

TRANSVAAL CHAMBER OF MINES.

MINERS' PHTHISIS COMPETITION COMMITTEE.

REPORT OF JUDGES.

APRIL, 1904.

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JOHANNESBURG :
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Messrs.

*The President and Executive Council of the Transvaal Chamber of Mines,
Johannesburg.*

GENTLEMEN,

The judges appointed to adjudicate upon the suggestions and devices for combating the disease known as Miners' Phthisis, which have been received as a result of your Chamber's advertisement of the 10th October, 1902, herewith beg to submit their Report and fix the awards in accordance with your instructions, and the terms of their reference.

Chamber's Advertisement.

The Transvaal Chamber of Mines caused the following advertisement to be inserted in the papers of the United Kingdom, Europe, Australia, South Africa and America :—

"TRANSCAAL CHAMBER OF MINES.

"MINERS' PHTHISIS.

"The Chamber is desirous of taking steps to obviate or minimise the occurrence of this disease, and invites practical suggestions and plans for combating the causes leading to the same.

"No definite information is before the Chamber as to the causes of the disease, but the general assumption is that it is chiefly due to the inhalation of the fine dust given off during machine drilling operations.

"The Chamber offers the following awards for the *three best practical suggestions and devices* on this subject, viz. :—

" 1st Prize	...	£500 and Gold Medal.
" 2nd Prize	...	£250.
" 3rd Prize	...	£100.

"In suggesting devices for obtaining the object desired, the following points are to be taken into consideration :—

"(1) The applicability of the device or apparatus to the existing system of machine drilling.

"(2) The practical demonstration of the device or apparatus.

"The judges, before making the final award of prizes, will be entitled to require tests, and if not satisfied with any of the proposed devices, will be at liberty to re-open the competition, or to award part only of the prizes. Papers in connection with this subject must be accompanied by plans, models or apparatus of the devices suggested, and will be receivable.

"(a) At the offices of the Chamber, Johannesburg. Postal Address : Box 809, Johannesburg ; up to the 15th February, 1903.

"(b) At the London Agents of the Chamber, Messrs. Barsdorf & Co., Wool Exchange, Coleman Street ; up to the 15th January, 1903.

"(c) At the Paris Agents of the Chamber, Campagne Française de Mines d'Or et de L' Afrique du Sud, 20, Rue Taitbout ; up to the 15th of January, 1903.

"The judges for the award of the prizes will consist of,

"Two Members of the Transvaal Medical Society.

"Two Members of the Mine Managers' Association of the Witwatersrand.

"Two Members of the Mechanical Engineers' Association of the Witwatersrand.

"together with

"Three Consulting Mining Engineers to be selected by the Transvaal Chamber of Mines,

"and,

"Two practical Rock Drill Miners to be selected by the Mine Managers' Association.

"The decision of the majority to be final.

"By order of the Executive Committee,

A. R. GOLDRING,

"Johannesburg, October 10th, 1902.

Secretary."

Appointment and Names of Judges.

The judges were appointed as follows :—

Nominated by the Transvaal Medical Society :

Drs. Irvine and Macaulay.

Nominated by Mine Managers' Association :

Messrs. J. Harry Johns and R. M. Catlin ; with Messrs. Samuel Johns and Hugh Nicholls as practical Rock Drill Miners.

Nominated by the Mechanical Engineers' Association :

Messrs. W. H. Wood and J. A. Mills.

Nominated by the Transvaal Chamber of Mines :

Messrs. H. H. Webb, G. E. Webber and Fred Hellmann.

Dr. Walter C. C. Pakes was elected a judge at the meeting of the 29th October, 1903.

Meetings of Judges.

The first meeting of the judges was held on 7th March, 1903, and was opened by the President of the Chamber, Sir George Farrar, who explained more fully the object of the competition which the Chamber had inaugurated, and stated that the Chamber would furnish such clerical assistance as might be required and would defray all expenses incurred.

The judges have held in all twelve meetings.

Suggestions and Devices Submitted.

There were in all 229 competitors whose suggestions and devices were tabulated as follows :—

1. Respirators and Masks	...	...	...	41
2. Dust Extractors and Hoods	...	...	...	35
3. Water Drills	...	...	...	9
4. Jets delivering water inside the hole	...	...	...	4
5. Jets delivering water at mouth of hole	...	...	...	60
6. Sprays	...	...	...	22
7. Atomisers	...	...	...	6
8. Medical suggestions	...	...	...	15
9. Miscellaneous	...	...	...	37
				229

Weeding Out.

After careful consideration, and having examined every suggestion individually, the judges determined to condemn as quite impracticable and useless classes 1, 2, 8 and 9. The remaining classes, 3, 4, 5, 6 and 7, were reserved for further consideration, and a device typical of each class selected for trial under working conditions.

Jets Inside of Hole.

A device of this kind was tested at the Crown Reef in the presence of the judges on the 2nd April, 1903. The jet was quite independent of the drill, and required a man to hold and direct it. The drill blocked at 5ft. 6in. As a result of this test class 4 was rejected, the judges being of opinion that such a device, in addition to its use being entirely optional, would probably cause the drill to block frequently and thus prove troublesome. In addition, the necessity for another hand to hold the jet would mean extra and, it was felt, unnecessary expense.

Jets Delivering Water at Mouth of Hole.

Such a jet was tried at the Simmer East on the 8th April, 1903, in the presence of the judges. The apparatus was attached to the drill, but when the drill jammed was in the way. The drill stuck repeatedly at about 5ft. 6in. About seventy-five per cent of the dust was settled by the jet, and it did not produce supersaturation of the atmosphere. The judges, however, discarded this class on the ground that water delivered at the mouth of the hole would cause the drill to stick and thus cause the miners to discard it.

Sprays.

Spraying devices were found to be open to the same objection as jets, and were condemned by the judges.

Water Drills.

