ngs' MR. HENNEN JENNINGS, Consulting Engineer to Messrs. H. Eckstein and Co., was then called to give evidence.

Witness said: I have resided in Johannesburg since the latter part of 1889.

Chairman.

On what points do you wish to give evidence?

Witness.] I wish to give evidence in accordance with the Chairman's statement, in order to bring to light the actual state of the mining industry of the Witwatersrand goldfields, and the reasons for the same, and my candid opinion on the present condition of affairs. I have a statement to make which I wish to read.

Witness then read the following statement:

I wish to make a statement, more or less summing up, including and extending the evidence of preceding witnesses, and to vitalise the facts and statistics set before you by a connected linking of these facts in a logical and orderly manner, and to give you my candid ideas as to the actual state of the mining [redacted]

The magnitude and wealth of these goldfields have been examined, discussed, and written upon by very many able men from all parts of the world, and they have all agreed in stating that this deposit is unique in its characteristics, and contains vast possibilities. These reefs, which are conglomerate beds, have been traced for some 50 miles; showing varying thickness and gold value, and in one point proved by the Bezuidenville borehole to a vertical depth of 3,130 feet. Mr. Hamilton Smith has happily described the fields by stating that the excellence of these mines is not due to their exceeding richness, but rather to the large continuous bodies of ore of a moderate grade, and has recognised the necessity for the best possible mechanical plants, and the most skilful and economical management. He, moreover, was of the belief that if the management were radically bad, not more than three or four mines could have yielded considerable profit. He also estimated (January, 1893) that within the then recognised paying area of the Witwatersrand goldfields, down to a vertical depth of 3,000 feet, there was probably 325 million pounds sterling worth of gold to be extracted. His statement has been corroborated by Mr. Schmeisser, a German Government engineer, who estimated at the end of 1893 that down to a vertical depth of 3,900 feet, and for a lateral extent of eleven miles, there were possibilities of £349,367,000.

nd na- f reefs d, ated of reefs.

Professor Becker, of the United States Geological Survey Department, who visited these fields in 1896, estimates the possibilities within twenty miles of Johannesburg, to a vertical depth of 5,000 feet, at about 700 million pounds sterling. Hitherto, in all gold-mining regions of the world, gold mines have been considered highly speculative ventures, and liable at any time to give out; they have nowhere else such advantageous natural conditions as here for making a staple permanent industry, nor the same justification for the great expenditure of initial capital on their equipment and development. Gold is here supplemented by coal in close proximity, ample water supply, and favourable climatic conditions. Of course there are fluctuations even here in the richness of the different mines, and there are unaccountably rich, medium, and poor mines in juxtaposition or in distinct sections. There is no doubt there are sections of the Rand which can be continued to be worked at a good profit at the present rate of costs ruling on these fields, but there is a far larger amount of ground that will not be worked, or only tried and then abandoned, if the conditions prevailing as to costs are not lowered, and the predictions of the eminent authorities I have quoted can only be realised by all parties interested doing everything in their power to obtain highly efficient working at low cost, and thus increa

ntageous litions of d.

ing the scope and possibilities of the whole fields. Take Professor Becker's estimate of 700 millions sterling. At the present rate at which we are now taking out gold, these fields would have a life of about 90 years, but the rate at which we extract this gold will be constantly increasing if the working conditions are rendered more favourable, and the life of the fields will become correspondingly shorter; this takes into no account the working of our southern low grade reefs, but only the Main Reef series. Professor Becker's estimate, too, as well as Mr. Hamilton Smith's and Mr. Schmeisser's, do not include the Klerksdorp, Potchefstroom, Heidelberg, Lydenburg, Barberton nor other districts, which, according to the figures for 1896, contributed approximately 9 per cent. to the total gold production of the South African Republic.

The State Mining Engineer, in the course of the proceedings of this Commission, has stated that there were 185 gold mining companies in 1896 in this Republic, with a nominal capital of £54,000,000.

On the Witwatersrand fields there have been about 5,500 stamps erected. The annual report of the Chamber of Mines shows that on an average 3,470 stamps were running during 1896; consequently, it would appear as if 2,030 stamps had been stopped; but this is not really so, as many have been dismantled, and new ones have replaced them. But it is a fact that there are on the fields many companies with a large number of stamps that have suspended operations, and there are several others which, during this year, will probably follow suit.

The Chamber of Mines' report shows that in 1896 there were fifty-six companies in operation: while the statements from the Chamber of Mines and the Association of Mines for March show that there are now only forty-seven companies with 3,275 stamps working. On the other hand, great energy is being shown by deep level and other companies in pushing forward work with the object of starting more stamps, and it is estimated that about 1,000 new stamps will start during the current year, if conditions are favourable. I have gone to considerable pains to obtain as far as possible the last annual report of all principal mining companies working in 1896, and which have been working continuously during the periods covered by their last annual report, and to analyse these reports; the gold returns being according to the sworn statements of their managers, and the accounts being in each case signed by the auditors and secretaries. It should be noticed that, in dealing with these twenty-nine companies, the period covered is not necessarily the year 1896 only, but embraces the actual period covered by each individual report, and often this is for part of 1895 and part of 1896, and in several cases includes periods longer than one year. This table I consider most remarkable, in that it is compiled by a private individual from published statements given freely to the world, and anybody can make out the same table who obtains the same reports. In this connection I would state that in discussing the matter of statistical information about these fields with different eminent mining men from all parts of the world, the consensus of opinion is that more generous and accurate information is given on these fields of the working of the mines than is the case in any other part of the world. In addition to the companies' reports, we have also the vast amount of accurate information collected by the State Mining Engineer, the Chamber of Mines, and the individual enterprise of C. S. Goldmann, so that the investing public should certainly be cognisant of all vital facts here with such statistics before them; and if they exaggerate the possibilities of the mines, we have nothing to reproach ourselves with. At the same time, it is regrettable that more publicity has not been given to the work of the State Mining Engineer's Department as regards the statistics of the gold industry. The Government should have been proud of this collection, and had it published in all languages, and distributed to the world. They have, I think, been negligent in this

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respect, for, although their information is most valuable, it is inaccessible to the majority of investors in these fields.

