

# Four Decades in the Mining Industry

## PRESIDENTIAL ADDRESS

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### INTRODUCTION

Most presidential addresses are in the nature of a review of some specific topic and this will be no different. In thinking about the subjects which might be suitable for this address I decided that as next month will see my retirement from the gold mining industry I might review the four decades since I started in the industry in 1929. These four decades have been more than usually interesting and exciting. They have covered a period when the price of gold increased from the old figure of 84/- an ounce to the price of \$35 an ounce today, taking in on the way at least two periods of premium sales from which the producer benefitted. The industry in these four decades has survived the most totally destructive war in history and has seen fundamental changes in the political, economic and governmental life of South Africa.

There have been great technological changes and improvements, some of which I shall refer to later, and in addition there have been profound changes in the relations between employer and employee in the industry which have affected not only the economy of the industry but the traditional thinking of both management and labour.

I believe that the address presented to this Institute on the occasion of its 75th Anniversary by Mr Goode covered more than adequately the history of the Institute and the part it has played in the mining industry of South Africa. It would be merely repetitive, therefore, to discuss the affairs of the Institute of Mining and Metallurgy. Having said this, however, it is also necessary to point out that the history of the Institute is, and always will be, an important record of the history of mining in South Africa. There are many facets, however, on which we ought to look back and to re-examine.

One of the most rewarding, but at the same time one of the dullest, places to look for historical facts is in the annual reports of the Chamber of Mines. I suppose that some of the dullest of these have been the reports for which paragraphs have been prepared by me personally. The notes which follow do not claim to be anything like a full record of this exciting period.

### RISE AND FALL OF THE GOLD MINING INDUSTRY

In talking about the mining industry of South Africa it is inevitable that one talks, particularly in the historical sense, about the gold mining industry — an industry of fundamental importance which has made South Africa what it is and which has been dying since the early part of this century.

In Table I is shown the progress of the gold mining industry measured by its output of ounces of fine gold from the beginning of operations until the end of 1969, and if you are interested in the productivity of the men who work this industry the table, composed entirely from

figures set out in the Chamber's annual reports, also shows the production of gold expressed as fine ounces per European and fine ounces per Bantu worker over a long period. If you are still minded to think of this industry as dying then the last column in the table shows how uranium has played such a vital part in the prosperity of the country.

TABLE I

GOLD, SILVER AND URANIUM OXIDE OUTPUT OF THE TRANSVAAL AND ORANGE FREE STATE FROM 1910 TO 1969

Sources: Government Mining Engineer and Chamber of Mines Annual Reports.

Year	Gold — fine ounces			Uranium oxide produced lb.	Silver output fine ounces
	Total production	Production per employee in service			
		Whites	Non-Whites		
1910	7 527 108	296	39		823 752
1911	8 249 461	328	42		894 333
1912	9 107 512	374	44		1 018 253
1913	8 798 336	386	54		952 928
1914	8 394 322	384	47		890 562
1915	9 093 902	397	41		965 915
1916	9 296 618	401	45		968 895
1917	9 018 084	391	49		938 111
1918	8 418 292	365	52		877 488
1919	8 331 294	352	48		891 264
1920	8 158 226	358	44		892,188
1921	8 128 681	378	45		830 338
1922	7 009 767	482	41		1 117 642
1923	9 148 771	495	48		1 375 529
1924	9 574 918	496	50		1 399 616
1925	9 597 573	477	51		1 160 068
1926	9 954 762	485	51		981 333
1927	10 122 459	469	51		1 011 736
1928	10 354 157	462	50		1 031 376
1929	10 412 326	459	51		1 031 779
1930	10 716 349	471	50		1 050 038
1931	10 877 708	466	49		1 063 050
1932	11 557 858	479	51		1 120 668
1933	11 012 340	420	45		1 065 011
1934	10 479 194	349	39		1 002 203
1935	10 773 041	314	36		1 042 203
1936	11 335 094	301	35		1 075 625
1937	11 734 553	290	36		1 100 641
1938	12 161 375	283	35		1 135 374
1939	12 821 061	283	37		1 182 516
1940	14 046 496	328	37		1 292 272
1941	14 406 761	331	36		1 482 836
1942	14 126 290	336	37		1 477 513
1943	12 804 318	313	39		1 334 036
1944	12 279 629	313	38		1 213 051