The principle of the water drill was so generally approved that the judges decided to institute exhaustive tests in connection with the drills that had been submitted in order to determine their relative efficiency and likewise their efficiency as compared with the ordinary types of drill in use on these fields. In order to accomplish this end cablegrams were sent to the designers and makers in England to ship out complete drills and appliances at once, the freight out and back to be paid by the Chamber of Mines. The result was somewhat disappointing for, after much delay, it was found that of the nine who had submitted drawings and specifications covering water drills only two were able actually to enter the competition, namely, the Leyner and the Ingersoll Sargeant. The test run was made at the Crown Reef beginning on the 2nd November, 1903, and ending on the 13th January, 1904. The result of the test is embodied in Mr. Wood's report to the judges, which is appended. It demonstrates clearly that the Leyner drill as a water drill possesses great advantages over the Ingersoll Sargeant water drill in its present state of development. Taken in conjunction with the other evidence before the judges the test also shews the general inefficiency of both drills as compared with the ordinary drills in use on the Rand. That fact, together with the evidence submitted by mine managers as to the high cost of maintenance and the short life of the machines make it quite impossible to recommend these drills in the forms submitted, for general use on these fields.

The judges, however, fully recognise the principle embodied in the water drill, namely, that of laying the dust at the very point where it is generated and since the incidence of silicosis falls principally on rock drill miners in drives and rises, they hope that great improvements in the surroundings of such workers will be achieved by means of water drills when their mechanical arrangements shall have been so improved as to make them practicable in this country. The reports from various mine managers, which are attached, support the views of the judges with regard to this point. In recognition of the principle and of the effort to apply it the judges have awarded the 2nd prize of £250 to the Leyner Drill in the hope that this award may stimulate manufacturers to further exertions in the direction of the production of a perfected water drill.

Atomisers.

Of the various Atomisers submitted Mr. Thos. J. Britten's is the most perfect mechanically, and therefore the most useful machine. It was found to lay 75 per cent. of the dust in the drive where it was tested (*vide* Dr. Pakes's report of the 23rd April, 1903), and would therefore probably lay a like percentage during blasting and shovelling. It can be used during drilling and blasting, and also whilst shovelling is being done in drives and stopes. It further possesses the distinct advantage of laying the nitrous fumes contained in the gases after blasting.

If a little lime be mixed with the water used, a portion of the carbonic acid resulting from blasting would also be absorbed. It assists local ventilation, and is simple and cheap in construction. On the other hand it involves a separate mechanism, requiring extra attention, which causes a disinclination on the part of the miners to use it. It is not necessary to the successful running of the drill, and its use, therefore, depends on the goodwill of the miners. The latter might prefer to discard it rather than bother with it. It involves the necessity of working in a supersaturated atmosphere, which disadvantage, however, is a negligible quantity if change houses are used by the men. It necessitates absolutely a supply of pure water underground for use with the Atomiser, and therefore some system of water supply in the mine, which would be more or less costly. The judges are of opinion that Mr. Britten's Atomiser is the best practical device that has been suggested, and therefore award it the First Prize of £500 and the Gold Medal.

Resolutions.

The judges adopted the following resolutions as embodying their opinions and decisions:—

1. That all devices are considered inapplicable except the Water Drill and the Atomiser.
2. That since the judges have two separate devices before them, one of which has proved practicable and the other of which has a very great theoretical value (although no absolutely practical device has been submitted) two prizes be awarded—viz., to the Atomiser and to the Water Drill.
3. That the judges award the full amount of the First Prize and the Gold Medal to the Atomiser, which has been demonstrated as being, in the terms of the reference, "the best practical suggestion submitted."
4. That, in the opinion of the judges, the best means of combating the disease would be the use in drilling of a perfect Water Drill, together with the use of an Atomiser for allaying the dust and gases during blasting and shovelling.
5. That the full amount of the Second Prize be awarded to the Leyner Drill as being the best device submitted which embodies what the Committee considers to be the ideal principle in actual drilling, although the drill in its present state is not sufficiently perfected to enable the judges to recommend it for general use.

We have the honour to be, Gentlemen,

Your obedient servants,

FRED. HELLMANN (Chairman).

J. HARRY JOHNS.

LOUIS G. IRVINE.

SAM JOHNS.

WALTER C. C. PAKES.

JOSEPH A. MILLS.

W. H. WOOD.

G. E. WEBBER.

For H. H. WEBB.

F. H.

R. M. CATLIN.

H. NICHOLLS.

DONALD MACAULAY.

Attached to this Report.

1. Dr. Pakes's report on experiments at Simmer East on 8th April, 1903.
2. Memorandum by Drs. Irvine, Macaulay and Pakes on the Chemical and Medical Aspects of Atomisers in Mining Operations.
3. Mr. Wood's Report on Test of Water Feed Air Drills carried out at Crown Reef Mine.
4. Further Report by Mr. Wood.
5. Letter re efficiency of Leyner Drill and replies.
6. Summary and full list of competitors.
7. Minutes of Judges' Meetings.
8. Statement of Expenditure.

PUBLIC HEALTH DEPARTMENT.

GOVERNMENT LABORATORY,
PRETORIA,

23rd April, 1903.

*The Secretary,
Chamber of Mines,
Johannesburg.*

REPORT upon Experiments undertaken on the 8th April, 1903, at the Simmer and Jack East Mine, to determine the amount of dust and the humidity under working conditions.

The first experiment was made before and during the drilling of a hole whilst Britten's Atomiser was working, and continued after the Atomiser had ceased working.

At the very commencement of the experiment the temperature was 74 deg. F., and the relative humidity 88·8 per cent. After the lapse of about 15 minutes the temperature had risen to 77 deg. F., the humidity being the same.

Before the drill started working the walls were wetted, and the Atomiser and drill began working at once. After ten minutes the temperature had fallen to 75 deg. F., and the relative humidity had risen to 100. Although the relative humidity remained at 100 per cent., the temperature rose to 76 deg. F.

The mine air was aspirated through cotton wool before the drill started working, and it was found to contain 0·1875 grams of dust per cubic metre.

Whilst the drill and Atomiser were working the air contained 0·2812 grams of dust per cubic metre.

Whilst the drill was working after the Atomiser had ceased, the air was found to contain 0·5625 grams of dust per cubic metre.

Thus 75 per cent. of the dust produced by the drill was prevented from reaching the aspirator.

The second experiment was made before and during the drilling of a hole whilst a spray was being used.

