THE ENGINEER IN SOUTH AFRICA

WASHING THE STREETS OF KIMBERLEY FOR DIAMONDS.

[*Frontispiece*

THE ENGINEER IN SOUTH AFRICA

A Review of the Industrial Situation in South Africa after the War and a Forecast of the Possibilities of the Country

By

STAFFORD RANSOME M.Inst.C.E

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Introduction

THIS book is a review of engineering and industrial South Africa under the new conditions, and is the outcome of a ten months' study of the subject in that country.

At the close of the war the author was appointed by *The Engineer* to visit all the British possessions in Africa south of the Zambesi River and to write frankly and fully to that journal on the various problems which have been evolved by recent events. His instructions were to record, to criticize, and to suggest. He was to be unhampered by any editorial point of view, and to take as much time as was found necessary for the purposes of his study.

The result was a series of articles on "South Africa from an Engineer's Point of View," the first of which was written in August last, and the final one in May of this year.

Author and publishers are indebted to the editor of *The Engineer* for his permission to dip very freely into those articles for the purposes of

this book and for the use of most of the pictures which illustrate its pages.

Though four-fifths of the matter which follows has appeared in the columns of that journal, this is by no means a reprint in the ordinary sense of the word. Some thirty articles have been drawn upon in compiling the twenty chapters, at least one-third of the original matter has been deleted, and the balance has been re-arranged, re-edited, and in some degree re-written by the author.

Though "from an engineer's point of view," and primarily intended to give practical information to the British engineer and manufacturer, the style is not severely technical. It is thought that, as the future success of a British South Africa must depend mainly on the engineering and industrial possibilities of that country, this book should appeal to a larger class than that for which the articles were originally written.

When a writer undertakes to express his opinions frankly on difficult and sometimes delicate situations he must lay himself open to the charge of being dictatorial. Whatever the opinions expressed in this book may be worth, the author has endeavoured to make those opinions perfectly clear. He has avoided generalities as far as possible, and in criticizing he has been specific.

The early portion of the book is in some degree controversial, and deals with the vexed problems which go to make up the practical side of the new South Africa. The later chapters are mainly descriptive, and treat of the more important engineering industries as carried on to-day, their possibilities and prospects.

The author's line of argument may be summed up as follows :—The passing of the sponge over the slate in South Africa, from a military and political point of view, has had the effect of altering, and, to some extent, effacing the commercial and industrial map of the country as we have known it. Some of the most familiar landmarks have been partially obliterated and others have sprung into being.

The industrialist must draw a new map of South Africa, a map in which the present political boundaries will be of decreasing importance.

The South Africa of the future will be ruled not by the seaports, or even necessarily by the coastal colonies, as in the past, but by the great industrial centres.

Up to the present the position of Johannesburg, Kimberley, and Rhodesia may be likened to that of the prisoners of the Fleet, whose gaolers could fix the price at which they delivered to them their food from the outside world. The

coastal colonies have been those gaolers, and, owing to the complications of Anglo-Dutch misrule in the various parts of South Africa, have been able to sweat and hamper the industries of the interior.

The war has had the effect of clearing the political atmosphere all over South Africa, except in Cape Colony, where at present it is heavier than ever. The growing strength of the industrial centres, however, is slowly but surely undermining the political importance of Cape Colony.

In Cape Colony herself, the whole of that area which lies north of the Orange River, and also the eastern provinces, though at present governed from Cape Town, are in sympathy with progressive South Africa. Either Cape politics must undergo a change, or in course of time Cape Colony will become split up into sections in the course of the natural industrial evolution of the country.

The political tendency of southern Cape Colony, the centre of all that is retrogressive and anti-British in South Africa, is towards parochialism and isolation, and to the comparative obscurity in which such a policy must eventually result.

The industrial prospects of South Africa are brilliant, but they will not be sprung upon the world suddenly. The alleged "boom" which was to take place as the immediate result of the

peace declaration, was an impossibility. The country must have time to recover from the effects of a long and devastating war. Trade, however, is increasing surely and steadily, and we may look upon this country as an important and permanent market for our products.

In spite of the repeated attacks on the methods of the British manufacturer, and the categorical statements that have been made to the effect that he is indifferent and blind to his own interests, and that he is, in consequence, losing his trade with South Africa, the author has been unable to find any foundation for these allegations.

The chapter on "The British Manufacturer" was written last September, at a time when there were no normal statistics available since the war. The somewhat optimistic views then taken by the author, however, have been more than confirmed by the statistics recently published of the imports into Cape Colony, the "rebel colony," for 1902. The author estimated that Great Britain's share in the engineering imports was not less than 66 per cent. of the total. The new statistics show that of the imports of all classes from all sources in 1902, Great Britain furnished 66 per cent., and that a further 10 per cent. was furnished by British possessions, making a total of 76 per cent. for the Empire. This leaves a balance

of 24 per cent. to be divided amongst the various countries who, it is alleged, are ruining that proverbially short-sighted firm John Bull & Sons. Incidentally it may be mentioned that the invoice for 1902, for goods delivered by this "obsolete" firm, amounted to just double the figure of their invoice for 1898, which was the last normal year before the war.

The Author would take this opportunity of thanking the many gentlemen in South Africa who have lightened his task by giving him their time, advice, and information on all sorts of matters. It is a part of the work of the writer who is making an investigation of this kind to worry all sorts and conditions of men, who know more than he does of the details of the various subjects about which he will have to form an opinion. The author fears that he has often made himself a nuisance to South African statesmen, politicians, capitalists, judges, barristers, government officials, fellow-journalists and engineers, mining, railway, and other managers, collectors of customs, manufacturers and traders, Britons and Boers. All of these he has pestered until he cannot help feeling that some of them must be glad to be rid of one so importunate. And yet he can only record that, from the High Commissioner downwards, he met with the greatest

courtesy and kindness, and that every facility was extended to him in the carrying on of his work.

He would also thank the officials of the various Government Departments, the many professional and amateur photographers whose pictures appear in this book, and Mr. Malcolm Fergusson, of Johannesburg, who wrote the description of the Orange River Farming Company's irrigation methods, which forms a part of Chapter XX.

Carlisle Place, S.W.
July 31*st*, 1903.

Chapter I

INDUSTRIAL GEOGRAPHY

IN making a business study of South Africa, or of any other country for the matter of that, it is essential at the outset to arrive at a general understanding of the industrial geography.

Recent events have so revolutionized the methods of life in all its phases that to obtain an adequate idea of existing conditions we must approach the subject with an open mind. We must forget much which we have already learnt, or must use such knowledge as a basis to start from in contrasting the country under the old conditions with the same place under the new.

The prominent landmarks by which this continent has been known are shifting. The most notable of them all, Cape Town, has already lost its supremacy as a commercial centre, and is now well on the way to lose it as a trading port. It is not that the trade of Cape Town is decreasing, for, as a matter of fact, it is increasing, and for some years should maintain an upward tendency, but other places are going ahead with greater rapidity, and must pass it before many years are

gone. This matter I will return to later on. I merely mention it here *en passant* as the most striking of the many instances of the sweeping changes that are taking place in the commercial economy of this country. These changes are not primarily due to the war, although the effect of the war has undoubtedly been to make them possible. They have been led up to gradually but surely by the inexorable law of evolution; and in the evolution of South Africa the war has been merely an incident.

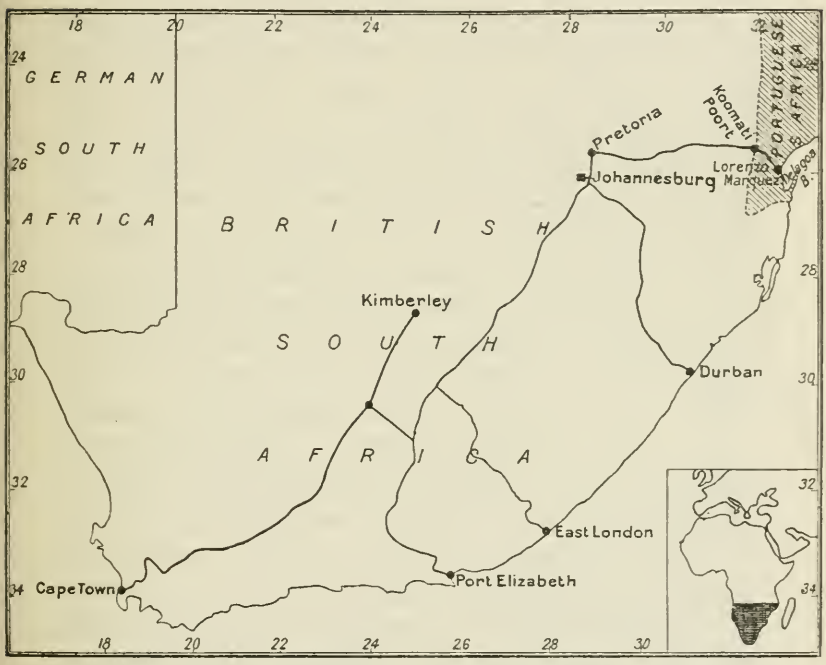
Industrially speaking, especially from an engineer's point of view, the centre of interest in South Africa lies in the Transvaal. The centre of the Transvaal is the Witwatersrand, or "Rand," as it is popularly called, and the centre of the Rand is Johannesburg.

It is Johannesburg that Lord Milner has foretold will some day develop into a city with several millions of inhabitants. Events would seem to be justifying this forecast. It is Johannesburg which is the industrial capital of South Africa, and it is on Johannesburg that British industrialists should rivet their attention. We must grasp this fact, and never lose sight of it, if we would understand the South Africa of to-day and form an estimate of the possibilities of the South Africa of to-morrow. We must not let our sense of perspective be warped by applying the conditions of the past to the existing situation.

On the opposite page is an outline chart showing the relative positions of Johannesburg and Kim-

berley, and the various existing railway routes between them and the sea.

Let the student of South Africa get this general outline into his head at this point, for an accurate appreciation of this simple chart will facilitate



EXISTING ROUTES FROM THE SEA TO JOHANNESBURG AND KIMBERLEY.

an understanding of much which I shall have to say hereafter.

From this map I have omitted every detail which might serve to confuse the reader, and in particular I have omitted all colonial boundaries and divisions of territories. This map makes

clear at a glance the fact that Cape Town, the place which for so many years was looked upon as the centre of all things South African, is now doomed to comparative obscurity as far as industrial South Africa is concerned, unless it decides to develop its local resources.

The great industrial centres have been shifted to the mining districts of Johannesburg, Kimberley, Rhodesia, and Natal. And now that other ports and railways exist, and are fast developing their effective handling, storing, and carrying capabilities, Cape Town will be decreasingly important except as a local port and dépôt.

The map shows that from Johannesburg there are five routes to the sea. The first, and once the most popular, zigzags its way down to the extreme south-western corner of the continent at Cape Town. The length of this line is 1,014 miles. The next route terminates at Port Elizabeth, southwards and slightly westwards from Johannesburg, and the distance covered is 714 miles. The third line reaches the sea at East London, and measures 666 miles. The fourth is to Durban, in a south-easterly direction, 483 miles. And the last, and least in mileage, runs north to Pretoria, and thence directly eastwards to Lorenço Marquez at Delagoa Bay. This measures 396 miles.

Of these five termini on the sea coast, there is only one which is possessed of a thoroughly good natural harbour, and that is Delagoa Bay. The Delagoa Bay route, however, passes through Portuguese territory.

The route from Cape Town is becoming less and less a channel for anything but mails and passengers to Johannesburg, except in special circumstances. This has not been entirely due to the fact that its length is greater than the others. Its dangerous and shockingly managed harbour has brought the port into very bad repute. The lack of accommodation and the apathy of the authorities have occasioned such a state of chaos at the docks that merchants at the present day have often to wait many weeks for delivery of their goods after they have arrived in Table Bay.

Thus it is that, quite apart from any question of cost of transport, the route from Cape Town to Johannesburg is fast becoming obsolete for goods.

At the present day Durban and Delagoa Bay share between them the transport of the heavy goods, while lighter stuff is dealt with to a great extent at Port Elizabeth and East London.

Of the relative merits of the various harbours I will say but little here, as I must deal with that subject on another occasion. It is as well, however, to point out that, with the exception of Delagoa Bay, there is not one which, in its present condition, is even tolerably convenient. Durban, it is true, possesses an excellent harbour for such ships as can get into it, but the presence of a treacherously shifting bar impedes the traffic very seriously in the case of large craft. The Durban authorities, however, are quite alive to the importance of improving their port, and elaborate extensions are now going on there.

Though Cape Town is losing a considerable amount of trade which she might have retained, and will be out of the running for much future business which she might have secured, her local requirements must increase in a manner which should compensate her in a measure for the losses she will suffer on account of the greater enterprise and more favourable geographical positions of her sister ports.

It is still the boast of Cape Colony that she possesses a larger white population than all the rest of our South African colonies put together. If we reckon as white that large multi-coloured population in and around Cape Town, the boast is justified. Even this somewhat questionable token of superiority will shortly be wrested from her by the more rapid increase of the population elsewhere.

Those who may marvel at the diminishing relative importance of Cape Town can easily grasp the situation by referring back to the history of the place.

Cape Town did not owe its birth as a trading port or as a colonizing centre to any innate virtues of its own, save to its geographical position. The town itself is still without industries worthy of the name, and although in the immediate vicinity of the port "almost anything" can be grown, the country has never been systematically exploited.

Further afield in Cape Colony there is said to be untold mineral wealth, which, with the exception

of coal in the eastern provinces and copper in the west, has been and still is practically untouched. The present booming of the copper mines is due to the energy of capitalists from the Transvaal and London, and all the coal mines are worked and supported by people of the progressive eastern and northern provinces. This retardation of southern Cape Colony is due to the fact that it has always been, and now is more than ever, Dutch—Dutch in numbers, Dutch in sympathies, Dutch in theory, Dutch in practice, and above all Dutch in government. Let no one run away with the error that recent events have done anything towards weakening the Dutch preponderance in Cape Colony. The "Bond" is stronger than ever, though for the time being it may be less openly aggressive. The Dutch element is bound to be strengthened as time goes on, for the Englishmen who come to South Africa go further afield than Cape Colony, and find their way to places where they can make money in modern industrial concerns. The Dutch agriculturist will gravitate back to the Colony from which he originally "trekked," because it is there that he finds a congenial atmosphere, sympathetic surroundings, politics which suit him better than those elsewhere, and equally good land for his purpose.

Cape Town has always had its "greatness thrust upon it." To explain this I will run rapidly through the history of the place. Table Bay was discovered in 1486 by the Portuguese, and

after some fifty years of spasmodic occupation as a *pied à terre* on the way to the East, was abandoned by them on account of the ferocity of the natives. Later on the Dutch utilized it as a suitable port of call for their vessels plying between Holland and the East Indies. They started a small colony of officials of the then powerful Dutch East India Company, and afterwards used the port as a dumping-ground for some of the French Huguenot refugees who had sought hospitality in Holland.

Then, in the course of developing our Eastern Empire, we, too, came on the scene. History all over the world and in all times has shown that Britons cannot live under Dutch rule. We ousted them there, as we have elsewhere, and assumed the government of the place. The Dutch had governed it badly, and we in our turn governed it equally badly, though on different lines. Systematically in those early days we treated the Dutch in Cape Colony unfairly, and our treatment of the English residents was worse. Now we treat the Dutch well and the Englishmen badly. In spite of all our muddling, however, Cape Town became increasingly important as a commercial and strategical point, until the opening of the Suez Canal, when much of its original *raison d'être* disappeared.

Meanwhile, however, fostered in the earlier days by the trade created by passing ships, it had developed into a self-supporting colony with requirements of its own.

In the course of time, however, it was found that

the natural industrial centres, where money could be made, were remote from Cape Town; and when gold was found in the Transvaal the important centre of South Africa was shifted abruptly from Cape Town to Johannesburg. This fact, however, was not patent to the world for a long time, for the firm hand of Paul Krüger was sufficiently powerful to keep that place in subjection though it could not prevent its growing wealth. And so for years Johannesburg has been a milch cow to the late Boer Governments, and to those of Cape Colony and Natal. Up to the time of the war it had no voice in politics, and now it is to rule South Africa.

New ports, as rivals to Cape Town, have been springing into existence, and the channels of trade are altering. Meanwhile, owing to the geological accident which placed the gold mines in territory which was out of our control, we found it necessary to go to war to ensure a reasonable government in that particular locality.

We have gained our point in theory at all events. Are we to profit by it commercially, or have we gone to all this heavy cost in blood and money for the benefit of our foreign competitors? That is the question which has to be solved.

Chapter II

THE COST OF LIVING AND TRAVELLING

THE cost of living is of such practical importance to those who contemplate visiting or residing in South Africa that it may be as well to place this chapter somewhat early in the book.

The engineers and business men who are likely to want information on this subject can be divided under three heads :

(1) The principal, or representative, of a firm, who, by means of a personal visit to South Africa, would organize or increase business, and establish or strengthen his local agents.

(2) The professional engineer, who, either on his own account or in the service of another, contemplates making this country his home for a term of years.

(3) The artisan, who would come to South Africa to look for, or to take up, permanent work.

I will deal with these three in the order laid down.

It has been my lot to travel in over forty different countries and colonies during the last twenty-five years, and on the assumption that most of my readers have had a personal experience of some

of those places, I will deal with this question from a comparative point of view.

My general experience, apart from South Africa, has been that with two exceptions one country costs about as much as another to live and travel in as a visitor. I place that figure at somewhere between £60 and £75 a month, and in doing so I assume that the visitor is living an ordinary hotel existence, is entertaining only in a modest manner, is moving from one place to another too frequently to admit of his making special terms for board and lodging, or of his studying other minor economies.

The two exceptions are the United States and Russia. I have found that in those countries expenses run to as nearly as possible £100 a month. I mention all this before dealing with South Africa so that those who have had experience in travelling may check my figures by their own. Individuals may or may not agree with my estimate, for the cost of living and travelling depends greatly on the man. If from their own experience such people find the figures I have just mentioned too high or too low, they can add to or subtract from the estimate which I give below relating to South Africa. It is probable that if they have larger or smaller ideas than I have in one country, the difference will be proportionate in another.

Now, if living and travelling in the United States and Russia are expensive, they are even more so in South Africa. Strange to say, in none

of the three does the visitor obtain his money's worth.

In the United States, though the resident may live in comfort, it is not so with the visitor. He sometimes finds himself in enormous hotels, and is often offered an enormous quantity of food, prepared and served with much eccentricity. In Russia, even in a small up-country inn, he can take his meals with a powerful mechanical orchestra braying "Tannhäuser" into his ear at a distance of three feet. Vodka, too, is cheap and plentiful, and is not unlike seed cake in a liquid form. All these luxuries, however, do not compensate the traveller for the want of the creature comforts which he obtains in the ordinary course in less expensive countries like England, France, Egypt, India, and Japan.

In South Africa to-day the traveller gets less for his money than anywhere else in the world. This, no doubt, is partly due to the war, and may improve with time, but the recovery will be slow.

I will deal now with the case of the travelling representative of an engineering firm. To "do" South Africa at all thoroughly in that capacity a sojourn of at least seven months in the country is necessary. Such a man must visit the principal centres in the four Colonies—Cape Colony, Natal, the Transvaal, and the Orange River Colony. He must also visit Southern Rhodesia, which is not yet a colony in the strict sense of the word. In doing this he should reckon on travelling some six thousand miles by railway. For the sake of

dealing in round numbers, I will call seven months 200 days.

As a rule, the commercial engineer will have but little "trekking," or wagon travelling, to do at the present day. His agents all reside in the big towns, and wherever there are mines, and sea-ports, and railway works, and users of machinery, except agricultural, there are, as a rule, railways to take him within easy reach of them. When he does have to trek, however, the cost should not exceed the figures I am about to give for living in a town without travelling. For this reason I leave that portion of his travelling out of the question.

Whether a partner or director of an engineering firm comes out here, or whether he sends out a representative, the cost should be practically the same. Your representative, to do any good, must be a man who can mix with good people, and he must live as other people live. As a rule, the choice of hotels in South African towns is very limited. They are all expensive, and, with two or three exceptions, bad. There is not one which, according to a European standard, could be accounted good.

In all cases there is a fixed price for board and lodging. In Cape Town this varies between 15*s*. and 30*s*. per day, with a small reduction for a month's stay. There are no such extremes as these elsewhere, but 12*s*. 6*d*. may be taken as the minimum limit and a guinea as the maximum. In Johannesburg all hotels charge £1 per day.

The daily fixed charge, however, is only one item among a number. The extras are heavy. Even a teetotaler and non-smoker must expect to add 5*s*. to his daily bill. The man who is not a teetotaler, but strictly moderate in his habits, and who drinks no wine, must reckon at least 8*s*. or 10*s*. for hotel extras. If he invites a friend or two to dine quietly once or twice a week, he will find that he has doubled his hotel bill in no time.

It is only in southern Cape Colony and the seaports that the penny is known as a current coin, except in Bloemfontein. Elsewhere, you cannot buy less than three pennyworth of pins or matches or postage stamps. The "ticky" is the lowest current coin. In Cape Town champagne costs 17*s*. 6*d*. a bottle, irrespective of brand; in Johannesburg, 25*s*.; and in Buluwayo, 29*s*.

To sum this matter up, I place the average hotel expenses of an ordinary commercial engineer, who does but little in the way of entertaining, at £2 a day in the towns in which he will spend most of his time out here.

The next item is the club. The prevalent theory that a club is not a place of business does not hold good in many South African towns. If the visitor wants to meet the business men it is essential that he should be put up for the clubs wherever he may be. He will often find that he has to lunch and dine at these places for convenience sake, while his hotel bill is going on gaily all the time. His club expenses add an average of 10*s*. a day.

Cab fares in Johannesburg are theoretically 7*s.* 6*d.* an hour, actually 10*s.* In most other places, except Rhodesia, they are somewhat less. The business man must at times use cabs, and he will often spend £3 in a day on these. He must reckon at least an average of 5*s.* a day for getting about by this and other means in and around the large towns. I therefore place the average daily cost of leading an ordinary life as a visitor in the big centres at £2 15*s.* per day.

In addition to these expenses, the business man has to purchase a licence before he can exercise his calling. In Cape Colony this is £25; in the Transvaal, £20; and in the other colonies smaller sums—say £75 for all, if his trip does not exceed one year. As a set-off against this, he has a concession on railway fares.

Full first-class fares cost 4*d.*, and second-class 3*d.*, a mile, and return fares 50 per cent. more than singles. The man who travels in the interests of any trading firm, whether he be a principal or representative, becomes legally a "commercial traveller," and is entitled to travel first-class at second-class rates. He is also allowed to carry free more luggage than the ordinary man.

The train accommodation, as trains go, is not bad, but the food obtainable along the lines, except in Natal, is extremely nasty.

Day in, day out, on the longer railway journeys, a man need not spend more than 15*s.* a day for his food. To this should be added 5*s.* for cabs, telegrams, tips, sundries and occasional extra fees.

There is only one thoroughly comfortable train in South Africa, and that is the new *train de luxe* of the Rhodesian Railways, which does the service once a week between Cape Town and Buluwayo. Another train, less well appointed, but where meals of a sort are served, runs at similar intervals between Cape Town and Johannesburg.

Some of the colonies issue season tickets over the whole of their systems. These may be of use to the ordinary commercial traveller who jogs on from town to town all through the country, but would be of no service to the representative of an engineering firm, whose tactics are not the same.

The man who obtains the "commercial traveller's concession" on his railway fares can reckon that his tickets will cost him, with 20 per cent. added for excess luggage, about £24 per 1,000 miles.

For purposes of convenience of calculation let us assume that out of his sojourn of 200 days the traveller crams all his travelling of 6,000 miles into twenty days. His expenses on this basis per day while travelling will be £7 4*s*. for tickets and excess luggages, and £1 for food and extras—£8 4*s*.

An estimate of expenses while living in South Africa for 200 days will come out as follows :

		£
Trading licences—say		75
180 days in various towns, or "trekking," at £2 15*s*.		495
20 days' railway travelling at £8 4*s*. . .		164
200 days.	Total . . .	£734

The commercial traveller obtains a certain reduction—I believe 10 per cent.—in some of the hotels, but my advice to the representative of an engineering firm is to go to the best hotel he can find, whether he can get a reduction or not. The best are bad enough to cause the traveller to wonder how it was that he ever found fault with accommodation in other countries.

In the above estimate I have allowed nothing for cabling messages home, for elaborate entertaining, for recreation, or for wear and tear of clothes and luggage. Such as it is, however, it works out to about £105 per month.

A very careful man, whose policy it is to move slowly, and who is allowed by his firm to work exactly on his own lines, can live less expensively than this. On the other hand, many business visitors tell me that they are spending sums which exceed my estimate.

We next come to the engineer, not a representative, who is endeavouring to make this country his home. Should such a man live a hotel and club life pending the time when he can settle down permanently, he should be able to do so for £2 per day if he is careful. He need not go to the most expensive hotel, and if he does he can come to an arrangement by the month ; he is not obliged to rush about in cabs continually, and he can generally regulate his life on economic lines. He gets no concessions on his railway fares, but it is to be presumed that most of his travelling will

be at someone else's expense, or that he will be recouped for it.

If he chooses to board with a family—and that is what I find most of them doing, until they have been in the country for some time—he can get boarded and lodged in Cape Town, Port Elizabeth, East London, Natal, Bloemfontein, and even Kimberley, for from £8 to £15 per month. This, of course, is merely for his bare board and lodging, and the cost of all the other essentials is so high that even the careful man must add another £10 or £12 to the above figure to get at his monthly expenditure. I consider that he should reckon his minimum cost of living in this manner, without travelling, and without clubs and recreations, at from £25 to £30 a month. In Johannesburg and Pretoria he would have to add another £20, and in Buluwayo £30 a month. In the country districts he can sometimes do things less expensively, but only on the understanding that he takes what he can get, and eschews most of the smaller luxuries of life. These last are often more expensive in the country districts than in the towns.

In the above estimate I am assuming that a man is endeavouring to live as economically as he can, either while looking for a situation, or while he is in a modest employment of some sort. If his wife is with him, and together they are living in the same sort of way, his expenses will be doubled. She will not require so many whiskies and sodas at from 1*s.* 6*d.* to 2*s.* 6*d.* each

as he may, but there will be rather more necessity to keep up appearances, and visiting will be an expensive matter.

I have allowed nothing for purchasing clothes in the above figures.

It is when a man sets up housekeeping for himself, or with his wife, that his troubles begin. House-rents are so very high, and the servant question is so difficult, that his expenses at once mount up.

I should say that a man and his wife could live in a small house and mix socially with the rest of the world in a modest manner for from £80 to £120 a month according to the locality. His house would be a galvanized iron shanty with five or six rooms, and he would keep no horses. Before such a step is taken, however, the man of limited means will probably have been in the country for some time, and will have ascertained for himself what this will cost him.

And now, at the risk of being accused of wishing to wreck the happy home, I would offer a word of urgent warning. To the man other than the artisan who is coming to this country with a view to taking up his residence in one or another of the towns I would say, "Do not bring out your wife, and especially your family, until you have seen the place, and know what the life is like. If you decide to stay you will be in a better position to arrange for settling down as a family man after a few months' sojourn in the place than you will as a new comer. You

will also be in a better position for going about the country and seeing things for yourself if you are alone.

In considering this matter I would point out that the social relations between white people in South Africa are not on a par with those in Australia and New Zealand. Class distinctions, though there is but little excuse for the fact in this sort of community, are very marked. For this reason the poorer gentleman, who would live as such, is much worse off than the highly paid artisan who need not keep up appearances.

Jack, though by no means as good as his master in South Africa, is often better off than his master. Not if his master be a Rand or Kimberley capitalist, or a hotel or shop keeper. What I mean to convey is that a fitter or smith may be in a far better position for saving money than is the salaried engineer under whom he may be working. In the large towns the expenses of the artisan may be high, and leave but a small margin for economies. But it is often the fate of the artisan in the engineering industries to be employed in outlying districts. The further he is set to work from civilization the higher is his pay, and the smaller his opportunity for spending his money. I saw a letter only recently from a fitter who had gone from Cape Town to Rhodesia, in which he said that his wages were 30*s*. a day, and that he was living quite comfortably for £2 a week. What he lived on I do not know, but, had he been an educated engineer who had to associate with people of

his own class, £2 a week would have taken him nowhere. In Buluwayo he would have to pay much more than that for his bare board, without lodging. In that place eggs are 8*s*. 6*d*. a dozen, soda-water 1*s*. 6*d*. a bottle, billiards 3*s*. a game, hair-cutting 2*s*. a time, and a shilling bottle of lime juice 5*s*. An engineer who is not very highly placed must have a good salary to be able to stand much of that sort of thing.

With the exception of the industrial and shop-keeping millionaires out here, and the undetected illicit diamond dealers, the Kaffir labourer is the best off of all. Now that the illicit traffic in liquor with the native has been in a great measure suppressed, and his pay is much higher than it was, the Kaffir can, and often does, put by money. With practically free quarters, an old khaki coat stolen from some dead soldier, a blanket, and a few mealies, he has got all he wants, and for the lowest of unskilled labour he is in some districts paid higher wages than the skilled fitter in some of the country workshops at home.

One of the most striking anomalies and most glaring injustices in the whole war was occasioned by the military authorities paying Kaffir coolies £4 a month and their keep, while our own Tommies were merely drawing under £2 a month.

No wonder that the black boy is now suffering badly from megalomania, and that the mine owners find it difficult to get him to work.

In conclusion I would say that, if it were possible to make a comparison of this sort where con-

ditions of life are so different, I should place the value of the pound sterling, as we know it in London for the purpose of buying the requirements of life, at the following rates in the more important districts :

Natal, and coastal Cape Colony.	12/– to 13/–
Central Cape Colony and Orange River Colony	10/–
The Transvaal and Northern Cape Colony .	8/6
Southern Rhodesia	6/–

These figures apply to the man with the small income, say £300 a year in Cape Town, £400 in Kimberley, £500 in Johannesburg, or £600 in Buluwayo. Such a man will require all the money he has to feed, lodge, and clothe himself.

To the man with a larger income the discrepancy between the value of money at home and in South Africa is not so great per pound, as it is the necessities of life which are the most expensive.

People are asking themselves continually how it is that the Englishman, when he has made money in South Africa, does not stop there and spend it, as do our fellow-countrymen in other British possessions, Australia, New Zealand, Canada, and the East and West Indies. The answer, I think, is simple. When a man has saved money in South Africa, and has given up the intention of making more, he naturally wishes to go to some part of the habitable globe where he can get a reasonable equivalent for any expenditure he may contemplate.

As a class, the Boer and the Kaffir alone are able to live in South Africa in the manner that

adapts itself to the country as it is. It does not suit the Englishman, and he will never look upon the place as a permanent home until the cost of living, as he requires to live, has been reduced to a figure which compares favourably with the cost in other countries.

Throughout this chapter I have dealt with the state of affairs to-day. I am told that everything is to come down in price. Let us hope that it may. There is but little sign of it at present, and as long as the rush to South Africa continues, and the hotels and boarding-houses are crowded, and houses unobtainable, I can see no reason for any material improvement in this way.

Great efforts are being made by Lord Milner and the Transvaal and Rhodesian Governments to reduce the cost of living to a reasonable figure by reducing tariffs and freights and improving communications. This question will be dealt with later. Years, however, must elapse before the full benefit of these measures can be felt by the community.

Chapter III

POLITICS AND THEIR BEARING ON THE INDUSTRIAL QUESTION

MUCH has been written on the subject of South African politics of late. So much that the Englishman at home has had rather an overdose of this mixed and somewhat nauseating medicine.

Nevertheless at the present day it is impossible to grasp the industrial conditions of a country without understanding the main political points, for the former are the outcome to a very great extent of the latter.

Writers have drawn lurid and sensational pictures of political South Africa from every point of view. It is not my purpose to adopt that method here.

In theory the industrialist, as such, is not a politician. In outlining the situation, therefore, I shall avoid the controversial, use no arguments, and propound no theories, but confine myself to stating bald facts. Only such facts will be given as bear upon the present industrial situation, and are likely to influence the prospects of the country.

The effect of the war has been to create, in name at all events, a British South Africa of all that territory which lies south of the Zambesi, with the exception of certain strips on the east and west coast, belonging respectively to Portugal and Germany.

The German territory is separated from the rest of this continent by hundreds of miles of desert country, and there is no railway communication between it and British South Africa. Consequently it is without political or industrial interest to us just now. On the other hand, Portuguese East Africa, or a portion of it, as affording the shortest high roads to Buluwayo and Johannesburg from the sea, is an important factor in the economy of British South Africa.

Years ago we might have purchased this territory for a small sum. We did not do so. Now, owing to treaties with certain other Powers, it is not in the market at any price for the moment.

Speaking industrially, the actual possession of that territory is of but secondary importance to us, provided that we can have a free hand in the disposal of traffic at Lorenço Marquez (Delagoa Bay), and Beira, and on the railway lines which tap Rhodesia at Macequece, and the Transvaal at Komati Poort, and can dictate the terms on which the transport of goods and passengers shall be carried out.

By a political arrangement, arrived at last year (1902), on the details of which I need not insist, and some of which are perhaps not inscribed in

any formal document, we have obtained that power. To all intents and purposes, for the carrying on of commerce, that portion of Portuguese territory which is essential to us is in our hands.

We now come to British South Africa. Starting at the Zambesi we have Southern Rhodesia, which, strictly speaking, is not yet a British colony. As another chapter in this book is devoted to the peculiar conditions obtaining in that territory I need say but little about it here.

Governed by the Chartered Company with extreme energy, its progress is being forced artificially to a far greater extent than has been the case with any other territory of equal immediate prospects under the British flag. The return for this expenditure will doubtless come some day. Meanwhile, there is not, and there never has been any question of disloyalty in Rhodesia, and the Dutch element has at no time been a cause of anxiety. The black troubles in this part of South Africa, so valiantly overcome by the handful of white residents, we may hope are things of the past.

Natal, though, as in most self-governing colonies, progress is sometimes hampered by party politics, is absolutely British and progressive. Speaking generally, the Dutch residents are genuinely loyal, while those who hold anti-British views are not sufficiently numerous to be a source of danger to the Empire.

In the Transvaal and the Orange River Colony

we have peace at last. Ruled by Lieutenant Governors as Crown Colonies, under the direct control of Lord Milner, and with a large and rapidly growing British majority in the more important of the two, we have nothing to fear in the way of an anti-British element in politics while the present régime shall last.

There never was any serious bone of contention between Britain and Boer in the late Orange Free State, and the Boers in both the new colonies, whatever their feelings may be, have accepted the inevitable for the time being, and are anxious to settle down quickly and quietly. The pernicious influence of the Afrikander Bond, however, whose home is in Cape Colony, is always latent here, but while the firm but light hand of the present High Commissioner guides the destinies of the Transvaal and Orange River Colony, the Bond will not be able to exercise any active control in them. Here the industrial future, clouded only by the present scarcity of labour, is brighter than anywhere else in South Africa. The sweeping reforms in the methods of life, the shortening and improving of the communications between these colonies and the sea, the reducing and abolishing of tariffs, the settling of agriculturists on the farms, the tapping of local agricultural districts by new railways, and the slow but sure reduction in the cost of living will all improve the conditions, and give an immense impetus to industries.

We now come to Cape Colony, the "rebel colony" as it is called. Like most generalizing

expressions, "rebel colony" is misleading. In the first instance there is no disloyalty which could cause the Empire any uneasiness in Cape Colony north of the Orange River, or in the eastern provinces. In fact, so great is the distrust in the present Cape Government of the people in those two huge slices of territory, that in the former Mr. Chamberlain was earnestly besought to bring about its annexation to the Transvaal, and in the latter the inhabitants petitioned for separation from the Cape.

The rebel district, if it may be described as such, is confined to Central and Southern Cape Colony. And even the rebels, the men who actually fought against us during the war, are no longer the active enemies of the Crown. Under the existing Government of Cape Colony, however, they may be a menace to British interests in South Africa.

It is that little understood organization, the Afrikander Bond, which is at the root of the reactionary influence in South African politics.

The Bond is a body which is supposed to represent and keep alive the Dutch interest and influence in South African politics. There is not a word in its printed documents which would suggest disloyalty to the British Crown. History, however, has clearly shown that the methods of the Bond are not in the least in accordance with its formal documents. We know now that it was Bond influence that propped up Paul Krüger in his belief that he could drive the British into the sea. It is an accepted fact that Bond influence prolonged

the war. It is on record that members of the Bond preached sedition and instigated the rebellion in Cape Colony.

It does not follow that all the active Bond agitators in and out of Parliament are formally enrolled as members of that body. It is thought better that some of the more prominent should be able to disavow actual membership. Mr. Merriman, Mr. Sauer, Sir Gordon Sprigg, and Mr. Douglass are none of them enrolled as members of the Bond.

Such is the party which at present rules Cape Colony. Such is the party of which Sir Gordon Sprigg, who came into power before the war as a so-called loyalist, has constituted himself the nominal leader and the actual tool.

Let us glance at the situation during that time which elapsed between the end of the war and the arrival of Mr. Chamberlain in Cape Colony. Since that date, in view of what passed between the Colonial Secretary and the Cape Government, the political situation must be regarded in a measure as *sub judice*.

At the close of the war Sir Gordon Sprigg came to London and assured the Imperial Government that, if he were allowed to remain in office, he would undertake with the existing Government to rule the colony on British lines.

I do not criticize his motives in making that statement, but it is necessary to point out that he was aware that before the war there was but a slender loyalist majority, and that, owing to

certain vacancies which had occurred during the war, that majority had been turned into a minority. Thus the Bond, the disloyal Party, the Opposition, were actually in power, and it became a practical impossibility to carry on the Government on British lines.

The erstwhile colleagues of Sir Gordon Sprigg urged him to bring about a redistribution of seats, which for years had been a crying necessity, owing to the shifting of the importance of the various centres in the colony. Such a measure would have created a loyal majority in the House. Sir Gordon Sprigg would have none of it.

Then the loyalists applied to him to take measures to fill their vacancies, but the Premier was inflexible.

"Then, how are we to carry on the Government?" asked the loyalists.

"It is not for you, but for me to carry on the Government," was in effect the reply.

Sir Gordon did not keep his former friends long in suspense as to his policy. He made it clear, through the medium of the Governor's speech at the opening of the first Parliament, after the war. It was then ascertained that the nominally progressive Premier had forsaken his loyalist colleagues and gone over to the Bond.

Never at the opening of any British Parliament has it been the lot of British subjects to listen to so humiliating a document, supposed to emanate from the Throne, as the address concocted by Sir Gordon Sprigg at the instigation of Mr. Hofmeyr

and his colleagues, and delivered by Sir Walter Hely-Hutchinson on that occasion in Cape Town.

From the terms of it we learned that there was to be no Bill for dealing with sedition or for the restriction of the importation of arms, or for the exclusion of political undesirables. There was no acknowledgement of the work of our troops, or regrets as to the loss of British life during the war, there were no thanks to England or the Colonies, and there was no tribute to the memory of the late Mr. Cecil Rhodes in the Governor's speech. There was to be no redistribution of seats, based on population instead of on area, as at present, and the Progressive or Loyal Party were to be condemned to a minority by this means. This effacement of the loyalist was to be made more secure than ever by the refusal of the Premier to sanction the writs for the filling up of the Progressive vacancies.

Small wonder that in these circumstances the whole of Sir Gordon's Progressive followers left him in a body, with the exception of his four ministers, repudiating a Premier who had thrown them over in favour of the anti-British policy of the Opposition. At the present day, therefore, Sir Gordon Sprigg sits with his ministers on the front Government benches, still calling himself a "Progressive" Premier, advocating the anti-British claims of the Afrikander Bond, on whom he relies for his majority, and who use him as a mouthpiece and a puppet.

By utilizing in this manner the services of the

" Progressive " Premier, the disloyal party have made for themselves an ideal position. They have attained power without responsibility. The items of their anti-British programme pass through as " Progressive " measures. They are sheltered by Sir Gordon Sprigg's political umbrella, and they carry the stick with which they belabour him if he does not conduct them along the paths that they have indicated to him. This unholy alliance has made it impossible for the loyalist party to pass a single measure in the interests of Imperial British policy.

No ! I am wrong. One Bill was passed which was essentially British. It was the war Indemnity Bill. Bond members tore their hair at having to pass it and, while voting for it, openly avowed that they considered it an iniquitous measure. Then why did they pass it ? Was it Sir Gordon Sprigg's influence with them ? No. Sir Gordon has no influence for good or evil with that body.

