "C" shows the disc which has a plain one thickness of metal with no holes, no cooling device at all, and consequently the temperatures which Mr. Donegan got on the test machine were in all probability considerably lower than what would have been engendered on the shuttle car.

Q. You go on to say that the electric motor was used to drive the brake disc against the brake linings. The temperature of the brake disc was measured by using a contact thermocouple and thermochrom temperature indicating crayons. The temperatures of the disc were found to exceed the maximum scale reading on the contact thermocouple, 500 degrees Fahrenheit, and then you show your results. On your first run the temperature at the edge of the brake drum - what do you mean by that? The brake drum or the brake disc? A. The brake disc.

Q. That was 200 to 300 degrees Centigrade. On the second run, above 300 degrees Centigrade. On the third run 410 to 500 degrees centigrade, and you have a note there that the third run was done under very heavy braking? A. Yes.

Q. You say "Because the temperature of the brake disc was above the ignition temperature of Eucalyptus species, stringy-bark type timber, pieces of this timber were jammed against the disc brake in an attempt to ignite the timber." In the light of what we have read from the letter, which of those temperatures are we saying is above the ignition temperature of the piece of wood?A. Can I modify this statement?

Q.Yes?A. And say that because the temperature of the brake disc could have been above the ignition temperature of the Eucalyptus rather than"was above".

Q.What you are seeking to do is to equate the position, of the wood being 270 degrees Centigrade,and thereafter the possible range within which that wood may ignite; you do not know that with certainty, do you? A. I was trying to find out whether the wood would actually catch alight under the circumstances.

Q.We will carry on and prove that it did. You then go on "In the first test a piece of timber was driven in between the edge of the brake disc and the universal. This position was similar to the location of the jammed piece of timber in No. 40 Shuttle car at Bulli Colliery.Since the edge of the brake disc and the universal have opposite motions at the nearest point of their peripheries on running, the brake disc tended to eject the timber. During running brake fluid and coal dust were thrown onto the timber. No ignition was obsdrved. In the second test, a piece of timber was driven into a four foot pipe and the timber levered against the

spinning rim of the brake disc. Brake fluid and coal dust were again thrown onto the timber. A large amount of smoke was produced and the timber was quickly eroded at the point of contact. No freely burning flame was observed." Then you point out the differences between the conditions applying to that test and to the shuttle car when working in the mine. The first one is the difference in construction. On the test car the disc there permitted air colling because it was a double plate with connecting pieces and air gaps between whereas on shuttle car . No.40 it had a solid brake disc. The second difference was that the disc and brake assembly normally operated within a metal protective enclosure, the atmosphere in which would retain some of the heat radiated from the disc. During the test the enclosure was removed permitting dissipation of the heat generated into the open air which would be assisted by the air current set up by the swiftly rotating disc and shaft.

The third difference was the removal of the enclosure also permitted the wood to be more easily thrown out unless manually held in place, whereas on shuttle car No.40 the wood was firmly jammed in position. No. 4 difference was that small non-luminous (blue) flames capable of igniting methane are not easily visible in daylight, if at all. At one stage you obtained a fleeting impression of a small pale flame in the smoke near the wood but you could not definitely state flame was present. So in view of that you made the following test in the laboratory: A series of tests were made to determine the ignition and glow temperature of Eucalyptus species, stringybark-type timber. This timber is similar to the type found jammed against the disc brake of No.40 shuttle car. Splinters of timber were placed in dishes in a muffle furnace with the door raised approximately one inch. Observations were made as the temperature of the muffle furnace was slowly raised to 450 degrees Centigrade. Some splinters of timber were soaked in A pol hydraulic brake fluid (sample No. 3714). This is the same type as that used in shuttle car No. 40. One of the oil soaked timber samples were coated with coal dust;

Then your results, in test 1 the oil-soaked timber started to froth at 100 degrees Centigrade, the untreated timber turned blackish at approximately 280 to 300 degrees Centigrade and the ends of both pieces glowed at approximately 340 degrees Centigrade.

HIS HONOR: Q. Does that mean you have got combustion there? A. Yes.