TABLE I (Continued)

Year	Gold — fine ounces		Uranium oxide produced lb.	Silver output fine ounces	
	Total production	Production per employee in service			
		Whites			Non-Whites
1945	12 224 222	320	37	1 236 190	
1946	11 926 999	286	36	1 203 978	
1947	11 200 266	275	35	1 147 694	
1948	11 584 668	283	39	1 170 934	
1949	11 704 994	283	37	1 159 375	
1950	11 663 570	258	36	1 119 135	
1951	11 516 450	248	36	1 162 588	
1952	11 818 681	252	37	1 176 433	
1953	11 940 615	249	38	1 193 152	
1954	13 237 111	266	40	1 235 418	
1955	14 601 395	287	42	6 609 518	
1956	15 896 684	311	45	8 736 023	
1957	17 030 737	344	48	11 407 774	
1958	17 656 442	362	49	12 497 395	
1959	20 065 478	394	50	12 888 740	
1960	21 382 559	419	53	12 817 479	
1961	22 941 396	456	55	10 936 591	
1962	25 491 922	512	63	10 048 400	
1963	27 431 942	566	69	9 064 704	
1964	29 111 524	622	74	8 890 452	
1965	30 553 874	678	79	5 884 649	
1966	30 879 700	697	81	6 572 290	
1967	30 532 880	708	82	6 427 287	
1968	31 089 686	753	82	7 765 763	
1969	31 276 577	774	85	7 957 765	

These are facts, but I am no prophet and the future of the mining industry is a form of prophesy which only the exceptionally brave would ever dream of making.

I personally, like so many of you, have seen the expansion of the East and West Rand. We were, in a manner of speaking, present at the birth of the mines in the Orange Free State and have had more than a little to do with the development of the Far West Rand and the Klerksdorp district. We have watched the mines of the East Rand die off slowly and inevitably and have seen their places taken by the gold fields of the Evander district. We have watched the great mines, some of the greatest in the world, close down in the Central Rand. Some of these mines went down to really great depths without very much fuss being made. Along the Near East and West Rand we have seen the same process at work and, last of all, we have seen the belated realization of the Government that it should assist in keeping the production of gold up to as high a level as possible, pending an increase in its price. Such an increase would unlock millions of rands worth of unmined gold in some very great old mines. Some of these mines can never be re-opened, no matter to what price gold might eventually rise; and some of these old mines, spread along the line of the original Witwatersrand, are mines whose spirits still live on today. For a mine can have a spirit, almost a soul — a distillation of the spirits and minds of those who worked faithfully in them. Perhaps the world will come to realise that, apart from any monetary value, gold will always be a sought-after metal for man's and woman's adornment, and when this fact is properly appreciated the price of gold will really reach its true value.

There are many things by which the value of an industry to a country can be measured, but whatever happens in the next three decades it must always be appreciated that it is not merely the material things which the mining industry has given to South Africa but the incentive and the means to build from an unproductive semi-arid veldt an important industrial complex. There are, however, specific areas of endeavour and change in the last 40 years which we should examine.

#### TECHNICALITIES

The years since 1930 have seen a steady improvement in mining techniques in almost every department. Even the war years were responsible, with shortages and war-time difficulties, for advances in many techniques and departments, particularly in teaching men the value of improvisation in the face of acute shortage.

The greatest advance in mining techniques, and certainly the most spectacular, has been in shaft sinking. Up until the end of World War II hand cleaning was the recognized, practically the only, method of cleaning sinking shafts. I count myself exceptionally privileged to have been at Van Dyk mine when a Priestman level cut grab was used for the first time in a shaft. It was slung from a jib attached to a sliding framework on the side of the shaft. The first use made of this grab was in 1946 during the Native strike. However, from the point of view of the development of the grab the strike was over too soon and the teething troubles from which the machine suffered were too severe to allow us to continue holding up shaft sinking when the Native lashing crew had returned to work and were standing by. After this episode a change was made to the cactus type of grab and from then onwards the story of shaft sinking is one of continual progress.