The temperature before the experiment was 74 deg. F., but the relative humidity remained at 88·8 per cent. throughout, while the temperature rose to 75 deg. F. during the experiment.

The dust before the experiment amounted to 0·3125 grams per cubic metre.

Whilst the drill and spray were working, the dust amounted to 0·4000 grams per cubic metre. The increase being thus 0·0875 grams per cubic metre not removed by the spray.

As the time did not allow of an experiment being made with the drill and without the spray, it is impossible to calculate the percentage of dust removed.

In comparing the two experiments, therefore, we must assume that the two drills produced the same amount of dust. Britten's Atomiser left 0·0937 grams of dust per cubic metre, and the spray left 0·0875 grams per cubic metre.

These experiments shew, therefore, that as regards humidity, the spray is preferable because it does not saturate the air with moisture. As regards the prevention of dust they appear to have about the same settling power, the difference in the results being so small.

WALTER C. C. PAKES,
Govt. Analyst & Bacteriologist to the Transvaal.

MEMORANDUM

of the

CHEMICAL AND MEDICAL ASPECTS

of

ATOMISERS IN MINING OPERATIONS.

1. The Effect upon the Dust.

Anyone who has seen the Atomiser working cannot have failed to notice that there is a considerable decrease in the amount of dust which leaves the face of the rock when compared with that produced when making the dry hole. Actual experiment has shewn that about 75 per cent. of the dust is removed by the Atomiser during the process of drilling.

The Atomiser has been shewn to allay a very considerable portion of the dust produced by blasting. Whether the dust produced by blasting is really finer than that produced by drilling is a matter which has not yet been determined.

2. The Effect upon the Gases.

The noxious gases met with in the mines are three in number, *viz.*—carbon dioxide, carbon monoxide and nitrous fumes. During the process of drilling it may be taken for granted that the only gas which is produced in appreciable quantity is the carbon dioxide, and this results from the breathing of the miners and the burning of the candles. A spray fed with ordinary water will have only a trifling effect upon this gas.

The operation of blasting is responsible for the production of carbon dioxide, carbon monoxide and nitrous fumes; the quantity of the latter gas which is produced varies very considerably with the completeness of the explosion, and this in its turn depends upon the quality of the explosive, the size of the detonator used and so on. Nitrous fumes are produced in greatest quantity when any of the dynamite burns instead of exploding.

On some occasions the amount of these noxious gases produced is considerable; this is evidenced by the appearance of red fumes, and the irritation which is produced after inhaling the gases, of the mucous membranes of the buccal and nasal passages of the miners.

When the gases come into contact with the water given off in very fine division from the Atomiser the nitrous fumes are quickly absorbed.

Several experiments were undertaken for the Committee, two of which may be detailed.

Experiment 1. An aspirator filled with air containing about 7 per cent. of nitrous fumes had a few cubic centimetres of water sprayed into it; in less than five minutes the whole of the brown colour had disappeared.

Experiment 2. About 10 litres of air containing about 10 per cent. of nitrous fumes were allowed to stand over about 10 c.c. of water for three minutes, with occasional shaking. At the end of this time, the nitrous fumes had sunk to 0.5 per cent. After fifteen minutes, the gas was present to so small an extent that no readable absorption could be obtained.

The result of these experiments shews that after fifteen minutes the whole of the irritating gases would have disappeared. The Atomiser would have little or no effect upon the CO and CO₂. If, however, instead of water, lime water were used, the absorption of the nitrous fumes would be accelerated, and in addition, a small portion of the CO₂ would be removed from the mine air.

It is true, therefore, that the Atomiser would leave the most poisonous gas still present in the air, and this would have to be removed or diluted by fresh air from the compressor. The removal of the irritating gases is, however, a considerable gain, quite independently of the removal of the dust.

There is a slight disadvantage in removing the nitrous fumes, which are perceivable and irritating, while the more poisonous CO which remains is not so; this is, that the miner might venture into the drive sooner after blasting than he otherwise would have done. We should therefore allow no relaxation in the regulations concerning the time which must elapse between the blasting and the return of the miner to the face.

3. The Effect of the Atomiser upon the Health of the Miner.

The great advantage of the Atomiser is that it allays a considerable proportion of the dust both at the face and in the drives. A possible disadvantage may arise from the supersaturation of the air by the Atomiser. This disadvantage may be either direct or indirect.

a Direct.—

The following facts should be taken into consideration :—

1. The mine atmosphere is nearly saturated with aqueous vapour. The readings of the wet and dry bulb thermometer show a relative humidity of about 90 per cent.
2. The Atomiser raises the relative humidity of the air at once to plus 100 per cent.
3. The air which the miner exhales is saturated.
4. Therefore the air in the smaller air passages and infundibula, or air spaces of the lungs, must also be saturated.
5. The whole of the excess of moisture would be felt, and probably absorbed by the upper air passages.

It seems difficult to conceive therefore, that there should be any important direct deleterious effects from breathing super-saturated air at a temperature of 70 deg. to 75 deg. F.

b Indirect.—

The great dangers of working in a nearly saturated atmosphere and proceeding immediately into a colder and drier atmosphere are so well known that it would be useless to dilate upon them. The point for us to attempt to elucidate is the disadvantage of the Atomiser in this respect.

Take a Lancashire cotton mill, the relative humidity of the moist room is about 80 to 90 per cent. with a temperature of about 72 deg. F.

The relative humidity of the air of the mines is about 90 per cent, with a temperature of from 70 to 75 deg. F., *without the Atomiser*. With the Atomiser the relative humidity rises to 100 per cent., while the temperature sinks a degree or two or remains constant.

In the summer the temperature of the Rand varies from, let us say, 60 to 90 deg. F., and the relative humidity from 25 to 80 per cent. In the winter, the temperature varies from 30 to 70 deg. F., and the relative humidity from 15 to 25 per cent.

Will the Atomiser make things much worse than they are normally? —that is, will the extra plus 10 per cent. of relative humidity have any calculable disadvantage? It is admittedly more enervating to work in a moist atmosphere than in a comparatively dry one. The mine air is under the best of conditions a moist one (about 90 per cent.), and the Atomiser renders the local atmosphere supersaturated. Probably, therefore, working in a supersaturated atmosphere is somewhat more enervating than working in a merely saturated atmosphere.

