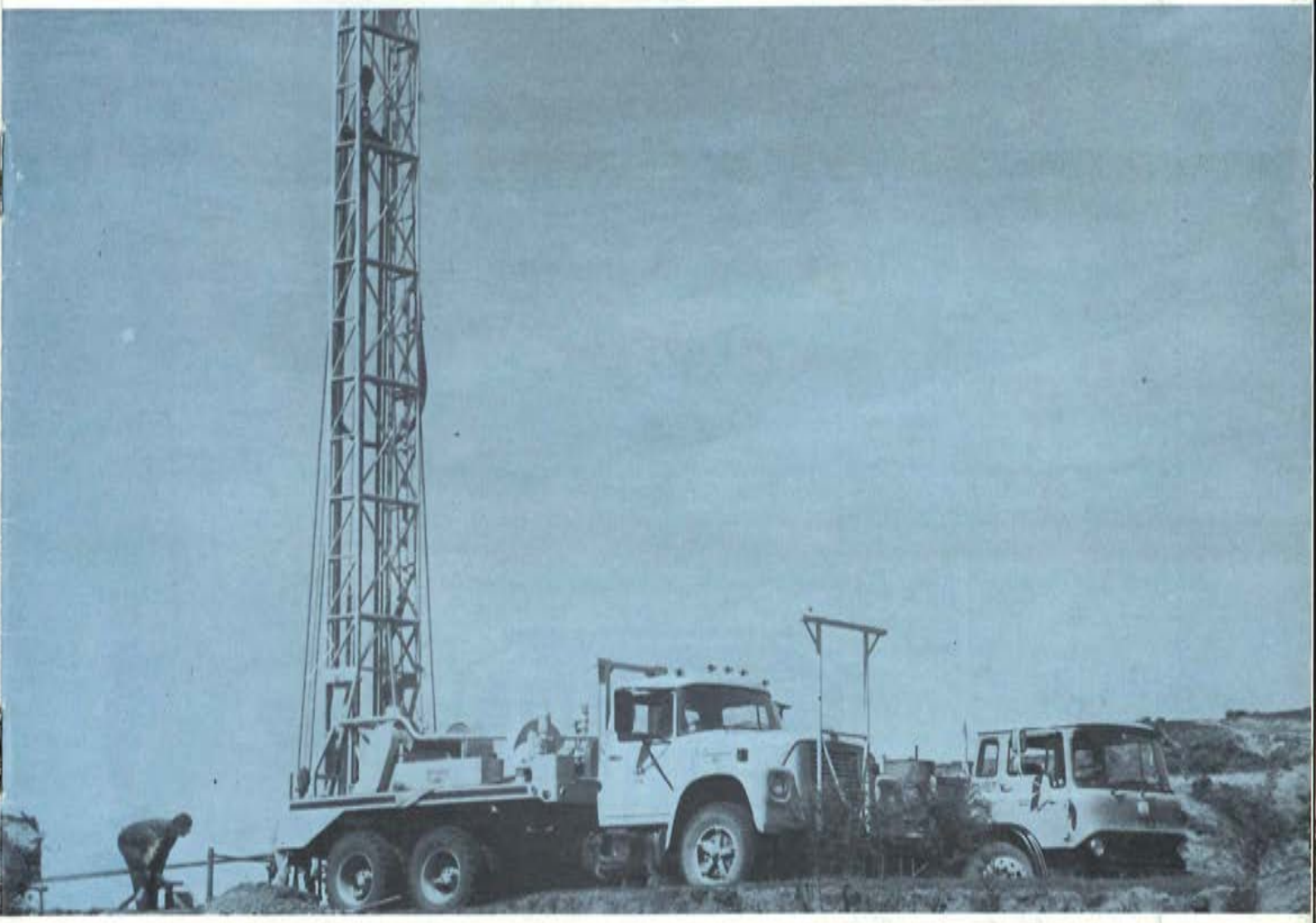
New Zealand

THE DRILLER

OFFICIAL PUBLICATION OF THE NEW ZEALAND DRILLERS FEDERATION INC. SPRING 1981



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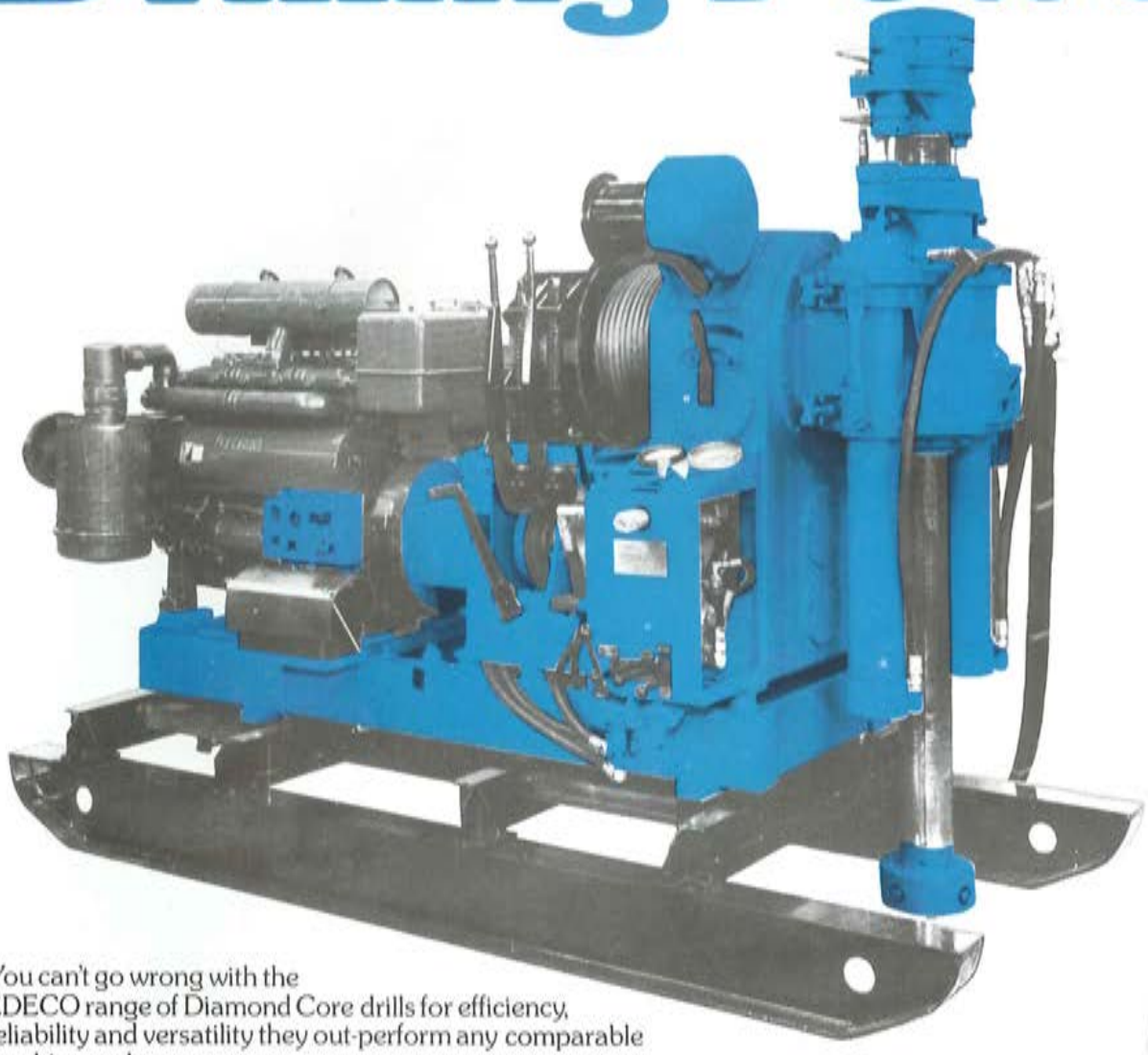

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Mr Hamish Pearson

Mr Bill Washington

Southerners take over

SOUTH ISLANDERS have taken over the top two positions in the New Zealand Drillers' Federation.

Mr Hamish Pearson, of McNeill Drilling Co Ltd, Invercargill, is the federation's new president, while the new vice-president is Mr Bill Washington, of Washington Drilling Co Ltd, Timaru.

Councillors elected at the federation's annual conference in Wellington at the beginning of August were Messrs D. Baylis (Napier), G. Brown (Rotorua), D. Burgess (Dargarville), E. Cameron (Tauranga), R. Farquhar (Christchurch), P. nett (Putaruru), J. Hill (Hastings), P. Lemmon (Wellington), J. McCallion (Opotiki), C. Woodford (Nelson).

Big variety in papers

A WIDE variety of papers covering many aspects of drilling were presented to the 1981 New Zealand Drillers' Federation conference and training school held at the Burma Motor Lodge, Wellington, from August 5-8.

The conference was opened on Wednesday, August 5, by the Minister of Works and Development, Mr Bill Young.

Papers presented, and the speakers on August 6 were:

- A formula for striking drill hire rates; Mr G.W. Valentine, Barr Burgess & Stewart, Accountants, Wellington.
- Drilling water wells for UNESCO; Mr G. Brandeis, Atlas Copco, Wellington.
- Downhole logging in investigation drilling, and, Step drawdown aquifer tests; Dr Hugh Thorpe, water and soil division science centre, Ministry of Works and Development, Christchurch.
- Underground water development in the Hutt Valley; Mr Jeff Jones, Wellington Regional Authority, and Mr Alan Farmer, Dominion Construction Co Ltd.
- Twin-tube drilling; Mr George Fyfe, Drilco Industrial, Australia.

In the afternoon delegates visited the newly-commissioned Waterloo pumping station in the Hutt Valley, which is the focal point of an artesian water development supplying the Wellington region, and saw a drilling demonstration.