Another innovation which I think was developed at Van Dyk was the so-called octopus for spreading concrete from the Blaw Knox bucket. Yet another innovation at the Van Dyk shaft was the use of curved, rapidly locking wall blocks behind which the concrete grout was poured. Here again in shaft wall support many improvements have been made. These improvements have also extended to the types of stage hoist and stages. The sinking stage has developed into a multi-deck affair, lacking only a cocktail bar to make the sinker's life happy. This is a far cry from the days when circular shafts were put down with a single deck stage, usually without any covering at all. Stage hoists too have developed until they are instruments of real precision and not the hit-and-miss affairs of the days when a stage hoist was quite often a converted steam hoist specially geared down.

South African engineers have demonstrated their ingenuity in bringing this country to the state where no mining industry in the world can compete with us for sheer speed and efficiency in shaft sinking. In shaft equipment, too, great ingenuity has been shown in such things as buntons and guides, and shaft dividing walls. Ventilation pressures today are very great and the walls put in to divide the shaft have to be of great strength.

The next area of great advances is that of exploitation. If one were asked to name the most important advance in this area the answer would probably be the development of scientifically designed mine lay-outs. These lay-outs depend now for their design chiefly on a thorough appreciation and understanding of the science of rock mechanics and its application to the design of areas of excavation at varying depths. Hand in hand with this

development, however, has been an appreciation of the part that ventilation has to play in maintaining an environment in which men can produce the maximum possible amount of work under the particular conditions of the mine's design.

Having improved the mine in so far as its lay-out and ventilation are concerned, it is necessary to consider whether or not other developments have kept pace. It is certain that in the last 30 years there have been great improvements made in the methods of drilling, blasting and breaking rock. Most of us can remember the difficulties experienced in the first designs and application of tungsten carbide in rock drills. Some of you have probably done as I have done, namely, devised a new pattern of holes for a development end and blasted the end either hole by hole or by groups of holes, and going in after each blast to see what had happened. No doubt the asthma and coughs which now afflict us are not due only to excessive smoking but are the price to be paid for discovering the fastest way to advance a development end.

There is one area, however, in the exploitation of mines where there is little if any improvement. I refer to the moving of broken rock on dips varying from, say, 37° down to flat. Almost continuously in the last four decades attention has been given to the various methods of cleaning broken rock from stopes. The track and gully method has been abandoned for a scraper system. Many mines have abandoned this in turn to go back to the track and gully system. Competitions have been held to find an effective, simple and reliable mechanical device for cleaning stopes, and we seem to be just as far from the ideal as we were in the early days. The lashing boy with his shovel is still a significant figure in the South African mining scene. The latest development is a rock cutter. Your guess is as good as mine as to the future of this device and it will be a brave man who would dare to prophesy what the future of rock breaking will be.

We have seen in our time vast improvements in the productivity of workers in mines. There have been great improvements in the tonnage duty of the underground labourer. A portion of this improvement is due to improved methods and equipment, and here one thinks of the application of concentrated drilling and blasting at the expense of bench mining. I believe, however, that the greatest part of the increase in productivity is due to more sophisticated and better understood training methods applied to all those concerned in breaking and handling rock.

We have seen also the service in mining, sampling, surveying, hoisting and pumping all improve slowly with the years. In the Orange Free State and on the Far West Rand, however, we have had the tragic effects of uncontrolled underground water rushes. This in turn has led to a very great improvement in pumping techniques, diamond drilling and cementation.

What has happened to the broken rock on surface? Here I would venture to suggest that no startling metallurgical changes in the gold extraction process have been as important as the impetus towards metallurgical and chemical development which resulted from South Africa's entry into the uranium market. With the versatility for which this industry is renowned, problems hitherto undreamed of in the beneficiation and reduction of ores containing uranium come about almost overnight. Reference to the Joint Symposium arranged by five of the constituent societies of the Associated Scientific and

Technical Societies of South Africa (which included this Society) a report of which was published in 1957, will bear out what I have said.