To put it another way, it would be better for a miner to work in the Atomiser air underground, and to return home via a properly constructed change house, than for him to work in the ordinary mine atmosphere and return home direct.

Taking all these points into consideration, therefore,—

The mine air is improved by the use of an Atomiser in so far as the dust and nitrous fumes are concerned.

The Atomiser has no effect upon the carbon monoxide, and but little upon the carbon dioxide.

The presence of an Atomiser does not make the mine air itself appreciably more deleterious; it makes it more necessary that the miners should use the change rooms which are provided.

We consider that it is essential that the water used with the Atomisers should be pure and free from organic contamination, as the use of impure water would constitute a source of danger.

REPORT

of

WATER-FEED AIR DRILLS TEST,

carried out at

CROWN REEF G.M. CO., LTD., 1903-1904,

for

MINERS' PHTHISIS COMMITTEE, CHAMBER OF MINES.

This test commenced on Monday, 2nd November, 1903, in which the "Ingersoll-Sargeant" Water-Fed Drill, and the "Water Leyner Drill Co's" "Model 5" Drill" competed.

November 4th.

"Ingersoll-Sargeant" Drill stopped 20 minutes for packing.

November 12th.

"Ingersoll-Sargeant" stopped 45 minutes to put in a new piston, as the chuck was badly eaten away by water.

November 14th.

After the shift the new piston put in the "Ingersoll-Sargeant" Drill was taken out owing to the necessity of having the chuck re-bored and a steel bush put in.

November 18th.

"Ingersoll-Sargeant" delayed 3 hours 45 minutes, awaiting a new drill man and above-mentioned piston.

This drill had not been working since the 14th inst.

November 19th.

"All work suspended removing drills from 7th to 9th levels. Both machines stoping up to date.

November 20th.

"Ingersoll-Sargeant" machine sinking a winze, "Leyner" machine driving.

November 21st.

"Ingersoll-Sargeant" machine prevented from working owing to rock not having been cleared away and a charge having mis-fired the previous evening.

November 23rd.

"Leyner" stopped 20 minutes to change three pawl springs.

November 24th.

"Leyner" stopped 45 minutes to change two pawl springs.

November 25th.

"Ingersoll" delayed 30 minutes owing to water connection being choked.

November 26th.

"Ingersoll" did not work owing to accumulation of water and rock not having been cleared away.

November 27th.

"Ingersoll" delayed 40 minutes to change front head, which was leaking badly.

"Leyner" delayed 35 minutes to change three pawl springs.

November 30th.

"Ingersoll" delayed for 65 minutes for repacking.

December 1st.

"Ingersoll" unable to work owing to rock not being cleared in winze. "Climax" water drill was started stoping and put in one drill successfully, but second drill bent and the trial was given up, the drill being taken out of the mine on the 3rd.

December 2nd.

"Leyner" delayed 45 minutes to replace broken water tube.

December 4th.

"Ingersoll" delayed owing to rock not being cleared in winze.

December 7th.

"Ingersoll" machine broke piston at the cross holes drilled for her water supply and stopped for the day.

December 8th.

"Ingersoll" machine re-started.

December 10th.

"Ingersoll" did not work owing to rock not being cleared.

December 11th.

Machines changed places—"Ingersoll" to drive and "Leyner" sinking.

"Ingersoll" stopped 2½ hours to change valve on water connection.

December 12th.

"Leyner" stopped 25 minutes to change one pawl spring.

December 14th.

"Ingersoll" delayed 2 hours for new water valve and air pipe connection.

December 17th.

"Ingersoll" stopped 15 minutes to clear choked water way.

December 18th.

"Ingersoll" stopped 1½ hours to be generally overhauled.

December 21st.

Both machines were put on double shifts and run by Italian drill men in place of experts.

December 23rd.

"Leyner" delayed 45 minutes to change one pawl and two pawl springs.

December 24th.

"Leyner" delayed 30 minutes changing feed nut.

"Ingersoll" machine front head had to be repaired and was not again started until January 6th.

December 28th.

"Leyner" delayed 45 minutes replacing two springs and one pawl.

January 2nd, 1904.

"Leyner" delayed 95 minutes for new water connection.

January 4th.

"Leyner" delayed 45 minutes for two pawl springs.

January 5th.

"Leyner" delayed 60 minutes to clear water connections.

January 6th.

"Leyner" delayed 68 minutes from above cause. Ingersoll started again, but could not work owing to bad leakage, and was delayed 4 hours 25 minutes.

January 7th.

"Ingersoll" delayed 3 hours 40 minutes with choked water connection, same machine delayed from same cause on night shift 6 hours 45 minutes.

"Leyner" machine stopped 6 hours 15 minutes to renew hammer head.

January 9th.

"Ingersoll" delayed 1 hour, water connection being out of order, also delayed same day $6\frac{1}{2}$ hours from above cause.

"Leyner" delayed $6\frac{1}{2}$ hours for new pawl springs.

January 12th.

"Leyner" delayed 6 hours 30 minutes, to replace chuck worn out, also water tube.

TOTAL TIME LOST FOR REPAIRS.

"Ingersoll"	...	...	...	210 hours 29 minutes.
"Leyner"	...	...	...	25 hours 8 minutes.

COST OF REPAIRS AND SPARES.

"Ingersoll"	...	...	...	...	£9 19 7½
"Leyner"	...	...	...	...	9 0 6

NUMBER OF SHIFTS WORKED.

"Ingersoll"	...	...	...	..	40 Shifts.
"Leyner"	...	...	...	...	71 "

COST OF REPAIRS PER SHIFT.

"Ingersoll"	...	...	...	...	4/11¼
"Leyner"	...	...	...	...	2/6½

SUMMARY OF WORK

performed by

EXPERT ROCK DRILL MEN,

From NOVEMBER 2nd to DECEMBER 21st, 1903.