The Bond passed the Indemnity Bill simply because the one stipulation that the Imperial Government had thought fit to make with Sir Gordon Sprigg was that until that Bill should have become law, Martial Law would not be withdrawn.

It is necessary to grasp fully this incongruous and humiliating political situation in Cape Colony before discussing the possibilities of the place as a field for engineers. How long the British Government will allow this state of things to last it is impossible to say, but until it is done away with

there will be a standing menace to British interests in South Africa generally, and a bar to industrial, and therefore to engineering, prospects in Cape Colony.

Cape Colonial politics, which Mr. Chamberlain has aptly described as "the politics of comic opera," may have their humorous side to the man who is not vitally interested in this part of the world.

Fortunately for every one concerned, the people of the colony, whether Dutch or British, are so sick of the existing state of affairs that a change must come. The Constitution is not to be suspended, but a Redistribution Bill cannot be put off much longer. The next elections will take place before that can come about, and yet it would seem that even with the present unfair distribution of seats there is a possibility that a small loyalist majority will be forthcoming. If so, we may look to see Sir Gordon Sprigg join the Progressives again if they will have him.

In any case we shall either have a Bond or a British Government, and not a Bond Government under a nominally loyalist Premier. We shall know where we stand, and that will be an improvement on the present régime.

And now Mr. Chamberlain has come and gone. In the course of his meteoric passage he spoke many words of wisdom in Natal, in the Transvaal, and in the Orange River Colony. When he reached Cape Colony Sir Gordon Sprigg reiterated to the Colonial Secretary the promises he had made in

London ; those promises which had had the effect of causing the Imperial Government not to suspend the Cape Constitution.

To Sir Gordon Sprigg's assurances were added those of Mr. Hofmeyr, who was Paul Krüger's trusted adviser before the war, and who now holds Sir Gordon Sprigg under his thumb.

Mr. Chamberlain, on behalf of Great Britain, has accepted those assurances. They were perfectly satisfactory, as Bond assurances always have been. We have yet to learn to what extent they will be fulfilled.

Mr. Hofmeyr, in accordance with his promise to Mr. Chamberlain, issued a conciliatory circular to the disaffected Dutch, and a few days later committed political suicide by saying that thenceforth he should retire from the political world. This robbed the circular of all its force.

A week after Mr. Chamberlain's departure from Cape Town, Sir Gordon Sprigg persuaded a Deputation to wait upon him. In spite of his undertaking to observe a conciliatory policy towards the Loyalists, the Premier used the occasion to make a violent attack on his late colleagues, and accused them still of keeping up an agitation for Suspension.

That is how the political situation stands today. The effect of it is that southern Cape Colony is alienating herself more and more from the sympathies of progressive South Africa, and the incentive to the industrialist to invest his money in that particular spot is reduced day by day.

Changes there must be, but it is difficult to say

what form they will take. The rapidly growing importance of other parts of the continent, however, is gradually and surely sapping the strength of Cape Town as a political factor in South Africa.

Of one thing we may be sure—If Cape politicians cannot be persuaded to govern on progressive lines that huge colony will be dismembered. The northern and eastern provinces will become detached from the southern portion; and this not by force or arms, but by force of circumstances.

Chapter IV

THE COMING BUSINESS "BOOM"

WE were told, and told continually, that as soon as peace was declared in South Africa there was to be an immense boom in trade.

That great talisman, the British flag, was to produce a marvellous and instantaneous influence upon business, and our industrialists were to wax fat.

"Trade follows the flag," we are told, and so it does. But it does not follow it by wireless telegraphy. And unfortunately it is not only British trade that follows the British flag, but the trade of other countries too.

We are wont, in England, to overdo things. We overdo teetotalism, and anti-vaccination, and ping-pong, as we overdid Mafeking and the Boer generals. And so, by long anticipation, and egged on by the forecasts of optimistic writers, we overdid our estimates of the trade which was to result immediately on the termination of the war.

Let me illustrate the case by means of a parable :—A man has been suffering for some years from a wearing and debilitating internal disease. He

is no longer the man he was. His vitality is being sapped, and yet by sheer force of will he endeavours to carry on his work. "Ah!" say his friends, "if only he were free from his complaint, what a wonderful man he would be, what a large business we could do with him." At last, after a difficult surgical operation, he gets rid of the evil, and he is pronounced "cured." His friends expect to see an instantaneous and marvellous development of the invalid's physical and mental capabilities. They forget that time must elapse, while the patient is recovering his strength, that if he were to try to do too much in these early days, all the good that has been effected might be undone. They expect too much of him, and they expect it too soon.

South Africa has been in the position of that sick man, and during the later period of the war strenuous efforts were made to carry on a certain amount of mining and other industrial work. And these efforts were partially successful. The termination of the war did not make the difference between no work at all and full work in the mines. It merely made it a rather less difficult matter to carry on work than had been the case previously.

The enthusiastic public thought differently, and bought "Kaffirs." When they were told that the recovery of the mines would be a very slow process, they jumped to the opposite conclusion, and began to fear that they might not recover at all. Both conclusions were equally

erroneous. The result, however, was the " slump " which now exists. And yet there is no cause for alarm. The labour difficulty is at the root of the business; and though things in this way are improving, the process of improvement is necessarily very slow. Then there was the delay of the Imperial Government in deciding the question of war taxation. This caused the big capitalists to hold their hand, and the smaller men, uncertain as to whether the "slump" was going to ruin them, were still less inclined to speculate in orders for plant.

Mr. Chamberlain's visit has had a reassuring influence on industrialists out here on the whole, though the non-interference by the Imperial Government in Cape politics has been a set-back to progress in that colony. Yet the decision that Cape Colony is to work out her salvation on her own lines has also in a measure steadied business nerves in that place.

People know, at all events, what they have to expect. Under Bond influence they are aware that progress will be slow indeed, but it rests with the people of the colony either to turn the Bond out at the next election, or to be governed by the retrogressive policy of that Party.

That South Africa will become an increasingly valuable market for the manufacturers of the world there can be no doubt, for whatever the future of Cape Colony may be, the rest of South Africa must steadily grow in importance now that peace is assured.

But I can see no reason to anticipate any sudden "boom," for there are still so many effective drags on the progressive wheel as to greatly restrict its freedom of action.

These drags may be classed as follows :—

1. The Bond majority in Cape Colony.
2. Intercolonial friction.
3. Excessive cost of living.
4. Excessive railway and shipping rates.
5. Inadequate trade channels.
6. Inadequate labour laws.
7. A tendency in politicians at home to dabble in the South African Labour question.

In this book I have endeavoured to show how the influence of these various drags, or most of them, should grow weaker as time goes on until such time as the wheel of progress shall have attained its full speed.

This removal of the obstacles to advancement will be very gradually effected, and so the promised boom will not come about suddenly. Perhaps it is all the better that such should be the case, for a steady increase can be much more satisfactorily dealt with, and will be less likely to lead to a sudden financial collapse of the country.

A gradual increase should suit the British manufacturer better than a sudden rush, for it will give him time to study the country and formulate his policy for dealing with it.

We are often told that the British manufacturer is slow to move. If that is so, he at all events has

an immense amount of weight when he does move, and, once in motion, his momentum is very powerful.

The saving of the South Africa of the future, as far as industrialists are concerned, is unquestionably the growing influence of Johannesburg and the other great mining centres. Whatever the policy of the capitalists, who must one day rule South Africa, may be, and whether we may agree with that policy in the abstract or in the concrete, there can be no question but that it must tend to the industrial advancement of the country.

South Africa may be a better or a worse place to live in when that time comes, but that it is coming I cannot think that any sensible man will doubt.

The capitalist cares nothing for South Africa but what he can make out of the place. Primarily he must mine, whether it be for gold, diamonds, coal, or copper, or, as we now anticipate, for iron and tin.

Incidentally there are the many industries which must spring up for the purpose of maintaining those mines and feeding an ever increasing population. All this means progress, and progress means orders for machinery and plant, and employment for engineers.

The chances of the manufacturer in the outside world as a permanent furnisher of goods to South Africa are enhanced by the fact that it is impossible to see how by any conceivable process

that country will be able to undertake manufacturing on a large scale on her own account.

Years must elapse before her wages are levelled down or the wages of the outer world are levelled up so as to equalize the discrepancy in cost of production which now exists.

Food stuffs she can be made to produce, and it is to be hoped she will. As that local food supply increases, so will the cost of living go down, and the inducements to immigration will become stronger. With an increased immigration there will be an increase in the general wants of the community, and so the prospects of the manufacturer away from South Africa should be great and lasting when the promised boom shall have reached its full force.

Chapter V

THE PROSPECTS OF EMPLOYMENT

FOR some months after peace was declared hardly a day passed without a notification in the papers to the effect that a fresh batch of artisans was about to arrive or had arrived in Cape Town from England or some other country. Of these a very large percentage were mechanics—fitters, machine hands, smiths, and a few pattern-makers. There were others in industries closely allied with engineering, such as masons, bricklayers, joiners, etc.

The rush is still going on, and since the withdrawal of the permit system it has naturally become worse than ever. In trying to explain the position of these men on their arrival I would point out at once that the fancy wages that are spoken of in England as prevailing out here for the casual applicant are non-existent.

Wages which appear high to the Englishman at home are paid and must be paid, for the cost of living is so exorbitant that the normal rates of pay elsewhere would not constitute a living wage.

In another chapter I have made an attempt to give a scale of the relative values of the pound

sterling in various parts of South Africa. Those figures are of particular importance to the man on a small salary or a daily wage.

In the chapter on Southern Rhodesia I have given the official figures for industrial and domestic labour. It is there that both wages and the cost of living reach the high water mark in South Africa, and probably in the world. Wherever one goes in this country wages and cost of living are proportionate.

White skilled labour of all sorts is wanted everywhere in this part of the world. It is wanted, but the country is not ready for it in great quantities. A steady influx of good skilled men, and, above all, of useful practical women are what South Africa requires at the present day.

While there is a scarcity of unskilled black labour it is impossible to find work for the skilled white man in great numbers, and I have endeavoured to show elsewhere in this book that white unskilled labour in the modern industries is an economic impossibility in South Africa.

The black labour supply is gradually and steadily improving. Let the workman who would come to South Africa watch the state of the black labour market, and he will find it a sure barometer to the prospects of employment for himself.

As wages vary so much in different parts of South Africa I shall deal only in this chapter with figures relating to that part of Cape Colony which is on or near the coast. In Natal wages are rather higher, in Kimberley and Northern Cape

Colony, and the Orange River Colony they are higher still. In the Transvaal they are yet higher, and in Southern Rhodesia they are highest of all. Yet in every case the cost of living is in proportion.

The only male white labour wanted in South Africa just now in a large, steady, and continuous stream, is for the building, agricultural, and pastoral industries. Building trade hands in coastal Cape Colony, provided that they are skilled in their callings, and steady in their work, can easily find employment at from ten shillings to twelve shillings and sixpence a day, exclusive of overtime. The average normal week is from forty-eight to fifty-one hours. The amount of building and construction work which is going on now, and which is daily increasing, makes it a practical certainty that any artisan in this line may reckon on securing work with but little delay after arrival, which will bring him in at least £3 per week. He must, however, fulfil the conditions as to skill and steadiness.

The wages for skilled mechanics are precisely on a par with those of the building trades, the only difference being that the artisan engineer is not wanted just now in great numbers, and the artisan builder is.

I do not mean to say that the individual fitter, or machine-hand, or smith, who has a strong inclination to try his luck in South Africa, should not come out now, for if he keeps his head, and really tries to obtain work here, he should be able to do so on the above terms. The time, however, has not come to recommend the policy of drafting

out gangs of men in this trade by the hundred, or even by the score, at a time. The artisan engineer is not a dire necessity in large quantities just now in Cape Colony, Natal, Rhodesia, the Transvaal, or the Orange River Colony. His day will come, however, and if the political atmosphere could only be cleared, and an era of systematic progress brought about, that day would not be far off.

The railways and harbours are extending, machine shops, mining, and private irrigation works are all developing, and everything points to a great demand for the artisan engineer. Let, therefore, the qualified men come out here by ones and twos if they can be satisfied with £3 a week at the start, but not by hundreds at a time just yet. For the effect of quantity will be to reduce the price of their labour.

Then comes the question as to the relative value of wages out here and in England. A fitter, pattern-maker, or smith in England, who is a steady and efficient worker in one of the larger centres of engineering, can usually make, year in, year out, at least from 32*s*. to 36*s*. a week. He has his home, his surroundings, his friends, his habits, and he has learnt how to accommodate his methods of living to his income.

Here in Cape Town he will find living very nearly twice as costly as in London, and vastly less comfortable. His bare board and lodging will cost him from 25*s*. to 30*s*. a week, and it will be bad at that just now. To the engineering artisan who arrives here, and has to find lodgings,

and live as best he can until he has made a settled home for himself, £3 a week will not go so far as 35*s.* in London, or as 25*s.* in some of the less expensive engineering centres in Great Britain. It would be quite a mistake for the married man to imagine that he could come out here by himself and live fairly comfortably on half the money he would make, while sending the balance home to feed his family.

The man of the artisan class who is wanted here for this country's benefit, and for his own comfort, is the steady-going married man with his wife and family.

In the early days he may find the initial expense heavier, but in the long run he will be much better off. If he can afford to rent a small house, and take in a lodger or two, he will make money and reduce expenses. And if his wife has a capacity for work of any sort, and his children are of an age to be of any use to him, he can reduce his expenditure and increase his income in an extremely satisfactory manner.

In other words, the bachelor artisan, as a new arrival, is not so well off with £3 a week as he would be at home with the money he at present earns; whereas the position of the married man, with a practical wife, is very much better.

I have harped on the figure of £3 because that is the regular minimum wage. It is the figure at which a skilled mechanic is started. There are fitters here, and smiths, and pattern-makers, who are earning up to £4 10*s.* Men are paid according

to their merits in this part of the world, for trade unionism, as we know it in England, has not yet succeeded in getting a firm grip upon them in the engineering trade. It is beginning to make itself felt in the mining centres and in one or two of the large shops in the coastal towns, with the result that in those there is less scope for the individuality of the workman than in the others. In such places there is a tendency to bring wages to a uniform rate for the benefit of the inferior man, and to the detriment of the better man. Thus it is that there is a decreasing prospect of reaching anything like the £4 10*s*. rate in those establishments.

Now, with regard to the supply of labour available on the spot. There is here, in Cape Town, a most excellent and effective Government Labour Bureau in connexion with the Department of Agriculture.

This institution, which is presided over by Mr. Eustace Pillans, registers the names of all who apply for work, and endeavours to place such applicants, after looking into their qualifications. There is no charge for registration, and, as far as possible, *bonâ fide* applicants, who are destitute, are housed at the cost of the country, at a place called Maitland Camp, near Cape Town.

During the thirty-five days which ended on August 31 (1902) no less than 872 men registered their names as being on the look-out for work. Of these, 700 were placed in one sort of employment or another. Of the remainder, 148 were loafers and

wasters, who either refused employment at a minimum rate of six shillings a day—temporary unskilled labour—or who had come with false certificates and recommendations, and who were quite incapable of working in the trades to which they professed to belong. Many of these refused to work at all for less than fifteen shillings a day, stating that before they left England they had been promised that sum—of this I shall have more to say later on—and preferring to live free of all cost, with nothing to do, at Maitland Camp.

When it is found that a man is absolutely hopeless he is turned out of the Camp, but every care is taken to ascertain something of his capacity and character before this step is taken.

The registration of unemployed takes place in one of the squares in the centre of Cape Town, in a little galvanized iron structure, before which from morning until night can be seen, any day of the week, a mixed crowd of applicants. As a class they are fairly respectable-looking, but many are as rough, dirty, and ruffianly as they can be.

Applicants for work here are made up of (1) men who come out from home for the purpose; (2) stowaways; (3) deserters from ships; (4) discharged irregulars; (5) refugees from the interior who cannot get back; (6) town loafers.

They are placed according to their trades, if they have one, and if there is any demand for their services in that capacity. If not they are offered unskilled labour, or placed on farms, where they can readily earn £1 a week and their keep. In

such employment the eventual prospects of any handy and steady man should be extremely good, and if we wish to Anglicize the country districts the more Englishmen who are placed on the farms the better for the Empire.

I have based all that I have said above on the state of things at Cape Town, because this is the largest and the natural port to which immigrants direct themselves. In the other British ports in South Africa conditions just now are very similar.

The ultimate goal of most people who come here from England "on spec." is, of course, Johannesburg, but those who would seek work there must bear in mind that the chances of employment just now are not necessarily better than they are elsewhere. Again, *bonâ fide* workmen who are in touch with the Government Labour Bureau in Cape Town can always be drafted up to Johannesburg or elsewhere when there is a demand for their services.

The Labour Bureau also recruits for the police. Only men of very good character are taken for this, but the emoluments and prospects are good in this service. This is not precisely an engineering subject, but I point it out because it is of the utmost importance that we should have all the good Englishmen we can find places for out here, if we are to make of this place a British possession in fact as well as in name.

And now as to the steps to be taken by those who would come out in search of employment. There is only one source of information in England

to which the emigrant should apply, and that is to one or other of the agencies in Victoria Street, Westminster, of the two South African Colonies which are possessed of seaboard, Cape Colony and Natal. The Imperial Institute is quite as useless for this as it is for any other colonial purpose. Above all, no attention whatever should be paid to those so-called "emigration agents" in England, of whom there appear to be many, and of whom—if I am to believe the tales of some of the unemployed now out here—many of the new arrivals have been the victims.

I am told by some of these men that they have paid to such agents heavy fees for the privilege of applying to them, and that they have paid through these agents for their passage out sums which have been in excess of what they would have paid had they applied to the shipping companies themselves. They state that they have been promised that on arrival in Cape Town they would be met by a deputation who would take them in hand and place them in work immediately on arrival at from fifteen shillings to a pound a day.

If these statements have been made to them these men have been grossly misled. But this is only the beginning of the pitfalls which beset the path of the emigrant from Great Britain.

Cape Town is no worse than any of the other South African ports in this way, except that it is bigger and may therefore possess greater facilities. After the war, however, it became infested with a community of ruffians whose especial business it

was to live upon the new comer. This community is largely a product of the late war, and its harvest has been very substantial.

Now that the war is gradually falling into the background things are not nearly so bad as they were in this respect, and as the result of a new law there has been a general weeding out of bad characters and bad establishments.

In spite of this fact, however, the working immigrant to this country should be careful of himself and his money when he comes ashore. There are landsharks enough who will be anxious to befriend him as long as his money lasts. The only deputation which awaits him on arrival is composed of men of the class who used to meet the soldiers who were returning from the front at the railway station, and who fleeced them. The men who are on the look-out for the immigrant, however, describe themselves as labour agents, and tell the new comers much the same tale as was told them by the so-called "emigration agents" in England. These people, too, will draw a fee from the new comer in return for a guarantee to find him a situation. They will also be kind enough to accommodate him in the meanwhile if he has any money, and the chances of the mechanic being robbed are only less than those of the homeward-bound soldier in that he is, as a rule, a more contriving man in money matters than is the emancipated "Tommy" who has drawn his pay.

As far as I can ascertain, not one in a hundred of the men who land in Cape Town in search of

work is in a position to maintain himself on arrival. Now that the permit system is abolished there is no stipulation as to a man having means. At the same time I would point out that it is highly advisable that a man should be able to pay his way for a few weeks while waiting for employment.

To the mechanic at home I would say, "Come, by all means, provided that you know your trade thoroughly, and are prepared to work hard at it, and provided that too many of you do not come at a time. Above all, before you decide to leave England, inquire of the Agent-General in London, and of him alone, as to whether there is a likelihood of your obtaining immediate work. Have your credentials examined by some one in authority at his office, and ask his advice as to accommodation on your arrival in Cape Town. When you reach Cape Town avoid all offers of assistance until you have been to the Government Labour Bureau, and do not postpone your visit to that office until all your money is gone and you are on your beam ends. And should you find that the Government Bureau cannot place you at once, and that you cannot obtain employment by personal application to the local employers, carefully avoid paying any fees to the outside 'labour agent,' who will merely take your money and leave you in the lurch."

There is one more point on which I would offer advice to the mechanic who is coming out here. "Do not sign an agreement before leaving to work for a specified time in South Africa, even at a

coastal town, for less than £3 a week in coastal Cape Colony or Natal, £4 a week in Central and Northern Cape Colony and the Orange River Colony, £5 a week in the Transvaal, and £6 a week in Rhodesia." I mention this because there are skilled men here working on a three years' contract, signed in England, at the rate of 10*d.* an hour. This means that they are practically in the position of bonded servants for a lengthy period at about two-thirds of the minimum market value of their services in the cheapest part of South Africa.

No coloured labour is used in the skilled engineering trades. The labourers are supposed to be all coloured, but in these days of landed stowaways and discharged irregulars any number of white men are applying for work as labourers in engineering shops. The black labourer is paid four and sixpence a day, and the white man a little more.

To leave the question of the artisan and deal with that of the professional engineer, it is advisable to note that large numbers of men of this class have come out to South Africa since the war. Of course at the present day South Africa breeds many of her own engineers. The railways and some of the mines have been going quite long enough for a generation of men, reared in an atmosphere of South African engineering, to have been produced on the spot. It is because the mechanical progress of the country is far in excess of the local supply that there is and there must be a

demand for the professional engineer from elsewhere.

For this reason I am very hopeful as to the prospects of engineers in South Africa, even in the early future. But those who come to this country without an appointment must not look for too much in the first instance.

That English engineers are looking to these colonies as a field for their future labours is quite clear from the fact that in the local papers I see almost daily advertisements from such people, who are still in England, applying for work out here. With all due deference to these applicants, I would say that I do not think that their methods are likely to lead to much. In practically every department where engineers are required in the higher grades of the profession there is an ample supply on the spot, and in most departments there are younger men qualifying to take the places of their seniors when the time comes. When a specialist is required from England or elsewhere the various Governments and mine owners know perfectly well where and how to apply for him.

The lists of applicants for Government employment all over South Africa, and especially in the two new colonies, are extremely lengthy. At present in the Transvaal and Orange River Colony these appointments are under the provisional Government, in the gift of the executive heads of departments. Applications are sent in to the department in question in the usual way. A few are picked out, and submitted to the executive

head, who is a member of Council. From these a selection is made. That the chances of the individual are small just now is clear from the fact that in the Department of Mines alone the applications for employment of all sorts number at the present day over 3,000.

The hotels and the boarding-houses are accommodating scores of engineers who have come out "on spec.," to fill vacancies, or make an employment for themselves. Many of these have succeeded, while others have been here for months and are still, like Micawber, "waiting for something to turn up." South Africa is, as I have pointed out, an expensive and, even for the man who possesses a certain amount of money, a somewhat comfortless place to kick his heels in, and he who comes out here without the promise of a definite billet is likely to waste a considerable amount of time and money before he gets placed.

It is quite a mistaken idea for a man to consider that, in engineering at all events, he can give up a moderate billet in England with a reasonable chance of jumping right to the top of the tree when he arrives out here.

The man whom I recommend to take his chances in South Africa is the young and energetic engineer, who has worked his way up to that sticking point, arrived at by so many, where, after having acquired a thorough knowledge of his particular branch, he can see no prospect of material advancement at home for many years to come.

If such a young man will come out with suffi-

cient money—say, £200—to enable him to live for a few months while he is looking about for employment, and taking his bearings, his chances in the long run might be good. But he must be prepared to take a position here at much the same level as that which he gave up at home, or perhaps a little lower down on the ladder, and from there he must work his way up. When he has shown himself capable, his advancement should be much more rapid here than at home. To such a man I should say, "Come to Cape Town rather than to Johannesburg in the first place." In Johannesburg everything just now is congested beyond measure, for want of black labour. Until this is remedied the chances of work for the professional engineer are small, and the cost of living is far higher there than it is in the coastal colonies.

Here I would emphasize the point that the engineer who is without the means which will enable him to remain without employment for a time, should not come to South Africa at present on the off chance unless he is prepared to take any sort of menial employment.

In South Africa the bulk of the engineering billets are either in Government or municipal work, or in one or other of the large companies for mining, electric lighting, power, and tramway companies. Practically all the railways and harbours are in the hands of the various Governments.

The requirements in all these departments are increasing rapidly, and that is why the chances for employment are great for the competent engineer

who does not mind starting in a humble capacity until he has shown his capabilities.

Very little machinery is actually manufactured in South Africa, and the prohibitive cost of labour and materials will make manufacturing on anything of a scale an impossibility for years to come. Consequently the engineering works are few and comparatively unimportant. Attached to the railways and to some of the mines are fairly large repairing shops, and independent engineering works carry on repairs and make such articles as must be turned out hurriedly. At the various seaports there are certain shops where marine and other millwrighting is done, and in Cape Town water boring plant is manufactured on a small scale.

Such as they are, however, these engineering works are increasing, but in South Africa the scope in this way is strictly limited, and, practically speaking, there is no chance of employment in the works that exist, as all openings can be filled locally.

There may be some openings for the manufacturing, or rather putting together, of bulky objects, made up from plates imported in the flat, such as pipes, cyanide vats, skips, and so on. But this is so essentially a question for personal investigation by the man who contemplates establishing himself in this way that it would be idle for me to deal with it here.

Chapter VI

THE LABOUR QUESTION

MANY random propositions have emanated from England for the solution of the labour problem in South Africa. Among them there has been none more impracticable and out of the question than that which advocated the substitution of white unskilled labour for black in the mines of this country. Weight has been given to the above suggestion by the fact that it emanated from the *Times*, and the theory that by flooding the country with white labour we should swamp the Dutch political influence was sufficiently plausible to lend to the scheme a certain primâ facie argument in its favour.

Writers at the present day are apt to coin a catch-phrase and to run it to death. Writers on South Africa have been no exception to this rule, and one of the most pernicious and popular of these catch-phrases is that "South Africa is a white man's country." What does this signify? If it means that we can do without the assistance of the native in carrying on the industrial, commercial, and domestic business of the country the doctrine is absolutely fallacious. South Africa

is only "a white man's country," in that the white man can live and rear his family in many parts of it, between the Zambesi and Cape Town. "If such is the case, then," people might ask, "why not encourage the unskilled labourer to do so?" This question must be answered by another, "Who is going to support him when he gets here?"

It is perfectly true that if we could succeed in planting British unskilled labour all over South Africa we might snap our fingers at the Afrikander Bond, for we should then have an overwhelming political majority. But it is impossible that we should be successful in such a scheme, for if we were to endeavour to force any measure of the sort upon the country we should transform every loyal British employer of labour out here into a Dutchman. In other words, we should make it impossible for the industrial man to carry on his business.

In such circumstances the erstwhile Uitlander would sigh for the return of Paul Krüger, and the Cape Colonial loyalist would cry, "Long live Sprigg and the Bond!" With one fell swoop all the low grade gold mines would have to stop work, and all the collieries and copper mines would have to lie fallow.

Without mining South Africa as an asset to the British Empire would be valueless. Then, again, if white unskilled labour is to be the order of the day in the mines, the other industries must follow suit. The unskilled labour on the railways and

engineering works, in the docks and elsewhere, would have to be white, for in practice, all the world over, it is found economically impossible or, at all events, absolutely undesirable, to place black and white labour on an equal footing.

We have several object lessons before us. In India, where the native is not a negro, but is many rungs above him on the anthropological ladder, we do not attempt to mix black and white labour. It may be urged that this has been a question of climate, and so in some degree it has. But there was another and all-important influence, viz., that in taking over the management of India we had to assume certain grave responsibilities towards the large native population. We undertook to civilize the Indian, and in doing so we have had to find work for him.

The other side of the medal is shown in Australia, where the aboriginal was never of use as a labourer and where contact with civilization and intoxicants has killed him. There we have a "white man's country" in practice as well as in theory. White labour lives in that portion of Australia where the white man can labour, and he rules the whole of that continent. What is the effect of his rule? He begins by prohibiting coloured labour in his own districts. That, though a selfish, may be classed as a very natural measure. Not content with this, however, he prohibits the introduction of coloured labour into those tropical districts which are impossible for the white man. The result is that the northern half of Australia

is destined to remain a wilderness while existing methods shall last.

Again, we have had experience of coloured labour in our Treaty ports and possessions in the very Far East. Here we have to do with the Japanese and Chinese labourer. Many of these places, as far as climatic conditions are concerned, are white man's countries. But it was found that the white labourer was not wanted, as the local coolie, whether Japanese or Chinese, was quite as efficient as his white competitor, and much less expensive.

South Africa is not like any of those countries in all respects, but it is from our experiences in those parts of the world that we should deduce our labour policy out here.

Like India, we have in South Africa an immense native population. We have put a stop to the inter-tribal warfare, and now that the natives have lost that means of thinning out the population, they are increasing in numbers with great rapidity throughout the country. Unlike the Indian, the South African negro is said to be useless as a skilled artisan, but, unlike the Australian aboriginal, he makes, under proper legislation and management, an efficient labourer.

Under British rule in South Africa excellent native labour legislation has not yet been forthcoming, for the simple reason that the voice of certain well-intentioned but misguided missionaries has been too strong. One of the most damaging influences brought to bear on the

native of South Africa is the black missionary from America. He has been persistently forcing into the native mind the fallacy that the black man is in every respect the equal of the white. And the various Governments have not put a stop to this pernicious influence.

The " man and brother " theory is excellent as a theory, but in labour matters, as between black and white, it does not work out satisfactorily in practice. British rule so far has not done much in the way of exploding this fallacy, and Sir Gordon Sprigg, who recently turned his back on a deputation of loyal Dutchmen, received with open arms these nigger emissaries of the " Ethiopian Church," who are doing so much harm.

We have thus a large black population to deal with, who must either be induced to work or allowed to lapse back into savagery, but whose heads have been filled with illusions as to their own importance, and who, unless handled with extreme care by the Government and by employers, will soon become a very serious menace to the country. Their capacity for unskilled work has been proved, and it has been made equally apparent that without their labour South Africa can have no industrial future. At the same time experience has shown conclusively that the African negro cannot be employed satisfactorily in large numbers unless he is subjected to a certain control, which, in the eyes of the philanthropist in England, may appear rigorous and humiliating. I use the word " phil-

anthropist" in this connexion because it sounds better than "narrow-minded faddist." I refer to the man who, from want of knowledge or intelligence, persists in maintaining the theory that there is no intellectual or physical difference between the black man and the white, and that in consequence the one should be treated in every way as the equal of the other.

In practice it has been found here, as in many other countries, that if a number of natives are brought without restriction into a white community they are ruined, and rapidly become useless. If they can procure drink they will not work, and their presence is a standing menace to the health of the neighbourhood.

The prohibition of intoxicants, and the system of placing the natives in a particular spot where a certain amount of sanitary control can be exercised, are the two most elementary and necessary precautions. This principle is in vogue throughout South Africa, and it is probable that the most prejudiced of those who hold the "man and brother" theory would have no fault to find with a system which stops intoxication and lessens the risk of disease.

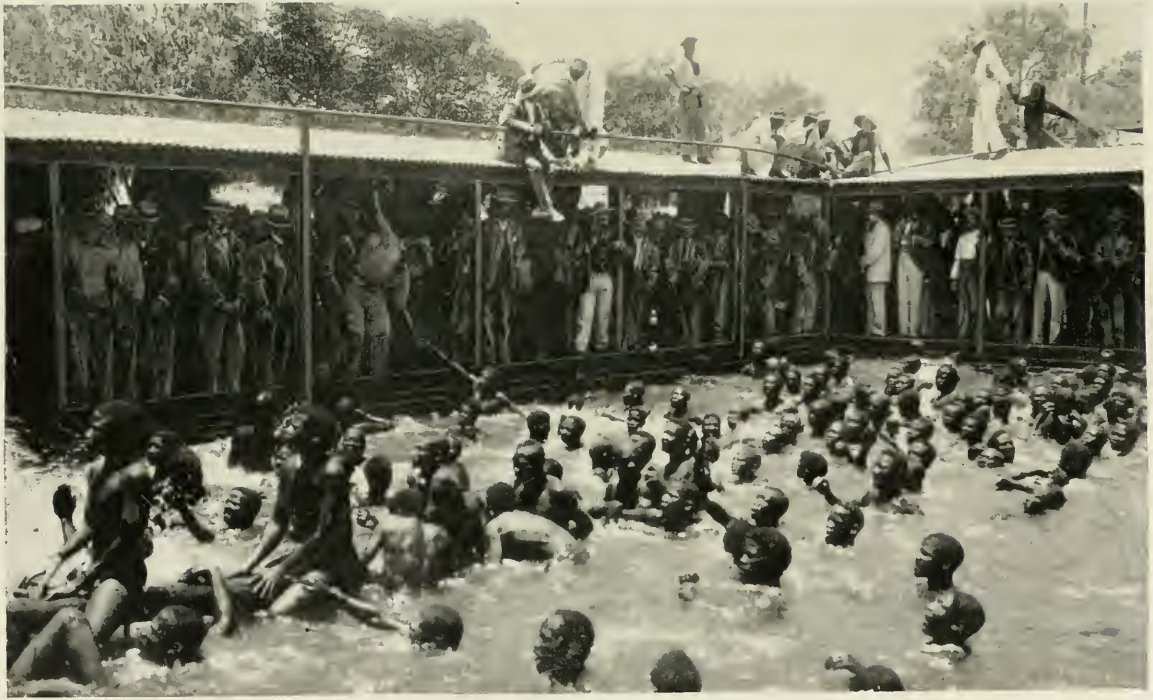
But this is not enough. The Kaffir or Zulu who is employed industrially will, if not restricted, run away without notice, obtain drink, and get into all sorts of trouble. To obviate this a system of passes exists in most places. This has the effect of restricting the movements of natives to the localities in which they have contracted to

work. In some cases the " pass " method answers all requirements, but when it becomes a question of mining for diamonds it is quite inadequate to prevent the inevitable robbery which must result from the temptations and facilities. The partially civilized Kaffir rapidly develops into a thief.

To obviate as far as possible a vast system of thieving at the Kimberley diamond mines it has been necessary to go one step further than the " Location " and " Pass," and to adopt the " Compound " system. Under this method the natives employed in the mines are confined to certain enclosed premises, which they never leave during the period for which they have signed on to work for the company. This is the system which has been described as slavery by people who possibly have not taken into consideration, firstly, that it is as much in the interests of the men who are confined in the compounds as it is of their masters; and, secondly, that the masters are bound rigorously by law as to the manner in which they treat their natives.

It is at Kimberley that the Compound system is carried out to its extreme logical end. Both company and miners are under strict Government supervision.

The applicant for work enters into an agreement with the company for a given time, usually three months. His wages when on full pay are at the rate of 5*s*. per day. His working day never exceeds eight hours, and there are three shifts in the twenty-four. Surface hands work the full



KIMBERLEY "COMPOUND"—NATIVES IN THEIR SWIMMING BATH

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time, but the underground workers are allotted a definite task, drilling certain holes to a specified depth, or filling so many trucks. When this has been done the labourers are free to return to the surface and to the Compound. On quitting work they are given free soup. The Compound is surrounded by a galvanized iron and a further barbed wire fence, and is roofed for a considerable distance from its boundaries with wire netting. This is to prevent the possibility of passing out diamonds to illicit purchasers. The entrance is guarded and the Compound is patrolled by native police, under European control. The Compound is to all intents and purposes a complete village in itself, the natives living in galvanized iron huts in long rows, with plenty of open spaces. They are obliged to keep their huts clean, and their cooking is carried on in the open air in front of their dwellings. Sanitation is very carefully dealt with, all outhouses being well away from the dwellings, and good swimming and shower baths are provided.

The Kaffir is naturally a gambler, a dancer, and a musician after his own particular methods, and he can follow the last two of his inclinations in these directions to his heart's content. Gambling is discouraged.

An excellent hospital, with all modern appliances, and with white doctors and nurses, is attached to every Compound, and the Kaffir can purchase food and finery from stores on the premises. Inside the Compound there are no restric-

tions, provided that a man behaves himself, and does not fight.

It is when his contract time is expired that he is subjected to a strict discipline and routine. For years the Company was unable to hit upon an efficient method of searching the native miner. The ingenuity of the Kaffir in concealing diamonds about his naked person baffled all the ordinary means of investigation. The mouth, the ear, the eye, and any other orifice of the body served as a hiding-place, and stones were concealed by swallowing them, embedding them in the hair, and even under the skin. The method now in vogue with the departing Kaffir is to place him in confinement in company with any others whose contracts may be expiring at the same time. He can, if he chooses, sell his clothes in the Compound, or, if not, each garment is examined carefully, even to the seams. His boots he is in no case allowed to take out. He and his friends are then stripped and placed in a building, which may be described as a comfortable purgatory. Here they remain in a perfectly nude condition, save for a pair of fingerless leathern gloves, which are padlocked to their hands, for some ten days. During confinement the Kaffir is in the charge of trustworthy officials who subject him to certain simple but effective physical tests to ascertain whether he has any diamonds about him. His food is carefully and specially prepared, and everything that is taken away from the house while he is there is subject to the

same rigorous scrutiny. Strange to say, the Kaffir does not object to this somewhat humiliating process. To him there is no indignity about it. He has no work to do and is well fed into the bargain. That is getting very near to the Kaffir's ideal in this world.

Doubtless that which I have said above will confirm the sentimentalist in his theory that the Compound system is akin to slavery. Restricted labour it is, but I would point out that the men who undergo it can leave when their time expires. They are well paid for their work, and are able to save money in a way that would be impossible were they subject to the temptations of a town life.

These compounded natives are the finest body of black labourers in South Africa. They are of better physique, and healthier than any others. They are better looked after, better fed, better housed, better paid, and they are not robbed in purchasing their food. Missionaries are allowed to visit them but are requested not to worry them unduly. They are enjoined to impress upon the native mind two simple Christian precepts—the virtue of obedience and the dignity of labour. Thus the natives receive religion in moderate doses, and in like manner their allowance of Kaffir beer is regulated on strictly reasonable lines.

The fact that the De Beers Company has never, except during the war time, been obliged to have recourse to labour agents, as on the Rand

and elsewhere, goes far to prove that the system is popular with the men ; and I am told that the same hands apply over and over again for work, while many of their own free will remain in the Compound for years. The smaller diamond mining companies employ the same system.

When a Kaffir has actually been known to swallow at one gulp £1,200 worth of diamonds, and to live happily, when his time in gaol was expired, afterwards, the necessity for compounding the native in these mines is apparent. In a Rand gold mine, where nuggets do not exist, there is no inducement to steal. A native never sees the gold at all, and to get £5 worth of it into his system he would have to eat several hundredweights of uninviting-looking mud.

The native, however, as above explained, can only be used for unskilled labour. The gangers, and contractors, and machine-hands, above and below ground at Kimberley, are all white men The lowest price paid to a white man below ground is, I understand, 16*s*. per day of eight hours. At one time the company endeavoured to institute a method of searching their white men. For obvious reasons, however, the search could not be of a nature that would prove efficient. Such as it was, it led to difficulties, and was therefore discontinued. The De Beers Company has no difficulty in getting all the white labour it requires, and there are practically no openings for casual new comers. The management treats all its hands on the paternal principle, and has

SPORTS IN A KIMBERLEY "COMPOUND"

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erected a model suburb called Kenilworth for its white employés, with schools, places of worship, recreation grounds, and so forth.

It is only in the diamond mines that the Compound system for black labour has been worked out thoroughly on a proper basis. On the Rand there are many who would apply the system to gold mining in that locality, but just now matters are in a transition state there, and no one knows what the ultimate solution of the labour question in Johannesburg may be.

Under Krüger the Rand labour market was in constant difficulties owing to the illicit liquor traffic with the black boys. By this means certain Boer officials and traders made a great deal of money. This led to an enormous amount of waste labour, as, owing to sickness and other causes, sometimes as many as 30 per cent. of the Kaffir labourers would be useless for work at a time. Since the war, although at first confusion reigned supreme, and in spite of the delay of the home Government in fixing the war tax, and the uncertainty that has arisen therefrom, the labour question has been slowly righting itself. The prohibition of liquor, and the better class of food now supplied to the boys, has lessened the number of absentees, and things are generally improving. There will be great opposition to an effective Compound system on the Rand, as the shopkeeping class naturally object to the withdrawals of tens of thousands of their native customers, whose wants, under

such conditions, would be catered for by the companies who employ them.

Perhaps a certain amount of colour has been lent to the possibility of substituting unskilled white for black labour on the Rand, as advocated by the *Times* and other newspapers at home, by the fact that, since the war, discharged irregulars and other destitute white men have been employed temporarily in that capacity. It is not possible —nor would it be desirable—that such a state of affairs should be prolonged, for although this may be " a white man's country," it is none the less a black man's country. The result is that, if we are to degrade the white man down to the level of the coolie, the wages of the former will have to sink to those of the latter, or very nearly so, when he is working in that capacity. It is injudicious, not to say unfair, to carry the " man and a brother " principle to this length.