9 companies shown in analytical

Now, to return to my own statistics. The companies included in my list are as follows:—City and Suburban, Crown Reef, Durban Roodepoort, Ferreira, Geldenhuis Deep, Geldenhuis Estate, Ginsberg, Glencairn, Henry Nourse, Johannesburg Pioneer, Jubilee, Jumpers, May Consolidated, New Comet, New Heriot, New Primrose, Robinson, Salisbury, Simmer and Jack, Wolhuter, Worcester, George Goch, Langlaagte Estate, Langlaagte Royal, Meyer and Charlton, New Midas Estate, Roodepoort United, Van Ryn Estate, Wemmer. It will be noticed that there are twenty companies omitted from the total now working; a large proportion of the reports of these do not cover a full year's work, while of others I was unable to obtain copies.

ation of ical re- of 29 nies.

The only dividend companies of 1896 omitted from my list are:—

Stanhope	£1,700
Langlaagte Block B (preference shares)	6,500

The above twenty-nine companies I now divide into three groups, summing up the yields, working costs, &c., under the heads of mining, milling, secondary treatment, &c., and also give the dividends paid during the period, the capitalisations, and the interest per cent. on such capitalisations.

These three groups are:—

(*a*) Mines that have paid dividends during the period covered by their last annual report.

(*b*) Mines that have shown a profit, but for various causes have paid no dividends during the period of their last annual report.

(*c*) Mines that have worked at a loss during the period of their last annual report.

The summary of this statement is as follows:—

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Cost ton.	D
d.	
·16	
·51	
·48	
4	

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This statement shows that, even at present depressed prices, the public places a value on the shares of the twenty-nine companies, which is more than double the amount at which they were originally capitalised, and that, taking the dividend actually paid, the interest obtained by investors in the eighteen dividend-paying companies alone is 12·4 per cent., and that, if these dividends be distributed over the whole twenty-nine companies in my list, the interest obtained is only about 6 per cent. What must it be for the whole fields? It appears to me that too much stress has been laid by this Commission on company capitalisation. What, after all, does it mean to the intrinsic investor what the capital of a company is, so long as he can buy into it at what he considers a profitable price? Are not the original capitals mere guesses to establish rates of division of interest, and if the guess is too small, may not as much harm be done as if the guess is too high? The conscientious engineer and examiner of a mine simply regard capitalisations as counters, on which he places value in accordance with the probabilities of its earning power.

Mark con

From this statement of yields and costs it is seen that the cost per ton of ore milled is shown in two ways:—

(a) Cost per ton, with depreciation of plant.

(b) Cost per ton, without depreciation.

Depreciation is considered by many merely a book entry, and unfair to include in legitimate working costs.

On the other hand, most companies do not include permanent main mine works in their running costs or current construction work; therefore I think the mean of these two costs a fair average for the fields, before any dividends are distributable, and we thus obtain for the total working costs of the fields, as shown by the twenty-nine companies I have mentioned, 29s. 4d. per ton, and the total yield from all sources, including mill, cyanide works, &c., 40s. 8·31d. per ton. The cost thus arrived at is seen to correspond with all reasonable degree of accuracy with the statement made by the Chairman at the Rand Mines Meeting, and I therefore beg to hand in as evidence that portion of his speech which deals with this subject. It will be noticed that there are seven million tons of ore developed by these twenty-nine mines, which is equivalent to a cash asset of £1,750,000.

Speech o man a Mines

Another interesting feature to be noticed from the tables is that the yield from the secondary treatment is shown to be 12s. 1·14d. per ton on the basis of the tonnage milled, and working costs, 3s. 2·34d., the profit from this treatment therefore figuring at 8s. 10·8d. From this it is clearly evident that, of the total profit of 9s. 7·87d. obtained by the combined treatments, no less than 8s. 10·8d., or 92 per cent., came from the secondary treatment, without which obviously only an extremely small number of the very richest mines here could ever have paid dividends. This is a strong illustration of what intelligent metallurgical and engineering skill has done for the prosperity of these fields.

Secondar ment.

I also beg to submit a statement showing the analysis of the working expenditure of six prominent companies for the year 1896. In this sheet are given the details of costs under labour and supplies of the following:—Crown Reef, Henry Nourse, City and Suburban, Robinson, New Heriot, Geldenhuis Deep.

Analysis of ing cos Crown Henry N City an burban, R son, New lot, and denhuis

The summary of this statement is as follows:—

	Costs per ton. s. d.	Per cent. of total cost.
Native labour	6 9·62	23·73
Native food	1 2·24	4·14
White labour, salaries, etc.	8 7·78	30·18
Coal	2 4·35	8·24
Dynamite	2 10·13	9·92
Fuse and detonators...	0 1·97	0·57
Cyanide	0 8·12	2·36
Zinc	0 0·62	0·18
Mining timber	0 2·98	0·87
Timber, deals, etc.	0 4·05	1·18
Steel	0 4·21	1·22
Oils, grease, and paraffin	0 3·73	1·09
Candles	0 4·15	1·21
Ropes, steel and manilla	0 0·93	0·27
Electric spares	0 1·47	0·43
Mill spares, shoes, dies, cams, cam shafts, stems, mortar boxes, screening, etc....	0 4·59	1·34
Trucks, wheels, and rails	0 2·24	0·65
Sundry stores: bar iron, bolts and nuts, buildings, machinery, assay chemicals, pipes and pipe fittings, etc. ...	2 0·73	7·19
General charges: Insurance, licences and rent, printing and advertising, sundries	1 5·99	5·23
Totals	28 7·90	100·00

This again corresponds so closely with the statements made by the Chairman at the recent Rand Mines Meeting, that I beg again to put this portion of his speech in evidence. It will be noticed that on this sheet I submit, each Company's Secretary has placed his signature as a voucher for the accuracy of the statements.

ntage of rking costs the whole nd, from ate Mining gineer's re- rt.

In support of these figures, as being a criterion for the whole Rand, I beg to state that the following statistics were compiled from the State Mining Engineer's report for 1895:—

	£	Per cent of total cost.
White labour	2,400,000	34·3
Kaffir labour	2,000,000	28·6
Coal	700,000	10·0
Explosives, *i.e.*, dynamite and gelatine...	600,000	8·6
Mining timber and sawn lumber ...	300,000	4·3
Cyanide	240,000	3·4
Meat, mealies and mealie meal (being for the most part food for kaffirs) ...	250,000	3·6
Iron	85,000	1·2
Candles and paraffin	95,000	1·4
Tools	70,000	1·0
Steel	65,000	0·9
Mercury, zinc, and other chemicals ...	45,000	0·6
Caps, safety fuse, ropes, cement, etc. ...	150,000	2·1
	£7,000,000	100·0

This is seen not to correspond exactly with the statement I have given; a simple explanation of which is that the State statistics are for a different period and cover an expenditure of £7,000,000, which includes the non-producing as well as the producing mines, while the figures in my statement only cover an expenditure of £1,300,524.