		"Ingersoll"	"Leyner"
No. of bits used during test	...	400	951
No. of shifts worked	...	28	38
No. of holes drilled	...	194	116
Total depth of holes	...	635 ft.	1,011 ft.
Average depth drilled per min.	...	1.81 in.	1.81 in.
Actual time engaged in drilling	...	69 hrs. 54 min.	111 hrs. 20 min.
Time lost in repairing, underground	...	21 " 6 "	3 " 25 "
" " on surface	...	27 " 30 "	0 " 0 "
Average air pressure, "Bristol's" recorder		61 lbs.	60.8 lbs.

SUMMARY OF WORK

performed by

ITALIAN ROCK DRILL MEN,

From DECEMBER 22nd, 1903, to JANUARY 14th, 1904.

		"Ingersoll"	"Leyner"
No. of bits used during test	...	112	541
No. of shifts worked	...	12	33
No. of holes drilled	...	25	91
Total depth of holes	...	111 ft.	411 ft.
Average depth drilled per min.	...	.68 in.	.81 in.
Actual time engaged in drilling	...	30 hrs. 31 min.	106 hrs. 17 min.
Time lost in repairing, underground	...	31 " 23 "	15 " 53 "
" " on surface	...	130 " 30 "	6 " 15 "
Average air pressure, "Bristol's" recorder		67 lbs.	68 lbs.

W. H. WOOD.

FURTHER REPORT

on

ROCK DRILL TRIAL,

conducted at

THE CROWN REEF PROPERTY,

for

THE MINERS' PHTHISIS COMPETITION COMMITTEE.

From the figures embodied in the detailed report already submitted, it will be seen that the "Leyner" water drill worked much better than the "Ingersoll," and much less delay occurred in the case of the former for repairs, etc.; also, this machine is much lighter than the "Ingersoll," and, consequently, more easily handled.

It will also be noted that the "Leyner" machine ran more regularly and got through more work than the "Ingersoll;" both whilst being run by a drill expert, and also by the Italian rock drill man.

The "Leyner," at the termination of the trial on the 14th January last, shewed considerable signs of wear and tear, and it is very probable that if the trial had been continued with this particular machine, the maintenance would have been high.

On the other hand, the "Ingersoll" machine, to all intents and purposes, was worn out and could not have run much longer without being practically renewed. Throughout the whole test this latter machine shewed greater structural defects than the "Leyner," and I am led to think that the former was run as an experiment rather than a fair competitive trial of a proved type of machine.

In conclusion, the opinion I have formed after carefully watching the two drills during the trial is that the "Leyner" principle is the better of the two on which to work, but that it contains structural defects which should be overcome; and, further, the machine was not adapted for the air pressure normally used on the Rand.

W. II. WOOD.

Johannesburg,

6th February, 1904.

Copy of letter sent to Messrs. Hardach, Gazzam, Hay, Pettitt and Hellmann, dated 31st October, 1903 :—

DEAR SIR,—

MINERS' PHTHISIS COMPETITION.

The Leyner Drill has been entered for the above competition, and the Committee are desirous of supplementing the results of their test with reliable information from parties who have had experience of the working of this drill on the Rand.

My Committee will therefore be greatly obliged if you will favour them with your views and opinion on the Leyner Drill, especially having regard to and dealing in your reply with the following points :—

- a. Length of time in use.
- b. Efficiency of drill as a borer.
- c. Amount of repairs required as compared with other drills.
 1. During the first six months.
 2. During the second six months.
- d. Cost of maintenance.
- e. Difficulties with steel, if any.
- f. How long the drill retains its first efficiency.
- g. Whether the drill presents any particular difficulty in handling or is easily workable; and if the men raise any objection to its introduction.

I shall be glad if you can make it convenient to let me have your reply at an early date.

Yours faithfully,

WILL BARNETSON,

Secretary to Miners' Phthisis
Competition Committee.

SIMMER AND JACK PROPRIETARY MINES, LIMITED,

Johannesburg, Transvaal.

Mine Office,
Germiston,
2nd February. 1904.

THE SECRETARY,
Miners' Phthisis Competition,
Box 809, Johannesburg.

DEAR SIR,—

With reference to yours of the 28th January, I beg to state :—

- a. About one year.
- b. Equal to Ingersoll-Sargeant in drives, 25 per cent. more efficient in raises.
- c. Cannot answer this question.
- d. 11/6 per foot of raise.
- e. None.
- f. For eight rounds.
- g. No difficulty, no objection.

Yours faithfully,

JOSEPH P. GAZZAM,

General Manager.

KNIGHT'S DEEP, LIMITED.

Mine Office,

P.O. Box 143, Germiston,

4th November, 1903.

THE SECRETARY TO

Miners' Phthisis Competition Committee,

P.O. Box 809,

Johannesburg.

DEAR SIR,—

In answer to your favour of the 31st ult. *re* the Leyner Drill, we only had three of these drills in use for about six weeks, when the hammers, cylinders and valves became so worn that we could only drill about two holes per 9 hours shift with each machine. We are now waiting for these spares to be imported, when we intend to continue their use.

- a. The drills were in use about six weeks.
- b. When perfectly new we have drilled 8 holes 5ft. 6in. deep with one machine in 9 hours in a rise of about 25 deg. in medium hard blue ground 1,200 feet below surface.
- c. 1. The amount of repairs required during first six months would be about double that required for an Ingersoll-Sargeant Drill.
2. Have not had them in use for second six months.
- d. The cost of maintenance is about double that of other standard machines working in similar ground.
- e. We had no difficulty with the steel.
- f. We only used the drills about six weeks, when they were in need of the repairs mentioned above; otherwise they were in good condition.
- g. The drills present no particular difficulties in handling, and are easily workable. The men raised no objection to their introduction. They work much more efficiently with a high air pressure, say 80 to 90 lbs. With the air at 60 lbs. or lower they will hardly work at all. I think the drills very useful for raising *only*, and that they are the best I have seen for that purpose.

They cost more for maintenance and steel than the ordinary machines, but this is compensated for by the less cost of getting the dirt out of a rise than a winze, and the extreme difficulty of getting men to work in a rise with an ordinary machine.

Yours faithfully,

E. E. HARDACH,

Resident Manager.

