The Symposium on Mine Fires would be held in February, 1958, and it was the intention to arrange a visit to a mine later in the year. The Council had agreed to arrange a Dinner in March or April, 1958.

The Chairman announced that in a letter recently received from the Chamber the G.P.C. had decided that all existing privileges and grants now made to the Society would be withdrawn on 1st January, 1958, and that it would be replaced by a grant of £1,000 for a year to be revised annually. In this connection the Chairman stated that an immediate application would be made to the Associated Scientific and Technical Societies to provide secretarial services for the Society from 1st January, 1958, and subject to confirmation by members at the next convenient Ordinary General Meeting an application would be made to the Associated Scientific and Technical Societies for membership. These steps would be in conformity with the wishes of the Chamber of Mines.

The Chairman stated that the proceedings of the meeting would be fully recorded and expressed the Society's thanks to Mr. Rabson for making his recorder available and to Messrs. Blignaut and Nicholson for assistance in recording the proceedings. Various commercial firms were also thanked for allowing equipment and apparatus to be displayed at the meeting. The Demonstration and Discussion of Routine Ventilation Measurements then followed.

Contributions were made by the following members:—

P. F. Cilliers	Rock-Drills
E. J. Kamionka	Water Sampling
A. Shaw	Whirling Hygrometer
N. M. Murray	Kata Thermometer
P. J. Vermunt	Anemometers
B. L. Turner	Low Air Velocity Measurements
C. C. Bell	Cross Sectional Area Measurements
J. C. Jacobs	Water Gauge
E. B. Cradick	Safety Lamp
J. D. Greig	Gas Sampling for Chemical Analysis.

The President thanked Mr. J. Lawrie (Convenor) and Messrs. D. G. Beadle and J. H. Quilliam for making all the arrangements for the meeting.

Mr. Lawrie then proposed the vote of thanks to the speakers and this was seconded by Mr. A. Yaxoglou.

At the conclusion of the meeting members took the opportunity of viewing the equipment and apparatus which was on display in the Hall.

The meeting was declared closed at 3.45 p.m.

DEMONSTRATION AND DISCUSSION OF ROUTINE VENTILATION MEASUREMENTS, REPORT OF PROCEEDINGS

The President (Mr. W. L. le Roux) explained that a number of speakers would discuss the various instruments in common use on the mines and would demonstrate their use. After each speaker had given his talk there would be opportunity for questions. The Council had intentionally selected as speakers such men as did not usually take part in discussions at general meetings, and he trusted they would be given a good hearing.

At the same time an exhibition of instruments from mines and from certain commercial firms was displayed on the side tables and these could be examined during the intervals.

He then called on the first speaker, Mr. P. F. Cilliers of Crown Mines, to give his talk on:

THE ROUTINE EXAMINATION OF ROCK-DRILLS

Mr. P. F. Cilliers: It is a well-known fact that rock-drills produce dust. This dust is produced in two ways: (a) by the grinding action of the jumper in the hole being drilled, and (b) by the atomisation of water containing dust particles in suspension (probably less well known to the junior members of ventilation staffs). These atomised water particles are readily evaporated by the air, leaving behind the dust particles to increase the dust concentration in the air. As comparatively "clean" mine water contains from 5 to 7 million dust particles per cubic centimetre, and, unfortunately, much higher concentrations are anything but a rarity, it is evident that as little atomisation of this water as possible should take place.

Let us just briefly examine how this atomisation of the water takes place in the rock-drill. Water to be used for allaying the dust caused by the actual drilling process is passed into the machine by means of the water bend, to which is attached the water tube, the joint between the two being made water-tight by means of one or more rubber gaskets, depending on the design of the machine. This water tube passes through the centre of the machine, discharging water into the axial hole of the drill steel, down which it passes to allay the dust created at the point of contact between the rock and the jumper.