Q. I mean you have got ignition? A. Yes, combustion.

MR.LEE: Q. On the second test the untreated timber blackened at 250 degrees Centigrade, the oil-soaked timber caught fire at 315-320 degrees Centigrade and the untreated timber glowed at 430 degrees Centigrade. On the third test the oil-soaked timber blackened at 220 degrees Centigrade, the oil-soaked timber glowed at 420 degrees Centigrade and the untreated timber glowed at 420 degrees Centigrade? A. Yes.

Q. In the next test, Test No. 4, the untreated timber gave an ephemeral pale flame and glowed at 340 degrees Centigrade, the untreated timber continued to glow at 360 degrees Centigrade and blue flame was observed. The flame was visible only in the dark interior of the muffle and invisible in the light of an ordinary electric torch. Untreated timber had a blue haze around the glowing area at 380 degrees Centigrade.

The oil-soaked, coal dusted timber glowed at 380 degrees Centigrade.In the final test, No.5, two oil soaked pieces of timber were placed into the furnace at 430-440 degrees Centigrade. After a short time both pieces of wood ignited and burnt freely. Your conclusion was: These tests prove that at a temperature of 340-450 degrees Centigrade,which could be attained in the brake assembly of shuttle car No.40 when in use in the mine,would ignite timber of the species found in the brake assembly of that car which in turn would ignite an atmosphere containing sufficient methane? A.That is my conclusion.

Q. I do not think there is any-thing else I want to ask you on the wood situation. We will go not to the Appendix D where you go on to discuss ignition in various ways and spontaneous heating.I do not think there is anything in there unless you specially want to say something? A. There are excerpts from "Fire Prevention & Protection Fundamentals (Comburology)" by Stetcher.

Q.I think for present purposes we can pass over that; not that it is not important. Your Appendix E is "Gas Hazards".That is on p.18. Again you talk about the gases and noxious gases and inflammable gases and what they are. I think most of the material part of that we have already been given information about. The mine atmospheres consist of three portions: A gas portion of mixture composed of combustible and inert gases; air; and what is called the diluent? A. Yes.

Q. That is an additional inert gas. An original atmosphere consists of the first and second only, and original air free atmosphere consists of the first only, that is the gases? A.That is right.

Q.I shall have to take you through the next part a little slower without spending too much time on it,but you go on to say that every original air free atmosphere that has explosive limits with air will form mixtures with inert gases (including black damp) and some of these will have explosive limits with air and others will not. Black damp is a mixture of nitrogen and carbon dioxide, usually 13% CO2 and 87% nitrogen but the CO2 can range from 12 to 15%. Experimental data has established the fact that the effect of inert gas in a mixture that has explosive limits with air is to reduce the possibility of flammation or to extinguish the flames of the combustible gases present. The severity of the extinctive effect depends on the inert gas itself; the combustible gases, and the percentage content of the inert gas in the mixture.

If an air-free mixture that has explosive limits is diluted step by step with additional inert gas, each of the new mixtures formed will also be air-free and will consist of progressively less (in per cent of the whole) of the air-free original mixture and progressively more diluent. One of the air-free mixtures so formed will be just incapable of forming an explosive mixture with air. Ash and Felegy have termed this air-free mixture the "Critical Gas Mixture". It contains a gas portion in per cent that is the maximum percentage of the air-free original atmosphere that can be present in any possible air-free original atmosphere-diluent mixture incapable of forming explosive mixtures with air. It contains a diluent portion that is the minimum percentage of additional inert gas that can be admixed with the air-free original mixture to form a mixture just incapable of forming an explosive mixture with air?A. Yes.

MR. LEE: This is the basis of the subsequent calculation and I feel I should proceed with it in order that it may go on to the transcript, unless Your Honor feels that the information on p.19 - it is all an Exhibit in any event.

Q.I will go on now to p.20 where you say that the explosive range of methane in air is from 5 to 14%. Mixtures richer than 14% methane, however, may burn on contact with external air, for mixtures which contain less than 14% are formed in the zone where the gases mingle. I think we can pass over the rest of that page now and come to your explanation for the benefit of the Court of the materials in tables 4 and 5 ? A. Yes.