WITWATERSRAND DEEP, LIMITED.

Office at the Mine,

2nd November, 1903.

THE SECRETARY,

Miners' Phthisis Competition Committee,

Box 809,

Johannesburg.

DEAR SIR,—

THE LEYNER DRILL.

In reply to yours of 31st ultimo, I have the following remarks to make :

- a. Two weeks.
- b. Bored two holes per shift as compared with five holes by the "Slugger."
- c. Costly in repairs.
- c1, c2, d, e and g. Not in use long enough to give a reliable opinion.
- f. Parts get worn very quickly.

Yours faithfully,

HENRY HAY,

Manager.

SIMMER AND JACK EAST, LIMITED, ELANDSFONTEIN.

Mine Office, Germiston,

P.O. Box 47,

9th November, 1903.

THE SECRETARY,

Miners' Phthisis Competition Committee,

P.O. Box 809, Johannesburg.

DEAR SIR,—

In reply to your circular letter of the 31st ult., re Leyner Drill, I beg to inform you that as the drills were only in use here for one month I cannot answer all the questions, but have answered as many as possible.

- a. One month.
- b. Fairly good as compared with other drills.
- c. 1.) I am unable to answer.
2.)
- d. I am unable to answer.
- e. The steel used seems to be too light for use in the hard rock here.
- f. I am unable to answer.
- g. There is no special difficulty in the handling of this machine, but 99 per cent. of the miners object to using it.

Yours faithfully,

ARTHUR E. PETTIT,

Resident Manager.

EAST RAND PROPRIETARY MINES, LIMITED.

P.O. East Rand,

Transvaal.

7th December, 1903.

THE SECRETARY TO

Miners' Phthisis Competition Committee,

Transvaal Chamber of Mines, Johannesburg.

DEAR SIR,—

In reply to your favour of the 31st October, I now have pleasure in handing you copy of Mr. Penlerick's report on the Leyner Drill.

Yours Faithfully,

FRED HELLMANN,

General Manager.

EAST RAND PROPRIETARY MINES, LIMITED.

COPY.P.O. East Rand,
Transvaal,

3rd December, 1903.

FRED. HELLMANN, Esq.,

General Manager,

East Rand Proprietary Mines, Ltd.

DEAR SIR,—

In answer to your letter referred to me regarding the "Leyner Drill."

- a. Time in use, about three months.
- b. 70 per cent. as compared with the Ingersoll-Sargeant.
- c. 100 per cent. more than the Ingersoll-Sargeant.
 - 1. Not in use for this period.
 - 2. Not in use for this period.
- d. £10 per month.
- e. No trouble with the steel actually, but takes twice as long to sharpen as the ordinary bit.
- f. Our experience is, that in three months there are a great number of working parts that need renewing, and one great fault is that the cylinder and valve are cast together.
- g. No trouble is experienced in handling, as the drill is very light, but the men prefer working with an Ingersoll-Sargeant or Holman, and endure the dust rather than worry with the Leyner.

Yours faithfully,

S. PENLERICK.

SUMMARY.

	No. of suggestions.
No. 1. Respirators and Masks	41
2. Dust Extractors and Hoods	35
3. Water Drills	9
4. Jets delivering water inside hole	4
5. Jets delivering water at mouth of hole	60
6. Sprays... ..	22
7. Atomisers	6
8. Medical	15
9. Miscellaneous	37
	229

No. I. RESPIRATORS AND MASKS.

482	Dr. J. L. A. Aymard	Inhaler.
6636	Wallach Bros.	Respirator.
6446		
427	John Stewart	Respirator.
833		
—	H. J. Lewis	Respirator.
671	Ben Gwilliam	A Silk Handkerchief as respirator.
6526	G. McCormick	Respirator.
6450	Thos. Sheppardson	Respirator.
391	D. Rhys Jones	Mask (using compressed air).
396	W. H. White	Respirator.
202	Miss H. S. Murphy	Stormont-Murphy Mouth and Nose Shield.
228	Thomas S. Morris	Respirator.
209	P. Henshel.	Face Protector.
6706	W. M. Pascoe	Respirator.
10	C. M. Ulrich	Respirator.
6567	Walter Siffleet	Two Indiarubber Teats filled with cotton wool in the nostrils (acting as respirator).
6219	E. Nettmann & Co.	Helmet.
44	William H. Wilson	Respirator.
365	E. J. Evans	Respirator.
363	Sidney Fry	Respirator.
231	John C Howe, M.D.	Respirator.
378	H. S. Cover	Respirator.
233	H. A. Stewart	Respirator.
290	Joseph Gervens	Respirator.
486	W. H. Burland, M.D.	Respirator.
369	T. S. Patrick	Respirator.
38	W. T. Jones	Respirator.
479	H. Tiedemann	Large Sponge tied before the nose and mouth.
571	A. Baumach	Respirator.
560	Edwin S. Seasells	Respirator.
6707		
229	Dr. Jobson Horne	Plate to be worn in the mouth to ensure breathing through nose and cotton wool in the nostrils.
2	Zimmer & Co.	Respirator.
11	John N. Holywell	Mask.
400	Sir John Macdonald	Respirator.
200	C. E. Heinke	Helmet (using compressed air).
545	Th. Debaucheron	Respirator (Le Spiro).
589	Detroye	
541	N. Naill	Respirator.
575	Y. Ducenne	Respirator.
573	Dr. Marcel Monier	Mask.
303	Dr. Maseaux	
6650	Adolf Brauer	Respirator.

No. 2. DUST EXTRACTORS AND HOODS.