In Cape Town to-day the visitor may see white men, kneeling in the muddy streets, cleaning the boots of the coloured population. This is a humiliating sight and one to be deplored.

The position of the white man in South Africa must be that of the skilled artisan and upwards. There is no reason why the unskilled white men who come here should not develop into " skilled " men as time goes on, as hundreds of them have —men under whom the black men will work. Even the agricultural labourer who takes work on a farm should look to raise himself above the black man.

THE LABOUR QUESTION

The astounding misconceptions on the subject of black and white labour in Africa that have been aired make it advisable for me to clear the ground a little by giving a few plain facts as to the situation. Had these erroneous views been confined to that class of paper or politician whose habitual method of solving the labour problem takes the simple form of crying "Down with the Capitalist," the question would not have been serious. Some of the weightier, the more serious papers, however, which generally accept the capitalist as a necessary item in the economic system of England and the world, have been the most emphatic in denouncing him as an unmixed curse in South Africa.

If ever a country wanted capitalists it is South Africa to-day. Whatever their methods may be, the future historian will be forced into the conviction that without them British South Africa would never have been developed, and perhaps would not even have remained a British possession.

When we find a journal like the *Times* advocating unskilled white labour for the Rand mines in the face of the obvious fact that such a policy must not only seriously injure, but instantaneously kill, every industry in the Transvaal except agriculture, misapprehension of the labour situation may be said to have reached a very dangerous stage. But it is not until we find that journal trying to explain away its unsound logic by advancing a still more preposterous theory that

one begins to tear one's hair. The theory in question is to the effect that *the reason why the Rand cannot afford to run its mines entirely with white labour, skilled and unskilled, is that these mines have not a proper working organization, and that they are insufficiently equipped with modern labour-saving machinery.*

As a matter of simple fact, Johannesburg and Kimberley have for many years past afforded the greatest object lesson in scientific mining and modern equipment that the world has ever seen. If they are insufficiently equipped then there is no such thing as an efficiently equipped mine in existence.

To man the Rand mines at the present day—and with existing machines and plant—entirely with white labour, capable of turning out fifteen million pounds worth of gold in a year, the wages, at the very lowest estimate, would amount to twenty-one million pounds, which would be a net annual loss on the pay-sheet alone of six million pounds. To this loss must be added the cost of plant and premises, depreciation, maintenance, general trade expenses, and interest on capital.

Let us look at it from another point of view. To make the Rand mines pay even reasonably with white labour throughout, labour-saving machinery which has not yet been invented would have to be set up which would reduce the above-named annual pay-sheet to ten million pounds. That would represent a saving in wages of about £36,000 per day.

When machinery to do this has been invented —a difficult matter—and when we have got a guarantee that wages will not be increased above existing rates—an impossibility—we can begin to talk of white unskilled labour for the Rand mines.

We all, of course, are anxious to see the white man, and, above all, the white English subject, employed in every possible capacity in South Africa. We all, and especially engineers, are anxious to see every conceivable labour-saving appliance adopted on the Rand and other mines out here.

In any attempt, however, to solve the South African labour problem, the following elementary facts must not be ignored—

1. The organization and equipment of the gold and diamond mines of South Africa are more perfect than those of any mines in the world.
2. The white man already is not only employed for all skilled work, but in a variety of semi-skilled capacities which the Kaffir could fill equally well for much less money.
3. For the class of unskilled labour required on these mines the average Kaffir is at least as efficient as the average white man.
4. Though labour-saving machinery saves unskilled labour as well as skilled, its great tendency is to effect a saving in the latter in greater proportion than in the former class. It is therefore the white man

rather than the black who will suffer from improved appliances.

5. The ever increasing depths to which it is necessary to carry these mines is continually increasing the cost of production. Consequently, the employment of the cheapest labour, whether of black or any other colour, is vitally important.

Though the equipment of these mines is the best in the world, South African mine owners and managers are continually on the *qui vive* to adopt anything new that may lighten their labour or reduce their pay-sheet. The Rand draws from England and the United States everything that is most modern and perfect in machinery in the two countries. Elsewhere in this book are described the huge graveyards of discarded plant, machines thrown out in favour of newer systems, from the mines at Johannesburg and Kimberley—machines which would have been kept going for years, to the disadvantage of the users in less go-ahead communities.

Then comes the question of the experiments in white unskilled labour. Several of the home critics of the Rand employers seem to take it for granted that the white man has never been tried as an unskilled labourer in South Africa. There are hundreds of white men now doing Kaffirs' work in this country, and the sight is a sad and degrading one. In some cases, though not on the mines, such men are working for less than Kaffir pay. It has been stated that the Rand

capitalists have not given white unskilled labour a reasonable chance. A great number of white men have always been used in these mines on skilled men's wages, in all sorts of capacities which are not accounted "skilled" in any other country. These much-abused capitalists have never allowed the Kaffir to compete with the white man in any form of labour in the mines which by any stretch of the imagination could be described as "skilled work." Thus it is that, in urging mine owners to do what they can for the white unskilled labourer, we are merely urging them to adopt a policy which on their own initiative they have been following for years.

We next come to the question of the effect of improved plant on labour. In another chapter I have gone at length into the equipment of these mines. Here I would merely again emphasize the fact that the saving to be effected by future mining plant will not merely affect the unskilled labourer, who at present is black, but it will hit still harder the skilled labourer, who is, and always has been, white.

As a general rule, the first aim of the inventor of labour-saving plant is to provide something that will do the work of the skilled man. Except on the Rand just now, it is usually the skilled man who is difficult to obtain, to keep, and to replace. It is he, too, who is individually the most expensive.

As an instance of what I mean, let us consider the effect of the recent improvements in machine-

tools. Already we hear the cry throughout the engineering world that in the future the fitter is to be eliminated. We know full well that in the shops of some of our manufacturers, for a given output, one fitter is now used where four or five were employed only a few years ago. It is the fitter that the machine-tool inventor seeks to eliminate, not the fitter's labourer; but in eliminating the one he eliminates the other, for the former is the *raison d'être* of the latter. Yet when the fitter, the skilled man, is no longer wanted at skilled man's wages, the fitter's labourer, the unskilled man, can turn his hand to working one or another of these new machine-tools which require no skilled operator. And so that form of labour-saving plant tends not so much to economy in unskilled labour as it does in skilled.

As with machine-tools, so with mining plant, though perhaps not in so great a degree. If you wash your gold in a hand jigger—a process always impossible on the Rand—your skilled labour, though such skill may have been acquired on the spot, is vastly greater in proportion to the unskilled than is the case when more modern appliances were used. Now, although South African mines are well to the fore in equipment, there are vast improvements looming in the immediate future. The most important of these new processes, which we may look for shortly, is the substitution of belt conveyors for trucks. The Rand is going to carry this method of handling ore to greater

lengths than have ever been attempted elsewhere. From the practical trials already made it is clear that an immense saving—in a certain department as much as 75 per cent.—will be effected.

What is the nature of this saving? With the truck system, now generally in vogue, there is the intricate mechanical haulage, necessitating miles of wire rope, and all the installation it entails; there is the permanent way to be kept in order, and a great amount of mechanism which requires the constant attention of the skilled man. When this is replaced by belt conveyors there will be less engine driving—white man's work; there will be hardly any repairs—white man's work; and, as far as mechanism is concerned, there will be merely belts passing over slowly revolving pulleys. The occasional visit of a man with an oil-can is all that is required in the way of what, by a stretch of the imagination, we will call "skilled" labour. Thus, while this sweeping innovation will effect a material saving of unskilled labour, it will practically eliminate all the skilled labour now required in this particular department.

The next great labour-saving appliance at these mines to be looked for is in rock-drills. Up to now there is no machine-drill in the market that can compete with Kaffir hand drilling, except in a few special instances. I will go further, and say that there is no machine of any sort that can be used for narrow work. Man for man, at hand-drilling the Kaffir is superior to the white labourer. Assuming, however, that the one is as good as

the other, the difference in the cost of substituting white for black labour in this department, at present rates of wages, would be at least £12 per man per month.

It is said that a new rock-drill will shortly be on the market. We are told, as is usually the case with new inventions, that it will have the effect of supplanting hand labour entirely, and that it is so simple that "any one can work it." I do not vouch for the realization of this optimistic prophecy. If it should come to pass, however, it would, on the one hand, eliminate the unskilled hand-drillers, and on the other, place machine-drilling within the capacity of those same unskilled men.

As a matter of fact, it is the Kaffir to-day who works the existing machine-drills in these mines, though, to keep up the fiction of "skilled work," there is always a white man in charge.

A mine-manager—not on the Rand—said to me the other day: "I have been discharging white men lately. It has not affected my output. In fact, I have found that for every white man I discharge I can free about three Kaffirs from that department who have been in the habit of waiting upon him, and utilize them for other work."

Here is an instance of the manner in which the white man has grasped the meaning of "the dignity of labour" in South Africa. The other day in a saw-mill I saw two white men, one of whom might possibly be classed as "skilled," and four Kaffirs, working a small circular saw-bench.

They were taking single cuts on the flat, through 3 in. deals, 12 ft. long. I timed them doing three. One of the white men occasionally touched the deal, presumably to assure himself that it was still there. The other stood with his hand on the saw-bench. The four blacks handled the planks. It was a solemn and imposing function. The average time occupied in cutting one deal, from the time of lifting it to the depositing of the sawn halves on the floor, was exactly 12½ minutes. If this break-neck speed had been maintained for a full day of eight hours, sixty-four deals would have been sawn. For the day's work the white men between them were receiving 32*s.*, and the four black men about 12*s.*; total, £2 4*s.* In England a sawyer and labourer would have done the sixty-four deals easily in an hour, and their wages would have amounted to 1*s.* 6*d.*

Whatever may be the crime of the South African capitalist, and however anxious he may be to employ black or coloured labour, no one can accuse him of not having given white labour more than its due. There is no country in the world where the white artisan is paid so highly for such light work, and there is no country in the world where the employer gets so small a *quid pro quo* from the white worker for the money expended on him. In spite of this, the South African capitalist has never, in his most grasping moments, even suggested the employment of coloured labour of any sort in the skilled trades.

Of course, the Rand is not full-handed to-day.

If it were, its requirements, roughly speaking, would be 25,000 skilled men, white, and 125,000 unskilled men, black. The wages of the former —16*s.* a day—would be £20,000 a day, and of the latter about £10,000 ; total, £30,000.

If white unskilled labour were used to replace the black, instead of £10,000 per day, their wages —8*s.* a day—would amount to £50,000 per day. This, when we add the amount for skilled labour, makes the total £70,000.

I do not ask if it would be fair to the mine owners to request them to adopt white unskilled labour in such circumstances. I merely ask how in the world serious people can be found who will advocate so preposterous a policy.

However near to perfection future labour-saving appliances may attain, it would be absurd to suppose that we are within measurable distance of economizing labour on the Rand to anything like the sum of £36,000 per day—when in full work—which I have mentioned as the minimum saving to be effected before we can think of employing the white man exclusively throughout these mines. Whatever policy is to be adopted it cannot be that one. But before dismissing the subject altogether it is as well to point out that, even were it possible, its effects might be disastrous. With no competition the white man would run up wages to an extent which would make the figures I have quoted above, as present rates, much too low, and the result would be to set off to the detriment of the

mining industry any advantages which might accrue from future labour-saving plant. South Africa of all things cannot be expected to welcome in her very mixed field of politics another agitating element in the shape of a labour party on the lines of that which has wrought so much havoc in Australia.

If, then, we cannot afford white unskilled labour, what is to be done? There are three alternatives:—(1) The importation of Asiatic labour; (2) the trusting to Providence to induce the Kaffir to work; (3) the taking of measures to make the Kaffir work.

With regard to the first item, which is usually described here as the "Chinese question," there is against this policy so strong an outcry that it would be an extremely difficult matter to carry it through. Personally, I can see no objection to this scheme if—and it is a very big if—the Chinaman is properly controlled when he gets here. If he is to be treated as a bonded labourer, to remain here for a certain number of years, and then shipped back to his country; and if, during his sojourn, he is to be restricted absolutely to Locations or Compounds, and not allowed in any circumstances to mix with the white community, then from the mine owners' standpoint I should say that it would be the soundest solution of the problem.

I know the Chinaman well, in his own and other countries, and have had reason to appreciate his undoubted faults. But I am forced to admit

that, if properly handled, he can be made to do more unskilled work than the Kaffir. He could, too, of course, do most of the so-called skilled work on these mines if necessary. He makes an excellent engine-driver and machine-worker, is a naturally expert carpenter and timber constructor, and handy man, and, with training, a good fitter and mechanic. I do not, however, think that it would be policy to use the Chinaman as a skilled craftsman. If the importation of Chinamen were to mean that they are to be accorded the full rights of citizens, as in Australia and the United States, then they should be excluded.

Such a policy would be wholly destructive to South Africa as a white man's country. The ghastly effect of treating the Chinaman as an equal, as in these two countries, and of letting him mix with white men, and, above all, with white women, is an experience at the mere thought of which South Africa may well shudder. That should not be allowed at any cost.

If, therefore, the Chinaman is to be employed in South Africa, bond him, and compound him, and send him back to China at the end of his time.

We now come to the second alternative: the policy of waiting until such time as the Kaffir may decide to take work on his own initiative, merely offering him facilities and inducements by means of properly accredited labour agents.

This is the plan in vogue at present, and I am bound to say that I do not think it has been given

a sufficient trial. The progress is extremely slow under the new régime. Mine owners are naturally enough chafing at the delay in getting their full staffs together, but there is no doubt that progress is being made.

Personally, I pin my faith entirely to the third alternative:—the introduction of legislation which shall induce or, if you prefer the expression, force the Kaffir to work.

Why many of our friends should cry out about this, and call it slavery, I do not know. In England we force able-bodied white men to work or starve. Why, then, should we object to do likewise in the case of our black British subjects in South Africa? We do not allow the natives here to indulge in their natural pastime of killing one another, and so they increase and multiply. We tell the Kaffir that he is as good as a white man, we worry him with an education which he does not want, and we preach to him doctrines which he does not understand. Then with his increased knowledge, such as it is, and his increased self-esteem, we let him lapse back into practical savagery and take unto himself as many wives as he can buy. They keep him in idleness, and each head of a family develops into a petty slave driver on his own account, and under the protection of the British law.

The copy-books have told us that "a little knowledge is a dangerous thing." With the South African native the little knowledge that we have forced upon him will turn out a very great danger

to the white community. If things are allowed to go on as at present, we shall inevitably have to face a native war sooner or later, and it will not be a simple affair when it comes. It is our duty, as well as to our interest, to forestall Satan by finding some less mischievous form of work for these idle hands to do. And the work is here.

"We will have no slavery," says Mr. Asquith. Then why encourage the Kaffir to be a slave-driver on his own account?

"Ah! but he does not like work in the mines, and it would be cruel to press him to do it," say the very people who are urging South Africa to put white men in those same mines. Yet no reasonable man would suggest that the white miner chooses his calling because he expects to find it a means to hilarious enjoyment.

What is good enough for the white man should in all conscience be good enough for the black. I am afraid, at all events, that for the purposes of my argument I must assume that such is the case. If, therefore, the Kaffir ought to be induced to work, what are the best means to employ to get him to do so? Many suggestions have been made. Of these the most practical is to tax him until he finds the necessity for work.

After all, in England we have to pay our taxes or go to prison. It may be urged that this might lead to difficulties. Well, if so, let us face them and get them over. Delay will only make matters worse.

Then comes the question as to how the native

should be treated when he does take work. To my mind, the Compound system, as above explained, is the only proper, and certainly the most humane one. Unfortunately, however, local shopkeepers will at once join their voices with the faddists at home in crying "Slavery" when this is mentioned. This is merely because when natives are compounded the shopkeepers lose their custom. Self-interest makes philanthropists of us all.

As compared with the white man, the Kaffir is a child. We keep our children within bounds until they understand the world. It is our duty to do the same for the Kaffir. Any one who has visited the diamond mines—where the strict Compound system is enforced under a special law—can see at once the advantage to master and man of this policy.

My only reason for advocating the Compound system for gold and other mines where there is nothing for the native to steal, is on the score of humanity. Humanity to the black who is compounded, because he is controlled and cared for and is better off in every way; humanity to the white community, because it is undesirable for those living in industrial centres to be in close contact with a hoard of partly civilized, that is to say, drunken and immoral, black labourers. It is essentially a form of familiarity which breeds the worst of contempt.

In conclusion, I would say something of this much-abused capitalist, of whose iniquities we are

constantly reading. He has made his position and is going to govern South Africa. We must have no illusions on that point. Whether we like him or not, he is going to rule the place in the same degree that capitalists rule England, and France, and the United States. Out here those who are not yet capitalists habitually describe him as a Jew, and the comic papers delineate him as a repulsive insect, a " gold bug " with a huge beak and long grasping claws. There are Jew capitalists here, as there are in other countries, but I should say that the proportion of Gentile capitalists in Johannesburg is at least as great as it is elsewhere. Jew or Gentile, however, South Africa cannot be worked industrially without him, and we have yet to learn that he will abuse his undoubted power more than is the case with other capitalists in countries which we are apt to look upon as highly moral.

Mr. Chamberlain, while tackling nearly every problem which presented itself to him during his visit to South Africa, very wisely refused to be " drawn " on the labour question. He gave it as his opinion that it was a local problem, and should be solved locally.

Let those well-meaning people at Exeter Hall refrain from rushing in where the astute Colonial Secretary has feared to tread. We can surely trust Lord Milner, who has already done so much towards ameliorating the lot of the native in the conquered colonies, to establish a practical and humane method of treatment for the black

labourer. As for the Governments in the other colonies, whatever their faults may be, we have no reason to suppose that they are incapable of dealing satisfactorily with this particular question.

Chapter VII

INTERCOLONIAL RELATIONS

THE progress of a particular group of colonies is, of course, influenced enormously by the relations which exist between the individual colonies, territories, or states concerned.

This fact has been brought home to us by a series of object lessons in Australia, Canada, and what are now the United States.

In South Africa before the war the possession of two of our present colonies by independent Boer republics made intimate relations between the various Governments of South Africa an impossibility.

The difference in the policies of British and Dutch South Africa were so much at variance that a solid *entente cordiale* could not have been brought about.

Under the buoyant influence of the late Mr. Cecil Rhodes Cape Colony at times seemed to be galvanized into gesticulating progressively. The dead weight of the retrogressive Bond influence, however, which was always there, was strong enough to drag it back into stagnation as soon as his attention was withdrawn.

Had the interests of Mr. Rhodes been confined

to Central and Southern Cape Colony, which is the seat of Bond influence, he might have made of the place, politically and industrially speaking, something very different to what it is at present. As a matter of fact, however, the important business interests of Mr. Rhodes were all north of the Orange River, and the active part he played in Cape Town was merely due to the fact that at one time that place swayed the destinies of South Africa. It was the great centre of British political power on this continent.

Since the death of Mr. Rhodes the Bond have captured his hard-working lieutenant, Sir Gordon Sprigg, and their influence for the time being is paramount in Cape Colony.

Between Natal and Cape Colony, relations have never been intensely cordial. Relations between adjoining colonies never are. The enormous difference in their sizes has contributed to the discrepancy in their views, and Natalians who have never been tinged with Boer leanings have always resented the overwhelming weight of Cape Colony in any intercolonial question that might arise. The existence of the two foreign republics acted always as a guarantee of friendship between the two British Colonies while it lasted. The dead weight of Cape Colony has often obliged Natal to follow her lead in questions of policy, and in a great measure has been responsible for the political methods of that colony in the past.

But while the abolition of the Boer republics may have had the effect of weakening any

sympathetic tie which may have existed between the Cape and Natal, another link has been forged which gives them a common interest.

Hitherto South Africa has been ruled commercially from the seaports, and while that régime lasted the coastal Colonies have been able to live upon inland South Africa.

All this is in process of being changed, and neither Natal nor Southern Cape Colony is at all pleased at the prospect.

The important centres are no longer at the sea, but in the interior. The coastal Colonies have for so long dictated the terms upon which the inland districts should be supplied with food and other stuffs that the re-adjustment of the economic balance in South Africa comes as a great shock to the politicians in those Colonies. Little by little they are learning to appreciate the fact that the seaports are merely the channels through which goods pass to their more important destinations, and that henceforth they will no longer be the masters, but merely the forwarding agents carrying on business which will be put up to competition.

The coming conflict in South Africa will be between the coastal Colonies—the Cape and Natal, and the inland possessions—the Transvaal, Orange River Colony, and Rhodesia. With these last, as far as interests and sympathies are concerned, must be included northern Cape Colony—from and including Kimberley northwards.

The coastal Colonies have been fighting tooth and nail to retain their old privileges—the right to levy customs duties on goods which pass through their territories to the inland Colonies, and the maintaining of railway rates at so high a level that the average cost of goods delivered in Rhodesia is eighty per cent. more than their value in the countries where they were produced.

At recent conferences the Transvaal has shown itself strong enough to effect certain of the coming reforms. The thin end of the wedge has been inserted, and Cape Colony has been obliged to abolish her transit duties, and railway tariffs have been generally reduced, especially in the case of South African produce. When the wedge has been driven home we shall have intercolonial free trade, the total abolition of transit duties and still further sweeping reductions in railway charges.

The policy of the inland Colonies—and it is a policy which is vital to their existence—is to reduce the cost of living.

To induce the coastal Colonies to accept this altered state of things, the Transvaal and Orange River Colony have taken the lead in abolishing nearly all the duties hitherto levied on South African products imported from the other Colonies.

Apart, however, from the policy of gentle persuasion, the Transvaal has used a powerful lever in assisting the coastal Colonies to a favourable consideration of its views. It has been made

quite clear to Cape Colony that should the Transvaal wish to do so, she will, in the not very far future, be able to dispense entirely with her services, as far as carrying supplies are concerned.

As the whole of the profits on the Cape Government Railways and about half the revenue of the colony are derived at present from its trade with the inland Colonies the argument is a powerful one.

To Natal the Transvaal has explained that, in the event of her not adopting a reasonable railway policy, the Delagoa Bay route, or another which could be constructed outside Natal territory, will be used as the main route between Johannesburg and the sea.

From the recent conferences it would appear that Natal—who, owing to her large local resources, has less to suffer in proportion to her size than has Cape Colony under the coming régime—has proved the more recalcitrant of the two in these negotiations.

At the present day, in the course of provisioning herself, the Transvaal has an annual bill to pay for railway carriage of something like five millions and a half. The bulk of this sum goes into the exchequer of the coastal Colonies. It has now been ascertained that with suitable railways and reasonable rates she could easily save between three and four millions on this one item.

It is hardly to be wondered at that, when the coastal Colonies have for all these years derived the greater portion of their revenues by taxing

their inland neighbours, they should sacrifice their enviable position without a very severe struggle. The first of these struggles has taken place at the recent Bloemfontein Conference, and, though arguments were heated and opinions were very divergent, the concessions gained towards progress were gained amicably.

That is the serious intercolonial problem in South Africa to-day, and its solution will take a great deal of time and delicate handling.

Of course the ultimate object of these colonies is Federation, but in spite of the predictions of optimistic writers, we are a very long way from that goal at present.

Mr. Chamberlain has flashed through this continent preaching the gospel of peace on earth and goodwill towards men. We are told that racial antagonism is to cease ; that there is to be no more question of Boer *versus* Briton. All is to be brotherly love as far as that matter is concerned. We all hope that the soothing syrup administered by Dr. Joe has had the effect of lulling the conflicting emotions of the two nations, and that South Africa may awaken in a healthier frame of mind on this and many other subjects. It is too early to hazard a guess as to what the lasting effect of Mr. Chamberlain's words will be on the race problem. From the point of view of trade, however, there can be no doubt that the benefits derived from his passage through these colonies have been great and practical. His visit has had a steadying effect upon the business

nerves of the community here. The war taxation has been fixed, loans have been raised, bargains have been struck, and, above all, we now know definitely what the attitude of the Imperial Government will be towards the various colonies of South Africa. Business people here may or may not agree with that attitude, but at least they know what they have to expect.

Until that was put clearly before them, industrialists and politicians were not prepared to launch out into large schemes, or to make an attempt to solve any of the many intricate intercolonial problems which were crying out for a solution, and which must be found ere the new South Africa can forge ahead as she should.

We have passed out of that period of hesitation, which had obtained in South Africa since the war, and have entered into a period of conferences. The general ultimate object of these meetings is to arrive at an intercolonial *modus vivendi* which will be more satisfactory than the present state of affairs; to adapt, in short, intercolonial relations to suit the altered circumstances which are due to the war and to the shifting of the power from the coastal Colonies to the industrial centres.

Chapter VIII

THE BRITISH MANUFACTURER

IN a country where war is being waged, or has recently been waged, trade statistics, however accurate, are usually misleading.

Abnormal conditions in a country create abnormal figures. The statistician is the only person whose nerveless routine is not upset by circumstances. He plods on, recording the figures in his cold-blooded brutal way with perfect accuracy. It is the very accuracy of his figures which is misleading on these occasions, for they are a record of times which are out of joint.

And then the lightning "trade commissioner," sent out by a Chamber of Commerce or commercial syndicate, shoots through that country and is home again in a few weeks. In the course of his rapid progress he makes a snatch at those accurate but misleading statistics, and holds hurried converse with certain honest but, possibly, prejudiced people.

And then he writes a voluminous report based on those misleading figures and superficial remarks.

Now, whatever may be the side issues in your trade commissioner's report, it is quite safe to predict that the main burden of its theme will be abuse of the British manufacturer. In support of his argument he will invoke the statistics which show clearly that during war-time the imports of British goods are not so great as they might have been in times of peace.

That the agriculturist may have, for the time being, forsaken the plough for the "mauser" is a matter unworthy of consideration; that the local user of British goods may possibly be a biassed informant is of no moment.

The report comes out, and in it the British manufacturer is written down an "ass." He does not, it would seem, know how to make things properly, or what is required; or how to pack; he never keeps his promises; he never delivers to time; he never considers his customers' convenience; and he seldom even answers their letters; he knows nothing of business; and above all he is blind to his own interests. He is a pig-headed, obsolete, rule-of-thumb person, who is rude and arrogant with his customers, and who, in consequence of his imbecility, is going as fast as he can to perdition. So says the report.

And yet the British manufacturer lives, and thrives, and grows fat, and is called by labour leaders a "bloated capitalist." Truly there must be something rotten either in the state of the industrial world, or in the theories of the average "trade commissioner."

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If ever there was a country where figures are mixed and misleading just now that country is British South Africa. There are four colonies, and the Chartered Company's territory. In all of these there was war, and in one a rebellion of British subjects, and two of the colonies have only during that war become British possessions.

Two of the colonies are self-governing, the two new colonies are Crown colonies, and Rhodesia is neither the one nor the other. The statistics in the two new colonies are mostly in Dutch, for the new Government have very rightly been slow in publishing comprehensive figures until things have shaken down a little more.

In this chapter I am going to try to give an idea of the position of the British manufacturing engineer in South Africa prior to the war. After abusing the statistician I am going to use his figures as a basis upon which to build, but I shall take his figures for a year during which the British manufacturer should show to the worst advantage. In doing so I shall confine myself to the imports into Cape Colony, for that is by far the largest of all, and contains three out of the four large seaports in British territory which feed South Africa. It is also the colony which is credited as the most anti-British, and so, if there is anything in the theory that political prejudices influence the purchaser, the British manufacturer should be worse off there than elsewhere.

I have selected the figures for 1900, because most of the goods which were delivered then (during the war) must have been ordered during the previous year (prior to the war) at a time when anti-British feeling was at its height. I do not take into account mining machinery, for the great bulk of this is required for the Transvaal, and I deal fully with this in another chapter. Elsewhere I also give some particulars regarding Rhodesian trade, as the conditions in that country are of a special nature.

Doubtless the war, which commenced towards the end of 1899, and the period of anxiety which preceded it, had a great effect in checking the ordinary South African business. Doubtless, too, machinery imports, except for military purposes, suffered with the rest.

I do not take into consideration munitions of war, or military stores, as these were abnormal imports due to extraneous causes which have no bearing on the case.

In spite of the check to commerce at the period in question, it is probable that the relative proportions, though not the quantities, of the imports of 1900 were much as they would have been in normal times.

It is therefore to these proportions rather than to the actual money values that I would draw attention in endeavouring to arrive at the position of the British manufacturing engineer in Cape Colony when the war came about.

It will be seen from what follows that up to

the end of 1900, with one or two exceptions, there was a very great preponderance in favour of British goods.

This fact must point to one of two conclusions. Either the people of this colony who have the placing of orders for machinery are not anti-British, or, being anti-British, they consider, generally speaking, that British machinery is superior to that of other countries.

I can find no trace of anti-British feeling among machinery merchants and agents of a nature which would be likely to influence their purchasing. They appear to me to buy what they want, irrespective of politics.

The Boer purchaser, if he dislikes the British, has quite as bitter a feeling against those countries who promised to help him in his war and did not do so, and consequently we are not handicapped in these matters.

The following figures are based on the Customs returns for 1900, and the prices given are the "declared values" in the register.

Let us first of all deal with that class of machinery in which our position is the weakest. Agricultural plant is the section under which the British manufacturer shows to the least advantage. When, however, we consider that in many of our loyal colonies in other parts of the world we have lost almost the whole of our trade in this particular line, our manufacturers should be gratified at the following statistics, relating to the "rebel colony" :—

AGRICULTURAL PLANT.

Imported from	*Machinery.*	*Implements.*
	£	£
Great Britain	22,833	36,288
British Possessions	259	339
Belgium	216	584
France	—	36
Germany	425	15,002
Holland	12	85
United States	22,253	22,938
Other Countries	—	6
Total	£45,998	£75,278

From the above it will be seen that in agricultural machinery we, with a small contribution from our colonies, furnished as nearly as possible half of the entire trade. The United States is close upon our heels, while imports from the rest of the world are insignificant. In Agricultural implements we did about 48 per cent. of the trade, America about 30 per cent., and Germany comes in as a formidable competitor to both at 20 per cent.

It is interesting to note that in native agricultural and mining tools, which are classed separately under the heading of "Kaffir Hoes and Picks," Great Britain furnished £95,710, Natal £5,243, and Germany £1,350 worth, making a total, from all sources, of £102,303.

In "Mining, Electrical, and Sawing Machinery," out of a total of £291,821 we furnished £189,844, Natal £58, United States £86,444, Germany £12,659, Belgium £2,553, and Holland £227.

In "Machinery for Manufacturing Purposes"

the total was £116,526, made up as follows :— Great Britain, £86,113, Natal £131, United States £18,399, Belgium £7,008, Germany £3,477, Holland £1,038, France £352, other countries £8.

In "Other Kinds of Machinery" the total was £70,788, made up as follows :—Great Britain £56,708, Natal £60, New South Wales £239, United States £13,073, Germany £565, France £67, Holland £65, Belgium £11.

The figures relating to "Government Railway Material" are even more satisfactory, with the exception of rails, in which we are outstripped by the United States They are as follows:

Rails.—Great Britain £103,115, United States £111,769, Belgium £16,748 ; total, £231,632.

Rolling stock.—Great Britain £136,549, United States £3,369 ; total, £139,918.

Unenumerated.—Great Britain £96,724, British Colonies (Natal, South Australia, West Australia, and Tasmania) £57,176, Germany £16,761, United States £2,543, other countries £2 ; total, £173,206.

Thus it will be seen that Great Britain and her colonies furnished nearly four-fifths of the railway material supplied during that year to the Cape Government Railways.

Of metal imports, it would appear that we supplied 97 per cent. of bar, bolt, and rod iron, most of the rest coming from Belgium. We also, as far as I can trace, supplied the whole of the pig, hoop, plain and corrugated sheet iron, and nearly all the steel.

In "Tools," out of a total of £34,086, we supplied about £20,200 worth, while the United States contributed £12,855, and Germany £1,028.

In "Piping," out of a total of £122,718, we supplied £111,689, with the United States as our nearest competitor at £10,522.

To sum the whole matter up in tabular form, it would seem that in general machinery and railway plant the position of Great Britain as the furnisher of Cape Colonial engineering imports was as follows at the end of 1900 :—

	Per cent.
Great Britain	66
United States	20
Germany	4
Other Countries	10
	100

This is exclusive of certain iron and steel imports, which are so vaguely classified that I cannot arrive at exact figures. In these, however, as I have previously stated, we had practically the monopoly.

We are told, and it is a truism, that the war is to revolutionize trade and trade methods.

Time alone will show how our position will be affected by the fight for trade supremacy in South Africa upon which so many of the nations are now entering. At all events we may rest assured that in Cape Colony we enter upon the struggle with the advantage of a very long start.

Having dealt with the past, I will, before making

suggestions for a future policy, endeavour to clear the ground as to the existing state of affairs.

One of the most important trade factors—one which many do not realize—is the question of the cost of transport.

We have got so into the habit of assuming that we are handicapped by cheap Continental freights, that it may come as a surprise to find that there appears to be nothing of the sort. On inquiry of the shipping people I can find no trace of cheap subsidized services to South Africa from the Continent of a sort that could damage us in any way. I believe that certain German boats trading with East African ports *viâ* Suez are able to underbid our firms on that particular route. This, however, hardly affects the Cape Colonial trade, as nearly everything comes out by the western route.

Of the sailing-ship rates I say nothing, as people do not ship machinery by sailing vessels. Particulars which have been given to me by the agents of the steamship lines in this part of the world go to show that there is at present a definite scale of rates for goods carried by the regular cargo boats of what is known as the "Shipping Ring," from Europe, which may go up or down, but which affects all firms alike.

Mail steamers charge an extra 5*s.* per ton, and intermediate steamers an extra 2*s.* 6*d.* per ton. The firms in this "Ring" practically control the carrying market, and among them are the Union-Castle, Bucknall, Clan, Ellerman and Harrison,

Bullard King, Rennie, German East African, and German Australian lines.

The rights and wrongs of the Shipping Ring question need not be gone into here.

Of course, the German manufacturer has one great advantage in his export trade to this part of the world, as elsewhere. I refer to the cheap rates at which he can send his goods by rail from the factory to the port of embarkation and place them on board ship. This is a great advantage, but has nothing to do with the cost of freight when once the goods are shipped. And the proof of this may be found in the fact that a good deal of German merchandise is sent across from Hamburg to be shipped out here in British vessels.

American manufacturers are more favourably situated in this respect than either the Germans or ourselves. In normal times rates from New York have been somewhat cheaper than from Europe. Just now the cost is particularly low, owing to the present freight war between certain American lines. The result is that the manufacturer in the United States can get his goods delivered at Cape Town for from 10*s.* to 12*s.* 6*d.* a ton. How long this will last one cannot say, but in the meantime the American machine-maker finds himself in a strong position at a very important stage in the history of South African imports.

From the above figures it would seem that the two most important "lines" in which the British manufacturer shows to disadvantage are agricultural plant and rails.

Whether windmills and their accessories are included as agricultural plant I do not know, for the Customs returns are not clear on that point. In any case, the whole of that particular trade is in American hands, and it is purely a question of price. In ploughs and harrows and many of the lighter tools the greater portion of the trade falls to the United States, and here again price is the main factor, although the question of design enters into the matter.

The sweeping assertions that have been made as to our agricultural engineers giving no attention to the requirements of this country are absurd. That some of them might do more than they do is merely a truism, but as to whether it would be worth their while to increase their efforts is quite another matter. I have met several of the travelling representatives of these firms out here, from manager's directors downwards, and they seem quite alive to their own interests.

As an instance of the value of what the local man will tell the visitor, I would mention that I have been distinctly informed by importers of agricultural plant out here that the whole of that trade has gone over to America. The figures given above show that such cannot be the case, and as the Americans carry much larger stocks of their machines here than we do, there is room for surprise at the fact that we still have a very large share of the market.

I often think that there is more joy in America or Germany over one order that goes to those

countries and might have come to us, than there is in England over ninety and nine such orders which come to us in the ordinary course of business.

The tendency to jubilation in the American Press over orders for machinery, and the exaggeration of the importance of such orders, are in a great measure responsible for the alarmist views with regard to the position of the British manufacturer. Over and over again notifications of quite imaginary orders for American machinery from South Africa are cabled from America to England and from England to South Africa. And the alarmist and his disciple, the flying "trade commissioner," are impressed.

Our position with regard to all machinery and appliances in the electrical trade is extremely critical, but as I deal with that question in another chapter I need only draw attention to it here.

On the railways practically all the machinery and about half the rails come from England. American locomotives have been tried and found wanting. The Cape Government Railways have only purchased them when they could not get delivery from England. They will do so again when they find themselves similarly situated. The British manufacturer is equally to the fore in harbour work requirements.

The elaborate electric tramways in and around Cape Town, originally put down by Americans, are drifting more and more into British channels. All the extensions in motive power and cars are

British. And although, sad to say, the rails emanate originally from the Fatherland and Belgium ; and although one sees on some of the bogie work and underframing certain American names, if one looks close enough, these, too, are now purchased from English firms.

The Post Office authorities purchase all their plant, with the exception of telephones, which come from Sweden, in England.

There is hardly any American or other foreign flour-mill machinery in Cape Colony.

The proportion of American or other foreign machine tools used in engineering works here is not so large as it is in Great Britain itself to-day.

In engines, and boilers, and wood-working and general machinery, we have up to the present held our own in Cape Colony at all events, and it rests with us to determine our future here.

The question of rails requires but little comment. They are ordered according to specification, and subject to approved tests. The man who can make rails to accord with these conditions and deliver them in South Africa for the lowest price gets the contracts for them. It is purely a question of manufacturing cheaply and of securing a low rate of freight.

In this sort of contract the high prices charged by the " Shipping Ring " offer a formidable obstacle to British trade.

And now for the complaints against the British manufacturer.

I do not say that they are all justified, and it is possible that the merchants and users whom I meet do not understate their case in conversation with me. At the same time, there is a general unanimity of opinion on some of these subjects which makes it clear that the manufacturer should have an opportunity of seeing himself as the local merchant and purchaser see him.

Let us first take the question of representatives. This is what the railway people tell me :— "The only people who ever come out and ask us questions, or who interest themselves in our railway matters, are the Germans."

"The representatives of British firms ?" said a very worried importer to me in Kimberley the other day : "I wish I could get rid of them. That man who has just gone out is one, and there is another sitting in my office now. There are hundreds of them in the country, and every day they turn up. They prevent me from getting on with my work."

Here is a pathetic story showing the other side of the medal.

"When you do send men out," said the partner in a well known importing firm in Cape Town, "they expect us to go and find them. They do not bother to come to us. The other day I learned by accident that the representative of a firm with whom I have done business for years had been in Cape Town for a month. I had to go and hunt him up at his hotel. He turned out an excellent man when at last I met him, and was

very glad to see me. He knew his trade too, and I was able to place some orders with him."

"There was a Trade Commission here recently," said the managing director of the largest importers of machinery and hardware in Cape Colony; "there was a Commission sent out by an English syndicate to find out all about South African trade. I know that they were here, for I saw it stated in the papers, but not one of the Commissioners came near me or any member of my firm."

Of course, the old grievance of long delays in delivery by the British manufacturer are heard on all hands, and also of the want of promptitude in answering inquiries, and even the non-acknowledgement of letters. And again I hear the oft-repeated complaint that I have listened to in China, Japan, India, Australia, South America, and elsewhere, as to the insufficiency of the information contained in catalogues, and worst of all the absence of prices. One can understand that in certain circumstances—where, for instance, a manufacturer has a local sole agent who is authorized to quote for him—the manufacturer might, in replying direct to an inquirer, send him an unpriced catalogue, and refer him to the agent for prices. Or, again, it sometimes happens that the nature of a manufacturer's goods is such that he cannot give prices until he knows all about local conditions—such, for instance, as a cargo transporter, where everything depends on how it is to be fixed and

what it will have to do; or cask-making machinery, where the machines have to be designed to fit the special form of cask.

I do not, however, refer to this class of special machinery on the one hand, nor to the actual user of machines on the other. It is the agent, the man who has to act for the manufacturer and sell his machines, who complains that British firms will not give him their price lists. "If you look through that bookshelf," said a machinery agent to me last week, pointing to a long row of catalogues, "I will engage to say that you will not find price lists in one out of six of the English books." I picked out a few of the catalogues, selecting those of representative British firms whom I knew personally, and with whose machines I was well acquainted. There were two machine-tool catalogues, and one each of cranes, shafting and gearing, wood-working machinery, and steam engines. There was no sign of a price list in any of them.

"Were there no price lists in these when they came out?" I asked.