I again wish to put in evidence the State Mining Engineer's figures regarding wages paid on these fields to white labour, taken from the report of 1895, which show:

Occupation.	Number.	Average monthly wage. £
Shift bosses	185	33
Miners	1,430	23
Rock-drill machine men	956	17
Trammers	226	18
Engine drivers	765	24
Pump men	129	23
Stokers	89	19
Carpenters	1,058	26
Smiths	638	26
Mechanics and fitters	900	26
Bricklayers	75	22
Stonemasons	213	29
Daily labourers	149	18
Mine and store clerks	287	23
Amalgamators	291	23
Cyaniders	217	22
Concentrators	35	22
Vannermen	32	20
Smelters	21	26
Various workmen	472	21
	8,168	£461

making an average of £23 7s. 10d. per man per month.

This amount is seen to be somewhat lower than that given by the manager of the Crown Reef in his evidence, which figured out at £24 1s. 10d., and which is, I believe, representative of the five other companies dealt with in this statement, but I would prefer to deal with this subject from the State statistics basis, and if there are any errors in the statement as regards the State Mining Engineer's Department, I beg that he will correct them so that they can be put in this statement on their right basis.

I also wish to vitalize all these statements by more or less culling from the history of the six companies I have given, and whose workings I am in a position to state with accuracy, and to show how these yields and costs have been arrived at, and how these whole fields compare with some of the yields and costs of gold mining in other parts of the world.

We will take the Robinson Company as the typical rich mine, and follow a little of its history. It will be noticed from its published annual reports that it first figures as a gold producer in the year 1888, and that it commenced with 10 stamps, which ran up to 1889 before being superseded by 40 new ones; that the yield per ton for its first year's work was 272s. 7·04d., and that the working cost, which then only included mining and milling, was 72s. 1·04d. per ton; that the extraction was 65 per

cent.; the machinery then erected was of a crude nature, and the mine workings rather of a prospective than a permanent kind.

Go to any old prospector and ask him the method in which he looks for gold in a new region. He will tell you that he has no great geological knowledge, but that he knows gold when he sees it; that he goes over the surface and wherever he finds an outcrop he tries it with the pan. He goes over the whole extent of outcrop that is open to him and naturally picks out the richest points at which to start work. He commences on a small scale and he works these rich parts, and as they give him profit so he extends his operations. So started the Robinson, and so was the Rand developed.

The richest mines are started first, and the richest places in these mines are selected for a start. It would have been folly to have done anything else. In the early stages there was no need of a highly trained engineer. In fact, a conscientious one would have told his principals that he had never seen any deposit like this, and he would have to be guided by actual disclosures in order to intelligently advise them.

With this digression let us return to the history of the Robinson Company.

Rob. M. Co. ROBINSON G. M. CO., LTD.—The nominal capital of the Robinson was first £50,000 in £1 shares, of which £5,000 were working capital. This small original working capital was due to the insistance of the original owner of the ground. The original owner was bought out after a time, and on January 24th, 1889, the capital was increased from £50,000 to £53,375, in order to acquire six claims leased to third parties before formation of Company. This again was changed on Feburary 16th, 1889, to a capitalisation of £2,750,000 in 550,000 £5 shares, to meet the public, who had placed a value of £60 or £70 upon the original £1 share. All of this capital was issued to shareholders with the exception of 16,250 shares, held in reserve, the area of the gold-bearing ground being equivalent to 106 claims, which has since been increased by purchase to 136 claims.

The financiers who controlled the workings of this mine realised the large capitalisation, and their endeavour has been to justify it by actual returns from the mine, and their success is demonstrated by the fact that, even on the present low market value of to-day, viz., £6 14s. per share, the capitalisation of this company is held by the shareholders at £3,685,000, and it is considered in Europe one of the Consols of the industry. On this capitalisation the last year's profit shows 10·21 per cent.

ofit.

Now, how was this brought about? The 10-stamp mill was replaced in 1889 by 40 stamps; the 40 were extended in 1891 to 60; the 60 extended in 1894 to 70, and in 1895 the mill was further extended to 120 stamps.

nd work-osts. The yield and working costs during these periods were as follows:—

	Working cost per ton, including depreciation. s.	d.	Yield per ton. s.	d.
1888	72	1·042	272	7·04
1889	65	11·846	182	7·24
1890	65	1·865	113	2·94
1891	52	5·575	103	5·53
1892	46	5·997	95	6·78
1893	42	1·097	101	0·02
1894	41	4·736	97	4·94
1895	30	0·913	80	5·67
1896	30	11·096	69	10·20

s. Mining was carried on in three reefs in this mine, known as the South Reef, Main Reef Leader, and the Middle Reef. The latter was afterwards discovered to be simply an overlap of the South Reef, and disappeared altogether at the third level.

The ore in the upper level, down to a depth of about 210 feet, was what is known as "free milling." The dip was 42 degrees, but has gradually flattened, until, at the greatest depth, viz., 1,484 feet down on the incline, it is only 29 degrees. At a depth of 210 feet the matrix of the conglomerate pebble formation changed from an oxidised to a pyritic character, and the mining became somewhat more difficult and costly. Nat

The difficulties in obtaining satisfactory results by simple plate amalgamation then became greater, and one of the problems facing this company was to get an adequate return of gold from the ore, as tailings leaving the mill averaged as high as 14 dwts. per ton.