HIS HONOR: Q. There is one thing that is perhaps of some special importance and that is the last paragraph on p.20: "When a source of ignition, such as an electric spark or a flame, is introduced into an inflammable mixture, flame tends to travel away from the source in all directions. In a very large volume of mixture the form of zone of combustion would be a spherical shell of increasing radius, were it not that the hot expanded products of combustion tend to rise and hence introduce convection currents." That is in line with what you have already said in relation to the burning of bottom gas? A.Yes. Q."Flame cannot travel downward when the upward movement of the gases due to convection is faster than the speed of flame in a still mixture as happens in weak mixtures near the limits of inflammability"? A. Yes.

HIS HONOR: I think that might probably go to explain some of the incidents of the fire that have been described by witnesses.

MR.LEE: Q. If you can now just show us on tables 4 and 5 how they show that the goaf gases in Bulli Colliery were within the limits of inflammability and explosability if given the right quantity of air? A. I have got the analyses of the samples as originally taken in the first part of Table 4. That includes not only the constituents but it includes the percentage of air in that original sample taken and the percentage of air-free gas in that original sample.

Q.That is the first part of it? A. Yes. Now the next part of it is to work out the percentage of each constituent in that air-free portion of the gas.

Q. What you might call the pure gas portion? A. The pure gas portion.

Q.You do that there? A. Yes, I do that there. I do not know whether you want any comments on that now or just explain the table?

Q.Perhaps at this stage if you would just explain the table? A. There are seven cases which have been investigated by the Bureau of Mines to determine the critical gas mixture value.

Q.As previously explained in your report? A. As previously explained, so that in each case, since the carbon dioxide was greater than, more than three times greater than the methane and there was no hydrogen present, I used Case No.2 formula to work out the critical gas mixture value of each one of those air-free portions of the gas. If that figure is greater than 100 or a minus quantity, then the gas portion is incapable of forming an explosive mixture with air. If it is less than 100 it is so capable and I have discounted that in the next line with the letter E for Explosive and

N.E. for non-explosive. Following on that, I work out the percentage position of the critical gas mixture. That is the next three lines. The diluent, as previously explained, is 100 minus the critical gas mixture value. The critical gas mixture value is in that line just under Case 2. It is merely 100 with that figure subtracted.

MR.REYNOLDS: I noticed that if you add the two together you get 100.

WITNESS: Well, that is the reason why and that also explains the significance of the figure 100 in the explosability. I have included the formulas for anybody to check my figures.

MR.LEE: Q. Then you got your diluent factor in - these are the factors you mentioned previously? A. Yes. Then I determined the total nitrogen in the critical gas mixture value which will be the addition of that diluent to the nitrogen in that above at the top. Taking the first instance, in No. 3694, it is 1.91 plus 54.5. Then I determine the constituency of the critical gas mixture. Then I determine the nose limit and the constituents in the nose limit, and for all practical purposes the critical oxygen value is .5% lower than the oxygen in the nose limit and I have explained there somewhere the significance of that critical oxygen value.

Q. Onthe same page then you arrived at an equation, a method of calculation which is set out there, and you arrive at conclusions and you are able to point now on the next page, are you not, to the various samples and why some will explode or burn and why some will not? A. Yes.

Q. Would you do that with as little technical description as possible? A. I might state that I did not derive these formulas. These formulas were derived by the United States Bureau of Mines which has exceedingly well-qualified expert staff. This is not hearsay. I have been in the Experimental Station at Pittsburgh myself and met some of the men.

MR. REYNOLDS: Q. Is that the one referred to in the technical paper 450? A. If that is the one that is mentioned there, yes, and I have worked in complete co-operation and collaboration with the Safety of Mines Research Establishment in England which Ihave also visited.

MR.LEE: Q.Which of these samples on Table 5 are inflammable, explosive or non-inflammable or non-explosive, and briefly why? A. Well, omitting all the stages of getting up to the last columns, you will find that the explosive limits are given of the critical gas mixture value, the air limit mixture and the percentage of oxygen in the limit mixture which has the upper explosive limit and the lower explosive limit. The upper explosive limit is designated LU and the lower explosive limit LL. That means to say that if in the original sample, the oxygen sample, thelast column, falls between the upper and lower limits of the oxygen limit mixture in the third and fourth last columns, then the original sample will be explosive per se.