"No!"

"When you inquire about machinery, do you make a point of asking for price lists?"

"Always, and I write again and again for them, and I go to England from time to time and tell makers that without prices I can do nothing with their machines. Why, even when I hold the agency of a British firm, I often have a difficulty in getting their price lists."

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"To deal with the British manufacturer," was the remark of another importer, "is like breaking stones. A firm of wood-working engineers, an excellent firm, asked me to take their agency quite recently. They offered me 2½ per cent. on all orders, on the understanding that I should travel the country for them, advertise their machinery in the local papers, and undertake to sell nobody else's wood-working machines, even in the case of special machines which the firm in question do not make. And, as if those conditions were not bad enough, they stipulated that I must never estimate for any of their machinery without referring to them for a quotation."

"We reckon," said a locomotive superintendent of the Cape Government Railways, "that if we order a locomotive from England on a certain day it will be running on our lines on that day year."

To me the most incomprehensible complaint of all, and yet out here it is the most persistent, is that, even at the present day, British makers will not go to the trouble of packing their machines properly. I have heard the same complaint in other countries at times, but never to the same extent as here. It is not that British makers spend less on their packages than others, but that, after making an elaborate case, they do not secure the parts of the machine inside it, and thus obviate a shifting of position. Times without number I am told machines come out here with the main framing fixed securely in position

or fitting the case accurately, but having a whole lot of loose parts in the same case, packed in straw or shavings. When this happens the natural result is that all through the voyage, when the case is moved or the ship rolls, the loose parts bump against each other and the main casting. Thus, the machine is always damaged, and very often broken.

Again, it is contended that many British makers send out their machines without taking the most ordinary measures to prevent the rusting of the bright parts. This has been a constant source of trouble and expense to importers during recent years, when, owing to the over-pressure on the harbour accommodation during the war, goods have had to remain for months without being unloaded, and for months after that in the docks before they could be delivered.

While on the question of packing, I would point out that the importer as a rule likes to have his machines delivered as far as possible intact. I mean that they should not be taken to pieces more than is necessary. Not only are British machines sent out in parts, but often to economize case-making the detached portions are placed in cases quite irrespective of the machine to which they belong. To make confusion worse confounded, these parts are often inadequately marked, or not marked at all, and the man who has to identify them and erect the machinery finds himself confronted with a mechanical Chinese puzzle. Importers assure me that they would far

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prefer to pay the freight on a larger case rather than have their machinery dismounted when sent out.

As a set-off against this point of view I have frequently been told, especially with regard to agricultural machinery, that British manufacturers do not pack their plant tight enough. In other words, in a case cubing a certain capacity they do not put enough machinery. It is maintained that by judicious packing sometimes as much as 50 per cent. in space could be saved. As freight is charged by measurement this is a serious item. Again, it means that the local merchant with a warehouse of a given capacity can find room for 50 per cent. more machines packed economically than would be the case if packed wastefully.

This question of packing and marking I believe to be a genuine grievance against the average British manufacturer, and there is no doubt that in these matters, speaking generally, the Americans, and even the Germans, are ahead of us. Of course I am aware that there are many English firms to whom these criticisms do not apply. On the other hand, there are very many whose system of packing is in urgent need of reform. The numbering and otherwise marking of dismounted parts is, above all, important.

And yet, with all his alleged shortcomings, it would seem that the Cape importer still sticks to the British manufacturing engineer.

And why ?

I am no great believer in sentiment in business

matters. I believe that in the long run a man buys what he wants. I believe that the Cape merchant buys American agricultural machinery, and rails and windmills, because they suit him. I believe also that it is for that same reason that he buys 66 per cent. of his machinery from Great Britain. I think, however, that if we want to maintain and increase this percentage, we must study his requirements, make what he wants, and pay attention to the complaints that he is raising.

The relative positions of the Colonial purchaser of machinery and the British manufacturer are not as they were. Until America and Germany began to make a bid for the trade of the world, our manufacturers could say to the customer, " Here is what I make ; you can take it or leave it." Such is no longer the case, and if we value this trade we must cater for it as our competitors do.

Our book publishers issue " colonial editions " of their books. So it must be with our machinery makers. They will have to make colonial editions of their machines to suit the local markets, or they will lose trade.

Then comes the question of representation. Elsewhere I go fully into the matter of branches and agencies. Here I would point to the advisability of sending out technical representatives.

It is technical advice that the user of machinery in South Africa requires. The flashy " drummer " with the diamond pin and a flow of generalizing

twaddle is no longer of any value as a salesman of machinery. The purchaser at the present day knows too much. What is the use of sending a man of that stamp to talk to the engineers of a railway or a mine. The people he goes to see know more of the practical details of the machinery he is urging them to adopt than he does.

Let a firm send out, either in a temporary or permanent capacity, the very best technical man they can lay hands on, and let them pay him well. Not only is it necessary for him to sell machines ; he must see how the machines of his firm are being used, and what other machines are working in competition with his own. He must keep his firm in touch with what is going on, advise them, and give them suggestions for improvements to suit the market.

Then let his firm be guided by his advice.

In her colonial politics Great Britain has often erred by first sending out competent men to advise her, and then not acting on the advice of the men in question. And so it is with our manufacturers at home—they will not follow the recommendations of their representatives and agents. "Pay! pay! pay!" sang Mr. Kipling, when it was a question of creating a British South Africa by the sword. "Pay! pay! pay!" is what we must sing to the manufacturer who would maintain British trade supremacy in South Africa. Get the proper technical men, pay them well, back them up and take their advice.

Apart from the question of mining plant, it is principally in the smaller machines and implements, which are stocked out here, that the Americans are making headway in Cape Colony. And it is possible that it is because the American makers take some risks, and encourage their agents to hold these stocks, that this headway is being made.

Among the machines that are mostly wanted in Cape Colony at the present day are agricultural plant, windmills, traction engines, railway plant, dredges, cranes, pumps, drills, steam and oil engines, flour-mill machinery, brick-making machinery, machine tools, and electrical lighting and driving plant—more particularly small motors. There is practically no market for gas-engines, for the simple reason that where there is gas the price is prohibitive for motive power purposes on account of the cost of coal.

Though motor cars are to be seen about, the day of the motor trolley and heavier vehicle has not yet arrived. These are badly wanted, but up to the present, in Cape Town at all events, they are under the same restrictive regulation as that from which we suffered in England some time ago, which recognizes the heavier motor wagons only as "traction engines," and stipulates that a man shall walk in front of them and wave a flag.

Except in the case of the mining industry, and certain others which are still hampered for want of labour, the market is already sufficiently

recovered to be classed as good. There is a certain amount of trade going now. There is much more to come.

Let me join the alarmists in expressing the hope that the British manufacturing engineer will tackle South Africa thoroughly and systematically before he discovers that the trade is gone.

Chapter IX

THE COMPETITION IN GOLD-MINING MACHINERY

THAT those amiable alarmists who periodically cry "Wolf" to our manufacturers, and assure them that they are about to be gobbled up by their American competitors, have made some sort of an impression on certain of their hearers is certain. Among the many inquiries that have reached me from England during my stay in South Africa one of the most persistent is, "Why do we not get more orders from the Rand for mining machinery?"

Many of those who raise this question suggest their own answers to it. Some attribute the decline in their orders to the fact that there are now many American mine managers in Johannesburg, and that these gentlemen have anti-British prejudices. Others maintain that it is due to under-bidding by our foreign competitors.

No doubt both of the above may be accountable for some loss of trade, but they are as nothing compared with other vital causes which are obvious enough to any one out here. The most practical of all reasons for the decline in orders

is that at the present time the Rand mine-owners are ordering very little machinery from anybody.[1]

People, in fact, have been expecting the impossible.

When only about half the mines are open, and all of these are short handed, when hundreds of thousands of pounds' worth of machinery is standing idle for want of labour, it cannot be said that the moment is opportune for the placing of large orders for new plant.

After exhaustive inquiries from the merchants and machinery importers in Johannesburg, I do not think that the orders at present given out exceed 25 per cent. of their value in 1899. Some of these firms are doing only about one-seventh of what they consider to be their normal output, and the most fortunate admit that they are not doing more than one-third. Thus, while the British manufacturer may rightly be alarmed at the falling off in his orders for mining plant, he may console himself with the fact that his foreign competitors must be suffering in a like manner. This, of course, is assuming that there is no decline in the popularity of British machines.

From the investigations I have made it would appear that, prior to the war, Great Britain must have contributed not less than 70 per cent. of the total mining plant used on the Rand. Although, of course, there are no cut-and-dried

[1] This was written in 1902, since which time business has been improving. It has not, however, reached anything like what should be the normal figure in existing circumstances.

statistics to verify the assumption, I believe I am correct in stating that, unless circumstances undergo a change, we shall not maintain that highly satisfactory figure. It is not that our firms are badly represented out here, either by their branch offices or their agencies, for I should think that there are at least five British manufacturers with offices in Johannesburg to every one of our foreign competitors. It is not that our firms are grudging money in trying to obtain orders, for I stumble across the special travelling representatives of our manufacturers every day, in the streets, hotels, clubs, and the offices of buyers.

It is due to the fact, firstly, that some of our competitors, notably the Americans, have succeeded in making certain machines and appliances for gold-mining that are more suitable for local requirements than anything made in England. Of this I shall have more to say in a future chapter. The second reason is that for years past there has been a tendency—at the present day it is stronger than ever—to control these mines in groups by syndicates with large capitals, instead of running them as individual concerns.

When this is the case it only stands to reason that a corresponding tendency towards organizing their methods of purchasing must follow suit. To put it in other words, when a user of machinery finds his requirements sufficiently large, it pays him to become his own merchant. When he becomes larger still, it may possibly pay him to

become his own manufacturer of machines. It is after this ideal that the various groups of mines have been striving. It is in the direction of this ideal, to which they will never completely attain, that they have bent their steps.

And now, in endeavouring to give a coherent outline of the purchasing methods, I must begin by explaining that the market is practically controlled by seven powerful groups of mines. There are many others, but as they are comparatively unimportant, it is unnecessary for me to complicate my subject by dragging them in.

I class these groups of mines for present purposes as follows :—

The Robinson Group, The Farrar Group, The Barnato Group } British.

The Consolidated Gold Fields Group, The Eckstein Group } Anglo-American.

The Goerz Group, The Albu Group } German.

This classification does not necessarily mean that the mines which are bracketed with a particular country are either owned or managed by people of that country, though sometimes it is the case. But it means that, through influence or inclination, the orders they give out have a tendency in a greater or less degree to go to the countries in question.

The three " British " groups buy their machines in the open market, but have a strong British leaning.

The Consolidated Gold Fields group keep a fairly open mind as between England and the United States, while the Eckstein group is largely interested in a firm of machinery makers and merchants, Messrs. Fraser and Chalmers, and consequently deal almost exclusively with that firm. Messrs. Fraser and Chalmers manufacture their mining plant in England and America—at Erith and Chicago respectively—and so may be classed as Anglo-American. In addition, however, they hold a number of agencies for such machines and accessories in the mining industry as they do not manufacture themselves. Thus they claim to cover the whole of the ground for mining requirements, and to all intents and purposes they do so. And for the requirements of the Eckstein group of mines they practically hold the monopoly.

I am not suggesting that this is a bad or an unjust arrangement, or that it results in the purchase of imperfect plant. I would point out, however, that as most of the machinery agencies held by this firm are American, the firm in question, when we take into consideration its large merchant business as well as its manufacturing, must be classed rather as American than as British.

The two "German" groups of mines on the above list have their own merchant firms from whom they purchase practically everything. The Goerz group buy through the Technical and Commercial Company, and the Albu group through the United Engineering Company. These firms, though blessed with British names, are German in sub-

stance and in fact. They of course purchase as far as possible from the Fatherland, but fortunately Germany is still so far behind the times with much of her mining plant, that many orders for these two groups find their way to England and America in spite of the teachings of the pan-Germanic League.

Of course, where mines have to equip themselves to the best advantage, it is theoretically a mistaken policy for them to bind themselves to purchase through one channel. I do not think, however, that any one of the above groups is tied so tightly to its own particular merchant as to be unable to purchase elsewhere. In fact, it is the usual practice out here for the groups and the firms to repudiate the existence of any sort of a compact between them. But whether a formal agreement exists or no, the result is the same. For good or for evil it tends to tie up the market, or to push orders in a particular direction.

I will endeavour here to afford some sort of an approximate notion of the proportion of the orders for the various classes of machines, which are given out to the competing countries. This, of course, involves a certain amount of jumping at conclusions. I can only say that I have looked before I leaped. I have done my best to ascertain the opinions of others whose business it has been to watch this trade for a longer time and in a more detailed manner than has been possible for me.

On the Rand it would appear that England has

practically the whole of the trade in boilers, and these are nearly all of the multitubular and water-tube types. We do also nearly all the skips and stamp mills and tool steel, and at least our share of the winding gear. The Germans latterly have been cutting into our trade with trucks of a very cheap class, but it is anticipated that this is only a temporary loss, as the German trucks do not give satisfaction, and the life of a mining truck is of far more importance than its first cost. In rails England shares the market about equally with the Continent. In the larger pumps America is coming to the front, doing probably three-fifths of the total, while we do the balance. We have, however, recently taken over nearly the whole of the market in boiler feed pumps and air pumps.

In compressors, steam and other engines, pipes and belting, England and America divide the market about equally. In wire ropes and machine-tools we still have rather more than half the total.

Germany is cutting into the American machine-tool trade by cheap and inferior, though otherwise very faithful copies of the American tools. She is also encroaching on our market in shoes and dies for the stamp mills, our price being from 23*s*. to 26*s*. per 100 lb., and hers 19*s*. for a fairly good article.

America has quite captured the market in conveyors and oils. In rock-drills she is ahead of us. Belgium does nearly all of the cyanide tanks and accessories.

In electrical plant our position is a very critical

one. I believe we do from 35 per cent. to 40 per cent. of the total, as far as the actual machinery is concerned, if we include the steam-engines for generating the power. In switchboards, lamps and other accessories we are entirely out of the market, owing to the fact that our Continental competitors make an equally good thing for, in some cases, only half the money.

To revert to the question of electrical machinery, i.e. motors and dynamos, we have been steadily losing ground in these to Germany and the United States. And the reason for this is that our older and better known manufacturers have failed to keep pace with the times. Every effort has been made by the local merchants here to continue to do business in their machinery, but their prices are altogether too high, and their machines are said to be no better, and their range much more limited than those turned out by our foreign competitors. Switzerland and Germany have cut us out in electrical accessories; Switzerland, Germany, and the United States are cutting us out in electrical machinery.

With regard to this last item, however, there appears to be one hopeful sign. There is, I am told, a younger generation of manufacturers of electrical plant springing up in England—a new school, if one may use the expression. These firms, who have started with new plant and new ideas, have been able to profit by the object-lessons set by our foreign competitors, which the older firms have not always troubled to follow.

The result is that British-made machines in every way equal to those made elsewhere, and at prices which will enable them to compete in the open market, are beginning to find their way to this country. There are many people here who hope that these firms may save the situation for British electrical plant. It is to be hoped, too, that when our older firms have grasped this fact they will follow suit, and aid in the re-establishing of a trade in a class of machinery which has been steadily slipping out of our hands.

In a place like the Rand, with its enormous requirements in the way of machinery, it only stands to reason that, however much plant it may import, a great deal of work must be done on the spot.

There are several good engineering works in Johannesburg, employing in normal times from fifty to two hundred hands. Just now they are terribly slack. Though, as a rule, their plant is none of the latest, they are equipped for dealing with a great variety of work, even of a very large class. Castings of ten tons can be poured, and heavy forgings are also undertaken. Repairs, of course, form the greater portion of their work, but the local firms at times make various mining accessories, such as skips, and the large built-up winding pulleys.

Of the resident representatives of British firms here, their name is legion. You can walk down street after street in Johannesburg, and, on looking at the window signs, imagine you are reading the

advertisement pages of *The Engineer*. Nearly all the well known manufacturers are to be found who deal in anything that is likely to be of service in the mining industry.

I have strolled in and talked to the managers of many of these firms. They are all very sorry for themselves just now, but I have hardly met one who has not implicit confidence in the future prosperity of the place.

One of the most hopeful signs of the times, as far as British projects are concerned, is the recently formed British Engineers' Alliance, Limited, owned and run by a number of our leading manufacturers, who between them cover nearly all the ground in mining plant. This syndicate is making a great bid for the orders of the British groups of mines above referred to, and for anything else that is going in the way of orders.

Personally, I believe that a judicious grouping of engineering firms, whose interests do not clash in the manner explained above, is the best method for securing trade out here. It is an extremely difficult matter to organize this sort of thing satisfactorily, but when done, it is far more effective than the appointing of the haphazard agent, who may or may not understand your machinery. It is also far less expensive than the establishing by an individual manufacturer of a branch on his own account.

On the whole I should say that British manufacturers are spending at least as much money as should be necessary for securing their share of the

trade on the Rand. For want of system, or rather for want of a method of satisfactory combination, they may not in every case be spending that money to the best advantage. I have, however, endeavoured to point out the classes of machinery in which we are suffering from competition, and so our firms will have an opportunity of judging whether they can counteract the influences which tell against their trade.

There are many instances where, with observation and perseverance, we might recapture some of our lost trade. Take the case of conveyors. These, as above stated, are practically all ordered from America ; and yet there are plenty of firms in England who make this sort of thing. They do not, however, make what is wanted out here. There is an immense amount of trade to be done in conveyors, and it would well pay any firm who may think of taking up this work to send out the very best man they have to study this question on the spot for six months. The result should be a very valuable trade to the firm in question. Then there are the cyanide tanks. It is, of course, easy to understand that in this class of work the Belgians can underbid us. Still, the matter is worthy of attention.

I have tried to explain that the present slackness in the machinery business is due entirely to natural causes, and that the ultimate prosperity of the Rand cannot be affected by the present "slump." Alarmists are predicting a financial crisis, but even they must admit that, after all,

the gold is in the ground, and that the big men here are so rich that it is almost a matter of indifference to them whether it is taken out to-day or to-morrow. Again, if it were possible for the depression to ruin these capitalists—and it is not possible—some one else would appear on the scene to work the mines in their place, and consequently mining plant would be as essential as ever.

Men may come and men may go, but mining on the Rand will have to go on for ever; that is to say, until the gold is exhausted. And the Rand optimist will tell you that that day is as far off as is the exhaustion of the coalfields in Great Britain.

Chapter X

THE STRUGGLE FOR LIFE IN RHODESIA

IN trying to describe the Rhodesia of to-day, I will begin by pointing out that step by step it is passing through many of the phases passed through by Western Australia.

There was a time—and that not so very long ago—when Australians generally were wont to ridicule the idea that Western Australia could be anything but a waterless desert, with sand for its only natural product.

Some twelve years ago, however, wild speculation brought about a great financial crisis, which temporarily ruined all the Australian Colonies, excepting Western Australia. That Colony was so far removed from the others, and her financial complications were so limited and local, that, standing on her own merits, she weathered the storm which had devastated her sister colonies.

And just then gold was found in Western Australia, and still the other colonies scoffed. They, too, had their gold and silver, and coal mines, all proved properties, and how could inaccessible Western Australia compete with them ? But men who had been ruined in Victoria, and

New South Wales, and Queensland, were tempted by these rumours, and went over to this trackless desert, where water cost more than whiskey. And they dug and delved in the parched up ground. The gold was there. Money was made, fortunes were rebuilt ; the population of Western Australia quadrupled in a few years.

And now that Australia generally is hard pressed once more on account of the prolonged drought, the people of the other States are beginning to realize that there is something in Western Australia after all. She has her gold, her hundreds of square miles of valuable forests which cover the country wherever there is rainfall, her pearls and her farming, and she of all the Australian Federated States is the only one who has been able to snap her fingers at the drought.

I do not say that Western Australia is not hard up. She has in recent years borrowed such a lot of money that the financial shoe must pinch for some time to come. But the money was borrowed for the purpose of transferring the desert into a habitable land, and it is already returning with profit to her.

Rhodesia, that vast tract of inland South Africa, with an area of 750,000 square miles, bounded on the north by the Congo and German East Africa, on the south by Cape Colony and the Transvaal, and hemmed in on the east and west by Portuguese and German territories, is the Western Australia of South Africa.

Rhodesia is systematically decried by the people

of the South African Colonies. Her progress has been debarred mainly on account of her inaccessibility. Her gold and other minerals, and her prospects in the way of agricultural and pastoral farming, have been ignored or cast into the shade by the glitter of the Rand goldfields. Like Western Australia, Rhodesia has demanded the expenditure of immense sums of money to render the country accessible and habitable, and now that the railway has just been completed through from Cape Town to Beira, it may truly be said that Southern Rhodesia, that is to say, all that part which lies south of the Zambesi, has been brought within commerical range of the world.

There is much to be done yet before Rhodesia can be described as an easy country for the ordinary man to live in, and the most important of the existing drawbacks is that to live there at all is a very expensive matter. The cost of transport on goods from Europe and America at present adds 73 per cent. to their value before they arrive in the country. To this must be added an average of 8 per cent. for Customs duties. Most of this enhanced value has been due to the high rates charged by the railways. In addition to this, Cape Colony has always done her best to strangle her younger sister by imposing a transit duty on goods which merely pass through her own territory to Rhodesia. This is one of the many things which Cape Colony ere long will be made to change.[1]

[1] Since this was written transit duties have been abolished and railway rates somewhat reduced.

Another cause for the high prices which prevail in Rhodesia is that, so far, she has produced nothing worth naming which would afford a return freight for the trucks which ply between her and the outside world. Travelling up the line from Cape Colony into this country, it is at the present day heartrending to pass train after train of empty trucks going down south. The result of this has been that the Rhodesian Railways hitherto have not been a commercial success, and the Rhodesian customer has had to pay, to all intents and purposes, for the returning of those empty trucks. But the history of the world shows that many are the railways in new countries that have had to create their own traffic—aye, and their population too, before they could claim to be paying concerns.

There are those who have taken the line that the Chartered Company has been ill-advised in spending so much money on railways with so small an immediate prospect of seeing their money back. But the fact remains that the Company has an enormous tract of country which can never be made to pay without an efficient railway system, and that until this was brought about the first important step towards developing Rhodesia could not be said to have been taken.

And now, what are the justifications for this great expenditure? Firstly, there is the gold, and of this you will be told in the other South African colonies that in Rhodesia it does not pay to mine. This, like most generalities, does not convey a

correct impression. In the first place, there are mines which have been and are working at a profit. There are not a great many of them, but there are a few. There are others that are just managing to keep their heads above water, more that are working at a loss, and more still that have been shut down. Above all, there are innumerable claims that have been pegged out and left practically untouched, although the existence of gold has been proved in them in quantities which would certainly have paid for the working, had they been situated in a country which was less severely handicapped.

Gold-mining in Rhodesia is more akin to the gold-mining in other countries than is that on the Rand. There are no *banket* formations here. I will not commit myself as to the average grade of the ore in Rhodesia, for statistics are very mixed. It is safe to say, however, that there is a great variation in the quality. If much of it has turned out disappointing, there have been of late, in individual cases, some extraordinarily high assays.

I have talked with men here from other countries who have been used to dealing with high and low-grade ores, and they have told me that, had these goldfields been situated in Australia or America, there is not one that would not have been workable at a profit. We must take such a statement with a fist full of salt, for the mining optimist is a misleading statistician. But the fact remains that there would appear to be an unlimited amount

of gold in Rhodesia which would make the fortune of any country which was situated in more favourable circumstances.

When we consider the difficulties under which the Rhodesian miner has been working we can no longer wonder at the disappointment of shareholders who have placed their money in this industry. It is satisfactory to be able to note, however, that many of these difficulties are being overcome. These are the main obstacles to mining in Rhodesia—

(1) The cost of getting to the country.
(2) The cost of living in the country.
(3) The cost of machinery and plant.
(4) The cost of fuel.
(5) The cost of labour.
(6) The handing over of a very large portion of any profits to the Chartered Company.

With the causes of the first three of the above I have already dealt. The through railway, which permits of feeding the country from either end of the line, will do much to reduce these evils.

With regard to the absence of coal, and the impossibility of importing it at a commercial figure, this great obstacle is now on the high road to be overcome. So far, as a general practice, wood only has been used on the railways and mines, and to obtain an amount of wood fuel which would give the same results as a ton of Welsh coal has entailed a cost of from £6 to £9.

Two hundred and three miles from Bulawayo,

however, the existence of an unlimited supply of coal has been found at Wankie, and it is said that in quality it is far superior to any other South African coal. A railway is now in course of construction from Bulawayo for the purpose of tapping this supply, and it is safe to predict that within a few months of the time when this book will go to press Wankie coal will be on the market. This Bulawayo-Wankie line is the most recent section of the Cape to Cairo Railway. It is to be pushed on rapidly northwards to the Zambesi at the Victoria Falls, which lie 72 miles beyond Wankie, and the whole is to be completed by the end of this year.

The enormous reduction in the cost of working the railways and the mines that will be effected by the introduction of local coal will go far towards rendering the mines payable. It should do much more. It is anticipated that this coal is of such quality, and can be produced so cheaply, that it will command the market as far south as Kimberley.

At the Kimberley mines the prices paid for fuel at the present day are extremely high. If a trade in coal can be established between Wankie and Kimberley, this should provide a bulky commodity for filling those empty trucks which I have referred to above, and which are such an expensive luxury to the man who lives in Rhodesia. Again, the Bulawayo-Wankie line runs for many miles right through a forest of "red teak," for which there should also be a large market further south. So

far there has been no means of exploiting this timber commercially. As a matter of fact this timber is not teak, though it is a hard, durable, well grained wood, and should prove of great commercial value.

The cost of labour can only be reduced as the cost of living is reduced, but if railways and cheap fuel will make gold-mining possible on a large scale, the larger population which it will bring will be an incentive to local farming, and as Rhodesia is far better watered than are most places in inland South Africa, and as the various scourges which attack the agricultural and pastoral farmer are much better understood now than they were, there is no reason why the ordinary necessities of life should not be produced locally, and even, in course of time, develop into an important export.

To convey an idea as to the price of labour, I give below a scale of salaries and wages which would be calculated to make the average unemployed Englishman's mouth water, were it not for the fact that their value must be discounted by the high cost of living already explained.

Monthly salaries :—Bookkeepers, £30 ; blacksmiths, £35 ; clerks, £22 10*s.* ; domestic servants, from £5 to £15 ; gangers, £15 ; gardeners, £15 ; mine managers, £75 ; overseers, £25 ; printers, £30 ; prospectors, £30 ; shop assistants, £20 ; stonecutters, £32 10*s.*

Daily wages :—Bricklayers, 30*s.* ; brick-makers, 15*s.* ; carpenters, 25*s.* ; engine-drivers, 25*s.* ; fitters, 30*s.* ; masons, 32*s.* 6*d.*; miners, 25*s.* ; painters, 25*s.* ;

saddlers, 25*s.*; shoemakers, 20*s.*; stokers, 20*s.*; tinsmiths and plumbers, 25*s.*; wagon-makers, 25*s.* The above figures have been given me by the Acting Civil Commissioner in Bulawayo.

The white artisan in any of the above trades, provided he is skilled at his trade and a steady man, stands every reasonable chance of employment up here just now. To get to Rhodesia and establish himself while waiting for work such a man should possess some £40 or £50 after landing in Cape Town. Workmen up here tell me that they can live quietly on from £9 to £12 per month. In the towns living is healthy enough, but in the mines and the country districts there is a good deal of fever and other sickness. The prospects for those who are higher up in the scale of labour are by no means as good. Salaries, as it will be noted from the above figures, are by no means as high proportionately as are the wages of the artisan, and the cost of living in the higher social grades is immensely more expensive.

I cannot recommend the educated engineer to come out to Rhodesia just now and try his luck, unless he is a man with money. Openings there are bound to be on account of all the extensions that are going on, but, as I have stated in a previous chapter, there is no difficulty just now in filling these appointments from men in the other colonies.

Let those who would enlighten themselves on this point apply to the offices of the Chartered Company in London. It is the man with capital

who is wanted in Rhodesia, and there should be many openings for the satisfactory employment of that capital by the man who knows the country. To make the country "go" it is not only the London shareholder that is wanted, nor is it he who is likely to see a return for his money just yet. It is the resident capitalist, who takes a practical and intelligent interest in the place, who stands to benefit himself and this country in the long run.

Rhodesia is languishing—as is every other place in South Africa just now, except Kimberley—for want of native labour. There is less legislation for controlling the native "boy" here than there is in any of the South African colonies. Strenuous efforts are to be made to improve this state of affairs, but at present the uncertainty in this department has a great retarding influence on practical progress.

While I am recommending Rhodesia in a general way to the British artisan, I would point out that it would not take a great number of his class to flood the market, and that the result of that would be to lower the rates of wages.

Coming to the sixth of the points which I have enumerated above, I would say that the relations between the Chartered Company and the residents are often misunderstood.

Southern Rhodesia is governed by an administrator appointed by the Chartered Company, and assisted by a council made up in such a way

that although four members of it are elected by the people of the country, the majority must always be in the hands of the Company. The good or bad governing of Rhodesia therefore depends entirely on the capacity for good or evil of the Company and its administration. I am not going to criticize this state of things, beyond saying that, whatever its theoretical defects may be, there is no other form of government that one can imagine that would have done anything like so much for the country as has the Chartered Company. As a Crown colony Rhodesia would have been doomed to stagnation for years to come, for the Imperial Government would never have sanctioned the huge expenditure on railways and other works which were put in hand by Mr. Rhodes and his colleagues. As a self-governing colony the place must have been bankrupt long since; for, assuming that the white population was large enough—which is not the case—it is inconceivable that such a colony, situated as it is, could have obtained the necessary loans for undertaking the extensive works which have been necessary to its salvation.

Mr. Rhodes had unbounded belief in the place, and he has bequeathed that spirit of confidence to his successors. On the strength of that the Chartered Company has expended money lavishly during all these years at the expense of its shareholders, with an eye to a big return in the somewhat remote future.

Until a resident commences to make money he is not heavily taxed, but from the moment that his profits begin his incentive to work is damaged by the fact that in virtue of obtaining his concession the Chartered Company becomes a shareholder in his business. The amount fixed as the Chartered Company's share was originally 50 per cent., but in practice this amount has nearly always been very materially reduced. By a recent concession the amount has been fixed at 30 per cent., and with a view to encouraging the modest industrialist and the opening up of small mines, the Company has waived all profits on mines which employ only a five-stamp battery. It has been maintained by mining men with whom I have talked that the mines that will pay out here will not, as a rule, be those which are worked by large companies, with offices and directors in London and a liberally-watered capital. It is the smaller man on the spot who is wanted, who carries on his work economically, and lives and spends his money in the country.

To turn from mining to farming, one of the great obstacles to progress in this line is due to the fact that in the early days the pioneers, in return for their military services, were awarded large tracts of land in the vicinities of what are now the principal towns of Rhodesia. As is always the case when land is parcelled out in this way, many of the owners had no use for it. Some left the country, others decided against

living on their property, and many were too hard up to hold it. The result was that most of it was bought up for a song by speculative companies in England, who in some cases obtained it at the rate of about £10 per thousand acres. Their object, no doubt, was to put it to some practical use, but the inaccessibility of Rhodesia was the stumbling-block in their way. This ground is still held by those Companies, who do nothing with it, and thus a wilderness is created around Bulawayo and other centres where farmers would be glad enough to start producing the food supplies which are such a vital necessity to the prosperity of Rhodesia.

This country has, perhaps, been unduly forced by the Chartered Company. Perhaps it is not yet ready to take that position which was contemplated for it by the late Mr. Rhodes. If such is the case, no doubt more money will have to be expended before it will turn the corner; but that its future will be a great one there can be no question. At present it is artificially propped, but the permanent foundations, so far as they have been completed, have been solidly built. The most healthy sign about the place, from the point of view of the manufacturing engineer, is that nearly all the important machinery firms in Johannesburg and elsewhere have their branches up here, and that, although they complain of business and of the immediate prospects of the country, they are extending their branches and their business in this part of the world. The

question of railways is dealt with in another chapter.

I append some statistics of Southern Rhodesian imports, more particularly with regard to engineering products, which have been prepared for me by Mr. E. C. Baxter, the collector of customs in Bulawayo.

The following figures indicate the values, at places where purchased, of goods received through Cape Colony and the East Coast (Beira) :—

	£
For eight months ended March 31, 1900 .	270,796
For year ended March 31, 1901 . .	1,221,968
For year ended March 31, 1902 . .	1,443,053

If an average of 73 per cent. be added to the above values to cover freight, railage, and other charges (exclusive of Customs duty), the cost on arrival in this territory will be seen to be about £2,100,000 for 1900-01, and about £2,500,000 for the year 1901-02.

The gross duty levied was :

	£
Year 1900–01	95,555
,, 1901–02	123,158

This indicates an average of 7·73 per cent. upon declared value of total imports, or 26·62 per cent. upon the value of dutiable articles only.

Customs Return of declared value of machinery and engineering plant and accessories entered for consumption in Southern Rhodesia free of customs duty from July 31, 1900, to March 31, 1902.

Articles.	Eight months to 31/3/00.*	Year to 31/3/01.*	Year to 31/3/02.
	£	£	£
Brass and copper manufactures	552	3,006	6,679
Building material, not otherwise designated	392	14,936	10,427
Cement	565	1,522	4,632
Hardware—Fencing wire	365	1,131	3,268
Unenumerated	1,779	19,921	17,728
Implements—Agricultural	865	2,785	4,050
Tools	588	990	5,720
Iron—Corrugated	6,843	18,511	17,268
Pipes and Piping	502	3,147	10,134
Bar, bolt, and rod	323	1,907	7,792
Sheet, not corrugated	—	144	634
Lead	67	58	213
Machinery—Mining	37,501	94,269	161,103
Other kinds	1,505	7,673	22,115
Mining requisites	1,948	—†	3,677
Oils, machine or engine	434	613	4,619
Railway & tramway materials	688	13,365	72,319
Steel—Bars, blocks, etc	158	325	6,825
Plate or sheet	142	580	1,289
Wood and Timber—			
Manufactured	2,270	3,190	13,582
Unmanufactured	4,635	8,626	21,504
Planed or grooved	3,511	4,164	14,797
Zinc	241	322	2,072
	£65,874	£201,185	£412,447

* Traffic from Cape Colony interrupted owing to the war.
† Subdivided this year, and included under other heads.

From a superficial glance at these figures it will be gathered that Southern Rhodesia, which imports nearly half-a-million pounds' worth of machinery and engineering plant and accessories, is a country worth cultivating. And so it is.

There is to be no falling off in the railway requirements, and I can see no valid reason for anticipating anything but a steady, and possibly a rapid, increase in all other plant which affects the manufacturing engineer.

The only thing that could ruin the country at the present stage would be for the Chartered Company to grow suddenly tired of its property and of the expenditure entailed. But there is no chance of this happening, and even if there were, the position of the country to-day is so infinitely better than in the past, and it is so very much nearer the turning point, though the benefit is not yet felt, that the money could be readily forthcoming to keep Rhodesia going. They say that to a nation that is weak financially, its national debt is its greatest security, from the fact that it does not answer the purpose of those who have invested their money in the place to allow it to fail. The vast sums expended by the Chartered Company and others on Rhodesia are the guarantee of its future prospects, and, personally, I am convinced that the future will justify the hopes of those who even now are optimistic.

Let those who habitually depreciate Rhodesia

remember that, apart from its being handicapped by its distance from the centres of commerce, and other drawbacks, its existence so far has been one long struggle for life against all sorts of detrimental influences. Taken by the sword in 1890, it was held virtually at the point of the sword until 1896. After the troubles with the black population had been settled, only two or three years were allowed to elapse before the recent Boer war came about. While our attention was absorbed by events which were taking place in the Transvaal and southwards we overlooked the fact that Rhodesia, which produces hardly anything in the way of food supplies, was entirely cut off from its fountain head—Cape Colony—and that its resources were still further drained by the importation of thousands of troops *viâ* Beira. We now know that it was not the beleaguered garrison of Mafeking who required feeding, but the inhabitants of Rhodesia further north, and that it was the troops who entered Mafeking from the north who were in need of a square meal and careful attention in that town.

Bearing in mind the manner in which Rhodesia has been handicapped in the past, we can only assume that, with the improved prospects, and a reasonable amount of good fortune, the day of her prosperity is not far off.

Referring to the schedule of machinery imports given above, it will be seen that if we add one-third to the period ending March 31, 1900, to make it up to a full year, the figures for the three

years stand as follows :—£87,832, £201,185, £412,447. If only the future shall show a much lower rate of increase than that which took place during the last two years, the manufacturing engineer will have no cause to find fault with Rhodesia.

There are no statistics to show how much of the above indicated trade falls to the portion of Great Britain ; but from what I can ascertain from agents and users in this country, our percentage of the machinery trade of Rhodesia should be at least as high as the figures I gave with regard to Cape Colony, and, personally, I am inclined to place them somewhat higher.

Chapter XI

POSSIBILITIES IN THE ORANGE RIVER COLONY

IN 1854 the British withdrew from the "Orange River Sovereignty" on the advice of a certain Government Commissioner, who had reported that the place was "a desert and practically valueless."

The greatest experts make mistakes at times. A celebrated English engineer once reported that to join the Mediterranean with the Red Sea by a canal would be an impossibility. Many men have condemned the Rand as a goldfield, and among them an American gentleman who is admittedly one of the greatest authorities on mining now living. And so the Orange River Sovereignty became the Orange Free State, and not long ago, in circumstances on which I need not insist, it became necessary for Britain to re-take the place. Then we re-named it the "Orange River Colony."

And now what of this "valueless desert"? What sort of a place have the Boers and Britons, who lived here side by side, made of it during the nearly fifty years that have elapsed since the adverse verdict of that British Commissioner?

POSSIBILITIES IN ORANGE RIVER COLONY

The Orange River Colony has been obscured from the notice of the world by its position. To the north of it glitters that Eldorado of South Africa, Johannesburg. On the west blaze the diamond mines of Kimberley. On the east lies the go-ahead colony of Natal; and on the south it is cut off from civilization by hundreds of miles of Karoo country, where "everything would grow if there were only water," we are told—but where, alas! there is no water. During the war the attention of the world was attracted to the Orange River Colony, but even then it was only in a secondary manner, as the less important of the allied republics. And so the position of this colony in the South African concert has been that of fourth, or perhaps fifth, fiddle.

Whatever its prospects may be, for the present it remains in that position. Whatever the mineral wealth, which may and assuredly will be developed, its present prosperity is due primarily to its agricultural and pastoral capabilities, and to its railways, which form one of the high roads to Johannesburg. Like every other part of British South Africa, the Orange River Colony has been thrown back by the war. In fact, in proportion to its importance, it has suffered more than any other of our South African possessions except Rhodesia. The war could not wipe out the diamonds in the Kimberley mines, or the gold at Johannesburg. It could check their output, but that was all. It enhanced the carrying trade of Natal, and made the fortunes of a number of

enterprising people in Cape Colony. The Orange River Colony, dependent mainly on its farming industries, was naturally badly damaged by the war. Farms were burnt, flocks and cattle were commandeered by one or other of the combatants, and, if we are to believe the sensational newspaper correspondents, there is nothing left in the country.

Things, however, are not as bad as that. There are plenty of farms still standing, and my impression is that at the present day you will see more sheep and cattle to the square mile in the Orange River Colony than anywhere else in South Africa.

After passing through hundreds of miles of barren Karoo country it is a distinct relief to find ourselves in the Orange River Colony, for here is grass ; yes, and water, too. It is too much to say that the Colony is plentifully intersected by rivers, but undoubtedly it is plentifully intersected by river beds, in which during a certain period, and, in many cases, during the greater part of the year, there is water.

The mean rainfall of the Colony is about 22 in., which would be good enough if it would fall when it is wanted. As in the rest of South Africa, however, the rain only falls during a certain short period of the year, and this happens usually when it is not wanted. To retain this water for as long as possible a very great deal of private dam-work has been carried out, and if the impressions of a passing visitor, who is not an agriculturist, are of any value, I should venture to say that the Orange

River Colony is a thoroughly good farming country. In confirmation of this I invoke the experience of the machinery merchants in Bloemfontein.

My first experience on visiting the offices of one of these gentlemen was refreshing in the extreme. There I found show-rooms and stores full of British agricultural machinery and implements; further supplies were being unloaded at the gates. There I found customers, mostly Boer farmers, coming in one after the other to purchase ploughs and gear of all sorts for their farms. And this, although it was already the off-season.