At every turn the industry is making extensive use of aids such as the sophisticated use to which computers can be put. A computer man's creed, according to an article in "The New Scientist" of July, 1967, would probably start with the tenet that "The computer is a good thing, a boon to mankind and that Parkinson is its prophet. The falsehood that the computer is inimical to efficient organisation because it encourages over-centralization, discourages delegation and diverts power to statistical megalomaniacs is probably as much a canard as that it produces redundancy, since the total saving in manpower when computers are installed is almost inevitably swallowed up in the large number of new posts created for project planners, system analysts, computer programmers, hardware salesmen and general handmaidens."

## HUMANITIES

In the last resort, however, industries depend on men to work them, and it is here that the greatest changes have occurred in the mining industry over the years. The whole world has come to realise that the worker in industry, whether he be a labourer, a technician or a supervisor, or indeed a manager, has to be treated and studied as carefully as any fine piece of machinery.

When considering the last 40 years, however, there is one striking development clearly brought out by the statistics which are published regarding employees in the industry. Whether it is because the industry is said to be dying, or whether it is because of an improvement in efficiency, the number of persons at work, particularly Europeans, has declined. The disturbing phenomenon, however, is that the proportion of officials necessary to supervise work has increased. The increase can be shown to be largely in the service departments and the clerical and administrative departments. The actual proportion of supervisors of work — in other words, production officials — has remained about the same. This is probably symptomatic of a world which is slowly running aground on the debris of bureaucracy. Nothing can be done without questionnaires, forms in quintuplicate, circulars whose volume is measured by the ton of paper, and all the trappings of a society helplessly bound in red tape. It has been said that a discarded toffee paper could not be blown around by the wind in Hollard Street because it would be seized upon, catalogued, indexed and filed. The really sobering thought, however, is that major decisions of policy could easily flow from the capture of our wind-blown toffee paper.

Prior to 1930 the gold mining industry, in common with other industries in South Africa, was clawing its way out of the tensions and frustrations which followed the First World War. The world had been in a turmoil economically and South Africa had seen just how badly a depression could affect a small, not very heavily industrialized, country.

After the strike and rebellion in 1922 the mining industry tried to return to normal. The industrial Conciliation Act was promulgated in 1924 — a piece of legislation which has stood the test of many years and, despite certain amendments, is still a model for the sensible conduct of industrial relations. It was necessary for the various agreements between employer and employee groups to be re-written, since these were all abrogated after the 1922 strike. It says a great deal for

the commonsense of both sides that these re-written agreements lasted for many years, being changed only by major improvements in the industrial set-up in the industry and usually as the result of co-operation from both parties in the resolution of a dispute in the granting of a request.

In 1934, after the benefits of leaving the gold standard had been clearly demonstrated, the Chamber of Mines agreed, not without misgivings probably, to meet the Unions sitting together in a common body — the Mining Unions' Joint Committee. In this single act the employers recognised that collective bargaining had an important place in industry. The year 1934 also saw the introduction of a procedural agreement between the Gold Producers' Committee and the Mine Workers' Union. This agreement, which has not been re-written since, sets out very clearly the agreed methods of handling disputes. It can be said with some certainty that the agreement has been scrupulously followed by the industry and it can also be stated with some regret that the Union has on many occasions ignored this agreement or, rather, has condoned breaches of this agreement by local bodies of its members when it suited their purposes.

One of the most important findings of the Commission of Enquiry which investigated the causes and effects of the 1922 strike was recognition of the undesirability of the amount of power in the hands of union stewards before the strike. After the strike recognition of all union stewards was completely withdrawn. In the years following the War many attempts were made by the Unions to have their stewards recognised and a temporary arrangement was instituted with the Mine Workers' Union whereby a member could be accompanied when visiting management by a fellow workman who was not connected with the particular dispute concerned.

In 1970 it was finally agreed to recognise union stewards under certain well-defined conditions, and in the instrument setting out the terms of such recognition there are fresh arrangements for handling disputes, taken largely from the 1934 agreement with the Mine Workers' Union. As a consequence there have been some slight changes in the 1934 agreement.