Q. So we are directing attention then to the columns, percentage oxygen in limit mixture first? A. That is right.

Q.And we are going to compare the information in those two columns with the information which is in the last column? A. That is right.

MR.LEE: Q.By making that comparison we are then in a position to determine whether the thing will explode or not? A. Yes, explode or not, as the sample was originally taken .

Q.If we find what is in the last column falls within the range of the figures under the two columns "Percentage oxygen in limit mixture" we have a mixture which will explode? A.Yes, that is in the original sample.

Q.Just to go through them on that basis, of what they will do? A.The first sample you will have observed is 15.4% oxygen and the explosive range, we shall call it, is between 15.7% of oxygen and 18%. That means it is just outside.

Q.It won't explode? A.It won't explode.

Q.HIS HONOR: The next will? A. The next one will. It is definitely an explosive gas. It would only need a source of ignition.

Q.3695 was nearer the brattice? A.Yes.

Q.Nearer the brattice in the shunt? A.Yes.

Q. These samples were taken by Inspectors Muir and the Chief Inspector? A.Yes.

Q.None of the others are explosive? A.None of the others will explode because you will see in the bulk of them, with one exception there is too much oxygen in the sample. That is due to the extra ventilation and the altered conditions when they went down to take the samples.

Q.But in 3702 there is not nearly enough oxygen? A.There is not enough oxygen but it does point to the fact that, having an explosive range, and explosive limits, if that was mixed with air, and that is all itneeds, to be mixed with sufficient oxygen then that gas was explosive.

MR.LEE: Q.It would burn, wouldn't it? A. Oh, it will burn, that third last one will burn, given a source of ignition in contact with air, just the same as coal gas will burn at the source of ignition with air .

HIS HONOR: Q.Do they burn more fiercely if they have a greater percentage of oxygen? Take a percentage of oxygen above explosive range? A. Yes.

Q. The gas will burn better? A. The gas would burn in a safety lamp. It would burn at the source of ignition if it has got methane in it but two much oxygen to explode.

Q.But will it burn more fiercely because of the presence of a greater quantity of oxygen? A. No.

Q.It won't? A.No, the most ignitable mixture I have already given and that would probably be the mixture which would burn at round about nine or ten methane in air, I think would be the optimum percentage to get the maximum heat burn.

MR.LEE: Q.Apart from explosion due to heat which of these, if any, will burn in the atmosphere? You mentioned the third last one? A.The third last one.

Q. What about this other one you excluded from explosibility because of too much oxygen present, will it burn? A. The methane in them will burn but these samples with the exception of those

mentioned there as having - I will rephrase - the samples that are almost pure air. There would be no significant burning obtained from that. The methane would burn in contact with a fire but I do not think it would contribute very much because they are practically pure air. The main trouble with that is it is supplying oxygen to a fire.

Q.Perhaps I can bring the point out quicker this way: Let us assume that in the shunt area the oxygen, the amount of air passing through is not as great as you get in your mixtures here? A.Yes.

Q. The reasonable inference is every one of the gas samples secured would have been capable of burning? A. That would have been capable of burning gas. If I might refer to sample 3702 again, that sample more nearly approaches the composition of gas in the goaf area.

Q.Where was that taken from? A.That one was taken from behind the brattice on the 15th, near the corner. Incidentally, it is diluted with air because no less than three of us lifted up the brattice to get behind it to take samples from that particular point.

Q.So you let air in? A. We let air in .

HIS HONOR: Q.Is this behind the brattice? A. The brattice at the end of the shunt at the end of A heading.

Q.Right at the goaf? A.Right at the goaf, yes.

MR.LEE: The brattice that was erected after the fire.

Q.You say that sample, even though showing 6.4, is a diluted sample not withstanding? A. It is a diluted sample notwithstanding, so that the gases that would be coming from the goaf would possibly have a composition more nearly approaching the original sample perhaps even than that one on the morning of the fire.