"The British engineer," said the manager to me, "could secure practically the whole of the agricultural machinery trade if he liked. But we still have a difficulty in getting him to carry out certain simple alterations in his wares to suit local requirements. He is much better than he was, though, and we live in hopes that some day he will rise to the occasion and knock out the American manufacturer."

"Tell me what it is that the Americans in particular cut us out with in the way of agricultural machinery," said I.

"It is with their No. 75 plough."

"And in what is that better than an English plough?"

"It is not better. It is a handy form of plough, and the cheapest thing in the market. Its framing is entirely of wood, which does not last, but it suits the farmer here, and he will have it.

It is, in short, the standard plough of South Africa."

"What is the price of it?"

"It can be bought wholesale, delivered at Port Elizabeth, for 27*s*."

"Perhaps that accounts for our makers not caring to compete," I suggested.

"No doubt," was the reply; "I suppose where wood-work is concerned you cannot compete with the Yankees. And then, of course, they have that very cheap freight just now. I will show you, however," he continued, "an English made plough, which is in effect the No. 75 plough, but that it has a steel framing."

"Well, is not that what is wanted?"

"Undoubtedly, when we can get the farmers to understand that fact. It costs rather more than twice the money, but it will last five times as long, and if properly pushed, it ought to take the place of the American plough."

"What do you call proper pushing?"

"Well, these sort of things ought to be stocked out here by the makers, and in large quantities. I could have sold a couple of hundred more during the last few weeks if I had had them by me, but I cannot get them fast enough."

"Then things are fairly brisk just now?"

"Yes. And they should be better as time goes on. The Boers are being rapidly repatriated, and they all are wanting machinery and implements. Then, too, there are the new British settlers, who also want fitting out in this way."

"Has the effect of the war been to bring many British settlers on to the land?"

"Yes."

"What sort of farmers do they make?"

"It is too early to say at present, but at all events they are keen enough."

"Have the Boers any prejudice against British machinery?"

"None whatever. They do not care whether it is English or American so long as they get what they require. There is, however, a distinct and growing dislike for German machines."

I had noticed all over South Africa this dislike for German machinery. One hears something of the same sort throughout the world; but elsewhere, even in our own Colonies, I have found that while people profess to object to things "made in Germany," they often buy them very largely.

Here in South Africa it is different. The distaste for German goods, and especially machines, has a very large effect upon the purchaser. It amounts very often to a prejudice. In fact, it is not merely a dislike for German goods, it is a hatred of Germany. One may well understand that Germany's attitude during the war was not conducive towards strengthening the friendship of Englishmen for the "Fatherland." But I confess that I was surprised to find the extreme bitterness of the Boers against Germany, which has been one of the effects of the war. Over and over again Boers have said to me that Germany has been at the root of all their troubles. Perhaps a

conversation which I had with a leading Boer politician under ex-President Steyn's Government may explain this feeling. The gentleman in question was no "uneducated Boer," an expression which we in England have been sometimes wont to apply rather too largely. He was a man of considerable enlightenment on many subjects, and had fought against us all through the war. I do not urge this last fact as a proof of his enlightenment.

"We never should have fought," said he, "but for Germany's assurances. We were convinced, on what we believed to be the very best authority, that there would be Continental intervention. And now we know that there never was a possibility of it."

"We have learned," he continued, "and we have paid heavily for the lesson, that Germany cannot fight England, because, quite apart from any question of naval or military strength, England could ruin Germany's trade without firing a gun, by simply shutting up Germany's trade channels. We know, too, now, that neither Germany nor anybody else could have found the transport necessary for landing their troops in South Africa."

"But supposing," I suggested, "that Germany had been able to do these things, and had succeeded in turning us out of South Africa, what then?"

"Well, we thought," he replied, "that we should have retained our independence, but we know now that such would not have been the case. We have

learned a good deal about international politics during the last three years, and we are aware that we should merely have exchanged British for German rule."

"And, of the two, which would you prefer ?"

"I can only say that if it were to become a question of being ruled by Germany we should all be willing to take up arms with England against that country. Every Boer would become a Briton in practice as well as in theory in such circumstances."

And thus it is that there is a slump in the demand for German machinery, and that not only the Briton and the Boer out here, but the big mining companies, largely financed by German capital, only purchase such goods from Germany as they find themselves obliged to, for one reason or another. Thus it is that in the Orange River Colony the great preponderance of the machinery trade is in British hands, while the United States is our only serious competitor.

Agricultural machinery, electrical, and railway plant seem to be the staple requirements of this Colony, in the mechanical line. But although this is primarily a land of agriculture, its mining is of increasing importance, and under British rule there should be a big impetus to this. At present, in the north of the Colony, there is plenty of coal under exploitation, and a large slice of the country comes within the "diamond pipe" area. One, at all events, of these pipes, the Jagersfontein mine, has proved itself of commercial value, in that it

yields an annual output of diamonds to the extent of some hundreds of thousands of pounds. In addition to coal and diamonds, iron, saltpetre, salt, and gold are known to abound, and had it not been for the overshadowing influence of the Rand, which is close to this Colony, and for the discouragement to prospectors, which formed a part of the policy of the Boer Government, much would already have been done in the way of gold-mining.

It is now practically an accepted fact that the conglomerate, or "banket" formations of the Rand extend south of the Vaal River into this Colony; but for obvious reasons the rich capitalists in Johannesburg have no wish to encourage the opening up of gold-mining further afield. The time must come, however, when the gold in this Colony will be worked systematically. And then who shall say what will happen to the importance of the place—whether its agriculture and cattle raising are destined to become secondary to its mining, and whether its Arcadian simplicity is to be exchanged for the push and bustle which prevail in Johannesburg?

Of the exports and imports of the Orange River Colony I have no recent data that are satisfactory. Immediately before the war the imports were just over a million sterling, and the exports just under two millions. If excess of exports over imports is to be taken as a sure sign of prosperity, then this Colony in its own modest way was prosperous enough. At the time when we took it over it had

no public debt worth naming, though I have no doubt that under the influence of British expansive policy this last condition will soon be modified.

In conclusion, I would say to the British manufacturer that, as a rule, with an energetic agent in Johannesburg, he can satisfactorily cover the Orange River Colony; but I think that the agricultural engineer should have an agent in Bloemfontein as well.

Chapter XII

A BUSINESS POLICY FOR MANUFACTURERS

SOUTH AFRICA is unquestionably the most difficult of all countries wherein to arrange a workable business policy which will cover effectively the whole of the ground. The difficulty of imparting information which will be of service to machinery manufacturers as a whole is enhanced by the fact that each individual case demands a separate diagnosis.

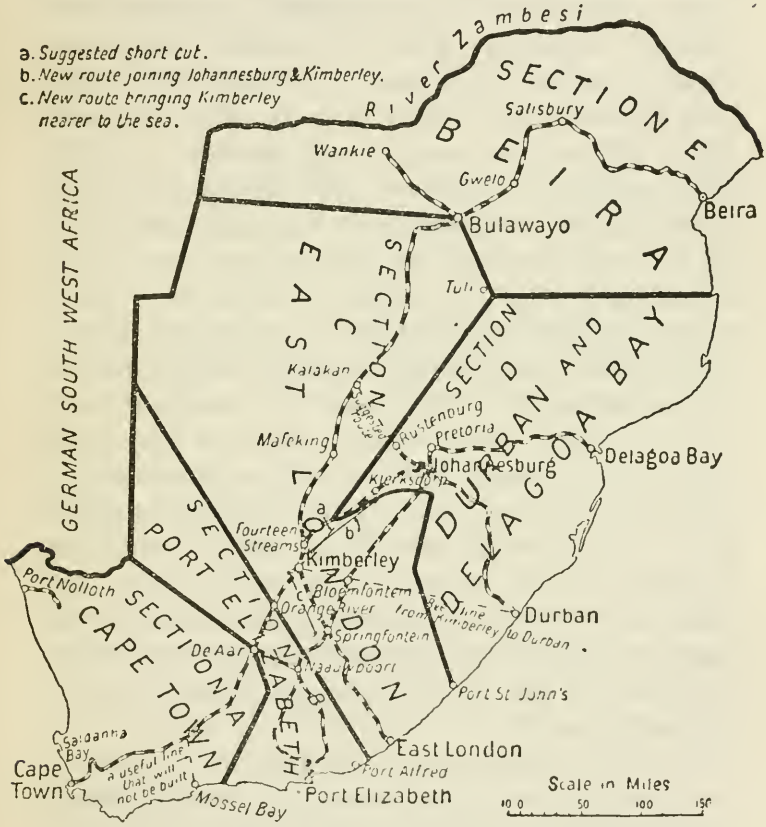
In this chapter it will be my endeavour to propound an unconventional theory of industrial and commercial South Africa—a South Africa which is being built by circumstances, and of which the scaffolding is the railway system.

If this information is absorbed, each manufacturer should be able to apply the conditions to his own special requirements, and to form his own judgment as to how and where he should establish his branches, agencies, or depôts for stock.

The sketch-map, which I have called a "Sectional Business Map of South Africa," is one which I made for my own information in studying this

particular question. In it all that portion of South Africa which lies south of the Zambesi,

SECTIONAL BUSINESS MAP OF SOUTH AFRICA.



THE AUTHOR'S SCHEME FOR FORMULATING A BUSINESS POLICY.

except German territory, is divided into business districts, each district representing the sphere of trade influence of a particular seaport or group

of seaports. From this map all railways, towns, rivers, and other details have been omitted except those which have a direct bearing on this article. The various railway extensions, marked "new route," though not yet completed, are shown as existing railways. This is because they are essential to my argument, and until they have been opened the industrial geography of South Africa will not be exactly as I describe it. It is safe, however, to assume that all the new lines shown will be in operation in less than two years. On the map, too, will be seen certain dotted lines indicating possible or suggested short cuts. There is nothing official about these, and to the best of my belief not one of them has been either surveyed or contemplated. My reason for marking them in is to show how routes between important centres may some day be further shortened or simplified without a vast deal of railway building. Even if the dotted lines shown should some day become railway routes, they would not alter materially the trade channels laid down in this chapter, except that they would increase the present tendency to the diversion of the trade from the southerly ports.

The first impression on looking at this map is that most of the inland towns are wrongly placed. Geographically, however, their positions are accurate. The illusion is fostered by the omission of extraneous railways, and by substituting for the ordinary colonial boundaries lines enclosing the various trade areas. In formulating a business

policy the manufacturer should be guided not by political boundaries, but by the channels through which the trade will flow in the natural course of events. These channels have been changing with the changing importance of the various trade centres and with the growth of railways. What that growth has been, and the influences which have brought it about, is dealt with fully elsewhere in this book.

It is unsatisfactory to speak definitely of any country which is in a transition stage. For the last few years commercial South Africa has been in that condition. The railway extensions now definitely decided upon are of a nature to render a forecast of the industrial geography of the country a fairly safe matter. When things are changing, it is of but secondary importance to know how matters stand. The man who is framing a business policy requires information on the permanent condition of the country. It is for this reason that my map and remarks do not represent the exact state of affairs to-day. In the course of the next few years the conditions laid down on the map should be realized, and from that time onwards the trade channels, as I have shown them, should gradually assume the functions that I am attributing to them here.

Up to the present South Africa has suffered much for want of practical and rapid connexions between the seaports and the principal trade centres. Most of the important extensions now in progress tend towards shortening and simplify-

ing these routes. The only two of these extensions which I use here are (1) between Fourteen Streams and Klerksdorp, and (2) between Kimberley and Springfontein. The other extensions to be made, important as they may be to the railway economy of the country, will in no wise affect the contour of the trade areas as shown on the map.

It will be seen that there are five of these districts: A, the Cape Town section; B, the Port Elizabeth section; C, the East London section; D, the Durban and Delagoa Bay section; E, the Beira section.

As the two Portuguese ports play so important a part in the railway economy of British South Africa, I am including them as part and parcel of the scheme. German South-West Africa has no bearing on the case.

To the British manufacturer who is making a bid for South African business, there should be no Cape Colony, no Natal, no Rhodesia, no Transvaal, no Orange River Colony, as distinct from each other. These distinctions are purely political as opposed to commercial. Each of the above may be separately governed and have different laws, but this could only be of importance to the maker of machinery in the event of there being inter-colonial restrictions to trade. Now that nearly the whole of this area is under British rule, and now that Portuguese East Africa is practically in our hands as far as trade interests are concerned, these restrictions are not heavy.

As the recent Customs Convention places all the

British possessions in South Africa on an uniform basis as far as import tariffs are concerned, the manufacturer can select the most suitable spot for stocking his machines, irrespective of colony.

The seaboard colonies have hitherto charged a small transit duty on goods passing through their territory for use elsewhere. This has already been withdrawn by Cape Colony, and it is to be presumed that Natal will shortly follow suit.

The future South Africa will be ruled from the industrial centres, and not necessarily from the ports. So far these ports have had the upper hand in politics, for the simple reason that in an unorganized South Africa the inland towns were in their power. This was because inland South Africa could not feed itself, and the various Governments concerned were unable to arrive at a common understanding with each other for dealing with the question. At first the now important towns had not enough money, and as Johannesburg was under Boer rule, co-operation was impossible.

It was not until Johannesburg and Kimberley grew enormously rich, in spite of all this handicapping, and until the late war cleared the political atmosphere in some degree, by abolishing Boer rule in the Transvaal and Orange Free State, that the immense power of the wealthy industrialist became apparent. By the re-organization of the railway system of the conquered colonies now going on, and by having the Portuguese

railways practically under her thumb, Johannesburg is already able to play off the Delagoa Bay route against the Durban route. This will have the effect of reducing the cost of supplies to a figure which will be determined by the Transvaal. In like manner the two great centres, Johannesburg and Kimberley, will in the not very far future be only a little over twelve hours apart by railway, and although the new route is shown running for a short distance on the Cape Government Railways,an even shorter cut—see dotted lines on map—between the two places could be made at any time without touching Cape Colony at all.

Kimberley lies so close to the Orange River Colony that she may now be said to be growing over the boundary line. Thus the routes between Johannesburg and the sea, and Johannesburg and Kimberley, will henceforward be practically in the hands of the Transvaal and Orange River Colony.

There is a third important point, viz., that Kimberley, by utilizing O.R.C. territory and discarding the greater portion of the Cape colonial route will soon be within twenty-four hours of East London. There are, too, possibilities for an alternative route from Kimberley to the sea, viz. *viâ*, or skirting, Basutoland to Durban. Such a line—see dotted bee line on map—would escape Cape Colony altogether.

It is the retrogressive influence of the Cape politician that industrial South Africa is endeavouring to elude. A Durban-Kimberley line, how-

ever, is too far off to make it a subject for discussion here.

When the other changes above enumerated have been made, the seaports will begin to realize that it is they who have been supported by the industrial centres in the interior. They will also understand that the man who has been paying the piper during all these years is at last going to assert himself and call the tune. I do not say that the growing power of the South African industrial millionaire will be an unmixed blessing; I am merely pointing out facts. To put matters in a perfectly selfish light, however, we must admit that it is only by encouraging the capitalist that we can hope for a big market for machinery.

The areas of the various districts shown on the map are by no means a guide to their relative importance. Large districts in each section, except Section D, are practically barren wilderness, and require no service at the present day. If, however, machinery were by any chance to be required, even in the remotest corner of any particular section, the seaport shown in that section would be the proper place at which to land such plant.

Now let us consider each district separately :—

Section A.—The Cape Town section is the smallest of all. It comprises only about a fourth of the area of Cape Colony. It has, however, a large population, though, man for man, it does not require anything like the amount of machinery required in some of the other sections. Except

in the north-west corner, which has its own little port and railway, there are no mines in this district. Port Nolloth owes its existence solely to the local copper mines.

Cape Town, however, is the headquarters of the Cape Government Railways, and as such is certainly the most important port for railway plant in South Africa. As the C.G.R. also administer the Rhodesian Railways up to Gwelo, north of Bulawayo, a great deal of the plant for those railways is also landed here. Once the only port in South Africa, and in the early days from force of circumstances the residential centre of everything South African, Cape Town had attained an importance in the eyes of the world which is now to a great extent fictitious. With its naturally defective harbour, and the steady neglect of its interests as a seaport by the Government, the scope of Cape Town as a distributing centre has been decreasing as the eastern ports developed and the railways extended. In spite of this its trade has been increasing, for the simple reason that business with South Africa has developed by such leaps and bounds, that with all the losses Cape Town has suffered at the hands of competing ports, her share in the general rush of business has been more than she could deal with. This rush, however, has not been due to a demand for machinery.

Up to now Cape Town has been artificially propped by various means. As the chief military base during the war, an immense amount of

extra traffic has been carried on here for the last three years, and this is not by any means over yet. Then, again, your business man is a creature of habit, and one of his habits has been to look upon Cape Town as *the* important centre of South Africa. He is slow to shake off this illusion. Some bankers and some merchants and agents still make their head offices in Cape Town, and goods are still stored in large quantities from habit in that place. Thus it is that merchandise from Cape Town finds its way even now north of De Aar, which I have shown as the furthest northern point of Cape Town's legitimate sphere of carrying influence in the future. When we consider that to send machinery from Cape Town to Johannesburg costs rather over £11 per ton, we can readily understand that it cannot compete with the nearer ports. In like manner Cape Town has lost Kimberley, and gradually but surely its sphere is being narrowed to the limits marked on the map. Inside those limits, however, there is a fairly good field for the manufacturing engineer.

Though there are no mines, there is any amount of undeveloped mineral wealth. Railway contracts for Cape Colony, except for sleepers, are all dealt with in London, and the manufacturer of machinery who would obtain railway orders does not so much require a permanent commercial agent in Cape Town as he does some one who will keep him in touch with what is going forward in his way. He wants to anticipate events,

so that he can tackle the subject at both ends. Let him spend money in cables, and let him be sure that his latest particulars are before the authorities out here. And when he knows that something big is coming off, let him, if it is worth his while, send a man out for the purpose. It is not the getting to Cape Town and back that is expensive and tedious. A man can leave London for Cape Town on a special trip of that sort and be back in London in from five to six weeks, at a cost of about £100. For the smaller articles which are in constant demand by the railways manufacturers should have an agent in Cape Town.

Of the general machinery required in Section A, I should say that all plant required by municipalities, except gas, is in fair demand. Electrical plant, is, of course, the most important of these. Then come steam and oil engines, agricultural, brick-making, and saw-mill machinery, well-boring plant, pumps and windmills, and the smaller machine tools. In constructional work there is a large and steady demand for materials, steel girders and galvanized iron being the most important of these. Of course there ought to be a large demand for some years to come for harbour plant for Section A. Five months ago it appeared that the Government were going to make a harbour worthy of the name in Table Bay. The Government, however, were merely indulging in one of their periodical talks on the subject, and practically nothing has been done. Thus

the demand for harbour plant for Cape Town is not likely to be considerable. Saldanha Bay, however, sixty miles to the north of it, is to be developed by private enterprise, and so in the early future there ought to be a certain number of orders for this class of goods.

The little port of Mossel Bay, on the other side of Cape Town, is an instance of how a coast town will insist on developing itself in spite of all obstacles. Up to now it has had no railway connexion. At last, however, it is to be linked on to a local line from the east, but Government will not allow it to have a railway northwards to tap the main western system—see suggestion on map—for that would compete with Cape Town. The railway from Cape Town eastwards has been stopped short a few miles from Mossel Bay.

There are still British engineering firms whose only agents in South Africa are in Cape Town. It is high time to alter this obsolete practice. Such an agency is as useless for handling business in Johannesburg or Kimberley as would be the case if it were at the other end of the world from those places. Of the two it would be preferable to work Cape Town from Johannesburg, though this would be a mistake as a rule. To the best of my knowledge, of all the important machinery agents in Johannesburg, who have their branches in Port Elizabeth, Durban, East London, Kimberley, and as far north as Bulawayo, and even Salisbury, there is hardly one who troubles to have a Cape Town representative.

Cape Town is isolating herself as far as the general machinery market of South Africa is concerned. As time goes on, her isolation will become more complete. She must, therefore, be considered as quite apart from the rest of this continent by the manufacturer who is establishing branches. In the future she will have to live on the merits of the Section A district, and her value to the maker of machines will depend solely on local conditions. Let us hope that she will face the situation, and develop the many resources that lie within the area of her natural limitations. The subsidiary seaports in this section are Mossel Bay and Port Nolloth. Soon there will be also Saldanha Bay.

Section B.—We come now to the Port Elizabeth section of the map. This has a seaboard of about 130 miles, and tapers as it runs inland, until at De Aar its width is only some 35 miles. Beyond that point it widens out into an enormous tract of no man's land, right up to the German territory. Whatever may be the ultimate prospects of that portion which lies west of the railway, at the present day it offers but little inducement for traffic. If Cape Town has lost the Johannesburg, Kimberley, and Rhodesian traffic, Port Elizabeth up to now has had her fair share of it. To this fact mainly she owes her present position as the second seaport of Cape Colony. When the short railway extension between Kimberley and Springfontein has been built, however, Port Elizabeth must lose the whole of her Kimberley

and Rhodesian trade. A glance at the map shows this. Then with the perfecting of the Delagoa Bay and Durban routes to Johannesburg, which is about to take place, she must eventually drop out of the running for the Transvaal trade. Thus Port Elizabeth, in spite of her present importance, is doomed, like Cape Town, to future localism, and is not in the long run to be regarded seriously as one of the principal trade arteries of South Africa.

As in Section A, so in Section B, there are no mines, though plenty of mining possibilities. Port Elizabeth, however, is situated in a splendid farming district, and until she develops mines she must look to this to maintain her in a state of respectable mediocrity. At present, of course, the place is used as a dépôt for Johannesburg and Kimberley, and elsewhere. While it may have paid to store machinery there for that purpose, and while it may yet do so for a time, I cannot recommend makers of machinery, except agricultural, to carry stocks there. The local requirements of Port Elizabeth, of course in a much smaller degree, are precisely similar to those of Cape Town, and as in the future the traffic will be local the same remarks apply to both places. All railway orders for this section, however, go through Cape Town.

Were there such a thing as a direct railway from Cape Town to Port Elizabeth, I should recommend machinery manufacturers to work Sections A and B together from an agency in

Cape Town. A bee line between the two, however, is about 270 miles, while the shortest railway route now open, or likely to be open for years to come, is 837 miles.

I am inclined, therefore, to recommend makers of machinery to consider whether it would not be preferable to work Port Elizabeth from East London, which is closer to it by sea, and will be a far more important place than either as a machinery centre. On the seaboard of Section B is also Port Alfred. A considerable amount of money has been expended on this port, but it is of no importance whatever to the manufacturing engineer.

Section C.—When we get to the East London section of the map we feel at last that we are approaching live South Africa.

Like Port Elizabeth, East London is doomed to lose much of its Johannesburg traffic by the improvements that are taking place in the Durban and Delagoa Bay routes. It will, however, for some years to come remain the third string to Johannesburg's bow for traffic. Its loss of Transvaal trade will be more than compensated for by its obtaining practically the whole of the Kimberley and the southern route Rhodesian traffic, which have hitherto been shared between it and Port Elizabeth. It follows, then, that East London is in no sense of the word dependent on local traffic for its future salvation. Even when, in years to come, some such railway as I have suggested by dotted lines between Rusten-

burg and Kalakani has been built, whereby most of the far northern traffic may be diverted from it to the Durban and Delagoa Bay routes, East London will retain the traffic to Kimberley and northwards up to the point where the Rhodesian railways will be tapped. It will be noted that East London is the nearest point on the coast to Kimberley, and that, with the new extension, the railway has attained as nearly to the bee line between the two places as could be arrived at by any possible competing route.

Here is a summary of the various permanent advantages possessed by East London. Section C commands : —

(1) Practically every diamond mine in South Africa.

(2) All the coal mines in South Africa south of the Transvaal, excepting those in Natal.

(3) All the rich agricultural lands in the neighbourhood of East London.

(4) The whole of the agricultural area of the Orange River Colony.

(5) At least half of the traffic with Basutoland, where the native is already using the plough on his own account.

(6) Half the traffic with Southern Rhodesia.

(7) A portion of the Johannesburg traffic.

Thus East London may be looked upon as a suitable dépôt for general machinery, such as I have enumerated as being required for Sections A and B, and, in addition, mining plant for

gold, diamonds, coal, etc. As pointed out earlier, her importance as a trade route to Johannesburg must diminish as the two shorter routes are perfected and their capacity increased, but with her wide scope in other directions her future is more than assured. Her harbour is a bad one, even for South Africa ; in fact, one can hardly call it a harbour at all. When business warrants the expenditure, however, harbours can be made, and long before East London grows to be as large as Cape Town we may expect to see there better accommodation for ships than there is in Table Bay at the present day. It is therefore to East London, in spite of her many drawbacks as a seaport, that I would direct the attention of our manufacturers. It is here that engineers generally should carry their principal stocks, as far as seaports are concerned, and it is here that any constructional engineering should go on from imported materials, such as pipes from sheet steel, and anything else for which, on account of the bulk of the finished article, it may pay to import the materials in the flat and make them up out here. East London, too, is the second centre of the Cape Government Railways.

The only event that I can foresee which might possibly in the far future seriously threaten the importance of East London would be the development of St. John's, about halfway on the coast line between East London and Durban. At the mouth of this river there are the makings of a fine harbour at a comparatively small cost. It

is conceivable that some day Port St. John's may take over the functions of East London as a port, just as it is conceivable that Saldanha Bay may some day take the place of Cape Town in this respect. That day, however, is very distant.

Section D.—This section, dominated by Durban and Delagoa—Lorenço Marquez—is at once the most important and the one which requires the least explanation. In another chapter I have dealt fully with these two competing lines for the trade of Johannesburg, and of the steps that are being taken to shorten and improve them both.

As these are the assured routes for the main portion of the Johannesburg trade, it is at one or another of these two ports that machinery dépôts should be placed. Had Lorenço Marquez been in British territory, it is probable that it would have been the better of the two for the purpose, as the splendid harbour of Delagoa Bay alone would no doubt have brought it to the front, and created a big centre of trade. As, however, it is Portuguese, it is merely a place on the high road to Johannesburg, and nothing more. There is no attraction there in the way of local trade as far as the engineer is concerned, and so one falls back on Durban. Natal is a go-ahead little colony, and, quite apart from the Johannesburg trade, has a certain market of her own for machinery. There are coal mines and marble quarries, and some day she will develop her iron, which abounds in large quantities. Owing to her

varying attitudes she can grow practically every sort of vegetable, from pine-apples to wheat. And the country lends itself remarkably to irrigation. Thus Durban should share with East London the attention of the British manufacturer as a general coastal dépôt. It is only less important than East London in this particular respect, in that most of the stocks will go straight through to Johannesburg. I think that, bearing in mind all I have said in previous chapters, I need not go into further details on the subject of Section D.

Section E.—The Beira section is a huge slice of country, but up to the present the requirements are not in proportion to the area. Rhodesia is a country which in the past has lived upon credit, and she will have to do so for some time to come. Those who have read the earlier chapters of this book know my opinion as to the ultimate prospects of Rhodesia. Her value to the manufacturing engineer depends entirely on whether those who have financed the place up to now, or others, will go on financing it until it has turned the corner. If so, there should be a steadily increasing demand for machinery, until some day it should be one of the best markets in South Africa. That day is yet afar. There will be no rush to Rhodesia. There are too many difficulties, more especially with regard to the cost of living, for that. The man who will ultimately make the country will be the practical settler, with a limited amount of means, who finds himself ousted from the Transvaal and elsewhere by the

large capitalists. For years to come it will be unnecessary for the manufacturing engineer to think of carrying stock of any sort at Beira, for the demand throughout Section E is not large or continuous enough to warrant it.

It will be noticed that on the map I have shown Sections C and E coming in contact at Bulawayo. This appears to give an unduly large area to the former, as the railway from East London to that place, with the forthcoming short cut, is about 1,100 miles, whereas the line between Beira and Bulawayo is almost exactly 700 miles. My reason, however, for placing the boundary line where shown is that in actual practice, I am told, the cost of both routes to Bulawayo is practically the same. The actual point on the railway at which transport from north and south work out at exactly the same figure is at Gwelo, north of Bulawayo. Thus it would seem that, strange as it may appear, the proper coastal port for stocking machinery eventually destined for Southern Rhodesia as far north as Gwelo, is East London. Gwelo is also interesting as being the point on the railway system of South Africa where the cost of living has reached its highest point. The demand for machinery in the region above Gwelo would certainly not warrant the carrying of stocks of machinery at Beira, except perhaps in the case of agricultural plant.

To sum up this matter, it would appear that, of the coastal towns, East London and Durban are the most important, as far as carry-

ing general machinery stocks is concerned. It is only in these that mining plant should be stocked. Cape Town, and perhaps Port Elizabeth, or one or the other, would be the southern towns for smaller stocks for local requirements.

Now for the general question. The manufacturer who would cover South Africa thoroughly, by establishing his own branches, should, of course, make Johannesburg his South African centre. Now that Johannesburg is to be so soon within twelve hours of Kimberley, the Johannesburg office can easily be made to cover that place too.

In Johannesburg it would be necessary to carry a large permanent stock of plant which could be fed from the stocks at Durban and East London. At Kimberley, except in the case of small agricultural plant and mining accessories, no stock should be carried. Kimberley would, of course, be fed from East London stocks, or in case of urgent delivery, where a suitably high price can be obtained, from Johannesburg, or even from Durban *viâ* Johannesburg.

If you have good business men at Johannesburg, you will not want even an office at Kimberley when the direct line has been completed. All that is required is some one who will keep your people in Johannesburg in touch with what is going on at the diamond centre. When there is something big to be done at Kimberley, let the best man you have in Johannesburg go there and take the matter up. The De Beers Company,

who, of course, are the only really important purchasers there, do not take long to make up their minds when they are ordering. If they want advice at all from the manufacturer, they want the very best they can get.

The coast branches should be more in the nature of dépôts and forwarding offices than anything else ; though, of course, it will be necessary to have in them men who are capable of dealing with the local trade. The only other towns in Sections C and D where it might be advisable to establish a branch would be at Bloemfontein, and perhaps Pretoria, and then only in the case of agricultural and electrical plant. The requirements of Section E being precisely of the nature of those required in C and D, I think that section should be worked by a branch under the head office in Johannesburg, especially as supplies for Section E come through East London in the natural course of things. In Section E the branch should be established at Bulawayo. Several agents for mining, agricultural, and electric plant have branches at both Salisbury and Bulawayo, and the reason for this is that the natural gold-mining centre is neither at the one nor the other. Salisbury is the political capital of Southern Rhodesia, and Bulawayo is the largest commercial centre. The actual gold-mining centre, as far as position is concerned, is Gwelo, half way between the two. There are people who prophesy great things about that place, but I can see no signs of these hopes being

realized for many years. Pending this, I recommend Bulawayo, not only because it is the most important town in Southern Rhodesia, but because it is hundreds of miles nearer to the Wankie coalfields and the teak forests. These two new openings bid fair for some time to come to be requiring as much plant as the local gold-mines.

Readers may think that I am rather taking it for granted that all makers are likely to carry stocks in South Africa, and to start their own branches. This is not so. I am merely explaining the policy of such firms first. I would also take this opportunity of urging makers to carry stocks out here whenever possible, and to keep the management of their business in their own hands. This is eminently a country which lends itself to stocking machines, for the requirements can be accurately gauged. And when users require a machine, or machines, in a hurry, they do not mind paying very heavily for the privilege of obtaining it.

With regard to Sections A and B, if you have at Johannesburg, at the head of your central establishment there, a man who is as good as the best man in your works or office in England, then by all means let him make his own arrangements for working your business throughout South Africa, even in Cape Town and Port Elizabeth. My only reason for suggesting this is that, all things being equal, it is better to control your branches from a distance of several hundred

miles than from a distance of several thousand miles. If your Johannesburg manager, however, and your office arrangements in that place, are not such as to permit of dealing with inquiries from a distance as easily and effectively as when dealt with from your large establishment in England, then it is preferable to run Sections A and B by local agents with whom you can deal direct from England. There is not enough business in A and B together to warrant independent branches in those sections.

When it becomes a question of covering the whole of South Africa by means of local agents, picked up on the spot, then one's troubles really begin.

I have pointed out in an earlier chapter that by far the best method is for a number of firms, whose interests do not clash, to amalgamate for purposes of South Africa, and to represent themselves out here, on the lines adopted by the British Engineers' Alliance, Limited, of Johannesburg. Failing this arrangement, however, and not being in a position to establish his own branches the individual manufacturer must fall back upon the local agent.

When such a policy is adopted, the lines laid down above in connexion with the establishing of branches should be followed as closely as possible. Unfortunately in practice this is very difficult to do.

Let us start once more from the centre of all things—Johannesburg. Here you appoint the

very best agent you can find. He no doubt has branches of his own in some of the other places where you require agents, and he will, if he takes up your agency, require you to let him represent you in those localities. It is perfectly natural that he should insist on this. One thing is quite certain, however, and that is that he will not have branches in all the places where you require representatives. You, equally naturally, wish to fill up the gaps in your South African representation, and so proceed to appoint the best agents you can find in the centres where your Johannesburg agent cannot cover the ground.

You will not have gone very far in your negotiations with these other men before you find that they too have branches in a number of towns, some of which will clash with the towns in which your Johannesburg agent has agreed to represent you. That is a complicated and delicate problem which has to be faced by every manufacturer who wishes to cover South Africa by agents.

Then, again, you will find, over and over again, that the man who is obviously the best agent you could possibly get in one particular place will be quite out of the running, as far as your machines are concerned, in another. All these difficulties will be greatly enhanced if the warning that I have tried to emphasize throughout this chapter is disregarded. I will repeat it here : It is worse than useless to arrange your agencies to accord with the political boundaries of South Africa. I mean that, owing to the peculiar

railway geography of the country, and the positions of the important trade centres, it would be folly to appoint one agent for the whole of Cape Colony, another for the whole of the Transvaal, another for the whole of Southern Rhodesia, etc. The result of adopting that policy would be chaos.

Divide your South Africa rather into the five sections of trade influence which I have shown on the map, and ignore all other boundaries. Run, if you like, Sections A and B together. It would also probably pay to run C and E together, and it might be possible to find a single agent with sufficient branches to cover C, D, and E. On no account, however, combine A or B with either D or E. B may sometimes, in special circumstances, be worked as a branch of C.

Your Kimberley agent—Section C—for instance, is sure not to have a branch at Cape Town—Section A. He may, however, have one just now at Port Elizabeth—Section B—because, until the new extension is completed, Port Elizabeth will not lose her portion of the Kimberley trade. It is to be presumed, however, that as soon as the two places get out of touch with each other his branch will be transferred to the natural port for Kimberley, East London—Section C. Your Bulawayo agent, in the early future, is sure to have business arrangements with East London, and your Johannesburg agent—Section D—is certain to have some one at Durban

—also Section D. He will probably, too, have business relations with Kimberley and East London—both in Section C.

In conclusion, I would urge British manufacturers to be more liberal with their agents in South Africa than has usually been the case. It is quite absurd to expect thoroughly good men out here, where distances are enormous, and the cost of living higher than anywhere else in the world, to take a violent interest in your machines unless they are to make some profit on the transaction. Many firms I know are quite alive to that fact, but over and over again I have been shown letters from manufacturers at home making propositions to firms in South Africa on the subject of agencies, containing terms, suggestions and stipulations which made business an absolute impossibility.

Then, with regard to the question of the fancy prices which many people imagined would come about after the war. There is nothing in this theory. Competition for orders in Johannesburg is so keen that representatives have to cut their prices to the lowest limit possible. It is only when a man wants a thing in a desperate hurry that he is willing to pay a big price for it. This happens frequently in the case of mining plant. It is for this reason, as I said before, that I so strongly recommend our makers to carry stocks of marketable machinery in South Africa.

In the late war we found that to conquer South

Africa was a much more expensive matter than we had anticipated. If the British manufacturer is to maintain his supremacy there, he must be prepared to make sacrifices and spend money

Chapter XIII

THE THEORY AND PRACTICE OF THE RAILWAYS

IT is hard to give the Englishman at home a correct appreciation of the enormous area covered by the operations of the late war. It is only when one comes to this country and travels for days in the train north and south, east and west, and sees the blockhouses and earthworks all along these lines, the hundreds of thousands of miles of barbed wire, and the millions of tin cans hung on those fences to sound an alarm in the event of the enemy attempting to break through, that one realizes the enormous cost to which we were put in protecting this great railway system of South Africa.

In a measure we were shutting the stable door after the horse had escaped, for bridge after bridge had already been blown up, and culvert after culvert had been destroyed long before the comprehensive scheme for protecting the railways had been elaborated.

What Great Britain lacked in foresight, however, she eventually made up for by her persis-

tency. Late in the day as we were, we at last set ourselves systematically and doggedly to repair the damage done, and steps were taken to prevent a repetition of the destruction. During my stay in this country I have collected some sixty photographs which as a set are unique in their way. They afford an insight into the extent of the capabilities of the Boers as railway smashers, and in a like manner attest to the wonderfully effective methods and colossal work carried out by those military and civilian engineers who repaired this damage.

Some day I suppose we shall know what the total value of the damage done and the cost of all these repairs have been. Up to the present, however, those figures are not forthcoming. Suffice it here to say that the promptitude with which the railway system was re-constituted, and the efficient manner in which the work was done in practically every case, afford a standing record of the skill and devotion of those who carried it out. The work of these men has been throughout the war of the most arduous and useful, and in many cases extremely dangerous, nature, and it was done unobtrusively. While the praises of our fighting men have been sung vociferously in the Press and elsewhere during the last few years, the public have heard very little of the splendid doings of the engineers who repaired and kept going the railways during the war. This is especially the case with the Railway Pioneer Corps, recruited almost entirely from

the staffs of the various railways in South Africa.

When we bear in mind the large amount of mileage of the various railways of South Africa, it must be admitted that, generally speaking, the geological difficulties to be overcome in constructing them have been surprisingly few. You can travel for thousands of miles without the sign of a tunnel, and almost without cuttings or embankments. The rise, too, is as a rule so gradual from the sea level to the plateaux of the interior that, although the railway at Johannesburg reaches an altitude of 5,689 ft., the gradients are not often severe. This is all the more unusual when we bear in mind that by far the greater portion of these lines follow the natural undulations of the ground, being laid upon the surface, with merely a sufficiency of ballasting to maintain the road as a permanent way. Even at the present day a long stretch of the Cape to Beira Railway, that section of it which lies between Bulawayo and Gwelo, is without ballast of any description. This no doubt is a temporary measure, but, except for the very heavy rains which occur periodically, very little artificial ballasting would be required in that and some other parts of South Africa, while the present rates of speed are maintained.

There are necessarily many exceptions to the above-named happy state of affairs, and these are found usually in the vicinity of the coast. The most notable of them are in Natal, where

CAPE GOVERNMENT RAILWAYS: ENTRANCE TO THE HEX RIVER VALLEY

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the ruling gradient—about to be altered—is 1 in 30 and the curves very sharp ; on the Delagoa Bay line in Portuguese Africa, where there is a rack railway ; and over the Hex River Pass, some one hundred miles north of Cape Town.

The most serious and permanent difficulty with which South African railways have to contend is, of course, the "washaways." The rapid transformation of trickling streams, and even dry river beds, into rushing torrents, both deep and wide, is a constant source of danger, delay and expense.

Before the war there were five large railway systems in South Africa—the Cape Government Railways, the Natal Government Railways, the Orange Free State Railways, the Transvaal Railways and the Rhodesian Railways. There were, in addition, a few small private lines, which for the purposes of this book I shall ignore, or rather include as forming part and parcel of the Government systems, as the tendency of these Governments is to take over all lines that are not obviously useless for anything but private purposes.

We have also to bear in mind those two short railways which traverse Portuguese East Africa inland from Beira and Delagoa Bay respectively. Though small, they are of vital importance to the general railway scheme of the country. As explained in an earlier chapter, there exists between the Portuguese and British railway authorities at the present day an *entente cordiale* of an ex-

tremely satisfactory and practical nature. In the mileage tables I include these two Portuguese lines, tacking them on to the Rhodesian and Central South African Railways respectively.

By the amalgamation of the Transvaal and Orange River Colony railways, now known as the Central South African Railways, the number of systems is reduced to four.

Though under separate administrations, it is a comparatively easy matter to treat all these railways as a whole, as throughout the entire general system there is no break of gauge, although there are a few purely local lines for agricultural purposes of a 2 ft. gauge.

The standard gauge is 3 ft. 6 in., and the standard weight of rail in the future may be put at 80 lb. There are some 100 lb. rails in use, and at the present day probably as many 60 lb. rails as there are 80 lb. These, however, are in some cases being replaced by 80 lb. rails for main line purposes, and new main lines will mostly be of the heavier section.