Another large step in the relations between the employer and the employee in the mining industry was taken in 1937, when a "closed shop" agreement was signed between the Unions recognised in the mining industry and the employers. This was an important step. Not least among the benefits which have been conferred on the industry by the 'closed shop' agreement is the fact that the industry does not need to recognise more than one Union committee for each particular category of employee or trade. There are some obvious disadvantages in having a 'closed shop' but it is fair to say that the industry has gained more in the way of stability by having the existing 'closed shop' agreement than it would ever have had in a 'free-for-all' where all sorts of break-away Unions could cater for small sections of the men in each trade, all out-bidding each other when it came to negotiations over matters such as pay, etc. In this country, too, there is an unfortunate trend towards the emergence of Trade Unions with extreme politically orientated ideas and these have not been able to bid for employees' loyalty, a situation where men in the same trade were split up in groups differing in political outlook.

After 1937 the affairs of the industry's European workers, when these affairs were the common lot of the majority, were settled by conference with all the Trade

Unions, only minor domestic matters being handled on the basis of discussions with each separate Union. There was no regularity in these meetings and throughout the War years and the early years after the Second World War this was the accepted pattern.

In 1947 the Mining Unions' Joint Committee submitted a large number of requests for improvement in working conditions of mine employees. Because of the large increase in working costs that would result, the demands made by the Joint Committee were refused. The Joint Committee then approached the Government and early in 1948 the Prime Minister of the day convened meetings between representatives of the Government, of the Joint Committee and of the Gold Producers' Committee. As a result the Government decided to appoint a Commission of Enquiry, the terms of reference of which were to enquire into and report upon the remuneration and conditions of employment of daily paid employees on the gold mines, with special reference to their claims in respect of wages, hours of work, leave conditions and the establishment of a pension scheme. The Commission was also given the task of considering the effect of any variations in the conditions of employment upon the gold mining industry itself and upon, and in relation to, the general economic and financial position of the country. The Commission was under the chairmanship of the late Dr H. J. van Eck. An exhaustive investigation was commenced and every facet of the mining industry studied in detail.

At about the time that the Commission presented its report to the Government towards the end of 1949, devaluation of the South African currency took place and as a result considerable benefits accrued to mine employees. There was an immediate increase in wages, a cash payment to each employee, the consolidation of existing medical benefit allowances, an improvement in the holiday leave allowance and certain other fringe benefits which had long been the subject of discussion between the Gold Producers' Committee and employees on the mines. One of the most important benefits was the provision of a contributory pension fund for the daily paid workers. This belatedly followed the granting of a pension fund for officials, who obtained it as far back as 1946. It is regrettable to have to state that the delay in the provision of a pension fund for daily paid workmen was almost entirely due to Union opposition to a pension fund.

In 1934, when an attempt was made to introduce a pension scheme for employees on the mines, a pension scheme was in fact drawn up by a committee consisting of employees from the mines, in which the Chamber took no part whatsoever. The only interest the Chamber had lay in whether it was the unanimous desire of all employees to operate this scheme and whether it could be made a condition of service. A ballot was held and as a result the idea of a contributory pension scheme was dropped. There is no doubt that a great deal of distinctly underhand agitation against the scheme took place before the ballot. As a result of the ballot the industry thereupon introduced the Provident Fund which has operated ever since. In 1946 mine officials asked for the introduction of a contributory pension fund, and this was granted.

It is a sad commentary on human behaviour and the opportunism of Trade Unions that the fact that the men themselves delayed the introduction of a pension fund for 11 years has been completely lost sight of, and the comparatively small amount of the present pensions is used as a rod to beat the employers' back. The employer

in the mining industry has done as much as could be reasonably expected and there is more arrant nonsense talked about pensions in the mining industry, and unfortunately believed in political circles, than would seem possible in a modern civilised State. The employer has also been ready at all times to consider sensible improvements in the funds, but picking at this particular sore has always been a popular pastime for electioneering purposes, whether it be in the parliamentary elections or purely for Trade Union political purposes.

The other important gain as a result of the changes brought about by devaluation was a formalizing of the contacts between employer and employee. From November, 1949, there have been monthly meetings between the employers, represented by the Gold Producers' Committee, and the Union representatives represented by, in the first place, the Mining Unions' Joint Committee. Regular meetings, despite administrative difficulties and cumbersome clerical procedures, have brought employer and employee together and to a better understanding of each other's problems. Later, the Mining Unions' Joint Committee turned itself into the Federation of Mining Unions and, still later, due to a divergence very largely on political lines, the Federation split into two parts. On the one hand there was the so-called Federation of Mine Production Workers, which included the Mine Workers' Union, the Engine Drivers' and Firemen's Association, and the Reduction Workers' Association; and on the other side there was the Federation of Mining Unions which catered for all the Trade Unions responsible for the affairs of artisans.