This company was the first on the Rand to successfully run frue vanners. It supplemented this work by the erection of a chlorination plant, which not only dealt with its own concentrates, but also those of other companies; and this chlorination plant has produced gold to the value of over £860,000 since it started. Ch pl

This company was also the first to introduce on a large working scale the cyanide process. It replaced the first original works by larger ones, and has expended in connection with this branch of the industry, over £40,000. Cya

The treatment of slimes was also introduced on a large scale at this mine, and in connection with the Rand Central Ore Reduction Company, it has expended £60,000 to £70,000 in this direction. Slim

Outl. sol

The total amount of money put into buildings, plant, improved processes, etc., by this Company has amounted to	£426,736
Development	355,528
Making a total outlay of	£782,264

and the reserve ore in sight in the mine is 441,506 tons. Reser

Granted that a large proportion of this money was obtained from the ground, it was put back into the ground, and it aided all other companies in improving their appliances, and in their own case has brought up the gold extraction from 65 per cent. in rich free milling rock to over 90 per cent. in the pyritic ore worked at the present day, and has thereby given encouragement and impetus to all mining on these fields. In dealing with the metallurgy of the ores on the Rand, the ordinary process of milling, concentration and chlorination, though adopted at this mine, did not prove as successful as in other parts of the world, owing to the way in which the gold was found in the rock, *i.e.*, in very minute particles; and this great percentage has been obtained by the initiation of a comparatively new system in metallurgy which has had its growth and development on these fields, viz.: the treatment of tailings and slimes by the cyanide process, and the Robinson Company was one of the early pioneers in this direction. It will be noticed that a remarkable decrease in costs has taken place from the early stages of the mine to the present time. Cyanic men Decre ing Robi Co.

Milling and tramming costs have been reduced from 18s. 8d. to 3s. 8d. per ton; mining costs 36s. 3d. to 17s., inclusive of development.

Cyanide costs started at 13s. 6d. per ton treated, including royalty, and were reduced to 3s. per ton treated last year. The total cost per ton on a milled basis was 72s. 1d. in 1888, and is now 30s. 11d., including two more metallurgical processes, working in harder ground, and all current capital expenditure as well as depreciation, showing a reduction in cost of 41s. 2d. per ton.

In comparing the cost of the Robinson with other mines, it must also be remembered that, although little sorting is done on the surface, a considerable quantity of waste is eliminated below. These are indeed startling reductions, and, from an

engineer's point of view, I cannot see how the efficiency of this Company's works can be greatly increased.

Rob- Co. The Board have used every endeavour to obtain men of acknowledged excellency in their departments from all over the world.

The manager of the Alaska Treadwell, the working costs of which mine have so prominently figured before the public, was induced to take the management of this Company in 1892, and, though not alone, a great deal of the credit of the reduction in costs is due to his instrumentality and to his wonderful power of dealing with the employees of the Company. His motto among his officers was to impress them with the idea that in each department they were to work as if the Company were their own; and with great firmness he combined great kindness, and was loved as well as respected.

The work done at the Robinson has had its effect on other mines, and without a Robinson mine you would not have a Heriot, and without a Heriot you would not have a Geldenhuis Deep.

ot. NEW HERIOT.—The Heriot Company is an illustration of a not exceptionally high grade mine starting with inadequate working capital, poor and meagre equipment, and being obliged to suspend operations owing to the fact that it could not be made to pay with the appliances and funds at the disposal of the Company.

l and The Company was formed in August, 1887, with a capital of £50,000 in £1 shares, the vendors receiving £4,000 as the price of the property, which consisted of twenty-nine claims.

ield and The battery commenced work in January, 1888; the initial yield after six months was valued at £2 16s. per ton, and the actual expenditure £1 19s. 8d.

d capital The capital was increased in October, 1888, by issuing to shareholders 10,000 shares at 30s., and three dividends of 5 per cent. were declared, but the Company again ran out of funds.

In December, 1889, the Board was authorised to increase the capital to £75,000 by creating 15,000 new shares. But no tenders for these shares were received, and it was not until April, 1890, that they could sell even at par the small amount of 1,000 shares, and these only on the condition that they were to be redeemable at 30s. within six months. In the following month 5,000 shares were allotted to an applicant for £7,500.

Attempts were made to obtain loans, but these were fruitless owing to the restricted borrowing powers of the Directors, which were limited by the trust deed to £3,000; and, moreover, the bank not only refused to sanction an overdraft beyond that amount, but expressed disapproval of the debt already incurred.

elopment history of v Heriot. During the year ending July, 1890, the mill of twenty-five stamps crushed 8,873 tons, yielding gold to the value of £3 1s. 4d. per ton, the working costs being 52s. 6d. for mining and milling only.

During 1891 the mill practically stopped work. Early in 1892 the New Heriot Company was formed, the capital increased to £85,000, and the management and finances put into strong hands.

The mine was developed and thoroughly equipped with the cardinal idea of a centralisation of power. The cyanide process was introduced, and the new works were started towards the end of 1893. The total working costs in 1894 were 32s. 11d.; in 1895, 27s. 4d.; in 1896, 26s. 10d.; and the extraction brought up to a total of 85·3 per cent.

This is now considered one of the model mines of the Rand, and the manager is a practical man who has grown up with the industry here.

ual capital d claims of ew Heriot. The capital was increased in 1895 to £115,000, in order to acquire more ground, and the total number of reef-bearing claims is now fifty.

HENRY NOURSE G. M. Co., LTD.—This Company was floated at Pretoria in April, 1887, with a capital of £35,000, in £1 shares, of which 24,000 shares were given for the property, and 11,000 shares were issued against £11,426 5s., which constituted the original working capital. This sum was soon exhausted, and a special general meeting of shareholders was held in Pretoria on June 4, 1888, when the capital was increased by 15,000 shares, which the Directors were instructed to issue at not less than 30s. each. At the first annual meeeting of shareholders held on August 14th, 1888, the Directors reported that owing to this limitation they had been unable to dispose of these new issue shares, excepting 2,670 shares taken by Sandycroft's agent to settle an amount due to them and to pay for a new 15-stamp mill which had been ordered. The balance sheet to June 30, 1888, shows that 1,642 ozs. 9 dwts. of gold had been won, so that the original 15-stamp battery must have started about March of that year, but no record of the number of tons crushed appears to have been kept. On June 30, 1888, the Company's cash was exhausted, but there were on hand 12,330 out of the 15,000 reserve shares created in June, 1888. Cal ar H.

At December 31st, 1888, the west shaft had been sunk to a depth of 103 feet, the central to 16 feet, and the eastern to 39 feet. The report to that date states that 2,330 of the reserve shares had been disposed of at 31s. per share, and the balance of 10,000 at 56s., thus placing the Company in funds; and that an order for a 15-stamp battery had been increased by 40 stamps, making 55 stamps in all, to make with the 15-stamp mill then running a battery of 70 heads. This battery was of too light a pattern, and was never erected, but was disposed of as an opportunity occurred.