We have then to deal with four systems :— (1) The Cape Government Railways, which I shall sometimes refer to as the C.G.R. ; (2) the Rhodesian Railways, R.R. ; (3) the Natal Government Railways, N.G.R. ; (4) the Central South African Railways, C.S.A.R.

The C.G.R. is divided into three systems— the Western, the Midland, and the Eastern— but as these are all connected I need not trouble with these distinctions. The only isolated line

in Cape Colony is a short section running inland from Port Nolloth on the west coast to the O'Okiep copper mines. This does not affect my subject in any way, and so can be left alone, as is also the case with the unimportant and isolated lines in German South-West Africa.

Before going further it may be as well to give a list of the Railway Works which serve to maintain all these lines. Though many of them are important concerns, there is practically no manufacturing done in them. Their function is purely that of maintenance, and any constructional work that may be carried on is in connexion with that, and with the erection of finished parts. As far as I am aware, there has never been a locomotive made in South Africa, nor can I conceive how in any circumstances that are likely to arise will they be made there.

The cost of labour and materials are both prohibitive. The same conditions apply to all rolling stock, although for experimental and special purposes a few carriages and wagons have been made. Below is the list of Railway Works, which I have classed under two heads as "Important" and "Auxiliary":—

Important Railway Works.

Cape Town . .	Cape Colony (C.G.R.)
Uitenhage . .	,, (C.G.R.)
East London . .	,, (C.G.R.)
Mafeking . . .	,, (R.R.)
Pretoria . . .	Transvaal (C.S.A.R.)
Bloemfontein . .	Orange River Colony (C.S.A.R.)
Durban . . .	Natal (N.G.R.)

Auxiliary Railway Works.

Beaufort West. .	Cape Colony (C.G.R.)
Kimberley . .	,, (C.G.R.)
Cradock . . .	,, (C.G.R.)
Naauwpoort . .	,, (C.G.R.)
Johannesburg . .	Transvaal (C.S.A.R.)
Delagoa Bay . .	Portuguese E. Africa (Portuguese)

Many of these shops are continually ordering new machinery, several of them are being thoroughly overhauled and reorganized now, and I do not think that those concerned will consider me hypercritical when I say that a lot of the plant in some of them might well be consigned to the scrap heap in favour of more modern appliances. I am not giving data as to the number of hands employed in these various works, as owing to the industrial upheaval caused by the war normal conditions do not obtain just now.

On the Special Railway Map, which will be found at the end of the book, and which it would be well to refer to at this point, are shown all the British and Portuguese railways in South Africa as running to-day. I have also marked the lines in progress and sanctioned, and a few on the C.S.A.R., which, though not formally sanctioned, are bound to be proceeded with in the early future. The positions of towns are accurate, the actual lines showing the course of the railways are approximate. To assist me in getting at accurate and much later information than that given by any published maps, the C.G.R. and the C.S.A.R. were good enough to furnish me with maps of

their systems with all the newest data filled in; the R.R. furnished me with a list of its extensions, projects and mileage. The N.G.R., however, is just now in a state of political turmoil over railway questions generally, and nobody knows quite what the upshot will be. The result has been that I have been forced to jump at conclusions as to the lines to be built, and for that reason my figures with regard to Natal are approximate only.

On the map I have marked only those towns and places which have a direct bearing on this chapter. The towns where there are railway works are indicated by a star.

The Cape Government Railways.—A reference to the portion of the map which relates to Cape Colony will show that the laying out of the C.G.R. system appears on paper to have been very erratic. One definite object, however, was obviously borne in mind, and that was the obtaining of as direct a route as possible between Cape Town and Kimberley. The rest of this system seems to be a mere patchwork of lines, many of which appear to lead to nowhere in particular. And then there are loops and *culs de sac,* some of which seem to stop short just where they should have been continued for the purpose of effecting a junction with other lines. In short, it would seem that, apart from the western line, the greater portion of the C.G.R. system has been arranged with but little attention to the requirements of the country. It

appears, too, that in some cases the Government must have cast about for the most inconvenient method of getting from one important place to another, and to have adopted that method when found.

This is due partly to the evolution of South Africa, in the course of which the relative importance of the various industrial centres has undergone a great change, and partly to the fact that railways have been often built where not urgently required, as the result of political jobbery.

In the days when the two Dutch Republics would have no railways, the Midland and Eastern sections of the C.G.R. were built purely for dealing with local traffic, and in laying them out the Government were on several occasions influenced by electioneering motives. Thus it is that East London, which as the crow flies is only about 325 miles from Kimberley, and is the natural port for that important centre, is at a distance of 546 miles from it by rail. Port Elizabeth, which is some 70 miles further from Kimberley in the straight line, is, in spite of its wide deviations, 61 miles nearer to it than East London. No doubt all these zig-zagging and meandering lines have benefited certain local farmers, but the effect of them has been to handicap the progress of places like Kimberley and Johannesburg for want of practical direct railway services between them and the nearest seaport. Then, again, in Cape Colony there has

been no attempt to link up the important seaports. The following figures serve to show the difference between the sea and the railway routes :—

Between	By sea.	By railway.
Cape Town and Port Elizabeth	436	839
Cape Town and East London	543	912
Port Elizabeth and East London	150	500
Cape Town and Durban	823	1,479
East London and Durban	280	1,149

Yet in spite of the many defects in the laying out of the C.G.R. system, its money-earning capacity has been enormous, reaching, as I mentioned recently, over £150,000 in one week. The restricted railway service of the past in the Transvaal and the Orange River Colony, when under Boer rule, has of course played into the hands of the C.G.R.

From the map it will be seen that at the present day all traffic from East London to Kimberley has to be carried nearly half way to Cape Town at De Aar, and thence northwards to its destintion. A comparatively short line joining Kimberley to Springfontein, in the Orange River Colony, would reduce the distance by nearly two hundred miles. Up to now the whole of this journey has been performed on the C.G.R. system.

The Springfontein-Kimberley extension, now to be constructed, must revolutionize the railway communications with Kimberley by absorbing the traffic between Port Elizabeth and that place.

The following sets forth the practical effect of the forthcoming Kimberley-Springfontein line. The two routes, from Port Elizabeth and East London, which now share practically the whole of the traffic between Kimberley and the coast, have a mileage of 485 and 546 respectively, totalling 1,031. Both of these are all C.G.R. routes. The new route, East London, Springfontein-Kimberley, will measure as nearly as possible 350 miles, of which 289 miles will be on the C.G.R., and the rest on the C.S.A.R. In time the new route must absorb the whole of this traffic. Thus the C.G.R. will lose 1,031 miles of carriage and gain twice 289 miles, or 578 miles, representing a net loss to the C.G.R. of 453 miles on all goods between Kimberley and the coast.

Another instance of the incongruities of the South African railway system is afforded by the fact that the two most important industrial centres in South Africa, Johannesburg and Kimberley, lying about 275 miles apart as the crow flies, are separated by a railway distance of 661 miles. This is to be remedied in the early future by a line between Fourteen Streams and Klerksdorp. The new route will save at least 450 miles, and permanently abolish the traffic between Johannesburg and Kimberley now running over the C.G.R. route—Kimberley-De Aar-Norvals Pont—for a distance of 275 miles. This will be set off only by the short run between Kimberley and Fourteen Streams on the C.G.R.,

48 miles, which means another net loss to that railway of 227 miles.

The mileage of the Cape Government Railways at the end of 1901 was placed at 2,722, from which must be deducted 587 miles of Rhodesian railways between Vryburg and Bulawayo, worked but not owned by C.G.R. This leaves 2,135 miles to end of 1901. Since that time a good deal of mileage has been opened and is in progress. The C.G.R. now work the Rhodesian railways north of Bulawayo to a place called Gwelo.

I give below a detailed list of the extensions in Cape Colony :—

Railway Extensions in Progress in Cape Colony.

	Miles.
Sir Lowry's Pass—Caledon	53
Malmesbury—Moorreesburg	30
Moorreesburg—Eende Kuil, or the "Rest"	49½
Swellendam—Riversdale (private line subsidized by Government at rate of £2,000 per mile)	64
Port Elizabeth—Avontuur (2 ft. gauge)	179
Mossel Bay—Oudtshoorn (subsidized)	75
Oudtshoorn—Klipplaat	155½
Somerset East—Fort Beaufort	82
Fort Beaufort—King William's Town	65
Kalabas Kraal—Hopefield (2 ft. gauge)	49½
Amabele—Butterworth	78
Indwe—Maclear	107
Klapmuts—French Hock	16½
Hopefield towards Vredenburg (2 ft. gauge)	14
De Aar—Prieska	111
Victoria West—Carnarvon	77
Paarl—French Hoek	17
Ceres—Ceres Road	10
Aliwal North—Gairtney	47
Bamboo Junction—Romansfontein	8
	1,288

These extensions, 1,288 miles, when added to the 2,135 miles open in 1901, make 3,423 miles open and in progress at the present day. In the above I have not included a private line which it is expected will be built to connect Saldanha Bay with Hopefield.

It is to be noted, too, that the line from Worcester to Riversdale, though subsidized by the Government, is a private enterprise. One would have thought it essential that this line should have been pushed on to Mossel Bay, which would be an important port if given half a chance by the Government. It will be seen, however, that the only railway service contemplated for Mossel Bay at the present day is a zig-zagging line from Klipplaat, which will prevent it from competing with Cape Town except for purely local traffic. Had Mossel Bay been connected with the main line at Beaufort West its prospects would have been greatly enhanced.

Another clear instance either of the short-sighted policy of the Cape Government or of Cape Town's discouragement of inter-port communications is afforded by the fact that the Port Elizabeth-Avontuur line, which should be an important link in what ought some day to be a direct line between Durban and Cape Town, is to be treated merely as a local railway with a 2 ft. gauge.

Again, Cape Colonial jealousy of Natal has occasioned the C.G.R. to stop two of its extensions within a few miles of the Natal border rather

than link either of them to the Natal system which runs nearly down to the border at Port Shepstone. The northern limit of the C.G.R. system is at Vryburg.

The Rhodesian Railways.—As the Cape Government did not consider that Rhodesia was worth tapping by railway, it rested with the Chartered Company to carry on the line north of Vryburg. Up to the present, as far as an immediate return for the outlay is concerned, the C.G.R. were quite sound in this matter. Thus it is that the Rhodesian railways own the railway which runs through Cape Colony from that town to a point on the border rather north of Mafeking, and thence right through Southern Rhodesia, *viâ* Bulawayo, Gwelo, and Salisbury, to the Portuguese frontier at Macequece. The mileage now open on the Rhodesian system is as follows :—

	Miles.
Vryburg—Mafeking	96
Mafeking—Bulawayo	487
Bulawayo—Salisbury	375
Salisbury—Macequece	192
Total	1,150
Macequece—Beira (Portuguese)	183

List of Railway Extensions Sanctioned in Rhodesia.

	Miles.
Bulawayo—Wankies	206
Wankies—Victoria Falls	72
Bulawayo—Gwanda	104
Gwelo—Selukwe	24
Bulawayo—Matoppos	9
Total	415

These extensions of the R.R. system, with the 1,150 miles now in operation, make a total of 1,565 miles.

Rhodesia, which has suffered from many inconveniences and hardships, has so far escaped the curse of self-government under a Sprigg-Bond régime, and so its railways have been built and are being built where they are urgently wanted, and not for the purpose of catching the votes of individual farmers, or even for some less reputable purpose.

Whatever criticisms one may have to make of the Chartered Company and its methods, its salvation has been bound up in the ultimate success of Rhodesia, and its railways have been constructed with a view to that end. By the completion of the through line from Cape Town to Beira the C.G.R. has already received a blow to its traffic as a furnisher to Rhodesia, as now that Bulawayo is only 750 miles by rail from Beira, the railway returns for goods for Cape Colony to Rhodesia are already falling off. Until recently Port Elizabeth, 1,199 miles from Bulawayo, was the nearest seaport as far as railway service was concerned.

The most important of the R.R. extensions is the Bulawayo-Wankies line, which is to open up the important coalfields in the latter district, and thereby cheapen the cost of gold-getting and railway-working by providing fuel for about one-sixth of its present price. At the time of my visit 88 miles of this road had been built.

By now the line has been nearly completed as far as the coalfields.

The Bulawayo-Gwanda line is for the purpose of opening up goldfields, and the short line to the Matoppo Hills, where the late Mr Cecil Rhodes lies buried, will bring into touch the large farming district under artificial irrigation, organized by that great man.

The Natal Government Railways.—We now come to the Natal Government Railways, and in dealing with these I must speak with bated breath, for just now there is a fiery controversy going on on the subject of railways—a controversy so strong that even the visit of Mr. Chamberlain was hardly sufficient to subdue it temporarily. Now that he has passed the campaign is waging again as fiercely as ever, and it is on the momentous question as to whether the main line on the route to Johannesburg shall be doubled or an alternative line built.

Of course it is political. All railway questions in self-governing colonies are. And in this case it is the point on which the pending elections are to be fought. Natal voters are divided just now, not into Conservatives and Liberals, or Progressives and Moderates, or Protectionists and Free Traders, but into double-main-linists and alternativists.

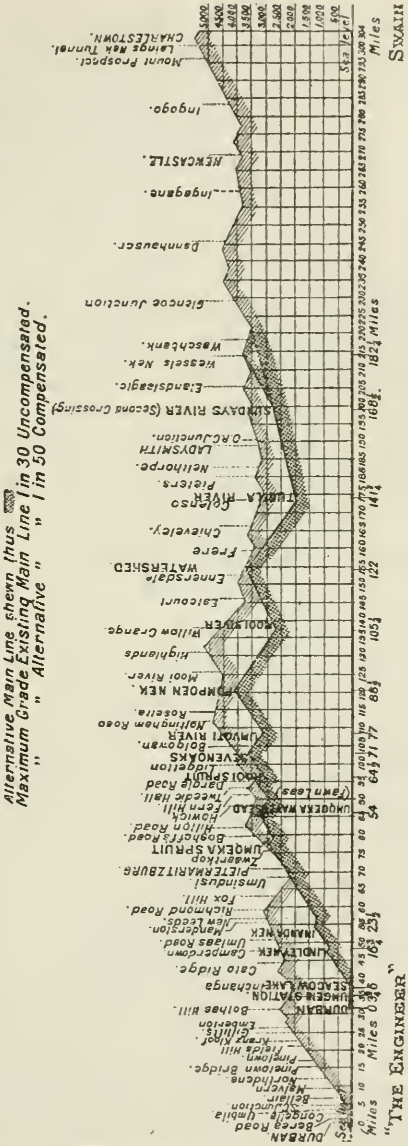
I shall not enter into this discussion at all, beyond mentioning a few facts which should carry conviction to the outsider whose brain is not aflame with party fanaticism. I show also a map illustrating this question.

It must be borne in mind that the Natal railways live out of their traffic with Johannesburg. That traffic is assured to them for an indefinite period provided that they can compete with the

Portuguese line from Lorenço Marquez (Delagoa Bay). As the crow flies, Durban is 310 miles from Johannesburg, and Lorenço Marquez 280 miles. The present railway from Durban to Johannesburg is 483 miles, and the journey is

done in twenty-seven hours. From Lorenço Marquez the distance is 396 miles, and the time occupied is twenty-four hours. The C.S.A.R. are contemplating shortening the route through the Transvaal from Johannesburg to the Portuguese frontier still further; and thus, unless Natal can shorten her route, she will lose much of her traffic with Johannesburg. The alternative line proposed would run north of the existing line, forming with it a loop, with its junctions at Durban and Waschbank.

A comparison between the schemes for doub-



NATAL RAILWAYS: PROFILES OF MAIN AND ALTERNATIVE LINES.

ling the existing main line and constructing the alternative double line shows that the latter would shorten the distance by 50¾ miles, obviate 21 miles of curves, and reduce the maximum rise and fall by 1,188 ft. The maximum grade, too, of the proposed new line will be 1 in 50 instead of 1 in 30, as at present, and this will more than double the haulage capacity over the ruling gradient. These features will have the effect of reducing the time between Durban and Waschbank by six hours. The profiles given on preceding page illustrates these two routes.

As a set-off against all these advantages we find, in favour of the scheme for doubling the existing line, merely that this latter, including easing curves and gradients, will cost about half a million pounds less to carry out. As, however, with the alternative line, the profits by increased traffic and cheaper methods would probably amount to more than that figure in one year, and as without it much of the traffic will be permanently diverted to Delagoa Bay, this small extra capital expenditure is not worth considering. The secret of much of this political opposition to the alternative line lies in the fact that it will not pass through Pietermaritzburg, the capital of the Colony. The vain endeavour to bolster up Pietermaritzburg simply because accident has made it the political capital of Natal, while Durban is the real centre of industry, commerce, and progress, may cost the Colony a heavy loss of money.

What the world wants, what Natal wants, if she

wishes to make money, is to provide the best, shortest, and cheapest route between Durban and Johannesburg. As far as economics are concerned Pietermaritzburg, in spite of its ponderous name, is of no consequence at all. It might as well be placed in the centre of Siberia as far as taking it into consideration in this matter is concerned.

It would be as reasonable for United States politicians to insist that all railways between New York and Chicago should deviate so as to pass through Washington, as is the attempt of certain Natal politicians to include Pietermaritzburg in the main line between Durban and Johannesburg when it has been proved that there is a far better route to be followed elsewhere.

The mileage of the Natal railways running at the present moment, including that extension which penetrates the Orange River Colony leading to Harrismith, must, I imagine, be as nearly as possible 600 miles. I give no detailed list of extensions and projects in this colony, as while this war of the routes is going on it is impossible to speak with certainty on this head. Assuming, however, that reason will eventually prevail, and that the alternative line will be put in hand shortly, we may place work in progress and the immediately prospective lines at some 300 miles, making a total of operating and prospective lines of 900 miles.

The Central South African Railways.—We now come to the Central South African Railways, recently known as the Imperial Military Railways ;

and in the days of the Boer Republics as the Netherlands Railways. Though the open mileage of these is at present :—Transvaal, 889¾ miles ; Orange River Colony, 439¾ miles ; total, 1,329½ miles only, the railways are for the time being by far the most important and interesting of all in South Africa.

The energies of the C.S.A.R. are being devoted seriously and with great intelligence to rectifying the defects of the old system. These are many and serious.

I have already pointed out how the forthcoming short lines between Kimberley and Springfontein, and Fourteen Streams and Klerksdorp, will revolutionize certain of the important trade routes of South Africa. There are other equally important alterations in progress. At the present day there are practically no printed data concerning these lines and projects to assist the man who is looking for information. This was to be expected when we bear in mind that the country is only just emerging from Martial Law, and from the chaotic condition in which the railways were left by the Boers.

By the courtesy of the Commissioner of Railways, Colonel Sir Percy Girouard, I have been able to obtain all the information I required for the purposes of this book in the way of policy, mileage and projects. Under the Boer régime the railway centre in the Transvaal was, of course, Pretoria, and a glance at the map will show that Johannesburg, the real centre of all things South

CENTRAL SOUTH AFRICAN RAILWAYS: NEARING PRETORIA

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African, is merely on a branch line This has all to be altered. It is essential, above every other consideration, that all roads should lead to Johannesburg, and by the shortest possible routes. The first step, of course, was to transfer the general administration of these railways from Pretoria and Bloemfontein to Johannesburg. This has been done.

The two most important schemes for shortening the distance between Johannesburg and the sea will be provided for by the two new lines to be constructed from Springs to Machadodorp, in the Transvaal, and from Johannesburg, *viâ* Vereeniging and Viljoen's Drift, to Harrismith, in the Orange River Colony respectively. The effect of a Springs-Machadodorp line would be to replace two sides of a triangle by one. Pretoria would be excluded from the new main line between Johannesburg and Delagoa Bay, but that would be of no importance. After all, Pretoria, on its own merits, is at the present day merely a pretty little country town, and even if all the dreams of gold and diamonds that we hear of just now in connexion with the place are to be realized to their full extent the existing communications between Pretoria and the outer world are extremely good, and will amply suffice.

On the next page is a list of the lines either under construction or in definite prospect by the C.S.A.R. at the time of my recent visit to Johannesburg :—

	Miles.
Johannesburg—Vereeniging . . .	43
Viljoen's Drift—Harrismith . . .	175
Sannah's Post—Ficksburg	63
Sannah's Post—Wepener, say . . .	28
[1] Kimberley—Springfontein . . .	130
Fourteen Streams—Klerksdorp . . .	148
Krugersdorp—Rustenburg, say . . .	30
Vanlockte—Vork (local Johannesburg gold-mining line not shown on map) . .	16
Total	633

Of the smaller lines above mentioned, that from Krugersdorp to Rustenburg is for the purpose of tapping the richest tobacco-growing centre in the Transvaal, while the Sannah's Post–Wepener, and the Ficksburg lines open up the finest agricultural district in the Orange River Colony.

All through the C.S.A.R. railway projects one notices that utilitarian motives alone are actuating the authorities. The absence of party politics just now in the Transvaal and the Orange River Colony, and the master hand of Lord Milner make it possible for these practical schemes to go through without opposition, and the benefits will be real and lasting.

Perhaps in giving details of some of the C.S.A.R. proposed lines I am a little previous. The whole scheme was estimated to cost over ten million pounds, and of this sum only five millions have been as yet allotted for the purpose. The rest must follow, however, when it is wanted. Should it be required, any amount of private

[1] It is possible that this line may be constructed by private enterprise.

capital would be forthcoming to make up the balance, and I have it on good authority that the schemes which I have enumerated above are bound to go through substantially as given. The open and prospective lines of the C.S.A.R. amount to 1,963 miles.

Conclusion.—To sum up the railway mileage of South Africa according to my most recent information, we have the following figures :—

	Open.	In progress.	Total.
C.G.R. . . (end of 1891)	2,135	1,288	3,423
R.R.	1,150	415	1,565
Beira line (Portuguese) . .	183	000	183
N.G.R., say	600	300	900
C.S.A.R.	1,330	633	1,963
Delagoa Bay line (Portuguese) .	59	00	59
Total . . .	5,457	2,636	8,093

With all this work going on, it would seem that there is an ample field for our manufacturing engineers. Elsewhere I have explained that nearly everything for these railways, as far as machinery is concerned, is ordered from Great Britain. When the C.S.A.R. were in the hands of the Boer Republics as little as possible was ordered from Great Britain, and the result has been that the workshops in Pretoria and Bloemfontein are replete with very weird-looking machinery from continental sources. Already, however, the change of management is beginning to operate in our favour, and while there is no

doubt that the whole system of shops will have to be reorganized and re-arranged, it is quite noticeable already that there is much new plant in them which has come recently from Great Britain.

Our weak point in orders for railway plant in South Africa generally is, of course, rails. I have dealt with this question before, but mention it again, as it cannot be emphasized too strongly. We must, too, endeavour to meet the requirements of South African railways somewhat better than in the past in the way of delivery. This applies especially to locomotives. American locomotives are extremely unpopular on all these railways, but we must not trade too much on that fact. There is a limit to the patience even of the managers and engineers of South African railways. We talk in a general way of colonial patriotism, and what we should expect from it; I think that British manufacturers get vastly more toleration from users in South Africa, in the way of accepting long delivery and paying high prices, than from any other British Colony or possession.

Chapter XIV

THE HARBOURS OF CAPE COLONY

BRITISH South Africa is said to be very badly off for harbours. The more correct expression would be that the harbours at present developed and used commercially are all unsatisfactory.

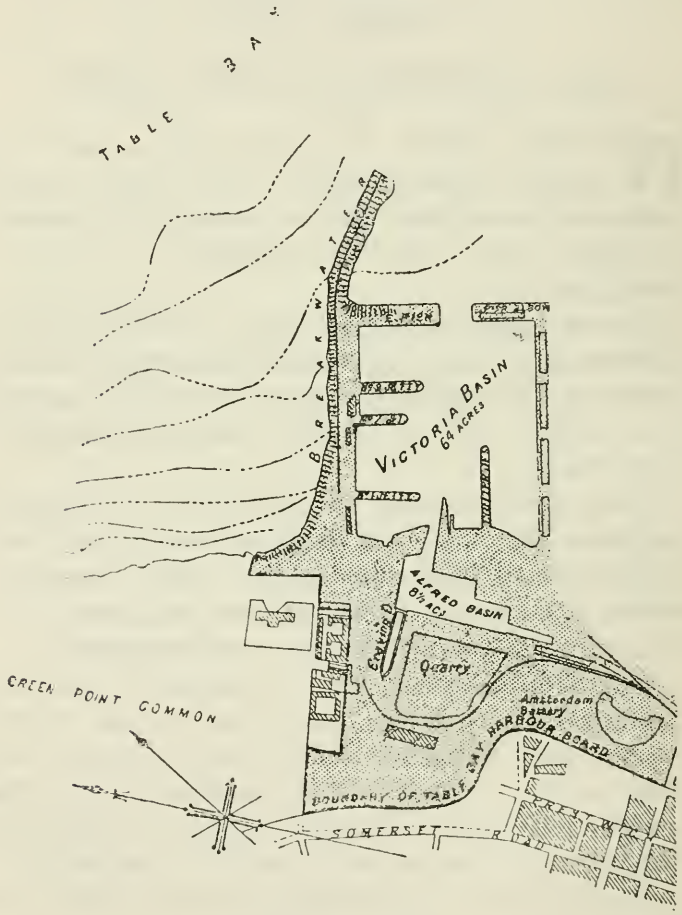
Let me begin with Table Bay. Successive Cape Governments have deliberated periodically on the advantages which would accrue to the community if a proper harbour were to be constructed at Cape Town.

From time to time the advice of well-known engineers has been invoked, and many plans and schemes have been drawn up. When presented to the Government these schemes, as a rule, have been wrangled over, shelved, and forgotten.

In 1860, however, the Government took its courage in both hands, and came to the praiseworthy determination to build a breakwater out into the Bay. That solitary breakwater is at the present day about 4,000 feet long, and affords the only available protection from the dreaded nor'-westerly gales to the shipping which visits Cape Town.

Such as it is, it protects only an infinitesimal portion of the Bay, and stands a monument to the masterly inactivity of generations of Cape politicians.

About half its present length was completed



CAPE TOWN HARBOUR.

during the first eight years. Five and thirty years have been occupied in building the other half. But it must not be thought that things are at a standstill. Almost the first thing that the visitor will see on arriving in Table Bay is an apathetic gang of convicts dumping concrete blocks into the sea to prolong this breakwater. According to the above records of advancement, they should be able to double the existing length of this breakwater by about the year 2023.

Protected by this breakwater is a rectangular dock basin, surrounded by the conventional wharves and wharf buildings. And yet it is not like the ordinary dock, for, while it possesses every other evidence of antiquity, it appears to be incomplete.

"Are there no cranes here?" asks the visitor, astounded, for he has been reading in a guide book that the tonnage of the vessels which come to this port amounts to several millions annually.

"What's the use of cranes in a harbour?" is the surprised retort. "Haven't the ships got their own cranes for loading and unloading?"

"Yes, but how do you get the goods on to the railway trucks?" asks the visitor. "Ah!" he continues apologetically, glancing round, "I see you have no railway here."

"Oh, yes we have," is the proud reply, "the rails are round there, behind the sheds. You see they are well out of the way in that position."

Yes, trucks and rails and everything else which is wanted are well out of the way in these docks.

The quays are choked with merchandise and lumber, which all have to be moved out by hand, and carried through the sheds to the rails on the other side. And chaos reigns supreme.

There is also a small inner basin and a graving dock. And that is all. The total area of the enclosed water in the two basins is $72\frac{1}{2}$ acres.

That is Table Bay harbour to-day. When we take into consideration the tonnage, and the number of vessels which now use this port, we are well within the mark in saying that Cape Town is vastly worse off to-day for harbour accommodation than she was thirty years ago.

A casual glance at the Bay shows a very much larger number of ships waiting outside than inside the harbour. The former are totally unprotected from the furious gales which rage at frequent intervals in this "Bay of Storms," as the Dutch used to call it.

So trade is driven away from Cape Town to the eastern ports, ships carrying cargo for this place pass on and take it elsewhere, or back whence it came. Others refuse to receive cargo for Cape Town at all, while many ships have to wait for months before they can discharge, until sometimes they are blown ashore in one of the oft-recurring storms, and are added to the many wrecks which serve to diversify the panorama as seen from Table Mountain. Other sunk, or partially sunk, ships remain for months and years here, an additional standing menace to the shipping in this naturally dangerous bay.

It really seemed as if the terrible losses of life and ships which occurred in August last, when five vessels were lost in one night, were going to have the effect of awakening this lethargic Government to a sense of its responsibilities. The last of the series of shelved schemes for harbour improvements was taken out and dusted.

I need not go into the details of that scheme beyond saying that it was an elaborate and complete one, providing for about seven times the existing accommodation, that when completed it would have reduced the cost of working enormously, that it would have cost three and a half million pounds, and that the money expended would have been more than repaid by the rental or sale of the reclaimed ground, which was an item in this particular scheme.

The reason why I need not deal with it here is because the Cape Government, after making a show of deliberating how to prepare to begin upon it, quietly placed it back in its pigeon-hole at the earliest opportunity. And there it is likely to lie.

As a matter of fact the chances of harbour extensions in Cape Town, on anything but a very petty scale, are more remote than ever. This is because the Afrikander Bond rules Cape Colony to-day, and the Bond represents the Dutch farmer.

The Dutch farmer may be an excellent man according to his lights, but his lights are somewhat dim. He does not wish to grow goods for export, and a very few ships would suffice to bring to him

his coffee and his sugar and the odds and ends he requires from the outer world. "What are the use of seaports to us?" say the farmers to Sir Gordon Sprigg. "Our interests lie in the interior. If the Government want to throw money about, let them throw it all to us." And the Bond Government acquiesce.

The prospects of harbour improvements are still further darkened by the fact that Mr. Douglass, who is responsible for progress in Cape Colony just now as far as public works are concerned, has openly stated that he regards money expended on harbours as "money thrown into the sea." In fact, it is to be feared that in Cape Colony under the present régime public works are looked upon merely as a means of vote-catching. Railways, well-boring, irrigation all are utilized for the purpose of seducing the country voter. "If you want a railway through your property," says the Bond to the local farmer, "you must vote for my man. If the other man gets in, he won't waggle the railways about to suit your personal convenience."

In Southern Cape Colony at all events the practice of the Government is to leave all advancement of the interests of the progressive community to private enterprise, to hamper those enterprises by every possible means, and then to abuse the capitalists who start them for creating a monopoly.

I am not going to defend the monopolist or the private monopoly, but it is safe to say that without

NATURAL WHARFAGE AT SALDANHA BAY

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the capitalist Cape Colony would be an almost impossible place for the progressive Englishman.

In such circumstances it is perhaps only natural that what would appear to be the solution of the harbour question in Southern Cape Colony should have been arrived at by local business men in Cape Town. Such men have been driven to desperation by the losses they have suffered owing to the mismanagement of the shipping and the inadequate accommodation in Cape Town.

It is characteristic of this Colony that during its successive occupation by the Portuguese, Dutch, and British, there should have existed, unutilized, an almost ideal natural harbour within sixty miles of Cape Town—a harbour of which a very large portion is entirely land-locked, and of which the whole is effectively protected from the dreaded nor'-westers and south-easters which ravage this coast; a harbour so large that it could be made to contain at one time in perfect safety ten times the total of the ships that visit all the ports of South Africa to-day; a harbour with so much depth of water and natural wharfage that, without excavation or dredging, ships drawing 15 feet and 18 feet can be moored alongside its coast line.

Its existence and possibilities have long been appreciated by men who have visited the place. It was discovered by the Portuguese in 1503, explored by the Dutch in 1652, and warmly commended to the British authorities by Captain Percival in 1796. Twenty years ago General Sir

Edward Brabant heard complaints from the farmers as to how their prospects were hampered by the absence of a means of getting rid of their produce. The Government would not build a railway, and the prices of their goods were fixed at a ridiculously low figure by an enterprising capitalist who had the monopoly of their trade, and who owned the only sailing ships which plied between this port and the outer world.

"Why do you not develop Saldanha Bay?" asked General Brabant.

And now at last Saldanha Bay is to be developed. For years, while ships have been wrecking themselves in and around Table Bay, the Government have found no better use for Saldanha Bay than as a quarantine station, and it is a marvel that our Admiralty, who have been and still are squandering enormous sums of money in a futile endeavour to make a tolerably safe harbour at Simon's Town, should not have pitched upon Saldanha Bay as a ready-made naval station. Yet such is the case.

During the last few years merchant ships of various lines, unable to obtain any sort of accommodation at Cape Town, have been forced to use Saldanha Bay for purposes of debarkation and transhipment. Thus it is that the importance of developing the place has gradually forced itself on the community here.

The Government, of course, would take no steps in the matter. "It may be a very fine harbour," they maintained, and with a narrow-

ALONGSIDE NATURAL WHARF AT SALDANHA BAY

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minded logic they continued, " If that is the case, it is all the more reason why we should not raise up a formidable rival to Cape Town in its immediate vicinity."

They could not admit the broad principle that the more and the better ports a country may possess the better for the commerce of that country. They would not allow that it was preferable to retain in their immediate neighbourhood trade which they could not cope with themselves, rather than let it go to the eastern ports.

But suddenly the chances of this scheme became more hopeful. Sir Gordon Sprigg and Mr. Douglass saw in it a means of saving their faces. They could be " Progressive " at some one else's expense, and above all the springing into life of Saldanha Bay would afford some sort of an excuse for burking the harbour extensions in poor old Cape Town.

The Saldanha Bay syndicate did not ask the Government for money. They purchased their own ground, and requested to be allowed to develop the place. They would build the railway at their own cost, and the Government could take it over if they found it advisable to do so when made, or subsequently. They merely applied for the right to do at their own expense work which, in any other colony, the Government would have been only too anxious to carry out on its own account.

Such a request was not to be granted lightly. It was necessary to hum ! and ha !

At last, however, a steamer was chartered, and a Bond picnic to Saldanha Bay was organized. The weather was fine, the scene was fair, and the wines were excellent. In after-dinner speeches in the saloon some of the most ardent retrogressive members of Parliament in Cape Colony pronounced themselves in favour of allowing a business Company to do their work for them.

It is now a foregone conclusion that there will be a Parliamentary majority in favour of this scheme, and that Saldanha Bay is to become a trading port.

I have gone thus fully into the manner in which this affair has been pulled through for the purpose of making clear the obstacles which an industrialist on a large scale will have to face in trying to organize a scheme for the advancement of Cape Colony.

Nothing but a fortunate chain of circumstances could have brought about the permission which is about to be granted for this enterprise. Above all, those concerned were fortunate in coming on the scene with their project precisely at a time when the Government were badly in want of an excuse to shelve the Table Bay extensions.

As Saldanha Bay must play an important part in the South Africa of to-morrow, I make no excuse for giving some particulars of the place to-day.

Nothing in this world is perfect, we are told. Saldanha Bay possesses one grave defect. There is no supply of fresh water, except that which is

collected in tanks. There is an ample rainfall for the purposes of crops, but the hills in the immediate vicinity have not a sufficient catchment area to provide the amount necessary for feeding a large community. The only practicable source for this purpose is the Great Berg River, which will have to be tapped at a point some sixteen miles from its mouth and thirty-five miles from Saldanha Bay. This is, however, a simple engineering problem which will merely cost money. Now that in Western Australia water is pumped successfully uphill over a course of nearly four hundred miles, we need have no apprehensions with regard to a scheme for running water downhill for thirty-five miles.

The map on the next page shows that Saldanha Bay, with the exception of a small portion on the western side, is entirely land-locked. The entrance is on the western side of the harbour, and is divided into two inlets by Marcus Island. The one lying north of Marcus Island is $1\frac{1}{4}$ miles wide, and though capable of admitting ships of the greatest draught in places, is not uniformly deep throughout its width. It is proposed to span this opening by a breakwater eventually, and to utilize only the entrance which lies south of Marcus Island. This opening is two miles wide, with a maximum depth of 84 feet, and a minimum of 36 feet. The harbour proper includes all the water shown on the map eastward of a line drawn from promontory C, through Marcus Island, to the Cape on the south which forms the western

SALDANHA BAY.

limit of Salmander Bay. Salmander Bay is shallow and studded with islands and rocks, and for this reason I do not include it as being in the serviceable portion of Saldanha Bay. There is a further small harbour outside these limits, shown as North Bay on the map, between the points A, B, and C.

The only artificial wharfage accommodation at present in this harbour is a small rough wooden jetty at E, but the whole of the land on the coast line C D E drops almost sheer into the sea. One of the illustrations gives a practical demonstration of this fact by showing a steamer which draws 18 feet moored alongside the natural shore line C D.

To put the matter in another light, throughout the whole of the line C D E, a distance of nearly two miles, and especially along that natural breakwater C D, there exists a ready-made wharf, which, with but little artificial aid, can be made to accommodate ships of the largest tonnage. Along the easterly or land side of the bay the coast is shelving gradually into the sea with a sandy beach and some boulders. I believe I am correct in stating that there are no sandbanks in the harbour. In any case, there is no bar, and throughout three-quarters of its area the soundings give from 30 feet to 80 feet of water. At present there is no township except a few straggling houses, mostly of the crudest type, which I have marked as Houtjes Bay fishing-village.

The country round is devoid of trees, but a

forest nursery has already been started, and the result seems to point to success. Farming is carried on all round this district in the lethargic manner usual in Cape Colony, and this has been further checked hitherto in this particular district by want of an outlet for produce, as explained above. The country, however, from an agriculturist's point of view, is excellent, especially for cereals, of which there is a dire want all through South Africa.

The hinterland is undulating, but, as a rule, not steep, and the nearest existing railway is a 2 ft. gauge line at Hopefield, twenty-two miles from the Bay. On reference to the small key map it will be seen that the Hopefield line joins the main Cape Government system at Malmesbury, where the standard gauge is 3 ft. 6 in.

In the first instance a line will be constructed from Saldanha Bay to Hopefield, and as it is proposed to adopt a 3 ft. 6 in. gauge, it is clear that this line will only be a preliminary step, and that ere long it will be extended so as to tap the main-line system at another point, and thus obviate the transfer of goods at Hopefield, and again at Malmesbury.

There are plenty of stone and materials for brick-making, and it is clear that a tenth of the money expended on this place would suffice to produce a far better harbour than could be made for any sum at Cape Town.

In the early days Saldanha Bay will only serve to absorb the traffic with which Cape Town for

one reason or another cannot deal. But there can be no question that when once the fresh-water problem has been solved, and the place has been linked by railways, it must divert traffic from Cape Town to itself.

And one can well foresee, though it is looking a long way into the future, that Cape Town will have no further *raison d'être* as a shipping port, except for purposes of supplying that limited area which is known as the Cape Peninsula.

Thus it would appear that, while English people have got into the habit of accepting as an axiom that there is no such thing as a good harbour in British South Africa, there exists one which has been waiting for development all these years, within sixty miles of the leading port of Cape Colony.

There is another natural harbour, which, if it does not possess all the advantages of Saldanha Bay, is at all events naturally superior to any one of those which now handle the bulk of the commerce in Cape Colony.

This is the Port of St. John's, at the mouth of the St. John's River on the eastern coast. Its situation is a useful one, as it divides almost equally the seaboard between East London and Durban.

As is the case, I believe, with all South African rivers, there is a dangerous bar across the mouth of the St. John's River. It is maintained, however, that, unlike the others, it is slow in forming, as the sand travel at this particular point is not

so great or so rapid as at Durban and other ports on this coast.

It is therefore considered by experts that this bar could be negotiated easily by systematic dredging, and that when once a channel has been made through it, it could be maintained without difficulty or great expense. On the soundness of this theory depends the success of St. John's as a future port, for inside the bar there is ample accommodation for a large amount of shipping, and the mouth of this river affords a sheltered and otherwise excellent harbour.

I will return, however, to the present, and deal with the harbours of Cape Colony which handle the commerce of the country. Of these, after Cape Town, Port Elizabeth is at present the most important. For reasons given in another chapter this is not likely to remain the case for long. The development of the railways in the Orange River Colony must have the effect of robbing Port Elizabeth of most of her present trade. Her future will depend mainly on local requirements, and as a port for general traffic she must eventually yield her place to East London, or perhaps in the far future to St. John's.

At Port Elizabeth there is no harbour in the proper sense of the word. It is merely an open sea anchorage, with a couple of wrought-iron jetties at which cargo is landed from lighters. A breakwater, of which the construction was commenced in 1856, proved unsuccessful owing to the silting up of the sand, and had to be removed.

Ships drawing up to 20 feet can remain alongside the jetties in most weathers, and these jetties are adequately furnished with cranes and modern appliances. The connexions with the railways are also satisfactory. Considerable sums of money are still being spent on improving existing accommodation, and there is a big scheme involving millions for making some day an elaborate enclosed harbour.