At about the same time, in order to speed up the discussions between employers and employees, the Industrial Relations Committee was brought into being by the Gold Producers' Committee. This Industrial Relations Committee was representative of the various committees of the Chamber and the Managers' Associations. Both gold and coal mines were represented and at the first few meetings with the Unions it was clear that an important channel of communication had been opened. However, the work of the Committee was very soon brought to a complete standstill by the inordinate number of demands made on it by one of the Federations. The demands were of such a magnitude, and covered such a wide variety of fundamental changes and conditions of service, that it was quite impossible for a negotiating committee, which did not have the ultimate power to make decisions, to cope. Thus, what should have been an important step in the employer/employee channels of communication was wrecked by the complete irresponsibility of Union leaders who at this stage had better be nameless. It was finally necessary for the Gold Producers' Committee to attempt to bring the two Federations together into a single negotiating body and to deal with this body itself, leaving the Industrial Relations Committee to deal only with matters of purely domestic scope with the Trade Unions concerned.

The latest development has been that the two Federations have come together again for joint consultative purposes under the title of 'The Council of Mining Unions'.

Apart from a number of incidents sparked off by internal strife in one Union, the last four decades have shown a period of almost unbroken peace in the mining industry. This is not only due to forbearance of both employer and employee representatives but it is contended that the system itself leads to this sort of attitude.

The whole trend of events has shown that only when the lines of communication are completely unclogged

between the men and the manager can there be industrial peace. No stratagem such as industrial councils or other means will achieve any lasting results unless there is this desire to get together and talk over difficulties.

The machinery for keeping peace in an industry, however, does not produce men for the industry, and this is the situation which the mining industry, in common with all other industries in South Africa, is facing. There is a shortage of skilled responsible manpower and, in an industry where the colour bar was enshrined in law as far back as 1910, there can be acute problems presented under present-day conditions of a general shortage of manpower. This shortage is not common to South Africa. It exists all over the world and the quicker it is realised that every reasonable logical step must be taken to remove artificial restrictions, the better. Time and again the industry has had to stand by and see its reasonable endeavours to make everyone take one step up the ladder frustrated either by shortsighted Union policy or (and this is regretted) by political expediency given effect to by Government departments.

It seems that this is the time when men, not only of goodwill but of commonsense, should get together and examine methods for using all the manpower in South Africa to the best possible advantage.

#### TRAINING AND EDUCATION

In this area the industry has in four decades made reasonable progress. There are many training schemes developed and put into operation by the industry and by individual Groups to provide almost every class of skilled worker that the industry needs.

The Government Miners' Training Schools, which were started in 1916, is an example of a fruitful collaboration between the Government and the industry. In the structure of these schools the Government pays two-thirds of the capital expenses while the industry bears three-quarters of the maintenance and running costs. Here the young European, usually taken on just before his 18th birthday, is given a thoroughly practical training, leading to the issue of a blasting certificate and his absorption into the industry as a fully trained miner after about 480 shifts. It should be noted that great emphasis is placed on a thorough training in Fanakalo and a complete knowledge, by actually doing the work, of all the manual tasks performed by Bantu workers. There have been, over the years, considerable changes brought about in the Government Miners' Training Schools, not the least of which are the improved living facilities and the emphasis on placing these lads under the care and tuition of skilled miners.

Throughout the industry training centres for mechanic apprentices are coming into operation and the industry is beginning to take the point that the only people who should be allowed to teach are those who are specially trained to do so. That this policy is paying dividends can be gauged from the fact that the percentage of passes in the trade tests for apprentices has gone up to a figure at least comparable with those of other industries in the country. There is the need, however, completely to overhaul the whole apprenticeship system. In a world of modern teaching methods and devices there is need for a drastic reduction in the period of apprenticeship. There is also the need to train the brighter lads for dual trades, for example, the electro-mechanic, and it should be the earnest desire of everyone connected with all industry to endeavour to rationalize a situation where a man who, purely by the effluxion of time, has become

an artisan and is paid the same rate as another who has voluntarily sat for and passed his trade test at the earliest possible opportunity.