Papers presented, and speakers, on August 6, 1981 were:

- Site investigation and its importance; Mr John Travis, Brickell Moss & Partners, consulting engineers, Wellington.
- Drilling with fluids; Mr George Strickland, Baroid Australia Pty Ltd.
- Diamond Drilling; Mr Andrew Bignall, Longyear (NZ) Ltd.
- An introduction to ground water; Mr Karl Black, Ingersoll Rand, USA.
- Lakos separators application to well drilling; Mr D.R. Wilkinson, Metallurgical and Industrial Consultants Ltd.

That afternoon another field trip, taking in the Ministry of Works and Development's central laboratory and further outside demonstrations was also held.

Copies of most of the papers presented at the conference are available from The Secretary, New Zealand Drillers' Federation, P O Box 1318, HAMILTON.

The Driller is the official publication of the New Zealand Drillers' Federation Inc.

EDITORIAL
All editorial inquiries, including manuscripts, should be directed to
The Editor
The NZ Driller
P O Box 245
WELLINGTON
Ph (04) 729 924
The New Zealand Driller is produced by The Contract Editorial Company Ltd on behalf of The New Zealand Drillers' Federation.
Editor: Greg Newton

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Advertising inquiries, material should be directed to
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q1Full page	**$200**
Half page	**$120**
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Specified pos	**.20 per cent**
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Cols 26 cm 13 ems

SUBSCRIPTIONS
Inquiries to
The Circulation Manager
The NZ Driller
P O Box 1318
HAMILTON
Ph (071) 390 069
Cost $10 for four issues

The NZ Driller is circulated free of charge to all members, employee members and associate members of the New Zealand Drillers' Federation, and to selected catchment authorities, territorial local regional water boards and government departments.

Optimism for future — Young

OPTIMISM ABOUT the future of the drilling industry has been expressed by the Minister of Works and Development, Mr Bill Young.