For numerous technical reasons it is impracticable to have the end of the water tube entering the drill steel, and a compromise has had to be made, stopping the water tube some distance short of the drill steel and relying on the jet of water to pass into the drill steel with as little splashing as possible. It is for this reason that Government Regulations stipulate that the water pressure must not be less than 15 lb/sq. in. Any water from the water tube which does not enter the drill steel will be atomised by compressed air leaking into the front head of the machine via the splines on the front portion of the piston, and via the hole in the centre of the piston through which the water tube passes. It is for this reason that Government Regulations stipulate the external diameter of the water tube and the diameter of the axial hole in the piston. This atomised water then passes into the atmosphere through the front-head release ports. If these ports are blocked, it is true that all the water would have to pass down the drill steel, but the compressed air leaking into the front-head of the machine would do the same, giving the same result as before, but in a worse form, as the compressed air would now blow through the sludge formed in the hole as well as causing intermittent periods of dry drilling. For this reason the Government Regulations forbid the blocking of the front-head release ports.

To decrease the amount of atomisation as much as possible, Government Regulations stipulate that the gap between the end of the water tube and the top of the drill steel when the jumper is fully inserted in the chuck of the machine shall be between 1 in and $\frac{1}{4}$ in. The minimum distance of $\frac{1}{4}$ in is designed to give some margin of safety in preventing the drill steel from striking and damaging the end of the water tube, and also to prevent any compressed air from being entrained by the water passing into the drill steel. A machine with a damaged water tube will cause an uneven jet of water, increasing the amount of water being lost through the front-head release ports. A further Government Regulation has been drawn up to prevent this, stipulating that a machine with a damaged water tube may not be used.

In view of all the abovementioned factors, the routine checking of rock-drills forms an important part of the duties of the Ventilation Department in its task of dust suppression. Many makes of rockdrills exist in the industry, but their basic principles remain the same. These notes should therefore be adapted to suit any particular machine in question.

Let us begin our checking of the rock-drill by first making an inspection of the salient points.

(1) The water bend—is it securely tightened down?

(2) The front head release ports—are they open?

(3) The shape of the jet of water issuing from the water tube—is it regular and approximately in the centre of the chuck? (This must be checked with the drill steel removed from the chuck).

(4) When inserted in the chuck of the machine, does the drill steel allow the water to flow freely through it?

(5) With the water turned off and the drill steel removed, inspect the end of the water tube through the chuck, making sure that the piston has been pushed right back, exposing the end of the water tube. Does the end appear normal, or is it burred indicating that the jumper is striking it? Does it appear to have been tampered with?

(6) Note the number and type of machine.

Now let us proceed to measure the gap between the water tube and the drill steel. This is generally done by removing the drill steel from the chuck, ascertaining that the piston has been pushed sufficiently far back to expose the end of the water tube, and inserting a rod which will pass through the chuck to make contact with the end of the water tube. With the rod in this position, the position of the lower end of the chuck is noted on it. This is the distance from the end of the water tube to the lower end of the chuck. As the drill steel should enter the chuck for a specified distance for each type of machine, this distance is marked off on the measuring rod from the end inserted in the chuck. A further distance of 1 in or $1\frac{1}{2}$ in is marked off on the rod, generally in $\frac{1}{4}$ in divisions. The point flush with the end of the chuck is then read off to give the gap between the water tube and the drill steel directly.

There are many variations of this measuring rod, but all rely on the drill steel entering the chuck for a specified distance. Danger exists in simply accepting this measurement, for excessive wear on the front of the chuck or slippage of some types of collars which are shrunk onto the drill steel may actually cause the end of the jumper to enter further into the chuck than was originally intended. This would not be noticed when using one of the abovementioned rods.

Personally, I advocate the use of two separate measurements to obtain the "gap." First, the piston of the machine is pushed sufficiently far back to expose the end of the water tube. A rod, sufficiently narrow to pass through the chuck is then inserted to come hard up against the end of the water tube. With the rod in this position, the position of the front end of the chuck is noted on it. This distance is now measured by means of a tape, and is the distance of the end of the water tube from the front of the chuck. The drill steel is then inserted into the chuck as far as it will go, and the position of the front end of the chuck noted on it. The distance from the back end of the jumper to this point is again measured, and subtracted from the first measurement obtained to obtain the clearance between the end of the jumper and the water tube. Instead of using a tape, the end of a metal anemometer rod could be suitably graduated and used for the abovementioned measurements.