Q.Behind the brattice which had originally been erected in A heading or course the air - very little air reached there, didn't it? A. It was supposed to have cut out the ventilation.

Q.When these particular gases as shown in these samples you took would come through can you say to His Honor that the probability of fire, if there was an ignition point, was very high? A. I could.

MR.LEE: May he mention something,Your Honor. I am not sure what it is.

WITNESS: Could I consult with my counsel just to ask him whether he wants me to - ?

HIS HONOR: Yes. (The witness left the witness box)

MR.LEE : He has drawn my attention to a matter which may perhaps be on the fringe of the inquiry, but at the same time, may have some relevance:

Q.You have been checking on the fire at the Bulli Colliery of 1881, have you not? A. 1887.

HIS HONOR: That was an explosion.

MR.LEE: That is the point, Your Honor.That is perhaps why it is on the fringe although it does connect up with this and what might have happened.

MR.LEE: Q.You have ascertained that was an explosion and you have ascertained the cause of the explosion as found by the Royal Commissioner on that occasion was not what we are calling bottom gas here but some combination of methane and carburetted hydrogen? A.Carburetted hydrogen gas,yes. Actually the methods of analysis in those days and their knowledge of gas was not what it is to-day.

Q.Without being too critical, they certainly found it was a gas explosion. There was something you wanted to point out to His Honor, I think, from the point of view of the consequence of a gas explosion in relation to the presence of coal dust in a mine? A.Yes.

Q.And how that had a bearing in the 1887 fire. What happened when the gas exploded or burnt, whatever happened? A. The explosion started a coal dust explosion and it was the coal dust explosion which was responsible really for the major part of the disaster and the huge loss of life.

HIS HONOR: Q. There were over 80 lives lost? A. 81. There is one matter I would like to mention and to get quite clear and that is the fact that you can have coal dust explosion without the necessity of there being a gas explosion. That is the reason why stone dusting is enforced by the Mines Department.

Q.It keeps down - does it keep down the coal dust or keep the explosive tendency down? A. What happens is that the stone dust is lifted into the air by the pressure wave preceding the explosion and mixing with the coal dust, cools the flame and the explosion, in a manner somewhat similar to that of water cooling the flame of a fire. It also has the additional benefit that if the limestone dust is decomposed at the heat of the explosive flame it will give off carbon dioxide.

MR.LEE: Q. You do not need an explosion of gas to cause the explosion of coal dust? A.No.

Q.Burning of the gas is sufficient? A.You need - yes, burning of the gas would, under certain circumstances, cause a coal dust explosion.

HIS HONOR: Q.With violent burning there is rapid and violent expansion of gas near which a critical temperature point is sufficient? A. It is a critical temperature point. I have been inby, inby a coal dust explosion which was generated with coal dust itself alone, but naturally, in an adequately protected area with stone dust, in America, in an experimental mine there, but there was no gas used to initiate that coal dust explosion.

(Witness stood down)

HIS HONOR: There are certain things I would like to hear: I would like to hear Mr.Mangles again for a short time, at your convenience. Also, Mr.Cambourne.

MR.McNALLY: I represent the organisation to which Mr.Cambourne belongs.

HIS HONOR: I have mentioned his name already. I would like to hear Mr.Cambourne.

MR.McNALLY: Your Honor has said you wanted his reports. I did not Your Honor said you wanted to hear him.

HIS HONOR: I did say about his reports. Also, Mr.Fears. And, there is an under manager mentioned, I do not know if his name was given.

420. H.A.J.Donegan, stood down.

MR.SULLIVAN: Mr.Puddle.

HIS HONOR: The under manager who visited or, who, by one witness it was said came to this section during the shift.

MR.REYNOLDS: I don't know what my learned friend knows about this, but Mr.P uddle wasn't there. If somebody wants some other man called who was not present he will be called, but it wasn't Mr.Puddle.

HIS HONOR: Whoever it was.

MR.REYNOLDS: Mr.Fred Wright.