He told the Driller's Federation annual conference that geothermal exploration and development, and coal resource investigation, are two areas where expansion is likely.

In the geothermal area, field exploration and development will continue to be carried out by the MWD team based at Wairakei, because of the specialised nature of the work and the large capital investment requirements.

Greater use will be made of geothermal energy as a source of direct heat in commercial and industrial applications, and the drilling of wells for these applications has been and will remain the domain of the private sector.

Indications are that the number of rigs involved in looking for coal and other minerals will remain at current levels for some years, and may increase.

Mr Bill Young

Ten rigs owned by Drillers Federation members are now involved in coal-resource surveys. If the investigation of the South Island lignites as a source of synthetic liquid fuels proves encouraging, there will obviously be a substantial increase in the demand for drilling to establish the magnitude of the resources.

Mineral exploration is currently booming, with all available rigs being well used. Applications from local and overseas companies for prospecting licences cannot help but result in increased demand for members' services.

Government and private sector forces will continue to share geological and foundation drilling work, evidenced by the co-operation on the Clyde dam site where the MWD has let 12 contracts to six different companies.

The contracts have been worth a total of $600 000.

Mr Young said that advances in drilling techniques have opened up new frontiers of exploration and investigation, and the process will continue as New Zealand seeks to become more dependent on its own natural advantages and less sensitive to the vagaries of the changing world scene.

NZDF progress 'heartening'

THE EFFORTS of an active council, together with the support from countless individuals, has seen the Drillers' Federation achieve a great deal of solidarity in terms of communication with each other and with drillers and associations from overseas.

The president of the New Zealand Drillers' Federation, Mr Gordon Brown, who stood down this year after two terms, said that it had been a pleasure to have served in that role.

"It is heartening to see the numbers of members continuing to support their federation in times when ever-increasing costs have an influence on travel and correspondence of all types.

"One thing I would like to point out regarding the reasons for having our own federation, apart from the strengths of communication, general knowledge and training, is the factor of education.

"In this field I think we are very privileged in having the support of so many to make our lectures and exchanging of information and ideas so plentiful."

Mr Brown wished those sitting the examinations well, and hoped that candidate sponsors would find that the return on their investment is worthwhile.

"Remember that in this day of rising prices a small error of judgement or an ability to solve a problem can represent a lot of money."

The federation's magazine, The New Zealand Driller, highlighted the organisation's achievements, and Mr Brown is sure that it was appreciated by members and other readers alike.

"I would like to congratulate the people involved in this project including the secretary, members of the council, the publisher and those who sponsored and contributed items of interest."

Another big pass list

THE LIST of people who passed the training school examination held in conjunction with the New Zealand Drillers Federation 1981 conference in Wellington has been released.

The council of the federation has congratulated all those who were successful, and has noted that the list includes several drillers from the public sector.

A total of 34 candidates were successful in the examinations, the same number as last year.

Top marks were obtained by Mr R.J. Hannigan, of Lemmon Piling and Drilling Co Ltd, of Wellington.

The list of successful candidates is

R.J. Hannigan (Lemmon Piling and Drilling) Wellington. 1; J. Gibbons (Manukau City Council) Auckland. 2; John Hill (Hill Welldrilling) Hastings. 3; Ewen Cameron (Farm Maintenance) Tauranga. 4; Peter Ward (Rotorua Welldrilling) Rotorua. 5; Mark Ayre (Wellington) 6; John Hampton (MWD) Turangi. 7; Doug Honnor (Hastings) 8; W. Campbell (Masterton) 9; D. Williams (Whangarei) 10.

A. Aylward (Whangarei), W. Bradley (Richmond), Joy Hill (Hastings), S. Montgomerie (Tauranga), K. Jenkins (MWD, Napier), N. Richardson (Palmerston North), S. Fitzgerald (Auckland), D. Burgess (Dargaville), G. Honnor (Hastings), D. Clemance (DSIR, Wellington).

R. Stevenson (Tauranga), W. Richards (Dunedin), L. Trigg (Whangarei), T. Griffiths (MWD, Cromwell), D. Ward (Rotorua), G. Carter (Tauranga), M. Gillies (Hastings), B. Washington (Timaru), S. Fisher (Hamilton), L. Carlyle (Te Puke).

M. Walker (MWD, Cromwell), J. McCallion (Opotiki), M. Carlyle (Te Puke), M. Foster (Auckland).

Macdow drills deep in UAE

A NEW ZEALAND company is making a massive contribution to the development of the water resources of the tiny oil-rich sultanates and sheikdoms of the United Arab Emirates.

McConnell Dowell Middle East has in just over two years completed around 400 wells, involving well over 50km of borehole.

The company is operating two rigs in

the region, and is considering adding a third, capable of drilling down to 1 300 metres, in the near future.

Mounted on 6 x 4 crane carriers, the rigs being used are a specialised American-designed unit. Sullair screw compressors – one of 250psi and one of 300psi – are driven by 350kW Caterpillar diesels and power Mission down-the-hole hammer bits that have tungsten carbide inserts.

Cuttings are lifted with air and foam.

Most wells are drilled down to around 200 metres, although the 300 metre barrier has been breached on some occasions. The equipment can drive a 200cm hole into limestone at over 30 metres/hr. Solid granite slows the operation down to around 10 metres/hr.

When a good run is encountered wells are being drilled on a 24-hour turnaround, with the rill spudded in the evening and the top casing placed, and the job being completed the following morning.

McConnell Dowell is believed to have been the first company to use down-the-hole hammer drilling in the region where rotary and percussion drilling had previously reached maximum depths around 60 metres before striking hard rock.

The impact of the McConnell Dowell operation is most clearly seen in the mountain village of Hatta, near Dubai. The change there, according to a McConnell Dowell executive, Mr Phil Coller, has been astronomic, with a water-starved area having been transformed into "an intensely green and beautiful place."