East London, between Port Elizabeth and St. John's, is at the mouth of the Buffalo River. Here training walls have been erected to encourage the scour. Like all these rivers, there is a treacherous bar at the entrance. In practice this bar can be maintained to a depth of 19 or 20 feet, as it is loose in formation and yields readily to suction-dredging. Heavy weather has the effect of dispersing this sandbank, and thus quite large ships can enter the river at certain times. The wharves which are inside the river can accommodate ships drawing 20 feet of water on a frontage of about 1,800 feet, and for such ships as can effect an entrance the river, which is very wide at this point, affords an absolutely sheltered harbour.

In practice it is found that nearly nine tenths of the cargo which comes to this port can be landed inside the river. The impetus to traffic which would ensue if the depth of water on the bar at the entrance could be permanently and considerably increased would be immense.

There appears to be no valid reason why this

should not be done by persistent dredging, and as the future of East London, as an important port, probably eventually *the* most important port in Cape Colony, depends upon this being accomplished, it is to be presumed that measures will be taken to effect this.

There are three other ports in Cape Colony worthy of mention, but of which it is necessary to say but little.

A great deal of money has been spent on endeavouring to make a commercial port of a place called Port Alfred, between East London and Port Elizabeth, and a railway has been built to the coast at this point.

On recent maps of South Africa Port Alfred will be found writ large, and the assumption might fairly be that it is a place of importance. The effect of the money spent, however—nearly a million pounds—was merely to make it possible for vessels drawing say 10 ft. of water to enter the river. The place is of no value as a port at present, and one cannot help asking oneself why the money frittered away here was not expended on improving Table Bay. Was this another electioneering move ?

Half way between Cape Town and Port Elizabeth is what might be quite a brisk little place, Mossel Bay. This port affords a great contrast to Port Alfred in that, while the Government have gone out of their way to try to make a port at the latter, which was not suitable, they have done their best to stifle Mossel Bay, which was

worthy of attention, and has been driving ahead in spite of there being no railway, and of other handicapping conditions. As I touch on this subject in another chapter I need say no more about it here.

There only remains Port Nolloth, situated on the western coast a little to the south of the southern frontier of German South-West Africa.

The sole *raison d'être* of this port is the existence of the O'Okiep copper mines, which are connected with it by railway. Railway and port, however, are hundreds of miles away from any other railway or port in South Africa, and so they do not enter into the question of an economic study of the country generally. At present this particular district is a howling wilderness, and, though rich in minerals, the time has not yet come to take the place into consideration.

Chapter XV

DURBAN HARBOUR

THE tendency for the sea traffic between modern industrial South Africa and the outer world to be diverted from Cape Town to the eastern ports is of course proving itself of immense advantage to the Port of Natal, Durban. The only reason why Durban and Lorenço Marquez (Delagoa Bay) do not at the present day absorb between them the whole of the Transvaal carrying trade is simply because neither of them has sufficient railway capacity for doing its share of the trade, and because, while Durban has not as yet a sufficiently good harbour, Lorenço Marquez, though possessing a natural harbour, is badly off for appliances and accommodation. The serious natural defects of Durban, however, are in process of being remedied. The extensions to the railways have been dealt with in another chapter. The result of these extensions should leave Durban and Delagoa Bay practically on a footing of equality with regard to the Johannesburg trade. As far as harbours are concerned, Delagoa Bay is to-day much better off than Durban, by reason of her natural harbour. Though the approach

DURBAN HARBOUR: WHARFAGE AND RECLAMATION AT THE BLUFF

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to Lorenço Marquez from the sea is studded with shifting shoals, there are channels through which large ships can find their way into the outer harbour at all times. At Durban it is different. A splendid and practically land-locked harbour exists, but its practicability is discounted by the presence of a treacherous bar. In 1899 the average low-water depth on this bar was 19 ft. $7\frac{1}{2}$ in.; in 1900, 19 ft. $8\frac{1}{3}$ in.; and in 1901, 19 ft. $1\frac{1}{2}$ in. The shallowest depths recorded during those three years were 16 ft., 15 ft. 10 in., and 16 ft. 10 in. respectively.

It is against this bar that engineers have to wage eternal warfare. The battle began in 1857. Since then, weather permitting, it has never ceased. A storm invariably decreases the depth of water, and to counteract this dredging has to be continuously carried on. The dredging plant is constantly being increased, and it is hoped that ere long a greater depth may be maintained than in the past. If Natal is to reap all the advantages of trade with the interior, future dredging must be of such a nature as to maintain permanently a much greater depth than the present average.

The bar is of shifting sand, and consequently suction-dredging is the only means employed for its disintegration. That the engineers consider it possible to maintain a far greater depth of water on this bar than heretofore is clear from the fact that they are dredging the harbour, alongside their new quay walls, to depths of 27 ft. and

30 ft. This would be useless unless ships drawing a great deal of water were to be able to cross the bar. The greatest low-water depth attained on the bar during the above-mentioned three years was 23 ft.

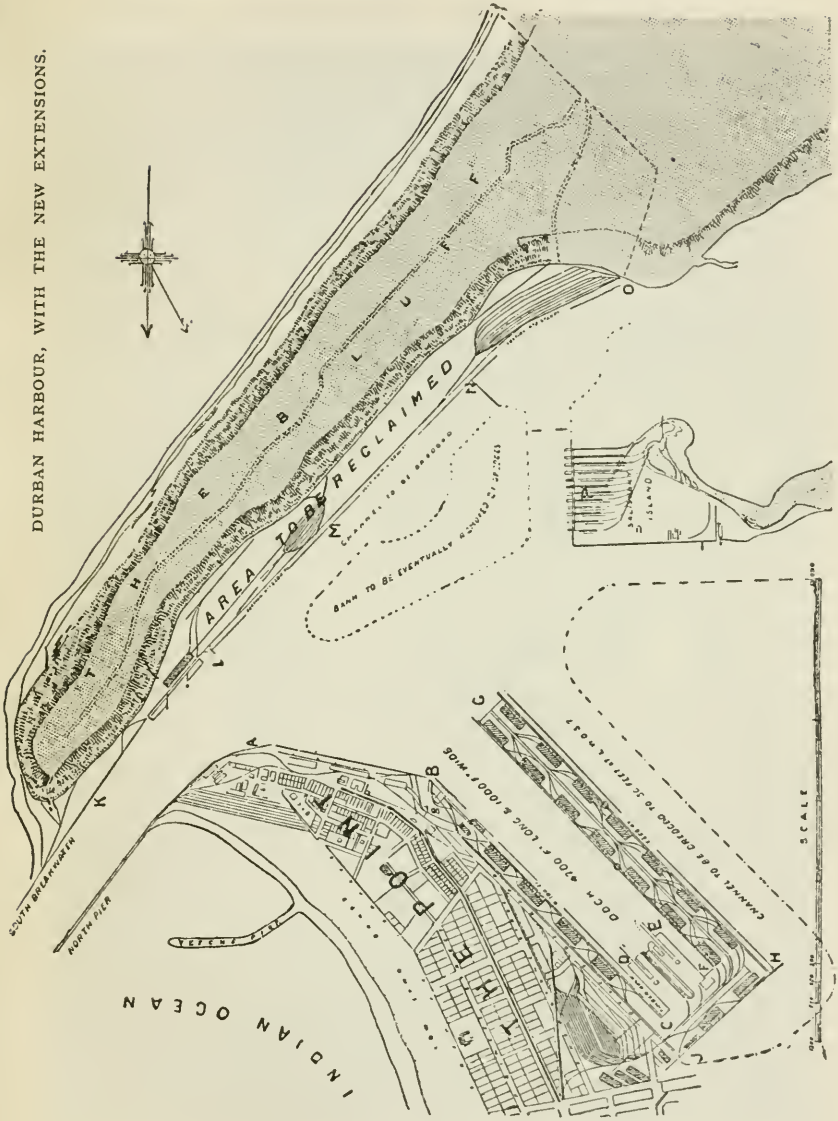
Nature seems to be peculiarly unbiassed as to the time of year she chooses for silting up this channel. One cannot say how much the diagram is influenced by dredging, but, as the bar chart now reads, the only peculiar feature about it is that the variation in depth is somewhat less accentuated during the months of January and February, June and July, than at other periods of the year.

Although the area of the harbour is $7\frac{1}{2}$ square miles, much of this is shoal water. These shoals are being removed energetically by dredging, and extensive reclamation work is being carried out for the creation of new wharves and quay walls.

After Cape Town Harbour, with its neglected Dock Road, its inconvenient connexions with the railways, its chaotic internal arrangements, its unkempt quays, and its wharves without cranes, its hopeless and helpless mismanagement, and its elaborate schemes for improvement which never come off, an inspection of the Durban harbour is a real pleasure.

Here we have bustle enough in all conscience, but it is the bustle which is a means to an end ; it is the bustle of business being done, of work in course of achievement. To watch the work at the harbour in Cape Town is like watching the antics

DURBAN HARBOUR



DURBAN HARBOUR, WITH THE NEW EXTENSIONS.

of a pantomime crowd, who hustle one another and throw things about, while the futile policeman, the Harbour Board, with the best of motives, only succeeds in rendering confusion worse confounded, and receives on his devoted head the blows which were intended for the clown, the Cape Government. On both harbours immense sums of money have been expended. In Cape Town the money has been frittered away; in Durban it has been laid out practically and well. Natal is alive to the spirit of progress; Cape Colony, if not dead to that spirit, is fast asleep and snoring.

The plan of the harbour shows the extensions now in progress and those which have been recently authorized. It is made up from the most recent map issued by the harbour authorities. Exclusive of the works to be carried out on the "Bluff" side of the harbour, for which I have no figures, these extensions are estimated to cost £2,333,333. At present the wharfage accommodation is practically confined to the "Point" side of the harbour, where a considerable length of the quay wall in the new scheme is already completed. Reclamation of the foreshore, along the line of the quay wall A B C, is rapidly proceeding. This will result in a bold and impressive frontage when finished. An illustration shows the method of reclaiming the foreshore behind the quay wall. The courses are finished to the coping level, and a suction dredger is filling in the place to be reclaimed. The distance A B on the plan is 2,100 ft., and the depth alongside at low water

DURBAN HARBOUR: WORK ON THE QUAY WALL

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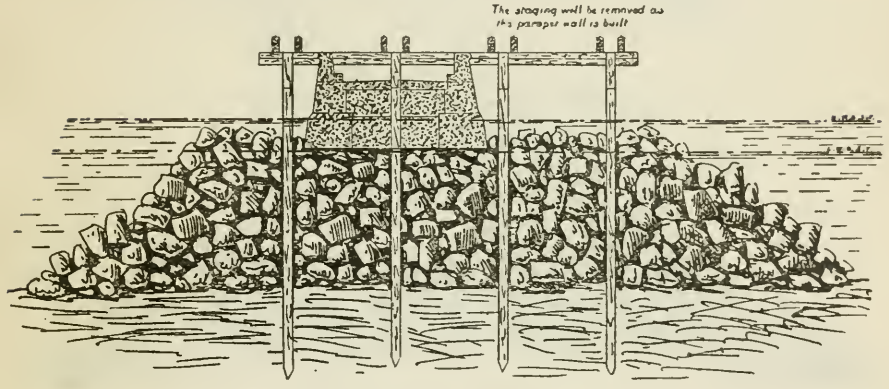
is 27 ft. From C to D is 4,700 feet, and the depth 23 ft. At C is a timber dock, and then comes the North Quay, C D E F , in which there is to be a graving dock 850 ft. long and two slipways. At F G H will be the West Mole, 5,250 ft. on its longer side, where the depth of water will be 30 ft. On the other side the depth will be 27 ft. Following the water line from A through all its deviations to J, the total quay frontage on



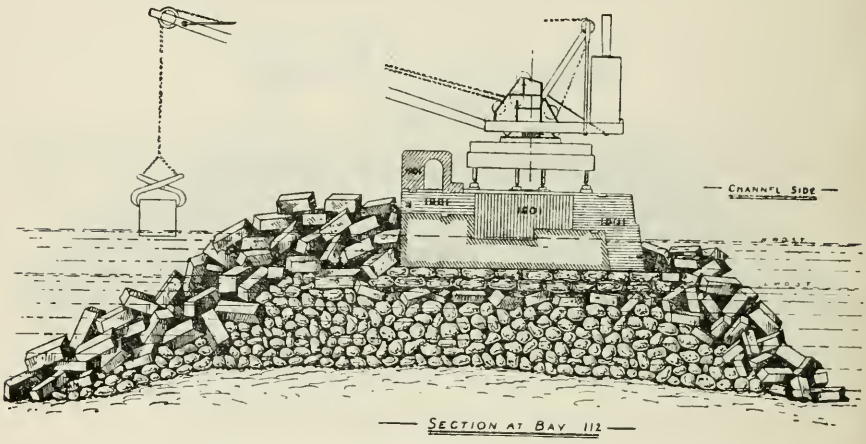
DURBAN HARBOUR: CONSTRUCTION OF BREAKWATER.

this, the Point side of the harbour, will be 20,370 feet—nearly four miles.

On the Bluff side of the harbour the work to be done is also very extensive. The training wall, K, from the South Breakwater is to be raised 12 ft., above low water, and the foreshore behind it reclaimed as a site for railway sidings. The timber wharfage, of which a length of 350 feet exists, is to be lengthened to 700 ft. The retaining wall, already started through sections 1,

2, and 3, is to have a total length of 7,780 L.M.N.O. Throughout this length a concrete quay wall will be built, as shown on the plan. It is to have a depth of 27 feet at low water, and, in the first instance, a 600 ft. channel is to be dredged throughout its length. Behind this wall some eighty acres of foreshore will be reclaimed.

At Salisbury Island, P, there is to be an elaborate

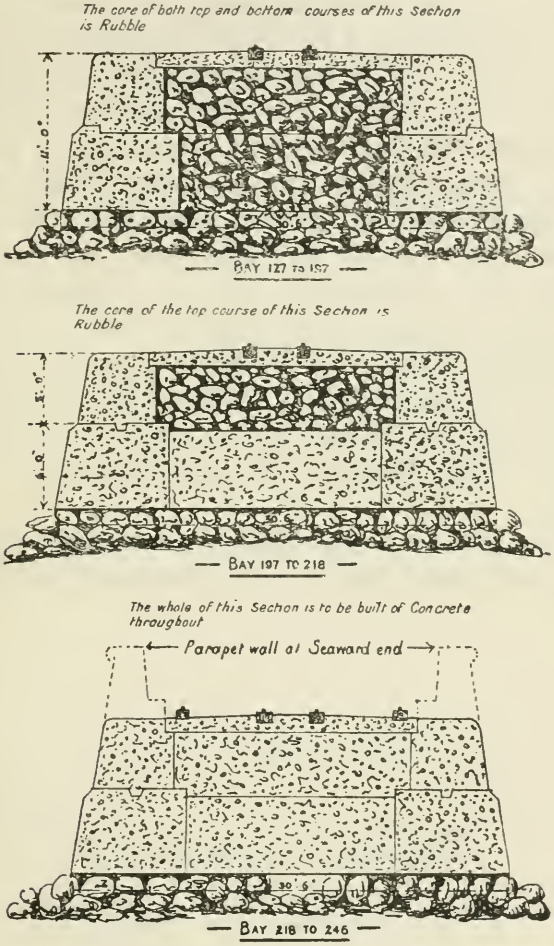


DURBAN HARBOUR: CONSTRUCTION OF PIER.

timber wharfage with a depth of 25 ft. alongside, and the island is to be made up to a level of 4 ft: above high-water mark. There are to be slides for timber discharged into the water through the bow ports of vessels, and timber-stacking grounds with all appliances for rapid handling, and a slip-way for tugs and lighters.

In connexion with the entire scheme which I have outlined above, there is to be an elaborate

railway service, and throughout a very complete installation of hydraulic and other cranes, and



DURBAN HARBOUR: SECTIONS OF PIER.

the rest of the paraphernalia which go to make a complete harbour on modern lines.

During the construction of this most comprehensive scheme there should be an extremely good market for our manufacturing engineers, though a very great deal of the plant is already working, or on order. So far it is practically all British.

When completed, provided always that the obnoxious bar can be made to succumb to persistent dredging, Durban Harbour should afford an object-lesson to all the other ports in South Africa. If it turns out the great success anticipated by optimists, and if a corresponding increase is made in the railway system, so that everything which can be landed can be carried away to its destination, without loss of time, I can see no use for any of the ports south of this, except East London, for anything save local traffic.

It is for this reason that I have dealt with the question at such length, and illustrated it so fully.

THE "CRATER" OF THE KIMBERLEY MINE

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Chapter XVI

DIAMOND MINING IN KIMBERLEY

IN considering this question it must first be understood that more than 90 per cent. of the diamond output of the world at the present day emanates from mines in the Kimberley district.

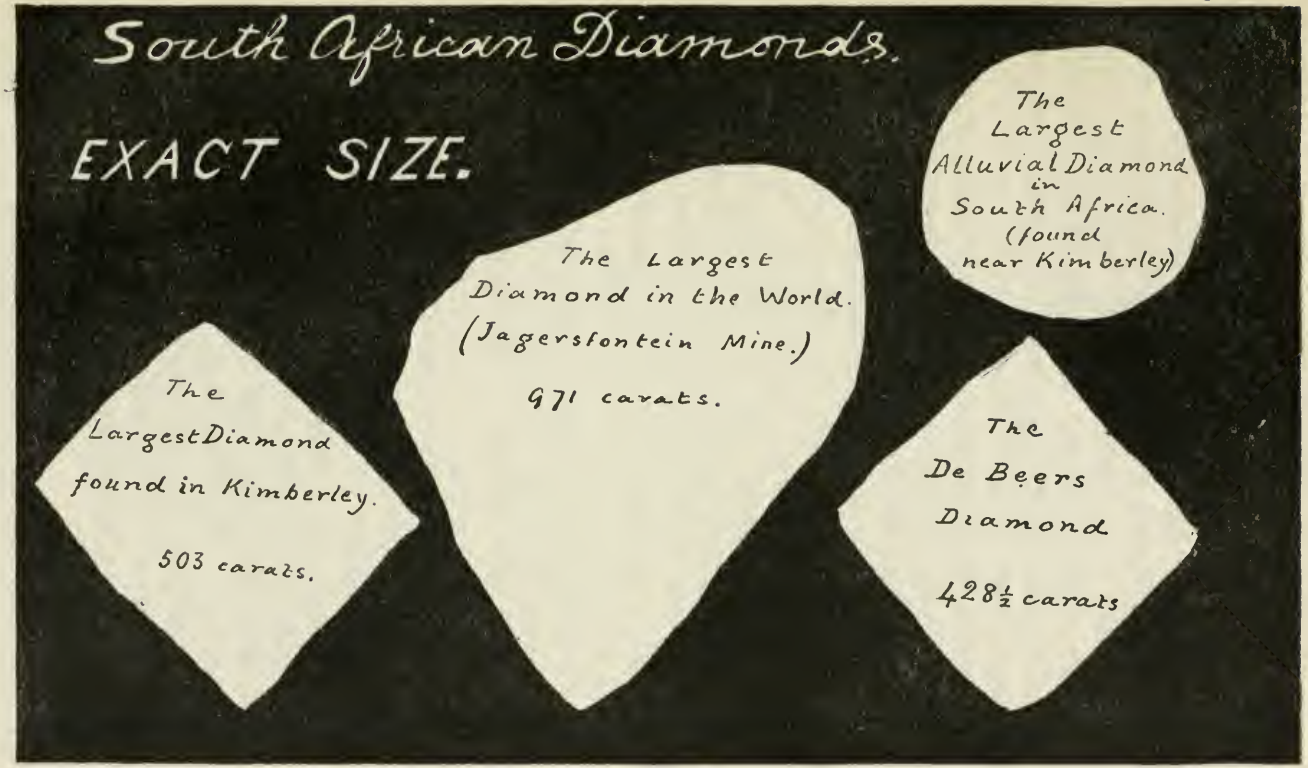
With a few unimportant exceptions the De Beers Consolidated Mines, Limited, own and work all the paying mines here, and in consequence it is they who control the diamond market of the world. I emphasize this fact, because until it is realized the conditions under which this work is carried on cannot fully be appreciated.

The De Beers Company, with its capital of four millions and a half, has formed so compact a system for according supply and demand that they are more completely masters of the situation in the diamond market than has ever been the case with " rings," or " trusts," or " combines " in any other industry. For the last six years, with the exception of the siege year, the dividends of the De Beers Company have remained uniformly at 40 per cent. This does not mean that the number of carats found during one year

was equal to that of another, or that the cost of diamond-getting did not vary, or even that the value of the yields of the various years was approximately identical. There was a variation between one year and another in the number of carats found to the extent of three-quarters of a million, and there was a variation of more than three-quarters of a million pounds in their value. And, strange to say, the year when the smallest number of carats was found, their total value was higher than that of any of the other years.

In fact, the output of the De Beers and Kimberley mines during the last year of which I have a record, ending June, 1901, is the lowest that has ever been touched since the Company took these mines over, with the exception of the first year after the consolidation and the year of the siege. This low output in 1901 was due to the Company being short of labour and supplies, as one of the effects of the war. But this mattered nothing, for the value of that small output was greater than any of the larger ones that had preceded it. I will endeavour to explain how this happy result is arrived at.

The industrialist who would work on economically ideal lines must first of all so arrange matters that he is not hampered by a want of money in carrying on his business. Next he must provide for a regular stream of work which never varies in its speed, and in which there is consequently no such thing as a "slack time." Finally, he


South African Diamonds.
EXACT SIZE.
The Largest Alluvial Diamond in South Africa. (found near Kimberley)
The Largest Diamond in the World. (Jagersfontein Mine.)
971 carats.
The Largest Diamond found in Kimberley.
503 carats.
The De Beers Diamond
428½ carats

R

must be able to sell everything he turns out without any difficulty and at his own price.

The De Beers Company has striven after that ideal, and succeeded. But it took more than a day to accomplish. They found that as long as they sold their diamonds in the more or less open market the middleman had a voice in fixing the price of diamonds. And so it became necessary for the company to be its own middleman. A syndicate was formed to take over the whole output of the company. Now, that purchasing syndicate is practically De Beers.

It is the business of De Beers the miner to work year in year out for twenty-four hours a day, excepting Sundays, and to hand over his output to De Beers the middleman (the syndicate), at a price agreed upon between De Beers and De Beers. It is the business of De Beers the middleman to place upon the market only such diamonds as he considers necessary, and to retain the balance as an asset for use when required.

That much abused person, the statistician, has discovered a very curious fact in connexion with diamonds. It is to the effect that, whatever the price of these stones may be, the world is always prepared to expend a certain sum annually on them; and that sum does not vary materially. If diamonds are expensive, the public do not buy so many, but they spend the same amount of money on them. If they are cheap, more stones are bought, and the annual

sum is thus made up. It has been ascertained that the annual spending capacity of the world on diamonds is about four and a half millions sterling. It is the business of De Beers the middleman to place as few diamonds on the market as the public will accept for that sum, and of De Beers the miner to keep his colleague supplied with the necessary diamonds for his purpose, and to run up a big reserve stock. At the present day the De Beers Consolidated Mines turn out between four and five million pounds' worth of diamonds.

It is only in South Africa that deep mining for diamonds is carried on. I believe I am correct in stating that the so-called "mines" in Brazil and elsewhere are merely surface workings. In South Africa alluvial diamonds are also found in various places. The so-called "Diamond Pipes" where mining for diamonds, in the proper sense of the word, is carried on, are at present confined to an area which is comprised in a triangle of which the apices are at Pretoria in the Transvaal, Kimberley in Cape Colony, and Jagersfontein in the Orange River Colony. "Pipes" consisting of the same "blue ground" have been discovered further afield, and have been found to possess all the qualities of the diamond pipes, save that they contained no diamonds. There are several of these "blind" pipes in the neighbourhood of Kimberley. I believe that no one really knows the origin or *raison d'être* of the diamond pipe, although there are many

theories, and consequently it is impossible to determine how far down towards the centre of the earth lies the point at which these long lines of "blue ground" start on their way to the world's surface. We do know, however, that they are volcanic in origin, and the workings at Kimberley, now over 2,000 ft. deep, show that the blue ground and the diamonds are still there. It is to be presumed that they descend into the bowels of the earth until they reach the inner surface of the world's crust, and so we may take it that the limit of deep diamond mining will be reached at that point where modern machinery is incapable of extracting the earth, or when the purchasing public goes on strike and refuses to pay the enhanced prices. We are, however, a long way off either of these eventualities.

It would appear that a "diamond pipe" is always complete in itself; it never intersects or fouls another on its course to the earth's surface. This is clearly demonstrated by the fact that the qualities of the diamonds in the various mines here all vary. In fact, they differ so much in quality that any of the Kimberley experts can easily sort out from a mixed heap the stones of the various mines. This is all the more strange when we bear in mind that these mines are only a few miles apart.

The expression "pipe" is due no doubt to the fact that running through the centre of the diamondiferous earth there is usually a core of barren rock.

In their course towards the earth's surface these "pipes" vary greatly in section. Where unopposed by rocks they extend in area, and when forcing their way through rock formations they become restricted in area—"wire-drawn," in fact. In all cases the dividing line between the blue ground and the ordinary formations is clearly defined. A blue pipe is irregular in section, and may have a circumference of some miles.

It is because this method of diamond mining is confined to a restricted area in South Africa that the outside world knows so little about it. For this reason I propose to deal with it at some length.

In this chapter I am confining my remarks to the De Beers group of mines, because it is here that the system of scientific diamond mining has attained its highest pitch. The few outside companies who work "pipes" on their own account all take their cue, as regards manufacturing, from De Beers, and only fail to follow that system when they have not the capital to go in for so elaborate a method, when their output will not warrant the expenditure, or when a patent stands in their way.

The most important outside mine is the Jagersfontein mine, where the largest diamond in the world was found. Its weight was 971 carats. Near Pretoria we now hear of a wonderful pipe, which, like most new discoveries, is going to eclipse all others, according to the verdict of optimists.

In an earlier chapter I have dealt with the labour question, the " Compound system " under which the natives are worked, and the strict searching to which they are subjected. I need, therefore, say no more about it here.

There are people who grumble at the De Beers monopoly ; but whatever the rights and wrongs of that question may be, it is apparent from the facts which follow that unless De Beers, or some other equally powerful combination, had taken matters in hand at Kimberley, it would have been impossible to carry on deep mining for diamonds successfully.

To make this point clear I shall have to run briefly over the manner in which diamond working was done before the consolidation took place.

At the beginning all went gaily. That was just over thirty years ago. Claims were pegged by individuals in the usual manner, and work was actively started by hundreds of diggers, all acting independently of each other. The country assumed the appearance of a gigantic chess-board, of which the squares were the pegged-out claims. The picture facing this page shows the state of affairs at the Kimberley Mine in 1872. Each miner owned a rectangular claim, thirty feet square, and the law provided for a roadway of a suitable width between each two claims. This principle acted well enough in the beginning.

But it was obvious that there would come a time when these roadways would collapse into

THE BEGINNING OF DIAMOND MINING AT KIMBERLEY (1872)

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the numerous holes with which the diggings were honey-combed.

When a certain depth was reached the inevitable happened. A miner, when the roadway had subsided into his claim, was in certain circumstances a gainer by the accident, and found himself the unexpected possessor of several tons of loose diamondiferous earth which had been disintegrated by the fall and was easy to wash. On the other hand, the landslip might demolish all his gear, and kill him, or some of his hands. Then, again, it might happen that the disappearance of the roadway would cut off the means of getting his stuff away to the outer world.

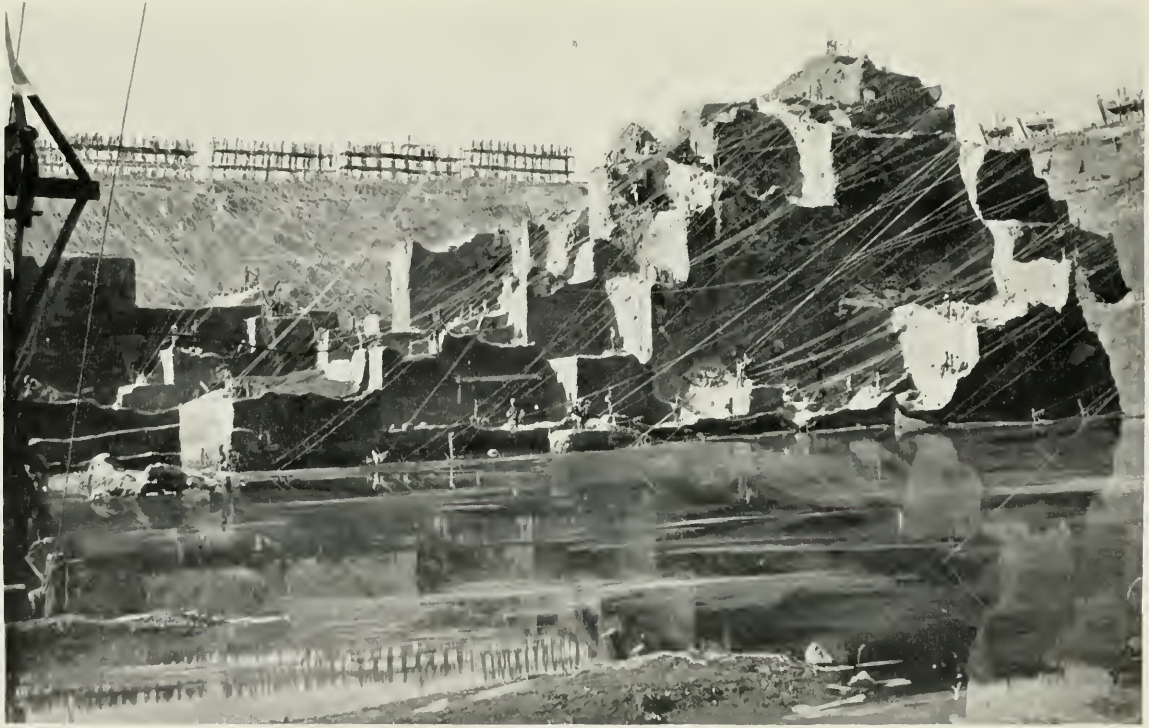
Then certain miners abandoned their claims, or sold them to companies who did not work them. The result was, as depicted in another illustration, that rugged rectangular towers of various heights, representing these unworked claims, alternated with rectangular holes of various depths, representing the claims where work was being carried on. Then the towers began to collapse into the holes, and lawsuits became the order of the day. Those who owned the towers sued those into whose claims their property had fallen for undermining and appropriating their ground. And those into whose claims the towers had subsided demanded compensation for damage to their gear and stoppage of their work.

As time went on matters became worse. Water was reached in such quantities that the individual

could not deal with it. It was everybody's and nobody's business to pump it out, and people could not agree as to the manner of doing this. The disintegrating effect of the water completed the work which the depth of the holes had commenced, and eventually the whole mine collapsed into one vast hole, which at the present day has the appearance of the crater of a volcano, and goes to a depth of 650 ft. from the original surface. A third picture shows this. It is claimed, and I should think with justice, that this is the largest open hole ever made by man.

While the hardworking miner was making a precarious living out of his claim, he was being robbed right and left by his Kaffir boys, over whom there was no control, and who were egged on to steal from him by a community of Jew dealers, which had sprung up on the spot, and whose members made a veritable "Tom Tiddler's ground" of these unorganized diggings. It is said that stolen diamonds to the amount of over a million sterling found their way on to the market annually in those days, and that the prices received by the miners from these land sharks for stones legitimately purchased barely reached that figure.

In any case conditions were such that it became no longer possible for the individual claim holder to work at a profit, or, in fact, to work at all. As with the Kimberley mine, so with the others in the neighbourhood. The history of the one is the history of them all. Nature,



THE EFFECT OF INDIVIDUAL MINING AT KIMBERLEY

To face page 248]

the Jew dealer, and the uncontrolled Kaffir killed the individual digger. He began to give place to the syndicate and small company. But these in their turn were unable to cope with the increasing difficulties.

And it was then, in 1889, that the De Beers Consolidation came about, organized matters on a vast scale, and laid the foundation for the scientific routine system of mining which is in vogue to-day, and which I shall now endeavour to describe.

The De Beers Company owns five mines, or diamond pipes, all of them within a radius of a few miles from Kimberley. These mines are known as the De Beers, Kimberley, Premier, Bultfontein, and Dutoitspan.

Of the above-named mines the Dutoitspan alone is lying fallow at present. Active operations are going on there for starting work on it. In the olden days it was in this mine that the largest diamonds were found, and I believe it was the first " diamond pipe " to be discovered.

Of the other four mines the Premier is the only one at which open working is at present going on. Its open depth is about 300 ft. But a shaft has been sunk, and levels are already being driven under it, and in a few years underground methods will take the place of the open workings.

Vaguely I should describe the underground work at Kimberley as being more like coal-mining than any other form of mining. The shafts

and levels and pit gear are much on the same principle. It is in effect a cross between the "longwall" and "pillar and stall" processes.

The levels occur at distances of 40 ft. and in the Kimberley mine, which is the deepest of them, the lowest level now attained is 2,160 ft. below the surface. As the levels are worked out the ground from above is allowed to collapse into them, and this in turn is hoisted. Dynamite, of course, is very freely used, and, as in all these mines there is a "horse," or core of barren rock formation, running through them, a considerable amount of expense is incurred in blasting and removing useless stuff. The most important of the risks run by underground workers in these mines are the collapsing earth and the "mud rushes." These latter occasionally break into a level without warning, and choke the passages, burying men and plant. The total mileage of levels in these mines I have been unable to ascertain, but I understand that eighteen miles of them are driven annually.

In the mines the loaded trucks are drawn by wire traction to a shoot, down which the blue ground is passed into a hopper in the lowest level, where work is going on. From this level it is fed into the skips that carry it to the surface. Here again it is dropped into hoppers, and from them into the trucks, which are to convey it by wire traction to the depositing floors. It is not very easy to realize the immense amount of paces necessary for this part of the work. At

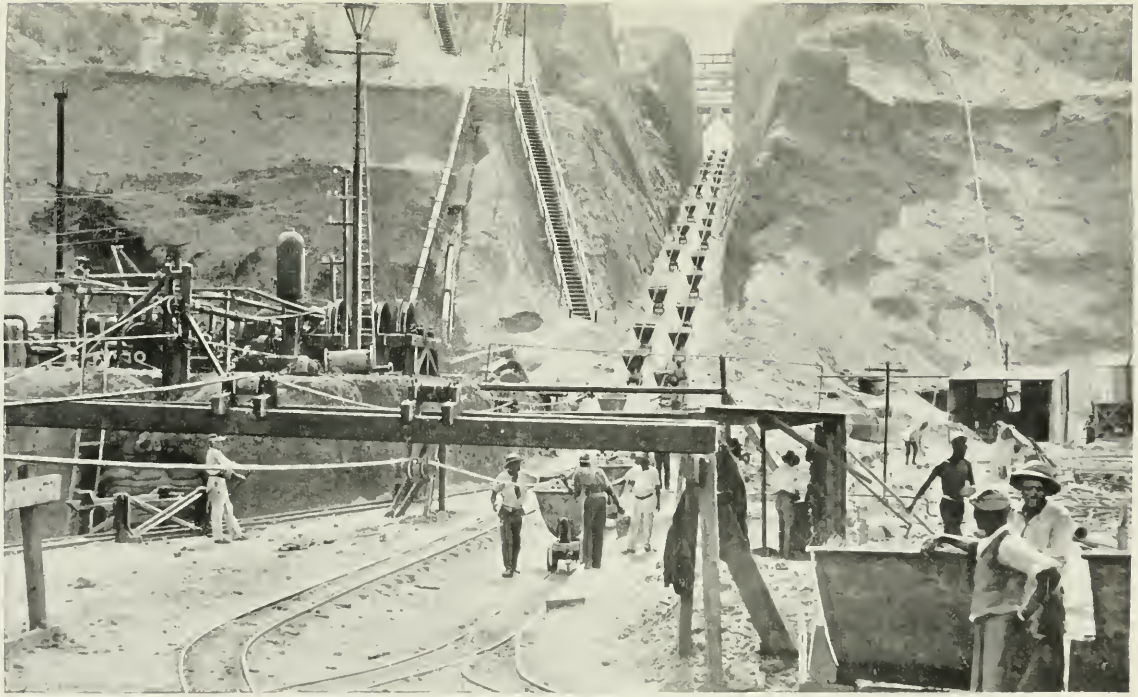
this stage the blue ground is supposed to be free of rock, as heavy fines are imposed on the underground workers who load useless material upon their trucks. The blue ground, thus put out to grass, is spread to the theoretical thickness of one foot. Here it is left for twelve months and upwards. The climatic influence during so long a period in this part of the world has a strong disintegrating effect on this somewhat recalcitrant material. At this altitude — 4,012 ft. above sea level — we have during a considerable portion of the year very hot days, alternating with cool nights, and at times very heavy rains. But the Company do not rely entirely on a merciful Providence to effect the necessary disintegration. Periodically a specially constructed harrow is passed over the stuff on the floors. These harrows are worked by traction engines, which are used as stationary winding engines. Their power of locomotion is merely utilized for shifting them from one place to another to open up a new line for the harrow as work proceeds.

One of the great advantages which a powerful company like De Beers has over the smaller fry is that it can afford to deposit for a period of twelve months a year's output of blue ground, representing over four millions of pounds' worth of diamonds. Without capital this could not be done, but it has been proved that unless the blue earth is subjected to this process of natural and artificial disintegration it is impossible to wash

it satisfactorily. The proof of this is found in the fact that, since the Company took over the *débris* left as worthless by its predecessors, who could not afford to deposit, they have been re-washing it, and have abstracted from it diamonds of sufficient value to pay them well for their trouble.

Another, and still more striking proof, of the wasteful results of the early primitive methods, is afforded by the following fact. In olden times a good deal of this *débris* from the mines was used for making up the streets of Kimberley. At the present day, only a few hundred yards from the room in which I am writing, individuals are engaged in "washing" the streets for diamonds. This process is shown by the picture which is the frontispiece of this book. In spite of the fact that the municipality stipulate that the streets shall be left in a better state by the washers than when operations began, these enterprising men are demonstrating the fact that Kimberley is literally paved with diamonds, and are making a very good income out of the stones they find.

When at length the blue ground is removed from the depositing floors its next destination is the washing machine. In practice it is found that among the stuff on the floors there are certain large lumps which have been impervious to the climate and the harrow. These recalcitrant lumps are conveyed in trucks to the central crushing-plant. Here they are first put through a rotary crusher of the "Comet" type, after which they are further



MECHANICAL HAULAGE AT THE PREMIER MINE, KIMBERLEY

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reduced by being passed between rollers which flatten them out and break them into pieces not thicker than $\frac{5}{8}$ in. One or more complete washing plants are attached to each mine. The blue earth after disintegration is conveyed in trucks to one of these.

On arrival at the washing-plant the trucks are drawn up an incline to a height which is above the machines. From here they find their way by gravitation on to a platform directly over the washers. In this platform are a number of hoppers which serve to feed the various machines below. Into these hoppers the trucks, which are side-tilting, deliver their stuff as they pass. The earth, assisted by a vertical revolving spindle, which projects into the centre of the hopper—on the coffee-grinding machine principle—falls into revolving cylindrical screens. These screens are perforated throughout their surface, and the loose earth and small lumps drop through the holes, and eventually find their way into the washing-pans.

The larger lumps are thrown out elsewhere and put through a crusher before being washed. The washing-machine is in reality a glorified pug mill, in which the rollers are replaced by a number of radial arms. From each of these arms depend into the circular trough a series of rods which, as the pan is revolved, serve to churn up the contents, and assist centrifugal force in guiding the heavy material towards the outside rim of the pan. Water in large quantities is admitted with the earth into the pan.

Stones and diamonds find their way automatically to the circumference, and the mud and water escape at the centre. When the stuff has been thoroughly washed the contents of the pan are drawn off into trucks below. There is now no earth left, and any water there may be overflows from the trucks as they are filled.

These trucks are now found to contain a number of small black stones, and mixed with them, although not necessarily apparent, are all the diamonds that were in the blue earth when it arrived at the washing-machines. The yield from the washers is known as "deposits," and is reckoned to represent in bulk from 1 to 1½ per cent. of the original blue ground.

The average value of a load—16 cubic ft.—of blue ground may be placed at 25*s*. On this basis it may be taken that a similar load of "deposits" from the washer should be worth at least £100.