All Groups have training schemes and central establishments for training the learner officials who are recruited by the Chamber for the industry. This training is on a wide basis and includes lectures either at technical colleges or at the central establishments, by lecturers from the colleges. An excellent preliminary education in mining is given and it has been most interesting to note over the years the change in the attitude of the industry towards the technical education of its junior officials.

Since 1930 one of the most important steps taken by the mining industry is the provision of bursaries for university education and the increasing assistance given to universities and technical colleges. The industry now believes that the time has been reached when there must be a closer link between technical colleges and universities so that these may complement each other in the better training of technologists and technicians. The man who cannot make the grade at university in engineering should not be lost to the industry, and would not be lost if he were encouraged to go to a technical college to take an engineering diploma. Similarly, the obviously bright youth with an A.T.C. II standard of education should be encouraged to go to university and be given credit for a great amount of the knowledge he has gained at the technical college.

There is a world-wide shortage of mining engineers. In fact, there is a world-wide shortage of engineers generally, and this is a problem which the generations following us will have to solve.

I should like to leave you with this thought; that perhaps the fault is not only with industry that so many men come forward with an engineering education and so few end up as engineers. Perhaps the engineering course in a modern university is far too analytical and is not nearly enough involved with design and practice. An editorial in 'The Engineer', published in Britain on 26th July, 1963, discussing the Feilden report put this point very well:

'Ever since the war there have been the voices of a few crying out that in this country engineering design is being neglected; that it ought to be but is not taught; that the universities are concentrating on teaching students to analyse and undertake research rather than to synthesise and undertake design . . .'

Universities turn out many round-headed long-haired little boffins whose minds click over like computers, who analyse everything from first principles, and who are completely unable realistically to design, lay out, and carry out the simplest engineering operations. They all want to get to the top before they know where the bottom is.

The greater proportion of the mining industry's labour is of course its Bantu workers. One of the most important things which the industry has done for its own very real benefit was the study carried out towards the end of the 1940's which led to the institution in all Groups of a system of aptitude testing and selective training. If this is efficiently done there should never be round pegs in square holes. But another important facet of the whole problem has been revealed. Some of those aptitude-tested have proved to be fit subjects for entry into many of the occupations which were carried out entirely by Europeans. Some of these occupations require purely menial hand labour for their completion, and it is a sad commentary on the state of mind of many people in South Africa that they would rather sentence young men

to the slogging, hard, unrewarding labour of sampling hard rock than allow the operation to be carried out by trained Bantu who are in much freer supply.

Lastly, I would remind you of the strides made in the last two decades in scientific acclimatization to heat and other physical conditions underground. The bad old days of multiple heat stroke deaths are literally a thing of the past.

## ACCIDENTS

In 1930 the accident death rate was 2.56 per 1 000 per annum. In 1968 it was 1.20 and in 1969 it was 1.55. The increase in 1969 was due largely to two major accidents involving multiple deaths.

These figures, which reveal an improvement of only one death per 1 000 per annum in service do not reveal the true situation. The highest death rate recorded was in 1909 when a rate of 5.26 was among the very high rates which caused the industry in 1913 to form the Prevention of Accidents Committee. In all accident statistics, however, true appreciation of the real tragedy and the pain and suffering that occurs is hidden. Despite all that the industry has been able to do and despite the constant efforts of people on the mines, of the Department of Mines, and of others, the incidence of deaths and injuries due to falls of ground is almost exactly the same now as it was in the middle of the 1920s. It is idle to say that this is due to greater depths and increase in pressure. These factors of course play a part but on the other side of the picture a greater knowledge of the mechanics of rock movement, more intensive research on support methods, and closer supervision of a labour force which has become more sophisticated and therefore presumably more safety-conscious, should have led to improvement.

There is a tendency to place the responsibility for the very slow improvement in the incidence of accidents on the large labour force of unsophisticated tribal Bantu. Again, there is a certain amount of truth in this, but it is interesting to note the large number of mines, at least 15, which for the year 1969 recorded a fatality rate of less than 1.0, and these mines had exactly the same ratio of Black and White workers as other mines of like characteristics. It is therefore unrealistic to persist with the argument of the influence of a large number of Bantu workers on an industry's safety record.