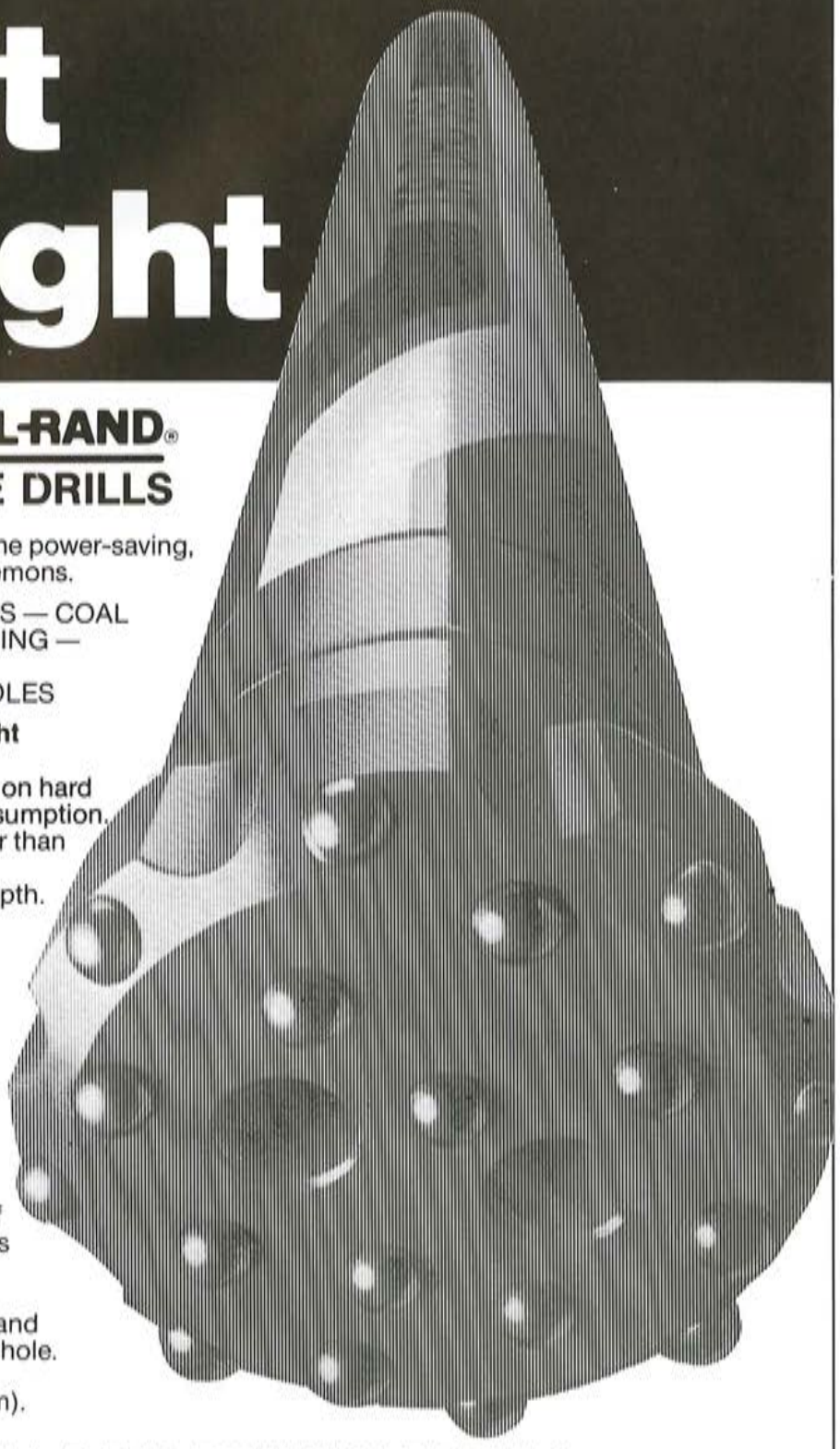
Date palms, which survive on morning dew and water with 20 000 parts per million of salt compared with a maximum of 2 000ppm acceptable to humans, were dying for lack of water.

Sheik Rashid, Dubai's ruler, was concerned about the situation at the village and when he heard that the new McConnell Dowell rig was being imported to the region, he ordered it to Hatta.

At 3am on June 10, 1979, McConnell Dowell's drilling team set out on the 140km trip from Dubai to Hatta, hoping to arrive at 5am so the rig could be set up and ready to go when the Sheik arrived at 6am.

He arrived 30 minutes early, but the action began soon after and with a flurry of dirt and rock work commenced, watched closely by the Sheik and his entourage. The gathering stayed for the four days that it took to get the hole down to more than 200 metres, but only a trickle of water was forthcoming.

Get it straight



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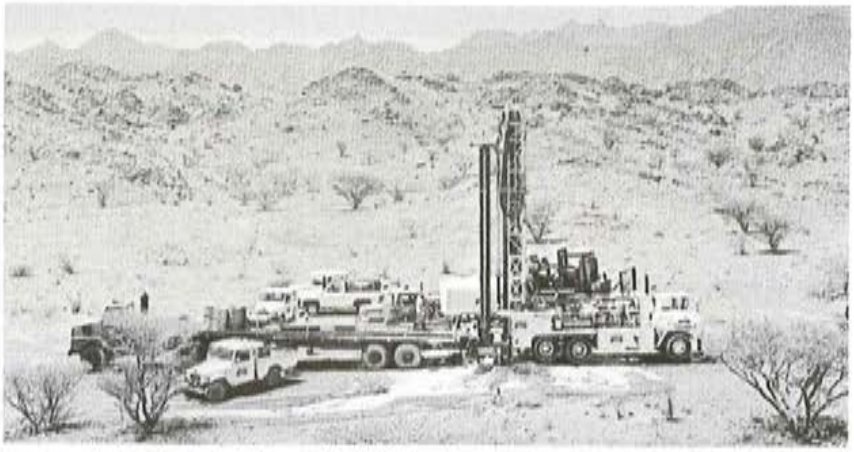


A McConnell Dowell drilling rig on site near Hatta, Dubai

The team worked on and two days later the second well to 180 metres was completed, and produced more than 15 000 litres of water every hour.