HIS HONOR: I think Mr.Longworth mentioned Mr.Puddlds name. I am interested in the under manager who visited this section during the shift.

MR.REYNOLDS: Mr.Puddle was the under manager and he wasn't there on that day at all, he was in another place with the check Inspector. Did Your Honor intend that the man who was mentioned as being with Mr.Fears should be called?

HIS HONOR: That is right.

MR.REYNOLDS: I will be calling Mr.Puddle, in my case as the under manager, who had obvious statutory authority and responsibility. He will be called.

MR.PARKINSON: I would like to remind Your Honor that Mr.Menzies did indicate that the under manager was at the seat of the disaster and was supervising operations at 9.43.

MR.REYNOLDS: Of course he was. There is no doubt about that.

MR.PARKINSON: I thought Mr.Reynolds said the under manager was in some other district?

MR.REYNOLDS: He was in some other district.

HIS HONOR: He was at the time the fire started, but the evidence shows he was there. There is nothing inconsistent so far because after the fire he was down at the rescue, or the attempt to rescue.

MR.REYNOLDS: Does Your Honor want Mr.Wright called?

HIS HONOR: Yes.

MR.REYNOLDS: He is the assistant under manager.

HIS HONOR: That is so. A t a convenient time.

MR.REYNOLDS: On what basis? Does Your Honor want me to call him or Mr.Lee or how can we do it? I am wondering.

HIS HONOR: It is a questi on as to whom he really belongs from the point of view of organisation of the evidence.

MR.REYNOLDS: Does Your Honor want to ask him questions?

HIS HONOR: I want to call him, really.

MR.REYNOLDS: We will arrange for him to come to the Court.

HIS HONOR: One of the witnesses, I think it was Mr.Dale Jones said earlier in the shift, he was explaining how the men all came to be round the timber bay area and he said in fact that the

overman was brought down, and he was brought down by, I think he said, the under manager. It was probably the assistant under manager who brought him down. They are the people I want: The overman and the man who brought him.

MR.PARKINSON: I think he did say "Mr.Wright".

MR.REYNOLDS: At p.53 he was asked whether Wright was there and he said he was. That is the man. We will arrange for him to be here. Does Your Honor suggest to-morrow or Monday?

HIS HONOR: I would have thought that we would not have time for him to-morrow. That was why I mentioned it late in the day.

MR.LEE: This is the last witness I intended to call except by direction of Your Honor. In other words this witness is the last in the case as we prepared it.

HIS HONOR: I understand in any case there is other evidence to be called. I would have thought Mr.Reynolds would come last but that is a matter for argument or arrangement.

MR.REYNOLDS: I think it has been assumed down here that Mr. Sullivan may have some short evidence to call and he will call it next and then I will be ready. I think Mr.Parkinson may also have some evidence.

MR.PARKINSON: I am not going to call anybody, Your Honor.

HIS HONOR: What about you, Mr.McNally?

MR.McNALLY: Your Honor indicated you wanted to hear from Mr. Cambourne?

HIS HONOR: If you could arrange for him to be present, actually he is a witness I will call.

Much of what could be given from the management has already been given although, of course, there may be points at issue. I do not expect you to lead the evidence if it can be done more conveniently, if, for example, it is done the way Mr.Lee handled it, in the way of statment from the witness and, with respect to him, it was done very well. If you call your officials, the under manager or the manager, and there is a statement which he swears to and the statement is read in Court I think that would be preferable to going through the process of having question and answer for he will then be subject to cross-examination by everybody and it is all down on paper, it is public for everybody to hear and I suggest that as a possible means of doing it.

MR.REYNOLDS: I have already given that some consideration. I think that course may be followed. I am obliged to Your Honor.

HIS HONOR: Of course, that applies to everybody.

MR.REYNOLDS: May I make this observation: It is becoming quite apparent in this inquiry that very much of the material is common ground. In these statements which I propose to tender much of it does not even need investigation. It may be becoming apparent to some of us that the questions that arise are rather an interpretation of the facts we know and the expert opinion concerning them rather than the fundamental facts themselves.

(Further hearing adjourned till 10.30 a.m. on Friday 17th December, 1965).