513	Henry Niblett	Dust Arrester.
229	T. J. Tregonin	Dust Catcher.
379		
1485		
241	George Dickie	Dust Catcher.
12	S. S. Stevenson	Dust Extractor.
495	James Watson	Dust Extractor.
488	F. Anderson	Dust Extractor.
130	James T. Andrew	Dust Catcher.
680	Harley B. Forsyth	Dust Extractor.
	R. McBrown	Dust Extractor.
512	H. G. Farrell	
	T. Dickson	
64	J. C. Elliott	Dust Collector (blanket).
6411	Stephen B. Williams	Dust Extractor.
227	E. W. Glascock	Dust Arrester.
485	Thomas Powell, M.D.	Dust Extractor.
520a	F. M. Jennings	Dust Extractor and Air Purifier.
401	J. C. Seaton	Dust Collector.
6429	Dan Morgan	Dust Catcher.
390	Charles Oldroyd	Dust Collector.
10	C. M. Ulrich	Dust Catcher.
38	W. T. Jones	
381	Chas. W. Bremis	
113	G. Arnall	Dust Shield.
380	P. McKay	Patent Dust Catcher (not described).
484	A. J. Irvine	Dust Collector.
289	J. J. Gilbride	Dust Catcher.
6756	W. M. Pascoe	Dust Catcher.
230	Chas. E. Richards	Dust Trap.
132	F. Andrews	Dust Extractor.
392	John Rees	Dust Arrester (sponge).
238	Thos. Clark	Dust Catcher.
25	Chas. Smith	Dust Catcher.
233	A. and Z. Daw	Dust Catcher.
235	E. Raywood	Dust Catcher.
402	V. Trouillet	Dust Extractor.
577	B. Vigouroux	Dust Receiver.
196	August Joppich	
195	G. Heiber	

No. 3. WATER DRILLS.

6484	C. Beresford Fox	Brandt Hydraulic Rotary Drill.
389	J. Whittle & Son, Ltd.	
474a		
475		
515	Ingersoll-Sargeant Drill Co.	New Leyner Rock Drill.
403	F. E. Kohlmeier.	
93	S. Sykes & Co.	
314	Mining Plants Co., Ltd.	Brandt Drill and Leyner Drill.
528	Courtney W. Thompson	
237	William Hopwood	
489	Jas. Hosking	Hosking's Water Drill.
6725	Frank B. Bailey	

No. 4. JETS DELIVERING WATER INSIDE THE HOLE.

403	F. E. Kohlmeyer	Jet of water through drill.
389	J. Whittle & Son, Ltd.	Jet of water through drill.
474a		
475		
515	Ingersoll-Sargeant Drill Co.	Jet of water through drill.
93	Sykes & Co.	Jet of water through drill.
314	Mining Plants Co. Ltd.	
628	Courtney W. Thompson	Jet of water through drill.
6525	Thomas Riley	Jet of water through pipe in hole alongside the drill.
304	J. W. Holmes	Jet of water through pipe in hole alongside the drill.
395		
237	William Hopwood	Jets of water through drill.
489	Jas. Hosking	Jet of water through drill.
648	E. P. Beaujean	Jet delivering water inside the hole.

No. 5. JETS DELIVERING WATER AT MOUTH OF HOLE.

6381	A. E. Pettit	Jet of water at mouth of hole.
519	J. Watson	Jet of water at mouth of hole.
426	P. R. L. Cornes	Jet of water at mouth of hole.
588	F. Watt	Sprays at mouth of hole.
384		
6644	L. S. Meintjes	Spray at mouth of hole.
306		
6248		
514	F. H. Plummer	Spray round mouth of hole.
389	J. Whittle & Son, Ltd.	Spray at mouth of hole.
474a		
475		
482	Dr. J. L. A. Aymard	Spray at mouth of hole.
37	J. H. Battis	Jet of water at mouth of hole.
6385		
6466		
6444	B. M. Tregaskes	Jet of water at mouth of hole.
64	J. C. Elliott	Jet of water at mouth of hole.
396	W. H. White	Spray at mouth of hole.
204	J. B. Hedley	Jet of water at mouth of hole.
405	S. T. Gelling	Jet of water at mouth of hole.
	W. A. McLeod	
393	J. A. Hodge	Steam or water jets at mouth of hole.
10	C. M. Ulrich	Jet or spray of water at mouth of hole.
6511	N. A. Merritt	Jet of water at mouth of hole.
365	E. J. Evans	Jet of water at mouth of hole.
517	A. J. Thorne	Jet of water at mouth of hole.
245	Howard Jones	Jet of water at mouth of hole.
41	John McTavish	Jet of water at mouth of hole.
6808	R. J. Renkin	Jet of water at mouth of hole.
370	Sidney Fry	Jet of water at mouth of hole.
133	Eugene Kilgore	Jet of water at mouth of hole.
6813	Hugh M. Lister	Jet of water at mouth of hole.
40	James Hardwick	Jet of water at mouth of hole.
243	Chas. L. Smith	Jet of water at mouth of hole.
42	Thornton Root	Jet of water at mouth of hole.

No. 5. JETS DELIVERING WATER AT MOUTH OF HOLE—*Continued.*

45	J. H. Baxter	Spray of water at mouth of hole.
109	Albert H. Wilson	Jet of water at mouth of hole.
244	Henry Shard	Jet of water at mouth of hole.
244a	W. McTavish	Spray of water at mouth of hole.
6805	Lewis Horne	Spray of water round mouth of hole.
382	E. Thomson	Jet of water at mouth of hole.
362	Donald Ross	Jet of water at mouth of hole.
371	W. W. Queen	Jet of water at mouth of firing.
367	Samuel Hornsby	Jet of steam or water at mouth of hole.
398	James Wallace	Spray of water in front of drill hole.
738		
338	J. Beatty	Spray of water at mouth of hole.
527	Millhouse & Thomas	Jet or spray of water at mouth of hole.
487	William Burgess	Patent dust layer to deliver jet of water at mouth of hole.
630	R. B. Squire	Spray of water at mouth of hole.
649	J. Telgate	Jet of water at mouth of hole.
661	James Park	Jet of water at mouth of hole.
741	J. W. Teale	Jet of water at mouth of hole.
632	Thomas Moore	Jet of water at mouth of hole.
226	H. Davis, Jun.	Jet of water at mouth of hole.
252	A. S. Brown	Jet of water at mouth of hole.
79	H. D. Robinson	Jet of water at mouth of hole.
307	L. M. McArthur	Spray of water at mouth of hole.
6504	R. J. Pearce	Jet of water at mouth of hole.
6563		
397	Geo. J. Tyack	Jet of water at mouth of hole.
684	James Gitsham	Spray of water at mouth of hole.
518		
6807	John Davis	Spray at mouth of hole.
237	William Hopwood	Spray at mouth of hole.
570	M. Gabillard	Jet delivering water at mouth of hole.
232	Rd. Harle	Spray of water at mouth of hole.
196	August Joppich	Jet or spray of water when drilling.
101	Karle Kolte	Water from special nozzle when drilling.
6587	Ernst Kramer	Spray of water round mouth of hole and a protection plate.