At December 31st, 1889, the Company's indebtedness had increased to £24,905 17s. 9d., and at June 30, 1890, to £26,946 3s., and at a special general meeting of shareholders held on September 10, 1890, the capital, then £50,000, was increased by the creation of 50,000 to £100,000. Of these 50,000 shares, 37,500 were offered to shareholders at 30s., but were not applied for. Eventually these shares were taken up and came into strong hands.

The report of December 31, 1891, shows that it had been necessary to pledge the Company's assets as security for an overdraft at the Standard Bank, and the above arrangement as to the issue of the reserve shares was the best the Directors were then able to make.

At 30th June, 1892, the Company had paid off its liabilities and had a cash balance of £25,000. By 31st December, 1892, the 15-stamp battery hitherto running was increased by 20 stamps, and on 12th December, 1892, a cyanide plant was erected near the old battery and commenced work.

During the next half-year five more stamps were added to the battery, and extensive additions were made to the pumping and hauling equipment, and at 30th June, 1893, the Company was again in debt about £17,000.

The mine was, however, opening up well, and showing such good returns that a special meeting held on the 7th March, 1894, sanctioned the increase of the capital to £125,000 by the creation of 25,000 shares, which were taken up by shareholders and guarantors at 40s. each. The capital thus raised, and profits accruing from mining operations, were expended in the erection of a first-class plant on the basis of 60 stamps. The total expense incurred in the equipment and buildings amounting in all to £200,000. Equipm Henry

The total number of claims in this property is about eighty. Numb claims ry No

The debt that was incurred in connection with the equipment was not wiped off until the middle of 1896, and the first dividend was 30 per cent., declared in December, 1896, and paid in February, 1897.

extrac- Henry

The yield from this Company has been fairly uniform, and shows an average extraction from the start to the present day of about 82 per cent.

costs of Course

The costs have been reduced from their maximum of 56s. 3d., to the minimum, 35s. 7d., shown in my table of working costs.

Even the present costs are high, owing to the small lateral extent of the property, which has necessitated the working through three shafts, and also to the fact that for the most part only one narrow reef has been worked, and 25 per cent. of the rock hoisted from the mine sorted out as waste; the rock has also been exceptionally hard. The small dip area for the major extent of the mine is due to the fact that, on starting, the conglomerate beds showed a declination of about 80 degrees, which would allow mining to be conducted at considerable depth before reaching the southern boundary.

The beds, however, within a horizontal distance of 240 feet have gradually changed their dip to 46 and 50 degrees, thus permitting the deep level company to commence mining operations at a comparatively shallow depth.

sation of and Su- n Com-

CITY AND SUBURBAN G. M. Co.—This Company was formed in 1887 with a capital of £50,000 in £1 shares, of which the vendors received £30,000, and then certain other interests were acquired, reducing the working capital from £20,000 to £8,900.

The capital was increased in

1888 by	1,000 shares, realising	... ...	£15,548
1889 by	5,000 „ „	... ...	62,950
1892 by	10,000 „ „	... ...	65,000
1893 by	10,000 „ „	... ...	86,250
	So that the total working capital subscribed amounted to		£238,648

It must also be added that in 1895 the capital, which then stood at £85,000 in £1 shares, was transformed into 340,000 shares of £4 each.

ber of ns.

The mining area of the Company is 150 claims (about), of which about 20 claims have been worked out up to end of 1896, including poor ground and pillars. The total tonnage crushed up to this period is 670,463 tons, and the gold bullion recovered from same, 428,794 ounces.

pts.

The total cash receipts from all sources have been £1,838,484
and the total cash expenditure on property, development, equipment and working expenses to end of 1896 1,559,695

ts.

leaving a profit of ... £278,789

out of which £251,661 has been paid in dividends to shareholders, and the balance of £27,128 is represented by cash, stores on hand, etc.

pment.

The equipment of the mine, the cost of which stands at £524,110, includes the development of ore reserves, amounting to 375,895 tons.

The first 10-stamp mill started crushing in August 1887, to which was added another 10 stamps in June, 1888. In May, 1891, a new 30-stamp mill was started, to which was added the first 20 stamps two months later. This 50-stamp mill worked on till November, 1895, when it was finally closed down, having been replaced by an improved plant of about 80 stamps started in July, 1894; 40 stamps were added to the latter in July, 1895, and in September following a further 40 stamps, making up 160 stamps at the new mill. The full plant, however, was not worked until July, 1896, owing to inadequate supplies of native labour.

anide works.

Cyanide works were started in 1893 to treat the product of the 50-stamp mill and the accumulation of tailings prior to that date. In July, 1894, a new cyanide direct

filling plant in connection with the new milling plant was started, which has since been extended for the treatment of coarse sands and concentrates, and double treatment has been adopted.

Incr tre

As no systematic samples of the ore were recorded prior to 1892, figures are not at hand to supply the percentage of recovery previous to that year. In 1892 the recovery by amalgamation only was 59·596 per cent. of the value of the ore crushed, which has been raised to 81·95 per cent. for 1896 by mill and cyanide, showing that with improved methods the extraction has been increased by 22·36 per cent.

Redu ing

It will also be noted that the working expenses have been reduced from 60s. 4·56d. per ton in 1887 to 26s. 3·91d. per ton in 1896, due to the improved method and appliances of mining and milling, and ore treatment, and working on a large scale, thus now making it possible to work profitably lower grade ore than formerly.

CROWN REEF.—Taking this company next, which in early days was considered only a low grade mine, though having two very regular reefs running through it with an average stoping width of 4ft. each.

Histo Ree

Its history can be summarised as follows:—

This company was formed on the 1st April, 1888, to acquire the lease of a mijnpacht on the farm Langlaagte from a private syndicate. It had an issued share capital of £100,000, in £1 shares, of which amount £14,000 was working capital. The share capital of the company was increased to £106,000, in 1890; to £110,000 in 1892; and £120,000 in the latter half of 1892; the profit from the sale of shares being utilised to equip the property.

Equipr

The milling power of the company was 30 stamps at the start. This was increased by a new mill of 40 stamps in 1890. To this mill a further 20 stamps was added in 1892. These two mills were replaced by a new mill of 120 stamps, with complete cyanide works in 1894, and slimes plant in 1896.

Capital ture.