The success excited the Sheik. McConnell Dowell staff who worked faster and better, and were presented with gold Rolex watches for their efforts.

"After one month the palm groves started to rejuvenate."

Easier ground

Pipe guide published

AS AN aid to customers, Longyear has produced the following list of pipe recommendations for laying waterlines and other such uses around the drill site. Naturally site requirements or customer preferences will cause variations; the following list is only offered as a general guide for pipe selection.

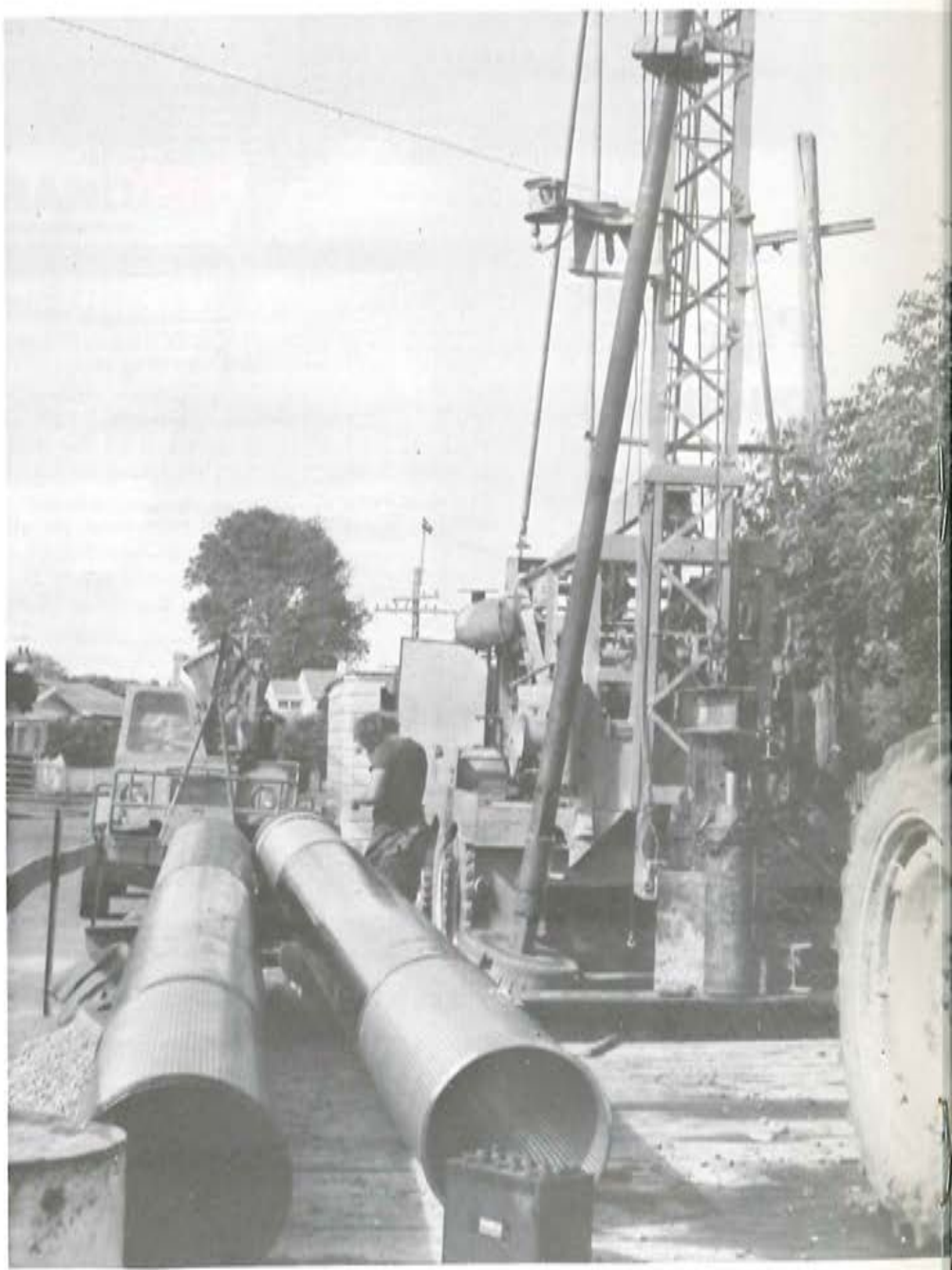
1. All pipe is to be made of a long hole, surrounded by metal or plastic centred around the hole.
2. All pipe is to be hollow throughout the entire length – do not use holes of different length to the pipe.
3. The inside diameter of all pipe must not exceed the outside diameter – otherwise the hole will be on the outside.
4. All pipe is to be supplied with nothing in the hole so that water, steam and other stuff can be put inside at a later date.
5. All pipe should be supplied without rust; this can be more readily applied at the job site (NOTE: Some vendors are now able to supply pre-rusted pipe. If available in your area, this new product is recommended as it will save a great deal of time on the job site).
6. All pipe over 150 metres long should have the words LONG PIPE clearly painted on each end so the drill crew will know it is a long pipe.
7. All pipe over three kilometres long must also have the words LONG PIPE painted in the middle so the crew will not have to walk the entire length of the pipe to determine whether or not it is short pipe or long pipe.
8. All pipe over 150mm diameter must have the words LARGE PIPE painted on it so the drill crew will not mistake it for small pipe.
9. Flanges should be used on all pipe. Flanges must have holes for bolts quite separate from the big hole in the middle.
10. When ordering 90 degree, 45 degree or 30 degree elbows, be sure to specify right-hand or left-hand; otherwise you will end up going in the wrong direction.
11. Be sure to specify to your vendor whether you want level, uphill or downhill pipe. If you use downhill pipe for going uphill, the water will flow in the wrong direction.
12. All couplings should have either right-hand or left-hand threads. Do not mix the threads; otherwise, as the coupling is being screwed on one pipe, it is unscrewing from the other.