The true situation is that South Africa has a very bad record in industrial safety. It is certainly among the lower half of the list of modern industrial nations as regards accidents at work, and its record in so far as mine accidents and safety are concerned is no better. There are many mining fields working at great depths with considerable problems of rock pressure, heavily mechanized and subject to all the usual hazards of underground mining, which regularly each year produce an accident record measured by a fatality rate that is almost always less than 1.0. Perhaps there is some connection between industrial accidents and road accidents. South Africa again has the unenviable reputation of being the worst among all nations in so far as road accidents are concerned.

Why is it that this country has over many years proved so unsafe in its driving habits and in the prevention of industrial accidents? The reason for this state of affairs is probably to be found in the spirit of arrogance and self-sufficiency which characterizes a great number of White South Africans. Careful consideration of the evidence led at almost any accident enquiry on a mine,

or into a fatal or serious traffic accident, inevitably reveals the same sort of pattern. The general attitude is that rules and regulations are a nuisance and are meant to be obeyed by everyone else except the person who, in fact, by his wilful act causes an accident. Examples of this are frequently seen. In one of the most reputable periodicals devoted to motoring there is a constant, almost regular, complaint about the absurdity of the 70 m.p.h. speed limit. How often have we, sitting next to our friends in cars, heard complaints about the solid white line, and how often have we heard the same friends speak with bitter anger about the time they were fined for driving over it. It is the same in industry and the same in the mines where so many men who should know better complain about, and deliberately flout, regulations which have been introduced solely as the result of bitter experience in accident prevention.

In 40 years this position has not changed much, and that is why in 40 years there has not been a really significant diminution in the rate of accidents, both fatal and non-fatal, in mines.

Another unfortunate factor is that it is so easy to measure the success or otherwise of accident prevention campaigns, whether they be on the roads, in factories, or in mines, by the number or incidence of actual deaths due to these accidents. There is a far greater weight of evidence against unsafe practices in the growing volume of paraplegics, people without limbs, and in the neurological wards of most hospitals which are full of unfortunate beings who, while they are not statistics in the accident records, are doomed until the day they die to eke out the existence of a cabbage with their breathing and bodily functions maintained by electronic devices.

If South Africa is prepared to put up with a great shortage of skilled European workers then its present attitude towards the observance of the rules made to protect the lives of its people is understandable. If not, then each South African must accept the necessity to travel and work in a situation where courtesy and co-operation rather than arrogance and carelessness are the motivating factors. Eternal vigilance has been said to be the price of many things. It is certainly the price of safety.

## CONCLUSION

That was four decades. What will the next three be like to bring us to the end of the century? Only a very brave or very reckless man would prophesy the course that the gold mining industry might take in the next 30 years. As far as gold is concerned, however, there are two question marks which overshadow the industry. The first is the completely unpredictable course that movements in the price of gold might take. There are almost as many experts on this subject as people who talk about it and one is sometimes tempted to believe that the sum total of all their pronouncements means exactly nothing. The price of gold will find its own correct level in obedience to economic and natural laws. The operation of these laws is in progress now, and rather than engage in idle speculation we should be content merely to await the inevitable outcome. The other question mark is the extent and the possible effect of Government assistance to keep in production mines which are now struggling pending the change in the price of gold. Both the above questions will be settled in the very near future.

In regard to other metals and minerals one can foresee a significant rise in the level of production, for in a world which is witnessing a population explosion there will be an explosion in the demand for goods and hence a demand for the products of mining. At some time in the not too far distant future man will have to rationalize his demands on the products of the earth and their proper conservation, otherwise humanity will rush, like the Gadarene swine, into a sea as heavily polluted as everything else in nature which man has touched.

But there is hope because already this problem of waste and pollution is being evaluated and, more important, talked about. In fact, in the United States the so-called 'demos' are demonstrating against waste and environmental pollution.

This Institute and others like it have a duty to add the weight of their knowledge and authority to the efforts being made, and I am certain that all of you members of the Institute will assist to the maximum of your ability.