Up to March 31st, 1895, the company had expended on capital account, buildings, machinery, and plant, dams and reservoirs, etc. ... £308,963 0 9
Purchase of freehold rights 26,009 0 0
Sinking main shafts and driving main cross cuts ... 62,521 7 3
£397,484 8 0
Besides this, mine development, charged to working expenditure, cost 58,850 16 9
£456,335 4 9

Revenue pendit

Since that time all expenditure has been charged against revenue account, and capital account has ceased entirely. During the two years ending 31st March, the company has expended for:—

Sinking main shafts and driving cross-cuts ... £21,618 9 2
Mine development 64,674 10 10
Buildings and additions to plant 6,433 18 0
£92,726 18 0
Amount brought down from above 456,335 4 9
Making a total of £549,162 2 9

Reserve o

The amount expended on development and sinking main shafts brought 1,495,550 tons of ore in sight, of which 442,859 tons are in reserve ready for stoping.

ex- The company originally recovered only 57 per cent. of the value of gold in the ore, this value being arrived at by the addition of the assay value of the residues to the total gold recovered.

This percentage has been increased gradually up to 86 per cent., which is the extraction for the last half of the financial year ending March 31st, 1897, when a slimes plant was added to the already existing equipment of mill, cyanide, and concentrating plants.

costs. The company first got its rock from open trenches which was a cheap method for a time. During the second year of its existence it started actual underground work. The total costs, exclusive of capital expenditure for that year, averaged £1 13s. 7d. Last year with the additional cost of three separate secondary treatments, the costs, inclusive of capital expenditure, were £1 8s. 5d. Although the mining costs have shown no great reduction, the milling costs have been reduced from 11s. in 1890, to 3s. in 1896. The position of the property in 1890 was most exhaustively dealt with in a report by myself, which deals fully with the difficulties and imperfections of gold recovery on these fields.

Leaving out of account the first year of the Company's returns, which was abnormal, the yield per ton has been fairly constant, though slightly increasing during the last two years, and varies from £1 15s. 6d. during the second year to £2 7s. 2d. for the last financial year.

lisation of denhuis ». THE GELDENHUIS DEEP, LTD.—This Company was formed in January, 1893, with a capital of £350,000 in £1 shares. The vendors received 175,000 shares, while 90,000 shares were issued for working capital, realising £94,500, and 85,000 shares were kept in reserve.

ber of ms. The property consisted of 212 claims, and work was commenced at once.

ture issue. In 1894, it was found advisable to issue debentures to the amount of £160,000,

of equip- and in 1895 15,000 out of 85,000 reserve shares were sold, realising £103,474 15s., and

nt. further sums were gradually borrowed to complete the development and equipment, on which, altogether, about £410,000 will be spent. This is the cost of putting the mine on a paying basis, and, after all the experience gained in former years there can be no doubt that the works here, as well as at other subsidiary companies of the Rand mines are of an extremely high order. The mistakes of early days have been avoided as far as possible, and every effort has been made to introduce the latest improvements.

al yield. The mill started crushing towards the end of 1895, and the early results were poor and unsatisfactory. During the last three months of that year the yield was only 18s. 2d. per ton, while the costs were 26s.

eased yield. In 1896, the yield was raised to an average of 27s. 4d., with working costs of 25s., while for April of the current year, the working costs, including sorting, were 26s. 5d. per ton, the yield 37s. 3d., and the monthly profit, £9,018.

d Mines. The Geldenhuis Deep is only one of the subsidiary companies of the Rand Mines Ltd., which, as shown by the last Annual Report, has seven other important companies already in course of development and equipment, and expects to require £3,630,065 to put them on their initial running basis of 710 stamps, with the intention of eventually increasing them to 1,300.

The total nominal capital of the eight companies is £3,607,391, a sum almost identical with the amount of cash estimated to put them on an earning basis.

I trust that I have not wearied you with all the details I have given you concerning the history of these mines; I have laid everything so fully before you in order to show you what has been the work of one group of capitalists on these fields. I do not for a moment wish to imply that our firm has been the only one to achieve

brilliant success, as you have been already, or will be, informed by the representatives of the other houses regarding the good work done by them.

Comp
dep
1890
1897

You will have seen from the struggling history of many of these companies, that after the early boom of 1889, there was a most serious depression, during which all the mines suffered, but it was during this very depression that the foundations were laid, by means of hard, earnest and intelligent work, of the revival which followed in the year 1895. We now again are experiencing a period of the most acute depression after the recent boom, but there is an enormous difference (which I cannot too strongly impress upon you) between the position and hopes of the industry at the present moment, and during the preceding relapse. In 1890 the industry was still young, it was undeveloped, and there was, as I have endeavoured to show, immense scope for improving mining results, both as regards working costs and extraction of the gold.

Govern
o p e
neces
reduc
ing c

Now, in 1897, the class of machinery on these fields can be considered the most perfect of any gold fields in the world; the various processes dealing with the extraction of gold are rapidly approaching practical perfection, and our working costs have been decreased until we can scarcely reduce them further without the Government's help; with this help however, we can still make great reductions.

Profits
into

I have tried, and I cannot too earnestly try, to impress upon you that the very men who in the early days obtained their profits from rich mines like the Robinson and Ferreira, freely put back this money into other mines, like the City and Suburban, the Henry Nourse, and the New Heriot, then struggling under the greatest difficulties, and after reaping the fruit of their energy and intelligence here, again turned their resources to gigantic enterprises like the Rand Mines.

Before pursuing further the investigations of these fields, I desire in a way to compare the yield, cost, etc., shown in the foregoing statements, with those of other gold mines in the world.

Workin
tions
ent mi

It must be remembered that to make comparisons applicable, the conditions under which work is carried on must be taken into account. Even comparing the twenty-nine different mines in the foregoing list, it will be found that different conditions exist. Some companies sort their ore, and others do not; some work only one reef, others two or three, varying in thickness, hardness, etc.; it is obviously unfair, for instance, to compare the costs of a company exploiting, for the most part, only one thin reef, and sorting out 40 per cent. of its rock, with a company which is not sorting and working two reefs averaging ten or twelve feet in thickness. The scale on which work is conducted must also be taken into consideration, and it is presumable that companies with large stamping power should have an advantage in working costs over those of much smaller power, and companies who are treating ore by two or three secondary processes should be under a disadvantage when comparing costs with those employing only one or two. It will be noticed that the average stamping power of the twenty-nine companies is about eighty-five stamps per company.