Company cars can take it

THIS VEHICLE identification guide should enable members of the drilling fraternity to distinguish company-owned equipment from cars and utilities from privately-owned vehicles.

1. They travel faster in all gears, especially reverse.
2. They accelerate at a phenomenal rate.
3. They have a much shorter braking distance.
4. They have a much tighter turning circle.
5. They can ride over judder bars at twice the speed of private cars.
6. Their batteries, radiator water, oil and tyres never need to be checked.
7. The floor is cunningly designed to double as an ashtray.
8. They do not need to be kept under shelter at night.
9. They can be driven for as far as 100km with the oil warning light flashing.
10. They need cleaning less often, especially inside.
11. The suspension is reinforced to allow the weekend carriage of bricks, concrete slabs and other construction materials.
12. Company cars are adapted to allow reverse gear to be engaged while the vehicle is moving forwards.
13. The tyre walls are designed to cope with bumping into and riding over kerbing.
14. Unusual and alarming engine noises are easily eliminated by turning up the radio.
15. Company cars need no security. They may be safely left anywhere unlocked with the keys in the ignition.
16. They have extra longlife batteries so that their drivers do not have the fag of remembering to switch off the lights at night.
17. Company cars with flat tyres may be driven to the nearest garage, thus saving the necessity of having to change wheels at the side of the road.
18. Only company cars are able to leave roads and chase after animals in the bush for a closer look.
19. They are specially sand and waterproofed for fishing expeditions on remote beaches.

Big contract develops Hutt Valley's artesian water supply



WELLINGTON HAS always depended on ground water supplies from the Hutt Valley artesian field for much of its domestic and industrial water consumption.

That field has been further developed recently with the construction of six new bores and a new pumping station at Waterloo to distribute the water through the existing reticulation system.

The size and number of wells chosen represented the final culmination of many years testing, probing and planning by the Wellington Regional Water Board, now replaced by the Wellington Regional Council, to meet increasing water demands in the region.

A contract to drill, develop and test the artesian bores was let by the council to the Palmerston North-based company, Richardson Drilling Co Ltd, which used a Ruston Bucyrus 22W cable tool rig.

The contract was completed within 14 months, well within the contract period.

A paper on the contract and its execution was presented to the 1981 New Zealand Drillers Federation annual conference and drilling school in Wellington in August by Mr Alan Farmer, of the Dominion Construction Co Ltd.

Each of the six double-cased wells was constructed in a similar manner.

An outer casing of 700mm diameter was driven into the first aquiclude, with the last metre being driven without removal of aquiclude material from inside the casing. The average depth of the casing was 16.5 metres below ground, and care had to be taken to avoid penetrating the aquiclude.

A 550mm diameter casing was then lowered and driven inside the 700mm casing, until the extent of the first aquifer, approximately 40 metres below ground, was determined. To find the most porous areas, pump tests were carried out at 1.8 metre intervals from 20 metres down, while the casing was being sunk.

From the pump test results and bore log, screen replacement was worked out. Five wells used nine metres of screen and one well used 7.5 metres of screen, spread over about 15 metres of the aquifer.

A mixture of Bentonite and water, in the ratio of 30kg of Bentonite to 112 litres of water, had been placed in the annulus of the two casings before the inner casing was driven.

Screens used were Surescreen Mk2 heavy pattern AISI Type 304 stainless steel, with an outside diameter of

Richardson's RB22W cable tool rig working on one of the bores sunk in the Hutt Valley as part of a major extension of the artesian water field. At left are two 17-metre-long screen strings ready for placing

508mm and a slot size of 2.5mm. The screen construction used wedge wire profile SH190 with 100 support rods of SR320 section, and had an open area of 34.48 per cent and a collapse strength of 12.44kg/sq cm (177psi).

The screens were placed over such a wide area so as to use as much of the aquifer as possible. Pump tests revealed that the gravels were more porous in some areas than in others.

The following results came from the Mahoe Street well:

- At 22.5 metres, flow was 680 litres/min with a draw down of 2.515 metres.
- At 24.3m, flow was 680 l/min with draw down 3.565m.
- At 26.1m, flow was 760 l/min with draw down 0.890m.
- At 27.9-29.4m, flow was 300 l/min with draw down 4m.
- At 29.8-31.2m, flow was 680 l/min with draw down 3.19m.
- At 31.7-32.7m, flow was 830 l/min with draw down 1m.
- At 33.4-34.4m, flow was 830 l/min with draw down 0.6m.
- At 35.2-36.6m, flow was 680 l/min with draw down 3.35m.
- At 37-38.1m, flow was 55 l/min with draw down 4.7m.

The gravel from 25m down was more compact, allowing up to 1.5 metres to be bailed from below the mouth of the casing, and pump testing of a greater area of gravel.

The screen string was manufactured after screen placement had been finalised. Spacing between screens was made with mild steel casing.

At 17-metres-long, the screen string was made in two sections and taken to the job, where the site joint was made.

Once the screens were in place the casing extraction operation commenced. The first few metres of 550mm casing was a little difficult to move – a 200-tonne jack would not shift it from one of the six holes – so a vibrating hammer, using a four-tonne pull, was used to start the job which was continued with hydraulic jacks.

Well development was carried out in two-metre sequences, due to the length of the installed screen, in the following sequence:

- Pull back casing two metres to expose screen.
- Develop screen using surge plunger.
- Pull back casing to expose a further two metres of screen.
- Block off the previously developed two metre section with a metal chip and sand mixture.
- Develop newly-exposed section.