Let us now examine the results we may obtain; firstly, if the gap is too small:—

(1) The small rubber gaskets at the top end of the water tube may be missing or badly worn, allowing the water bend to be screwed in further than normal, causing the lower end of the tube to come closer to the drill steel. To ascertain whether this has been the case, unscrew the water bend and remove the water tube. The rubber washers are then easily inspected.

(2) The water tube may not be of standard length. To ascertain whether this is so, check its length against the water tube of a similar type of machine having the correct clearance. It is a good policy to note down, in the back of the field book, the lengths of water tubes in use in various machines. If it is found that an incorrect tube has been fitted, it should be possible to obtain the correct tube from the ganger or shift boss in charge.

(3) There may have been excessive wear on the front of the chuck, allowing the drill steel to enter further than usual. This is easily seen by examining the front end of the chuck. If there are signs of excessive wear, the machine should be sent for repair immediately.

(4) Excessive wear on the collar of the jumper, or slippage of the collar may have taken place, in which case the drill steel would again enter the chuck further than normal. To ascertain whether this has been the case, compare the distances to which other jumpers enter the chuck. Should

jumpers be found with slipped or worn collars, they should be removed from circulation and the Study Department and Drill Shops notified to be on the lookout for similar jumpers.

If the clearance between the water tube and the drill steel is too great, the following might have occurred:—

(1) The collar on the jumper may have been incorrectly fitted, preventing the jumper from entering the chuck for the required distance. If this is thought to be the case, compare the distances to which other jumpers enter the chuck. If a jumper with insufficient shank length is found, it should be removed from circulation and the Study Department and Drill Shops notified to be on the lookout for such jumpers.

Although an extra couple of minutes may be spent in checking possible reasons for incorrect "gaps" that may have been encountered, it may be a small matter which could be rectified on the spot, thereby saving the time which would normally be spent in searching for spare machines, as well as the time the machines are out of commission while being sent to the repair shops. It must be stressed that, after making any changes to the machine, e.g. fitting or removing gaskets, tightening the water bend, fitting a new water tube, etc., it is imperative to check the "gap" again to ascertain that it now falls within the set limits of $\frac{1}{4}$ in to 1 in. Any incorrect "gap" obtained must be reported to the ganger in charge, who may not allow such a machine to be used until the matter has been rectified.

A point worth considering is to check the machine at a time when it is normally not drilling, i.e. after a hole has been drilled or when jumpers are being changed. This obviates unnecessary stoppage of the machine, and observations such as the taking of temperatures, katas, etc., may be made while waiting for the machine to be idle.

While the machine is drilling, the amount of "fogging" or mist produced from the front-head release ports should be noted. This amount of "fogging" is generally an indication of the condition of the water tube, although it should not simply be accepted as such. Worn splines on the piston, which would not be seen unless the machine is taken apart, would also cause excessive "fogging." Water vapour in the compressed air could also increase the amount of fog produced via the front-head release ports of the machine.

A machine "fogging" excessively from the front-head release ports, when compared with other machines, should be sent for overhaul, as it is quite possible that the splines on the piston are badly worn.

The fog issuing from the front-head release ports should not be confused with the fog caused by the compressed air from the exhaust ports of the machine, especially noticeable in near saturated air, where the cool compressed air causes condensation of moisture, and the formation of a fog round the machine.

The determination of the water pressure at the machine is most easily done by using a small dial pressure gauge fitted with a hypodermic needle which is pushed into the rubber hose, and the pressure read directly. On removal, the rubber hose generally seals itself. Unfortunately, this hypodermic needle cannot be used on plastic hoses as the small hole made by the needle will not be sealed on removal. A rough measurement can be made in this instance by removing the hose from the machine and holding it so that the jet of water is discharged vertically upwards. This jet of water should be higher than the width of four fingers of the hand, if the water is discharged through the normal $\frac{3}{8}$ in water hose. It must be emphasised however that this method gives only an approximate measure of the pressure, and is subject to many variables, notably the diameter of the hose. The use of a dial gauge wherever possible is therefore recommended for the accurate determination of machine water pressures.