I will commence with the Alaska Treadwell Mine, the annual report of which company for 1896 I beg to put in evidence.

From this report the operating costs are seen to be as follows —

ts of ead-Co.

Operating costs on 263,670 tons (all construction charged directly to operating).

	Dollars per ton of ore.	Shillings per ton of ore.
Mining	·5491	2·29
Milling	·3476	1·45
Chlorination	·1138	0·47
General Expenses (Douglas Island)	·0819	0·34
„ „ (San Francisco)	·0218	0·09
London Office Expense	·0112	0·05
Bullion Charges, Freight, Insurance, &c. ...	·0372	0·15
Total operating costs	1·1632	4·85
Net profit for year	1·8862	7·86
Total Yield	3·0494	12·71

The Wages paid were as follows:—

	Per diem.	Per diem. s.	d.
Miners, with board and lodging	2·50	10	5
Labourers „ „	2·00	8	4
Drillmen, with bonuses and board and lodging (Summer)	2·50	10	5
Drillmen, with bonuses and board and lodging (Winter)	3·00	12	6
Indians (paid daily	2·00	8	4

MILLMEN.

	Dollars per month.		
Concentrators, with board and lodging	65·00 to 100·00	£13 10 0 to	£20 16 8
Feeders „ „	70·00 to 100·00	14 11 8 to	20 16 8
Amalgamators „ „	90·00 to 100·00	18 15 0 to	20 16 8

CHLORINATION WORKS.

	Per diem.	Per diem. s.	d.	s.	d.
Roasters, with board and lodging	2·50	10	5		
Roasters (helpers) „	2·00	6	4		
Floormen „	2·00 and 2·25	8	4 and	9	4½

MACHINE SHOP,

	Per diem.	Per diem.			
Mechanics, with board and lodging	2·00 to 6·00	8	4 to	25	0
Blacksmiths „	4·00	16	8		
Blacksmiths' helpers „	2·00	8	4		

ourable king con-ons of Alas-Treadwell M. Co.

The Alaska Treadwell Company, however, is situated on an island with a good harbour. The mill is near the ocean, with the tailings running into the water, and is worked by water power for the greater part of the year; the lode varies in thickness from 50 feet to 426 feet, and the mining is more or less quarry work. The number of stamps is 240. The mine is most favourably situated for obtaining supplies at low rates, as is shown by detailed account, which I beg the Commission will compare with the rates of similar supplies on these fields, especially dynamite.

The following table is roughly made out to show the relative prices paid for stores at the Alaska Treadwell mine and at the Crown Reef here for 1896, on the basis of the amount used at the former mine:—

ARTICLE.	AMOUNT USED.	ALASKA PRICE.	CROWN REEF PRICE.
Dynamite	200,089 lbs.	5,134 11 2	17,354 12 2
Fuse	14,814 coils.	474 5 0	268 7 9
Caps	75,182	168 5 0	150 8 0
Timber	14,909 cubic ft.	482 0 0	3,168 2 0
Steel, Mining	25,519 lbs.	429 16 5	637 18 0
Oils	6,545 gallons.	428 3 5	1,309 0 0
Candles	272 boxes	177 15 0	145 0 0
Mortars	2	96 0 0	304 0 0
Mortar Liners...	58,058 lbs.	756 12 0	1,209 10 10
Cam Shafts	3	59 4 0	52 10 0
Guide Blocks	120 pair	22 16 0	856 0 0
Shoes and Dies	151,922 lbs.	2,178 17 3	2,278 16 8
Screens	1,300 sq. feet	109 6 0	97 10 0
Heads	12	49 16 3	78 0 0
Sulphuric Acid	328,000 lbs.	1,000 0 0	4,100 0 0
Salt	455 tons	790 8 6	2,733 0 0
Bar Iron	63,503 lbs.	275 9 6	529 3 10
Lead	1,461 lbs.	18 4 6	52 11 6
		12,651 10 0	35,324 10 9

Comp ble for Cro an Tre M.

If the same proportion exists for the balance of the stores used by the Alaska Treadwell which are not classified above, and which amount to further £3,500 exclusive of coal, these total stores costing £16,100 in Alaska on the above basis of prices, here amount to about £45,100, thus increasing their costs by £29,000, and the total cost per ton at the Alaska Treadwell Mine by 2s. 2d. on the tonnage milled: 263,670 tons.

Cost of stores milled a ka Tr G. M. C.

On the other hand, if the Crown Reef Company had been able to obtain its stores last year at the above prices ruling in Alaska, their supplies, exclusive of coal, which actually cost them £85,100, would only have cost £30,500, which would be a saving of £54,600, or no less than 5s. 6d. per ton, on their tonnage of 198,236 tons.

Cost of stores p mille Crown G. M. C

	Crown Reef.	Alaska Treadwell.
		1 dol. = 4s.
Tons crushed	198,236	263,670
Pounds of Dynamite used per ton crushed ...	1·10	0·76
Tons mined and milled, secondary treatment and general expenses per man per day	0·31	4·14

rative ng costs Alaska well and Reef Cos.

	Crown Reef.		Alaska Treadwell, 1 dollar—4s.	
	Cost per ton Milled.	Per cent. of total cost.	Cost per ton Milled.	Per cent of total cost.
	£ s. d.		£ s. d.	
Labour, total white and black, including food...	0 15 6	57·98	0 2 11	63·78
Coal	0 2 7	9·79	0 0 5	8·57
Dynamite	0 2 5	9·11	0 0 5	8·37
Cyanide Zinc and Royalty...	0 1 8	6·35	—	—
Timber	0 0 5	1·55	—	0·79
Steel, Mining	0 0 4	1·32	—	0·72
Oils	0 0 3	0·87	0 0 1	0·92
Candles...	0 0 4	1·20	—	0·23
Mill Spares	0 0 5	1·52	0 0 4	6·54
Fuse and Detonators	0 0 2	0·57	—	1·02
Trucks, Wheels, and Rails...	0 0 2	0·69	0 0 1	0·01
Pipes and Pipe fittings	0 0 1	0·36	—	0·50
Sundry Stores, General Expenses Electric Light and Drill Spares	0 2 4	8·79	0 0 2	3·46
Chlorination Supplies	—	—	0 0 3	5·09
Total cost per ton	1 6 8	100%	0 4 8	100%

This shows that the relative proportion of cost for labour at the Alaska Treadwell is somewhat higher on a percentage basis than at the Crown Reef, and also that the great lowness of cost is, in addition to the cheapness of supplies, due to the fact that the tons mined and milled per man per day are in a ratio of thirteen to one at the Crown Reef.

king costs of eadwood erra G.M. Co.