The pattern was repeated until the screen was fully developed, when the metal chip and sand mixture was removed from the inside of the screen. It took on average 100 hours to develop each nine-metre-long screen section.

Test pumping was a stop-start affair because of the tidal influence on the aquifer. Each well had to be tested to a rate of around 11 500 litre/min.

Testing was carried out with a 25cm shaft Berkley pump, while measurement of the flow rate was done with an Orifice plate.

The procedure was to start the pump and set the desired rate of flow. Water levels were monitored until the flow stabilised, and, excluding the tidal influence, once the pumping level was stable the pump was turned off and the static water level was recorded. Draw down level could then be calculated.

It took on average two hours to get the pumping level to the full flow rate, and the average time for pump testing on production bores was five hours.

Special difficulties included the tidal influence that could be as much as one metre between high and low tide, and the complete operation was conducted in a residential area that had little natural fall or waterways to handle pump test water.

Ancillary pumps often had to be used to push the test water away through creeks and stormwater drains, yet despite this some localised flooding did occur from time to time.

Rubbish skips of 2.25 cubic metre capacity were used to handle the spoil from each well.

Dual-tube technology expected find to special role

DUAL-TUBE drilling is a useful accessory to extend the range of conditions under which a drilling rig can be operated.

And it will in time be accepted as a system with its own particular advantages, according to Mr George Fyfe, general manager of Drilco Industrial, Australia.

He was speaking at the 1981 New Zealand Drillers' Federation annual conference and drilling school, held in Wellington in August.

Dual-tube drilling is based on an enclosed circulation principle. It uses two drill pipes, one mounted within the other, to carry bottom hole cuttings to the surface through the inner tube without unduly disturbing the walls of the hole.

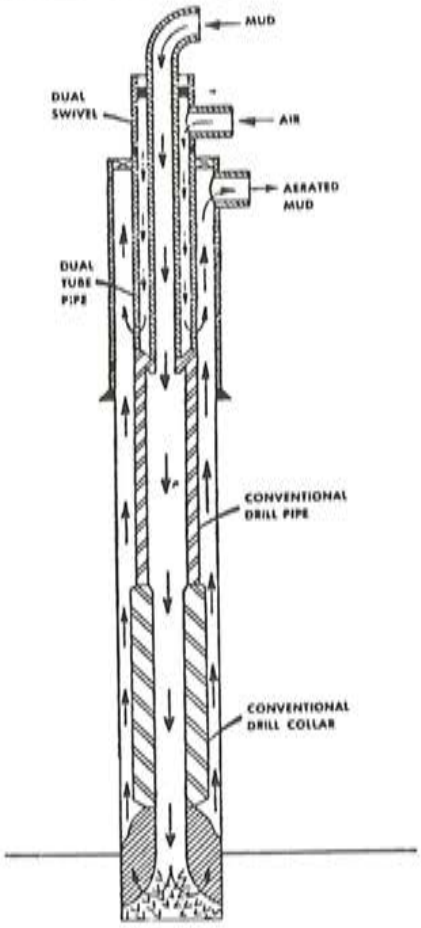
The system has been used for oil wells and large holes since the first patents were granted in 1892. It has lately been adapted for the smaller, more mobile, rigs used in water well and mineral exploration and is available locally in sizes from 6.67-35cm diameter.

It can be used in a wide variety of conditions and, although a number of rigs are designed solely for closed circulation, it is preferable to look on the system as an additional tool to expand the use of equipment rather than as a complete answer to all problems, Mr Fyfe said.

Because the system is self contained, it is apparent that drilling can be carried on under conditions of lost circulation, in areas where cavities are likely to be encountered, and in unconsolidated ground where a hole could collapse if open hole drilling was attempted.

Because of the enclosed circulation, an uncontaminated sample can be recovered from the bottom of the hole. The sampe cannot pick up on the way to the surface and thus give a doubtful picture to the geologist.

"In this environment, and using drilling methods which will produce a sastisfactory chip sample, a much more accurate reading of the subsurface strata can be obtained. Usually samples obtained in this manner will give almost as much information as a core, and at greatly reduced cost," Mr Fyfe said.



A diagram showing how cuttings are air-lifted in a dual-tube drilling system

Air and fluid circulation can be used with dual-tube drilling, and most common sample collection methods are readily adapted. This factor highlights another advantage: it is possible to continue drilling much deeper below the water table than conventionally, especially when using a hammer.

Another major advantage in the water well industry is that the system is simply converted to jet lifting, which will allow smaller rigs to cut much bigger holes than by more orthodox methods.

In Tucson, Arizona, water wells of up to 66cm diameter are being drilled by a mobile rig previously drilling holes of a maximum 30cm diameter.

Continuous coring is also possible with the dual-tube system. It requires core catchers to be fitted to the rig, but it does make a drill rig more universal in its operation.

Mr Fyfe said that the system will not replace the diamond coring rig. Because of the annulus to be cut, the dual-tube system is slower than normal diamond drilling, but that is compensated to some extent by its ability to continue cutting as long as the bit is effective.

Dual-tube drilling is adaptable to all types of rotary drilling, including drag bits, roller-cone bits, coring bits and hammer drilling, with only a minimum of special equipment. Most can be used with a conventional drill string without alteration.

The necessary equipment to convert an existing rig is made locally and consists of the special drill pipe, in a range of sizes, a special side inlet, skirted bit subs, and hammer subs.

Most top-head drive rotary rigs need only minor alterations to their circulation systems to accommodate the dual-tube and the changes do not interfere with normal operations. Kelly-drive units require a new kelly bar with an additional inner tube and special connections, along with the plumbing alterations.

Most modern rigs include some form of cyclone sample collection system, which an be readily adapted to dual-tube for dry sample collection. But in wet conditions special systems may be needed to collect a semi-dry sample.