No. 6. SPRAYS.

106	B. A. Penhall	Spray through the compressed air pipe after blasting, &c.
6562	Stephen Rogers	Steam Sprays.
405	S. T. Gelling W. A. McLeod	Spray after blasting.
426		
514	P. R. L. Cornes	Spray after blasting.
396	F. H. Plummer	Spray after blasting.
684	W. H. White	Spray after blasting.
518		
6807	James Gitsham	Spray after blasting.
6807	John Davies	Spray upon broken rock.

No. 6. SPRAYS—*Continued.*

368	W. H. Pengelly	Spray before and after blasting.
243	Chas. L. Smith	Spray after blasting.
109	A. H. Wilson	Spray two or three times a day.
244	H. Shard	Spray after blasting.
382	E. Thomson	Spray after blasting.
616	Tom Johnson	Water Sprays.
371	W. W. Queen	Spray after blasting.
226	H. Davis, Jun.	Spray after blasting.
252	A. S. Brown	Spray after blasting, &c.
661	Jas. Park	Spray after blasting.
482	Dr. J. L. A. Aymard	Spray or jet of caustic soda and water after explosion blown through compressed air pipes.
237	William Hopwood	Sprays after explosion, &c.
489	Jas. Hosking	Spray during and after blasting.
576	Touvier.	

No. 7. ATOMISERS.

261	Olaf H. Foss.	
469	T. J. Britten.	
6235	R. H. Jones.	
13	George Madeira.	
14		
587	T. J. Scoble }	Spray of air and water round hole.
	John Teague }	
582	Georges Hugot.	

No. 8. MEDICAL SUGGESTIONS.

671	B. Gwilliam	Cod Liver Oil.
202	Miss H. S. Murphy	Curative Chest Preserver.
485	T. Powell	Diet.
6449	A. R. Ray	Ancient Mariners Oil of Tar.
365	E. J. Evans	Lung Tonic.
246	Mrs. Walsh	A mixture of her own, described in letter.
242	L. M. McArthur	Metapathic Treatment.
307		
38	W. T. Jones	A patent snuff and mixture.
6405	Dr. F. Bushnell	States that the disease is caused by dust, but specifies no cure.
131	C. Hornbostel	Ozonized Air.
478	Dr. A. E. McCormack	Vaseline in nostrils and on lips.
289	Dr. J. J. Gilbride	Treatment for patients suffering from phthisis.
564	André E. Pautère.	
581	Dr. Sylvia Labber.	
6574	Dr. A. v. Filkorny	A patent recipe for lung sickness (not described).

No. 9. MISCELLANEOUS.

- | | | |
|------|--------------------|--|
| 514 | F. H. Plummer | Ventilation by Exhausters and Fans. Special travelling water carriage. |
| 426 | P. R. L. Cornes | Ventilation. |
| 6637 | W. M. Drake | Ventilation by Fans. |
| 216 | G. C. Hooper | Ventilation. |
| 405 | S. T. Gelling | Ventilation. |
| | W. A. McLeod | |
| 361 | A. M. Craig | Ventilation by Fans and Furnaces. |
| 360 | | |
| 629 | R. B. Squire | Ventilation, &c. |
| 630 | | |
| 6806 | E. Dunn | Hygienic Treatment. |
| 288 | | |
| 10 | C. M. Ulrich | Ventilating Fans and Drainage. |
| 378 | H. S. Cover | Exhausting Fans. |
| 6804 | M. Healy | Keeping a pebble in the mouth. |
| 42 | Thornton Root | Ventilation. |
| 369 | T. S. Patrick | Ventilation by Furnaces. |
| 6805 | Lewis Horne | Ventilation by Exhaust Fans. |
| 372 | John R. Hill | Inhalation of Slate Dust. |
| 6812 | Mrs. E. Havill | Chest Exercise and Cayenne Pepper. |
| 128 | A. J. Worrall | Offers to send something to prevent dust (not described). |
| 380 | P. McKay | Patent Drill, &c. |
| 152 | Oscar Katzenberger | Ventilation by Exhaust Fans. |
| 230 | E. H. Elmendorff | Ventilation by Exhaust Fans. |
| 649 | J. Telgate | Ventilation by Exhaust Fans with connection to hoods over holes being drilled. |
| 532 | J. M. Douglas | A Moustache. |
| 526 | W. J. E. Sutton. | Ventilation. |
| 226 | J. Davis, Jun. | Ventilation. |
| 373 | R. Polkinghorne | A method to ensure complete ignition of charge of dynamite, &c. |
| 366 | H. Sargeant | Ventilation, artificial and natural. |
| 252 | A. S. Brown | Ventilation, cleanliness, &c. |
| 79 | H. D. Robinson | Ventilation, supervision of men's clothing, housing, diet, &c. |
| — | Dr. N. Sisca | Abolition of night shifts and the use of other explosives than gunpowder. |
| | | Thorough Ventilation. |
| 307 | L. M. McArthur | Compounds to neutralise the gases of explosion. |
| 91 | J. N. Holywell | Ventilation by Fans. |
| 25 | C. Smith | Magnetic Cap. A method of removing gases of explosion. |
| 237 | William Hopwood | Ventilation, Exhausters to free the air from noxious gases after explosions ; sanitation, etc. |
| 489 | Jas. Hosking | Ventilation, Sanitation, Explosives, Change Houses, Baths, etc. |
| 648 | E. P. Beaugéan | Ventilation. |
| 101 | Karl Kolte | Every workman to take sugar during his working hours (sugar best lung medicine). |
| 6575 | Hermann Rieberer | Has a new drill, but does not describe it. |
| 6586 | Chr. Freese | Describes some types of drill which give protection to miners. |