The next comparison of cost I wish to make is that of the Deadwood Terra Gold Mining Company, Dakota, U.S.A., given me by the manager of the Geldenhuis Deep, who, previously to coming out here, was manager of this property. It was on account of the remarkably low costs ruling there that we were induced to obtain his services here on the Rand.

The total Mining costs of this company in 1895 are shown to be 1·37 dollars made up of:—

Mining ... ... 88·539 cents = 3s. 8d.
Milling ... ... 48·861 cents = 2s.

sld of Dead- wood Terra G. M. Co.

The yield of the ore being 1·74 dollars—7s. 3d. per ton.

If it interests you, further particulars can be obtained from the manager of the Geldenhuis Deep. He informed me that the width of the lode varied from 25 to 75 feet, the deepest shaft was 600 feet and no secondary treatment was used. The fuel was coal obtained by rail, and ruling rates of wages were as follows:—

MILLHANDS.

Engineer	2 at 3·00	per shift of	12	hours.	Wag D Te
Foreman	2 „ 2·50	„ „	„	„
Foreman helper	1 „ 2·00	„ „	10	„
Amalgamators	2 „ 3·50	„ „	12	„
Amalgamators	4 „ 3·00	„ „	„	„
Feeders	2 „ 2·50	„ „	„	„
Oilers	2 „ 2·50	„ „	„	„
Carpenters	1 „ 3·50	„ „	10	„
Carpenter helpers	1 „ 2·50	„ „	„	„

Miners in Deadwood Terra mine received 3·00 per shift of 10 hours and shovellers 2·50.

In the Homestake and Highland mines and mills all of this labour is paid 50c. per shift more. Wage at a Hi mi mil

The Deadwood Terra mine ran 160 stamps.

Regarding the gold mines of California the total costs in some of the principal mines vary from 10s. to 38s. per ton, depending on local conditions. Worki Cal gold

Mr. Leggett, a more recent arrival than myself, can give you fuller particulars.

The next comparison of cost I wish to put in evidence is taken from *Mineral Industry*, page 312, in which it states:—

"Mount Morgan Mine reports for 1895, the cost of working last year was almost 12 dollars a ton." Worki Mou mine

Mine Industry, 1895, same page:—"Mysore Company in India treated 60,654 tons, and cyanided half the tailings; cost, 9·50 dollars per ton." *Mineral Industry*, 1895, page 319:—"Milling in four districts in U.S.A. is averaged by P. A. Richards as under:— Worki Mysc

Black Hills	70 cents	a ton.		Milling some the State
Gilpin	75 „	„		
Grass Valley	80 „	„		
Amador	46 „	„	(soft ore)."	

Taking the average of the first three districts, we get 75 cents a ton, or 3s. This is practically the same as the Crown Reef cost for the past two years, including stone crushing.

From this it is seen that the average cost of milling in the Black Hills, Dakota, and the Gilpin Country, Colorado, and Grass Valley and Amador Country, California, is 2s. 10d. per ton, and the mining cost is not given, but varies with local conditions and the width of the lodes. Average costs i States

EL CALLAO.—The next comparison is a table of results showing the genera operations of the El Callao Company from its formation up to June, 1894. El Callao

Work was first started in 1870 on a small scale, and by people who had no previous experience in mining. The yield per ton is seen to have varied from 5·66 ozs. in 1884 to 0·6 ozs. in 1892, the average for the whole period being 2·03 ozs., or 155s. per ton. Initial and yi

Table showing the General Results of the operations on "EL CALLAO" Lode, since formation of the Company.

PERIODS.	Lode area worked on incline square metres.	Lode Average thickness metres	Ore Gross Yield in Tons.	Gold Gross Yield in Ozs.	Gold Yield per Ton Ozs.	Gold Gross Yield Value.	Gold Yield per Ton Value.	Mining Costs per Ton.	Milling Costs per Ton.	Miscellaneous Costs per Ton.	Total Cost per Ton.	Total Dividends Paid.
						£	s. d.	s. d.	s. d.	s. d.	s. d.	£. s. d.
1870 to March 11, 1881 ...	22,102	1·52	91,046	318,855	3·50	1,218,115	267 7	...	...	...	...	313,433 13 5
Mar. 11, 1881, to Dec. 31, 1883	15,461	1·60	67,073	300,650	4·48	1,148,700	342 6	...	...	...	149 2	497,886 4 11
1884	7,513	1·54	31,261	177,055	5·66	677,569	433 5	86 7	29 10	5 10	122 3	383,300 15 0
1885	8,949	1·94	46,868	114,500	2·44	435,040	185 8	59 1	20 4	4 5	83 10	181,429 0 5
1886	13,867	2·00	74,399	181,300	2·40	685,860	184 4	43 9	14 8	1 5	59 10	436,962 17 1
1887	13,273	1·75	64,215	73,872	1·15	282,000	87 10	45 10	7 3	1 10	54 11	58,772 15 7
1888	13,528	1·45	54,438	52,598	0·97	199,994	73 5	51 9	7 11	2 0	61 8	5,110 13 7
1889	9,755	1·68	56,389	52,973	0·93	204,184	72 4	42 5	6 3	5 2	53 10	20,442 14 1
1890	13,113	1·52	53,977	49,432	0·93	189,829	70 3	46 8	6 3	1 9	54 8	20,442 14 1
1891	16,321	1·33	59,284	34,774	0·59	132,270	44 7	32 8	5 0	2 1	39 9	
1892	13,825	1·40	52,823	31,931	0·60	120,297	45 6	33 3	5 0	3 1	41 4	
1893	11,000	1·36	40,085	34,537	0·86	131,559	65 8	32 10	6 3	7 0	46 1	
Jan. 1 to June 30, 1894 ...	3,048	1·40	11,607	8,417	0·73	32,063	55 2	45 9	6 3	1 8	53 8	12,697 6 8
TOTALS	161,755	1·54	703,465	1,430,894	2·03	5,457,432	155 2					1,940,478 14 10