The President: Thank you very much, Mr. Cilliers. I will not thank every speaker individually as there are ten speakers on the agenda. After everybody has spoken, I will ask Mr. Lawrie to propose a vote of thanks to these speakers and Mr. Yaxoglou to second this vote of thanks. I hope you all enjoyed this lecture and I am sure we would all benefit by coming up to this dismantled machine during the interval to see what it looks like inside. You may now ask

Mr. Cilliers any questions you like about rock-drills. He knows all the answers.

Mr. P. J. Vermunt: Mr. Chairman, Mr. Cilliers states that the jet of water coming out of the chuck should be inspected with the drill steel removed and should be a clear flow. I do not know if it has been noticed before, but with the piston in backward position the water may run out touching the sides of the chuck. With the piston forward, however, the water will come out clearly in a straight jet. Could Mr. Cilliers explain?

Mr. Cilliers: According to my experience I have noticed that, provided the water pressure is greater than 15 lb/sq. in. the jet of water will issue clearly, irrespective of whether the piston is at the front or back portion of the stroke. I do not know if that is your experience.

Mr. Vermunt: The experience I mentioned was at 15 lb pressure.

Mr. Cilliers: I must confess that I have not come across that at all.

A Member: I would like to add one additional reason for fogging. There are occasions in a mine when there is excessive water in the compressed air. That can cause a tremendous amount of fogging, which confuses the issue.

Mr. Cilliers: I agree with you, that is quite true, but most of that fogging, as I said before, provided that your splines are sealed, will take place from the exhaust ports; also it would, I agree, increase the amount of fogging coming from the front-head release ports.

The President: Thank you, Mr. Cilliers. The machine will remain here for inspection during the interval.

I will next call on Mr. E. J. Kamionka from East Geduld to tell us something about

WATER SAMPLING

Mr. Kamionka: Mr. Chairman and Gentlemen, sampling of mine water can be classified under three headings:—

1. Sampling for deep cell count.
2. Sampling for chemical analysis of mine water.
3. Sampling for bacteriological tests.

1. *Deep Cell*

As we all know, it is one of the duties of a dust inspector to report on all matters relating to the mine water supply and its quality, and also to determine the dust content of water used for dust suppression. This is done by the Ventilation Department, using the "Deep Cell" method.

On the day before sampling, the bottles must be prepared and labelled. The bottles used for collecting these water samples must be of clear glass to enable the appearance of the sample to be examined, and they must also be fitted with rubber stoppers. The bottles must be kept scrupulously clean, and should not be used for any other purpose. A 4 oz medicine bottle is very suitable for taking these samples.

The method of taking these samples, firstly from a pipe or hose outlet, is to allow the water to run for about one minute, then fill the bottle to about three-quarters full, so as to allow room for shaking thoroughly when preparing the final portion of the sample.

Secondly when taking a sample from a dam or sump, the bottle is immersed to about one foot below the surface and is allowed to fill to about three-quarters full.

When the sampling is completed, the samples are brought to surface, and then in the laboratory of the Ventilation Department they are treated in the usual way and counted in the deep cell; the final results are obtained in million particles per c.c.

2. *Chemical Analysis of Mine Water*

This type of sample is usually sent to the Chamber of Mines Laboratory for analysis and the arrangements are not as strict as for bacteriological analysis, but still certain precautions must be taken.

The sampling bottles must be prepared on the day before sampling. Also all necessary information must be made out with regards to the name of the mine, place of sampling and date, and the bottles must be properly labelled.

It must be a glass bottle (Winchester quart size) with a well fitted new or clean stopper. The stopper and neck of the bottle must be well protected, both before and after sampling, by securely covering them with a cloth or other suitable material. The bottles must be thoroughly cleaned before use. This is done by half filling the bottle with clean water, then shaking thoroughly, empty-