Mr Fyfe said that in the short time that the dual-tube system has been available, a considerable amount of work has been done with the system in Australia.

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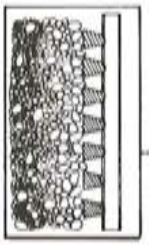

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Slicks bore and supresses dust.
Packed in 20 litre cans and 200 litre drums.

(Available now ex-store)

DRIL–MIST

Misting Agent for Injection into air stream.
Packed in 20 litre cans and 200 litre drums.

(Available September 1981)

DRIL–FOAM

Polymers and Misting Agent contained in Liquid Form in 5 litre Flagon which is added to empty 44 gallon drum and filled with water. Injected into air stream will give returns from bore as a stiff biodegradable foam. Four 5 litre Flagons to carton.

(Available September 1981)

DRIL–VIS

Powder Product, easily soluble with little agitation.
Instant viscosifier suitable for all drilling conditions, particularly for site investigation work.
Packed in 3/4 Kilo Polypots – twelve to carton.

(Available August 1981)

DRIL–POL

Powder product, rapidly soluble viscosifier, improves core recovery in fragile formations and can be used in ordinary rotary drilling muds as a base material.
Packed in 5 litre Flagons - four to a carton.

(Available Mid-August 1981)

DRIL–TROL

Granular product for viscosity and clay control. Effective in fresh water, salt and KCL fluids. Prevents clay and shale problems such as swelling, sloughing and bit balling.
Packed in 1 litre Polypots - twelve to carton.

(Available October 1981)

CONTACT:

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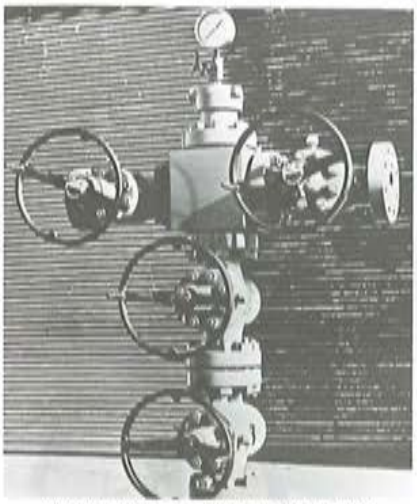
Telephone — 84397 Telex — NZ31383 Cable — Drill Fluid



A Christmas tree gate valve

Wellhead gear from Aussie

AUSTRALIAN DRILLING and wellhead equipment, gate valves and control systems for the oil and gas industry are now available in New Zealand.

The equipment, made by Cameron Iron Works, of Melbourne, covers a range of sizes, pressure ratings and trims suited to all well conditions and is already in use in Europe, Japan and the United States.

Well-head housings, spools, casing and tubing suspension equipment for land and platform applications are tested for working pressures up to 69 000kPa, and christmas-tree gate valves are tested to 34 500kPa.

The company manufactures all items for use below the rotary table and above the casing, including collet connectors, marine risers, marine well-heads and casing and tubing systems. Other products include threaded and sub-type casing connectors for casings 50cm in diameter and larger sizes. Information from

Cameron Iron Works Pty Ltd
Box 105
Mordialloc Vic 3195
AUSTRALIA

New pump from Mono

THE DEVELOPMENT of a special Mono borehole pump to suit the requirements of an overseas customer has major significance for rural New Zealand, according to manufacturer Mono Pumps (New Zealand) Ltd.

The pump is believed to be the first Mono-type pump in the world to yield a maximum 9 900 litres (2 200 gallons)/hr from a 100mm inside diameter bore at a total head of 120 metres.

The new pump, a 620A, has a substantial capacity despite its small diameter and is suitable for many hundreds of bores throughout New Zealand.

Apart from its ability to work in depths of up to 120 metres, a requirement in some places, it can also be used to bring water to the surface as well as reticulate from the bore. The dual role can mean cost-savings because the pump will do the work of two.

The usual method of reticulation from a borehole is for a secondary unit to be used to either pump the water to discharge points around the property, or pump water to holding tanks, or to a dam for gravity reticulation.

If a 620A is used to bring water to the surface from 66 metres down, the same pump can move the water to discharge points nearly 100 metres away, saving the farmer up to 20 per cent in capital costs.

In its dual role the new pump could also be used for modest irrigation, domestic water supply, or for watering livestock within a 5km radius of the bore, depending on the geography of the area.

Mono manufacture in New Zealand a model 320 size with a maximum outside diameter of 66mm (2⅝") on request. Capacity is 2 000 litres (550 gallons)/hr at a maximum head of 120 metres.

Mono borehole pumps have a two year warranty and are ideal for pumping fresh sandy, or silt-laden water, with electric, petrol, diesel or kerosene drivers. Work is already in progress to extend the borehole range, manufactured at the Mono factory in Auckland.

Device ups efficiency

AN INCLINATION instrument that could mean less drilling and more effective blasting of benching holes has been developed by Atlas Copco.

Called DSA80, the instrument provides rapid and accurate alignment in all directions encompassing the horizontal plane and in-hole inclinations of 0-45 degrees against the vertical plane.

It is adaptable to most benching rigs and gives high precision irrespective of the position of the rig. It indicates only the position of the feed beam, allowing the rig to be set up according to the terrain.

The drilling direct is set by aiming one of the sights against a distant fixed object in the drilling direction or at a 90 degree angle to it, in most cases parallel to the edge of the bench. By aligning the patterns, the feed beam can then be accurately set in the desired position.

Correct alignment is achieved when both patterns merge into parallel, horizontal lines.

The DSA needs no electricity or other power and used with inclinations of 3:1. Atlas Copco estimates that it enables drilling per unit volume of rock to be cut by 10 per cent, thus improving overall drilling economy.

"Camouflaged drill rigs—part of the Beautify America Program."

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