Wherever the mine may be situated all these deposits from it find their way to one central establishment for the final processes. This is called the "Pulsator." Meanwhile the refuse from the washing-machines has been carried away up an incline by a hoist, which shoots it on to the mud-heap to add to the height of one of the various piles of *débris*, which are fast assuming the appearance of little mountains on the dead level of Kimberley.

The pulsator is in reality an automatic diamond-finding machine, and is placed in a building

of its own close to the main crushing-mill. On entering the pulsator-house the deposits are first subjected to an ingenious process, known as jigging. The purpose of this operation is to reduce further the bulk of the deposits by removing all the lighter stones. The yield from this machine is known as "concentrates." The concentrates are conveyed automatically into the hoppers of the "pulsator," and from there are allowed to drop by means of a carefully regulated feed on to the highest of a series of inclined trays, arranged in the form of a shallow ramp or staircase. These trays have a "pulsating," or vertically vibrating movement, which gives its name to the machine. The upper surfaces of these trays are covered with a thickish layer of Stauffer's lubricant, which has for its object the retention of any diamonds that may come in contact with it.

When the concentrates are fed on to the upper tray, water in considerable volume is admitted with them. The water, aided by the inclination and the pulsating movement of the trays, causes all the concentrates which do not adhere to the grease in passing to fall from one tray to another until they drop from the lowest on to a conveyor, and are never heard of again.

I do not know how it was discovered that diamonds will adhere to grease with such tenacity as to resist the triple influence of a flow of water, gravitation, and a vibrating movement which should tend to remove them. Such, however, is the case, and the process has been patented by the

Company. It has proved a very valuable invention, and is, I understand from Mr. Gardner Williams, the general manager, the only patented process in the whole of this elaborate system of diamond-getting.

So effective is the grease as a diamond-catcher that when the water has been turned off and the machine stopped, it will be found that nearly all the diamonds have been arrested on the top tray ; a few will be seen on the second, and an occasional one on the third. There are other trays below these in case of accident, but it is very rare for a diamond to pass even the second tray.

From time to time a man comes to the machine and scrapes the trays clean with a knife, placing the grease with the diamonds, and anything else which may be adhering to it, in a pot with small perforations. The pot and its contents are heated until the grease melts and runs away. These concentrated concentrates are taken to an office hard by and turned out on a table. Here the sorters take them in hand and effect the final separation.

The stuff which has been collected by the " pulsator " consists of small black stones, containing iron and other heavy minerals—their average size is that of the currants in a plum pudding—nails from the dynamite cases (which have been loaded up among the loose earth in the mines, and have faithfully followed the diamonds throughout their treatment), garnets, and diamonds.

At this stage the diamonds are clearly visible, and the eye of an amateur can easily detect even many of the small ones. It does not follow, however, that such a man would make an efficient sorter, as a long training and a special aptitude are required for this work.

Finally, the extracted gems are taken to the head office of the Company in Kimberley, where they are graded and classed by a highly trained staff of experts, who carry on their work in a carefully locked office, to which the visitor is only admitted on production of a pass, and after being scrutinized suspiciously through a little grill in the door. And when he gets inside this Holy of Holies, he finds himself railed off from the counters on which the piles of gems are being sorted, in case the sight of such vast riches should cause his cupidity to get the better of his morality.

And here the work of De Beers the miner ceases, and De Beers the middleman comes on the scene. The syndicate take over the diamonds and commence their negotiations with the dealers all over the world—in Amsterdam, London, Paris, and, above all, New York. It is De Beers the middleman who regulates the market, secure in the knowledge that he owns nearly 90 per cent. of the world's output in diamonds, and that as long as vanity shall last the public will insist on buying at his own prices diamonds up to the annual limit fixed by the statistician. My business, however, is with De Beers the miner, and I must return to him.

Although, wherever possible, hand labour has been abolished in favour of machinery, most of the drilling for blasting is done by hand. It is found that while a Kaffir boy soon becomes efficient at jumping holes by hand for this purpose he is not to be trusted with a machine. The cost of white labour, therefore, has told against the use of the rock-drill in these mines, except in special circumstances. From the time that the "boy" fills his truck with blue earth in the mines the stuff is not touched by hand labour until twelve months later, when it leaves the depositing floors for the washing-machine. At that stage, of course, the loading of the trucks must be done by the hand-shovel. From that time onwards until the man scrapes the grease plates of the "pulsator" for the purpose of removing the concentrates, all the processes are automatic.

But, however much science may eliminate hand labour, it stands to reason that an enormous *personnel* is required to run a mining scheme of these vast proportions.

It must be remembered that, besides these five mines, with their railways, tramways, machinery, engines, repairing shops, crushing and washing plant, and all the accessories which they entail, the Company has its own explosive works, cold storage, market gardens, and model village of Kenilworth, with its water supply, lighting, churches, schools, and so on. It has, too, its own convict station, its police, its elaborate detective organization for entrapping the diamond thief and the illicit dia-

KIMBERLEY DIAMOND MINES : MUD HOIST AND SHOOT

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mond dealer, and a host of other accessory undertakings and responsibilities. All this entails a large staff, and an immense amount of black and white labour. I am told that when working full the Company can employ 15,000 black unskilled hands and 2,500 white men, all skilled. At the present time Kimberley has not yet recovered from the effects of the war, and is still short-handed. As far as whites are concerned, I would repeat what I have said before, that the Company has no difficulty whatever in filling up all vacancies from the families of the men already employed there.

I have endeavoured, but without success, to get some idea of the value of the machinery and plant used in these mines ; nor can I ascertain the average annual expenditure in machinery and plant. This, of course, varies very much indeed in different years. The practice of the Company, however, is to purchase machinery and plant out of the profits of the current year, and to wipe the entire value of these purchases out by debiting the cost to profit and loss account. Thus, presumably, at the present day, the entire plant of the Company stands at nil in its books. A sound arrangement, but one which only a few industrial concerns could afford to adopt.

I have mentioned elsewhere in this book that, in spite of the fact that there is a large German influence in the directorate, and that the management is American, Great Britain

secures by far the largest share of the orders for plant. Germany is not worth mentioning as a competitor of ours at these mines. The United States, however, secures most of the electrical plant, including the steam engines for producing the power, and, of course, the electric motors, which the Company is applying wherever possible, notably in its machine shops, and washing-plants. In hauling and other stationary engines, traction engines, boilers, compressers and compressed air engines, winding-gear, wire ropes, skips, hoists, trucks, trolleys, conveyors, washing-plant, and certain other commodities, we may be said to hold the market. But of the rails, of which there are now over one hundred and fifty miles above ground, and possibly as many below, we only secure about half the orders, the rest going to America. Americans also do most of the rock-drills and many of the pumps.

A very large proportion of the trade is done by firms like Messrs. Fraser and Chalmers, of Johannesburg, Erith, and Chicago, who lay themselves out specially for mining-plant which will suit this country, whose representatives are always on the spot, and whose goods, as they manufacture both in England and the United States, may come from either country.

Before I reached Kimberley I had been told over and over again by engineers that the De Beers Company was wasteful as a user of machinery. Certainly the newcomer is struck with the acres

of scrap-heaps which surround the machine-shops. Here he finds a veritable mechanical Golgotha, where discarded machinery lies rotting on the veld. And yet when he remembers that in this place everything has to be sacrificed to attaining and maintaining an even flow of work throughout this intricate system, and that the huge profits make it quite unnecessary for the Company to keep a machine in its works when it can find something better by which to replace it, he can find plenty of extenuating circumstances and many valid reasons for a policy which would seem in many businesses a reckless extravagance.

After all, if extravagance there be, it is all good for trade, and a company which can afford to write off its machinery as it buys it, and can distribute in dividends a million and a half pounds in a year and carry forward in its books a sum almost equal to that figure, is not obliged to study these minor economies, which are sometimes false economies.

I append below a few statistics as to the output and cost of diamond-getting during the year ending June, 1901. The loads referred to are of 16 cubic feet, and the material hoisted is the diamond bearing "blue ground." The "cost per load" is the cost of mining, hauling, depositing, washing, and pulsating—the entire process. The value per load is the average value of the diamonds found in a load :—

Mine.	Loads hoisted	Loads washed.	Cost per load.	Value per load.	Value of diamonds produced
			s. d.	*s. d.*	£
De Beers ..	1,242,020 .	1,675,881 ..	8 5 ..	30 3	3,959,383
Kimberley..	878,377 .	940,992 ..			
*Premier ..	1,571,631 .	1,517,981 ..	3 1 ..	8 1	610,831
†Bultfontein	148,086	— ..	—	—	146
Tailings and débris ..	—	265,239 ..	—	—	58,484
Total ..	3,840,114	4,400,093			4,628,847

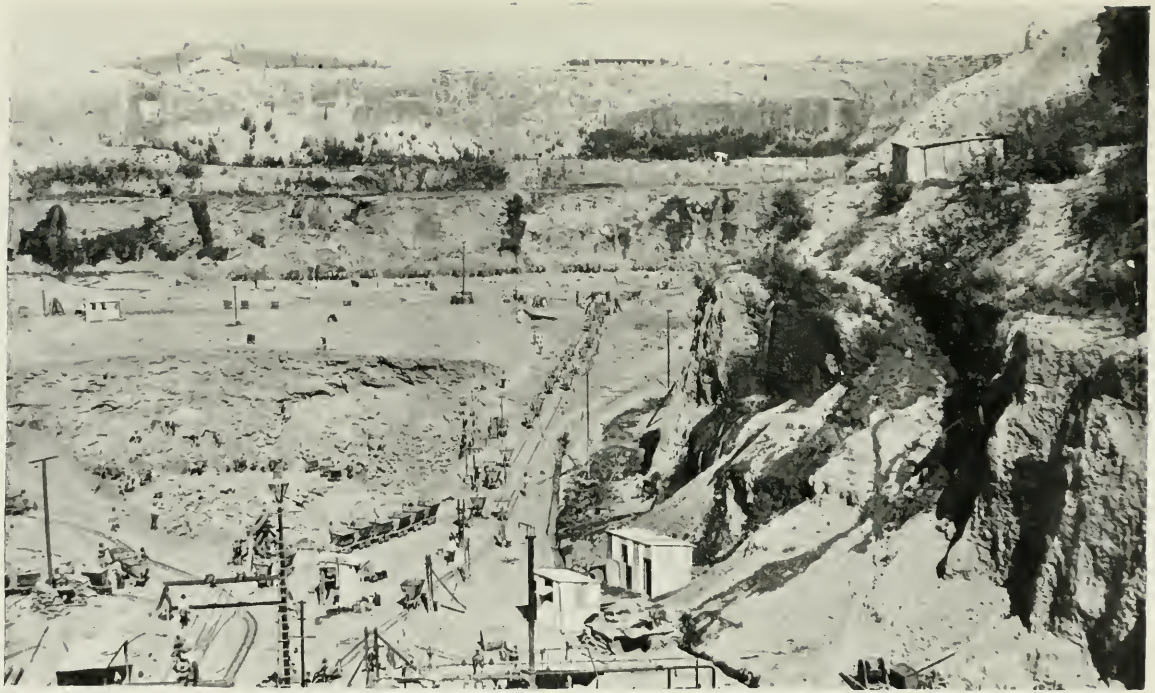
In addition to the above there were at that date 3,758,168 loads of blue ground on the depositing floors, and about 34,000,000 loads "in sight" in the various mines.

During the year in question the Company was terribly hampered by the war, which restricted its labour and made it impossible to obtain the normal supplies of coal and mining requisites. In ordinary times the Company reckons that it requires 1,000 railway trucks per month for its coal supply, and about 300 for general supplies.

Although still working at a great disadvantage, as one of the effects of the war, things are rapidly getting into shape again. Perfect autonomy is kept up throughout this complex system, which extends over miles of country. The whole process from start to finish, with the exception of the break which occurs at the depositing floors, where the blue earth may remain for a longer or shorter period as desired, is dependent on

* The Premier mine is all carried on by open workings at present.

† The reason for the small return from the Bultfontein mine is that it had only just been started, and there had been no washing.



PREMIER MINE, KIMBERLEY (OPEN WORKINGS)

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maintaining a regular flow of traffic from one point to another. Skips, trucks, hoists, mud elevators, conveyors, washing and crushing machines, and the pulsator must all keep pace with each other. And they do. A highly efficient autonomy is maintained throughout the system. When such is the case there must be a lavish expenditure on reserves in engines, machinery, parts, and stores; and, on the least sign of inefficiency, plant must be discarded and replaced. This accounts for the large graveyard of machinery to which I have already referred, and which, if it were near any large manufacturing centre, would prove a happy hunting-ground to the second-hand dealer in machines.

The De Beers machine-shop is neither a model in design or in arrangement. It is hardly likely that it should be. Like Topsy, it "growed," and it outgrew its constitution. The very varied nature of the repairs which must be undertaken here, from the largest to the smallest, has obliged the Company to fill this building with a very mixed collection of tools, and often to plant them down wherever a space could be found.

The capacity of this shop for dealing with anything, however, stood Kimberley in good stead during the siege, when the Company was enabled to manufacture the big gun "Long Cecil."

In conclusion, I would mention an interesting fact. Every one of these mines has been discovered by accident, and I believe it to be so

with all the diamond-bearing "pipes" that are now known. And this in spite of the fact that an immense amount of money has been spent in prospecting. The prospectors have often discovered pipes of the identical blue earth, but they have been all "blind," i.e. without diamonds.

It will be when somebody discovers another Kimberley that the De Beers Company will have to look to its laurels. Until then it will have it all its own way.

What will be the effect upon this question of the new Pretoria discoveries?

TYPICAL VIEW OF RAND MINES

HEAD-GEAR AND SORTING HOUSE AT THE ROBINSON MINE, JOHANNESBURG

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Chapter XVII

UNDERGROUND AT THE RAND MINES

THE man who can grasp thoroughly the theory and practice of gold-mining on the Rand, without visiting the place, must be exceptionally gifted.

There are many books which touch on the subject, and some that are entirely devoted to it, books that are bulky and exhaustive ; books that are practical and theoretical, and scientific and optimistic, and pessimistic. There are the annual reports of Paul Kruger's Government in Dutch and English, giving every imaginable form of statistic which is likely to be useless to the student. Then we have the frequent reports issued by the Chamber of Mines, of more value to the financier than to the engineer.

And, as if these documents were not sufficient to confound the searcher after light, there are the reports of the individual companies ; and the name of these companies is legion. For months before my arrival here I had been struggling with this mass of complicated literature. To my shame, I must confess that I utterly failed to gain a coherent impression as to the way in

which mining was conducted at Johannesburg. The books told me too much and too little, and their perusal forced upon me only one clear impression, a conviction that to convey by words an accurate appreciation of gold-mining on the Rand must be a very difficult task.

It is not that, taken piecemeal, there are any particularly difficult situations. As an engineering problem, the Rand mines have offered less complications to contend with than any other institution which has yielded proportionate results.

The gold was found "sticking out of the ground." Its continuity was established from the start. The wily financier, seeing a sure return for his money set the ball a-rolling and the British public followed suit. As an actual mining problem the matter was fairly simple. Existing appliances were sufficient for most of the requirements. No vertical shafts were required in the early days. There were no noxious gases, no choke-damp, no mud-rushes, no trades unions. The geological formation necessitated no undue propping, the hang of the reef necessitated no undue complications in the underground work. There was no dealing with frozen ground, as at Klondyke ; no lack of water, as in Western Australia ; no lack of provisions, as in most other goldfields, in the early days of their existence.

The real difficulty of understanding the Rand problem lies not in the engineering question by itself, but in accurately weighing and blending

the political, financial, industrial, commercial, and engineering influences which between them have brought about the present state of affairs.

It is for this reason that the man who would gain his knowledge from books finds himself confronted with a difficult task. It is for this reason that I feel it to be extremely difficult to convey an accurate impression of the Rand of to-day. In tackling the subject I have approached it from a definite standpoint. I am assuming that the reader is not a mining engineer, and I am endeavouring to put myself into the frame of mind in which I was before I reached Johannesburg. My endeavour will be to give the sort of information which I should have been glad to have come across in a compact form when I was studying my subject before arrival.

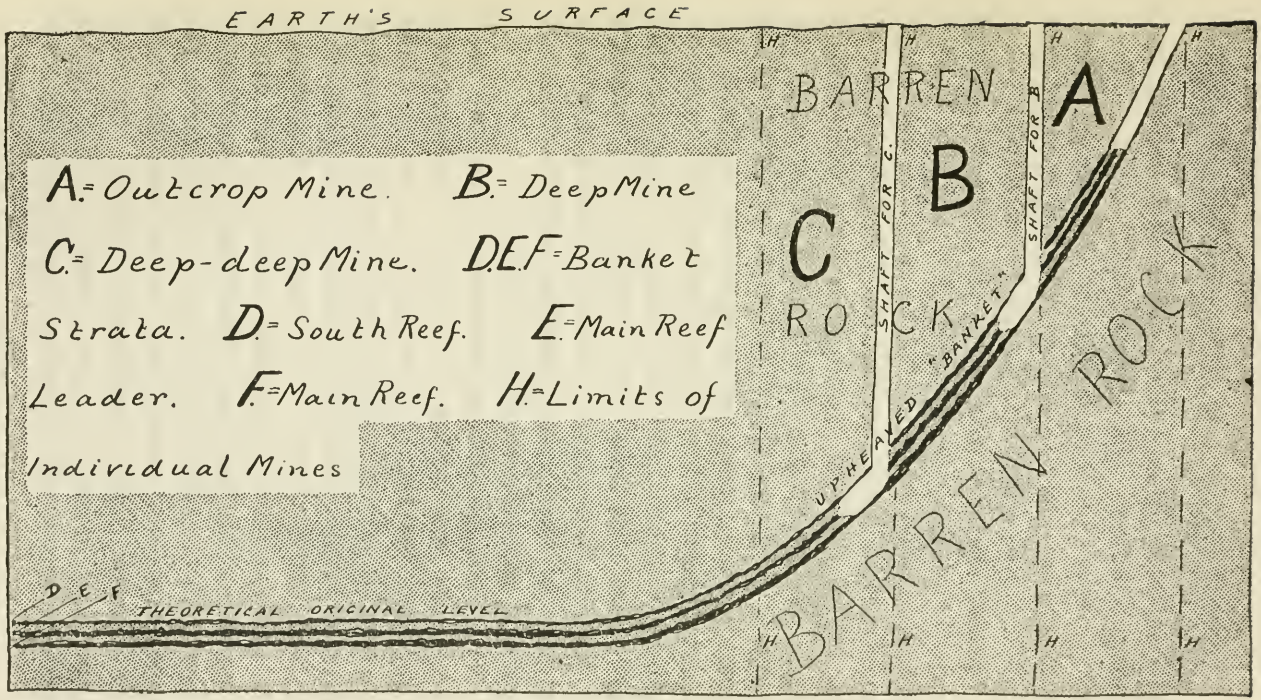
It is not my wish to discount the value of the books I have referred to. Many of them are excellent. Possibly I shall say but little which is not to be found in one or another of them by the man who can afford to make a minute search. Certainly there is a mass of information in them on which I shall not even touch, but which will be useful enough to the student who would thoroughly master the question in all its details. I can only hope here to give a practical and brief outline, and in doing so I fear that I may be accused of being too elementary. That, however, I must risk for the sake of making myself clear.

When the visitor to Johannesburg wakes up in the train on the morning of his arrival he can

hardly believe that he is still in South Africa. The veld as he knows it has disappeared. The treeless, grassy desert that he has become accustomed to is gone. For here there are both trees and grass in patches, and the whole scene is more cheerful to look upon than is usually the case in this country. On one side of the railway, in a long uninterrupted line as far as the eye can see in either direction, are chimney-stacks, and head-gear, and tram-lines, and trucks, and stamp mills, and mud-hoists, and cyanide-wheels, with their accompanying vats, and heaps upon heaps of pulverized tailings, almost snow-white, from which the gold has been extracted.

This interminable line of chimneys marks the famous outcrop of granite, which, with its mantle of gold-bearing conglomerates, has made Johannesburg. This is the Rand. We have come to be possessed of this "reef," which is not a reef in the proper sense of the word, and we have paid for it dearly in blood and money. Now it is ours. What is it? What are we going to make of it? Shall we know how to turn it to account?

There are many theories as to the geological conditions of this district, and some facts. Thousands of feet below the earth's surface—certainly over 6,000 ft.—the gold-bearing conglomerates, known as "banket," were deposited in three horizontal layers. The top one was the thinnest and the least defined, and in most cases it was only a few inches in section. In places it



SKETCH EXEMPLIFYING GOLD MINING ON THE RAND.

died out altogether. The middle reef was thicker, and the lowest was the thickest of all. These three layers are now known in their present positions as the "south reef," the "main reef leader," and the "main reef" respectively.

Banket is a Dutch word signifying "almond rock," and the conglomerate has been so named from its appearance. It is made up of white quartz pebbles embedded in what is to-day a hard blue cement, containing iron pyrites and gold. At one time the pyrites, the gold, the pebbles, and the other materials of which these conglomerates are made up, were unattached, and lay merely mixed together as left by a receding ocean in prehistoric days. Geologists are agreed on this point, on account of the manner in which these layers were deposited and the contour of the quartz pebbles, all of which are rounded and obviously waterworn.

At a later period an eruption of granite rock forced its way upwards through the horizontal "banket" strata to the earth's surface, where it outcropped, bringing with it on its southern slope a triple mantle of banket as represented by the three "reefs" aforesaid. It was during the process of this eruption that the heat attending it transformed the banket layers into firmly cemented conglomerates, which to-day have the appearance and consistency of a hard blue and white rock, with occasional yellow metallic flashes. The gold is not found in the quartz pebbles, but in the cement which knits them to-

gether. Most of it is embedded in the iron pyrites. It is the pyrites, and not the gold, which occasion the yellow flashes visible in a section of these conglomerates.

We have now to consider an outcrop of granite, overlain on its southern slope by the three layers of banket. For all one knows to the contrary, similar layers may be found to exist all around the upheaved rock when its contour has been traced. Up to now, however, we have only to do with the southern slope, which is the one that has been discovered, is being worked to-day, and is known as the Rand goldfields.

Johannesburg came into existence immediately north of this outcrop, and east and west of Johannesburg, following the line of the reef, an ever extending line of "outcrop" mines sprang up. Six months ago I should have said that the known reef extended for some forty or fifty miles in length, with Johannesburg cutting this line in two, more or less in the centre. To-day we have a long extension to the east (part of which is colloquially known on the London Stock Exchange as "Coronations"), said to be a continuation of the "main reef series."

It matters nothing to the shareholder, or to the maker of machinery, whether this new extension is part of the original reef or not, provided that it carries plenty of gold. The former wants a return for his investment, the latter a market for his goods. In any case, the new discoveries, if proved, would appear to add another thirty

odd miles of reef to the eastern end of the Rand. The continuity of the known reef is not perfect. There are several breaks or "faults" in the formation.

On the Rand goldfields prior to the war some eighty odd mines were extracting gold at a rate which in 1898 had reached a total value exceeding £15,000,000 for one year. At time of writing this only forty-one of these mines are working, and all of these are short of labour. The latest monthly returns show that during October last the output was 179,660 ounces of gold, to the value of £763,149. This means that the present output is at the rate of over £9,000,000 per annum. This is creditable enough when only about half the mines are in operation, and not one of them is in full swing.

As stated above, the banket formation follows and overlays the upheaved granite. In consequence it usually dips at an abrupt angle into the earth. This angle becomes less accentuated as the reef descends.

The "Deep" and "Deep-deep" mines, i.e. second and third row of mines, which attack the reef at some distance south of the outcrop, are sufficiently numerous to have proved this flattening out tendency. This has led optimists to believe that they will some day arrive at a level floor of banket, which will thus put a limit to the ever increasing depths to which shafts have now to be sunk. Some go even further, and predict that it will be found that the existing mines

are only nibbling at one of the edges of an enormous basin of banket of irregular and so far undetermined shape, but extending far south into the Orange River Colony. It has certainly been ascertained that the banket formation exists south of the Vaal River, though this has not yet been proved to form a portion of the alleged "basin."

The long line of mines which forms so striking an element in the local scenery are the outcrop mines. They are worked from the surface at the outcrop diagonally downwards towards the southern limit of the property. These mines have no vertical shafts, for in sinking they follow as closely as possible the descending incline of the reef.

A second row of mines, further south, take up the work where the outcrop mines leave it off. These are the mines known as "deeps," to which I have referred above. They strike the reef, by means of a vertical shaft, at some distance below the surface, after which they adopt the policy of the outcrop mines, and sink inclined shafts to follow the angle of the reef. This second line of mines, though by no means as imposing as the outcrop series, is continually extending. A third, or "deep deep" line of mines, further south, attacks the main reef at a still lower level. The number of rows of mines which will spring up south of those which now exist is only limited by the depth at which the extraction of ore becomes a commercial impossibility.

If, as is suggested, these mines are within measurable distance of reaching a level floor of banket, and if that floor will not be found at too low a level for operations, then the number and disposal of future mines will be determined by the area and shape of that floor.

I find myself continually harking back to theory in this chapter. My excuse must be that the atmosphere of Johannesburg is surcharged with speculation as to the possibilities of the Rand. This is, perhaps, the only imaginative recreation which this essentially hard-working and matter-of-fact community allows itself.

Before leaving the question of possibilities, however, I should like to say that every month that passes points to the fact that the gold resources of the Rand are vastly in excess of the largest estimates of a few years ago, and that, as far as exhausting the supply is concerned, we have hardly yet done more than make a start in the business.

It is not my purpose to deal with the mining laws or the relative rights of the farm owner, the projector, and the claim pegger. In this respect I would only say that the size of a single mining claim is about 153 ft. long, or parallel with the outcrop, by 413 ft. at right angles to it. A very sensible law of Paul Kruger's, which is in force to-day, and which differs from the gold-mining laws in a good many other countries, is to the effect that the claim-holder has only the right of mining within the area contained

by the vertical limits of his surface claim. He cannot follow the reef beyond those imaginary vertical lines, no matter how far down he may be working.

And here I would refer to the very rough sketch on an earlier page of this chapter. Obviously it is entirely out of drawing, for the simple reason that to make a correct section which would convey anything to the reader would be an impossibility within the limit of the page.

Let the London shareholder in Rand mining companies study this sectional picture, for its purpose is to show how the life of any particular Rand mine is strictly limited. Wherever the surface property may be the underground area is always of an exactly corresponding size. The mine is of no value whatever until the banket strata are "struck," and when these have been worked out that particular property as a mine is worthless. The thickness of the banket strata is never more than a question of tens of feet. There is no equivalent to the diamond pipe which descends vertically *ad infinitum*. When at a Rand gold-mine the banket strata have been worked through, the mine is completely exhausted.

At the present day in Johannesburg calculations are made so carefully, and experimental borings and assays are carried on so thoroughly and scientifically, that the life and value of any particular mine can be forecasted with precision. That life and value depend upon the area and section and gold-bearing properties of the banket

strata at that particular point, and on their depth from the surface.

It is a knowledge of this, which is easily obtainable on the spot, which enables the man in Johannesburg to invest his money in a practical manner. It is a want of this knowledge by the home investor which puts him out of the running altogether. In the ordinary course the value of a concern is judged by the purchaser by recent results. There is no reason why a Rand gold-mine which has paid splendid dividends for years should not stop abruptly. That in fact is what they are all bound to do, and the only reason why this has not been brought home to the investor in England is because these mines have not yet been going on for a sufficiently long time to make this a palpable fact to those who have not studied this question.

The permanent strength of Johannesburg does not rest on the permanent value of the mines that are being worked to-day, but on the enormous field for future mines which is continually extending as time goes on and prospecting brings to light new discoveries.

It is for this reason that a particular Rand mine or group of mines cannot be recommended to the widow and orphan as a life-long investment, unless, of course, the company in question is acquiring new properties against the day when their existing mines will be exhausted.

The individual miner on the Rand is as extinct as the Dodo. Even when new areas are pegged,

most of the pegging is done by proxy for capitalists, or by people who promptly transfer their rights to a syndicate. The single claim thus disposed of becomes a unit in some large mining area owned by a company; and these mines in their turn are being absorbed into "groups" of mines under one control. Some day, no doubt, these groups will lose their identity in a huge "consolidation." And the work of that organization will be to regulate the output of gold, to absorb any new properties that are worth absorbing, to gain political ascendancy, to make the gold laws of the country, and to rule South Africa.

Rothschilds, De Beers, Werner Beit, and most of the big capitalists are mixed up in the Rand. England, France, Germany, and the United States all have a finger in this financial pie.

Our guarantee that South Africa will remain British is that these great financial houses of mixed nationalities prefer the British flag to that of any other country for purposes of their trade. I do not say that the trend of affairs in the above direction is good or bad, I draw no moral from it. I merely point it out as bearing upon the question under discussion.

To come back from castle-building in the air, and descend to earth—to go below the surface, in fact—the theory of all these mines, as far as sinking shafts and driving levels are concerned, is identical. Practice only differs from theory when irregularities in the reef formations necessitate departures from the general rules.

In outcrop mines all the hauling is up an incline. In the " Deep " and " Deep-deep " mines the first or lower portion of the lift is up an incline, and the final, or upper portion, is up a vertical shaft. The three layers of banket, as above pointed out, vary greatly in thickness. They also vary in the distance which separates them from each other. Again, they vary greatly in their yield.

I saw it laid down by an authoritative writer that the main reef, which lies next to the upheaved granite, was so poor that it was never worked, and that it was always the second and third layers—the main-reef-leader and the south reef—that were relied upon for the gold output. This certainly holds good over a great portion of the Rand, but in some instances the main reef and the main-reef-leader are the only ones worked. The prolific south reef has become so attenuated in section on certain properties, and has wandered so far from its companion reefs, that in such cases it is not deemed worthy of being troubled about.

If a merciful Providence had made these banket formations of a uniform thickness, and caused them to descend into the bowels of the earth at a constant angle, matters would have been much simplified. Miners could then have sunk their shafts and driven their levels right through the stuff, and everything hauled to the surface would have been good ore. That would have been ideal mining. As, however, the gold-bearing

reefs vary between a few inches and some feet in section, as the worthless rock between them is equally uncertain in section, and as their descent is usually in the form of an irregular curve, a large percentage of barren rock has to be mined with the banket.

When the reef has been struck either at the surface on the outcrop mine, or at a certain depth on a deep mine, the angle of the inclined shaft is determined by the judgment of those concerned as to the probable approximate angle of the reef. The object is to keep the reef well within the limits of the hanging and foot walls of the shaft, and in sinking one has often to vary the gradients of the descent to follow the natural vagaries of the reef.

One or more shafts are sunk in this manner, starting from the highest point—i.e. the northern extremity of the property—and following the reef in its downward course to the southern limit of those imaginary vertical lines which are the underground boundaries of the mines.

The distances between the levels, which branch off from the inclined shafts and hug the reef, vary between 100 ft. and 200 ft. These levels are connected with those immediately above and below them by winzes—small inclined shafts lying parallel with the main shaft. In the construction of winzes work is carried on from above and below—i.e. they are done on the "sinking" and "raising" principle.

Between the winzes the ore is extracted by

stoping. In width the stopes are made where possible to conform to the section of the reef which is under operation. But as this section does not always permit of sufficient room to work in, a good deal of barren rock often has to be removed in stoping. The hanging wall of a mine is supported by pillars of ore, left standing for the purpose, and by "stulls" built up of detached quartzite. Where a level has been worked out, the ore pillars are removed and the "stulls" remain.

All excavation work is done by drilling and blasting. For shaft sinking it is agreed here that the hand-drill is quicker and less costly to work than any machine-drill. These last, too, are impracticable for narrow stoping, which forms a large portion of the work. It is also found that, whereas the smaller machine-drills are not stiff enough for the work, the larger machine-drills, owing to the size of the holes made by them, are wasteful of dynamite and of ore, besides occasioning the blasting down of an unnecessary amount of barren rock, all of which has to be hauled and sorted at the surface.

In the mines the ore bins on the various levels are placed above the hanging wall of the shaft, and the skips are filled from them through shoots. The skips are hauled to the surface in the usual manner, and their contents automatically tipped either direct into the bins over the sorting-house, or into trucks which convey them to that house, if placed elsewhere.

This ends the underground work.

The Rand mines are not unhealthy as compared with most mines elsewhere. A certain number of miners suffer from pulmonary complaints, but the average standard of health is good. Ventilation is easily obtainable by ordinary compressed air methods, and is as a general rule satisfactory. The pumping arrangements are fraught with no difficulties, and are excellent. The main arteries of these mines are habitually lighted by electricity where possible. Elsewhere open candles are used. Timbering only extends for a short distance from the surface, as the ore piers and "stulls," above referred to, suffice, as a rule, to support the hanging wall.

Chapter XVIII

THE TREATMENT OF GOLD ORE

IN the last chapter the process of mining was brought up to the point where the banket conglomerates are hauled to the surface. This, of course, is effected by means of the ordinary self-tipping skip.

With the banket there is always a considerable admixture of "country rock," the barren formation between which the banket layers are found. The percentage of barren rock is large, owing to a variety of causes. The most important of these are :—First, that it is somewhat difficult to follow the reef without blasting away a lot of useless material ; and, secondly, the section of the banket is often so narrow that, in stoping, one is obliged to detach barren rock in order to make the passage wide enough to work in.

When barren rock and gold-bearing ore are so mixed together a great deal of useless truckage and haulage is the natural result. I believe in the early days practically everything that came to the surface was put through the mill. But it soon became evident that it did not pay to employ labour, and, above all, to wear out machinery in

treating large quantities of barren rock, which was as hard as the banket itself. Thus it was that the process of sorting came about, and this is now regarded as an important—in fact an essential process at these mines.

When a mine has only one shaft it is usual to build the sorting-house actually into the head gear, as shown in the photograph, or close alongside of it. This is done so that the skips from the mine may tip the stuff directly into the bins above the sorting-house, and thus avoid unnecessary truckage. When a mine has two or more shafts at which hauling is going on, the sorting-house is placed in a suitable position for taking the stuff from all. In this case the skips deliver their loads into bins, whence the ore is dropped, on the shoot-and-hopper principle, into trucks, which carry it automatically up an incline into the bins at the top of the sorting-house. In either case the stuff eventually falls on to an inclined grid with $\frac{3}{4}$ in. open spaces between the bars. Revolving perforated drums are also used for the purpose of sifting out the small stuff. At this stage jets of water play upon the ore, washing all the dust and fine stuff through the openings, and effectively cleaning what remains, so as to render the identification of the banket from the "country rock" a very easy matter. The stuff which escapes through the bars is known as "fines." It dodges the sorting-table and the crusher, and passes on direct to the stamp-mills. Ninety per cent., or more, of the material remains

on the grid and is allowed to fall in easy instalments on to the sorting-table, or conveyor, as the case may be. The sorting-table would be more accurately described as a revolving counter, as, to use an Irishism, its centre is not there. Its outside diameter is some 25 ft. or 30 ft., and its width is some 6 ft. or 8 ft. Kaffir boys stand round it and pick out the barren lumps of rock as they pass. These they throw down shoots into trucks, which carry them away to the rubbish heap. The table makes one revolution in something over a minute, and a stationary scraper, or plough, removes the ore that is left on the table and shoots it into the mouth of a common stone-crushing machine. A more modern application of the revolving counter is one which has two levels. The higher level is on the inner portion of the table, and is somewhat narrower than the outer one. In this case all the ore is delivered on to the outer and lower table. The sorters pick out the barren rock and throw it upon the upper table. The scraper, or plough, acts only upon the lower table, and the "country rock" is shovelled off the upper table into the waste shoot by a couple of "boys."

There is yet another method of sorting. This is by means of a slowly moving belt conveyor. When this is used the sorters stand on either side of the belt, and throw the barren rock into holes in the floor, while the ore delivers itself to the crusher. There are mine managers who swear by the circular table system, and others who

believe only in the belt. I should say that there is but little to choose between them. In passing, however, it is as well to mention that the tables are usually made in England, and the belt conveyors are nearly all American.

At the De Beers diamond mines rotary crushers are used, and there are still a few of these, I believe, on the Rand. The usual process, however, is the ordinary reciprocating crusher, the name of which I forget, but which acts on the munching-up principle. This reduces the lumps to a maximum thickness of $2\frac{1}{2}$ in.

From the crushers the ore is trucked away to bins at the top of the stamp-mills, where it is tilted as wanted at any point along the length of the building. Thus a constant supply to all the stamps as required is effected. A few of the mines are discarding trucks in favour of Robins' conveyors, and as a material has now been found for these belt surfaces which will stand against the contact of the hard and rough-edged banket lumps, and as the cost of handling banket by this means is said to be reduced from 8*d* to 2*d*. per ton, we may fairly expect that all new mines will adopt this system, or something of the sort. The Robins' conveyors are of American manufacture. Indiarubber is the substance which has been found to stand for this purpose when everything else has failed. I carefully examined a belt on the Robinson Deep Mine, which has been working for several months, and had lifted, I am told, 80,000 tons. I failed to detect as much as a

scratch upon its surface. The virtues of india-rubber are truly wonderful, and its non-wearing-out qualities in unexpected circumstances have proved most useful to modern industrialists. I remember that, not so many years ago, saw-mill engineers used to tyre their band-saw pulleys with all sorts of materials, and that whatever they used had to be replaced at frequent intervals, as the saw teeth wore the surface into grooves. When india-rubber was introduced for this purpose, wear and tear on this part of the machine practically ceased.

For the benefit of those who do not know the Robins' conveyor, I would say that the pulley which receives the belt at the top of the stamp mill is fitted to a travelling trolley. This trolley runs on ways from one end of the building to the other, a distance of several hundred feet, dumping the ore as it goes all along its course. At the particular mill where I saw it working its action was reversed, when it came to the end of its course, by Kaffir boys, who stood at either end of the mill. I know of no reason, however, why the reversing motions should not be applied automatically. To maintain a proper tension on the belt, while the distances between the centres are continually changing as the trolley moves along its course, an effective compensating arrangement is attached to its lower and stationary end.

There is nothing unusual about the stamp batteries used on the Rand, most of which are made in England. They stand in two long rows,

one on each side of the ore bins from which they are fed. The general practice is to drive them in sets of ten, five of them operating in one mortar. They are raised and dropped on the cam principle, at the rate of about ninety-six strokes per minute, pulverizing the ore, which is fed in carefully regulated quantities into the mortars below them. With the ore, water is admitted copiously—I believe, theoretically speaking, in the bulk ratio of ten of water to one of ore. The much more effective work of the heavier stamps in treating low grade ore has induced a continual increase in their weight. Thus it is that at the present day a stamp, with its stem, head, and shoe, weighs from 1,200 lb. to 2,000 lb. The vertical range of the stems is about nine inches. The ore, as it falls into the mortar, forces out the pulverized material, or pulp, and the water, through 30-mesh screens. These fall, a thin liquid slate-coloured mud, on to inclined copper plates. These plates are some 12 ft. or 15 ft. in length, and about 5 ft. wide. Their upper surface is coated with mercury, which arrests and absorbs most of the fine gold as it passes over the surface.

It is reckoned that about 60 per cent. of the gold is extracted from the pulp by this process. From time to time the amalgam—mercury and gold—is scraped off these plates, and the gold is recovered by retorting. The effect of the retorting on the mercury is to purify it, and it is ready for use over again.

In nearly all the mines the mechanical process

ends at this point, and chemistry takes up the working. The tailings from the plates pass into a funnel-shaped apparatus, which catches stray particles of gold, and thence run along troughs into a tank. From this they are lifted by a bucket wheel into the troughs for the cyanide vats.

The exception to this general system is when chlorination is used as a part substitute for the cyanide process. The cost of chlorinating is so great that it only pays to use it on high grade material. Rand ore, at the best, is only low grade, and after most of the gold has been extracted from it by the mercury plates the residue is of a very low grade indeed. If chlorination is to be used, it is necessary to concentrate these tailings. This is done by means of a Frue-Vanner shaker. In this machine the main feature is an endless belt, of which the upper surface is slightly inclined, and moves slowly in the direction of the higher of its two pulleys. It also, by means of a cam, has a side-jigging motion. The tailings pour on to this belt at its upper end, and flowing down its surface escape, at the other end, into a trough. The belt, always moving up stream, arrests on its surface the heavier portion of tailings, containing iron pyrites and gold, and allows the lighter stuff with the water to drain off at the lower end of the machine. The stuff which is disposed of in this way is known as " slimes," and is extremely pooi in gold. The stuff that has been arrested on the Frue-Vanner belt is in the

form of a thick mud, which is automatically removed from the belt as it revolves. It is blue-black in appearance, and has nothing to indicate its value. It is found, however, to average about 6 oz. of gold to the ton.

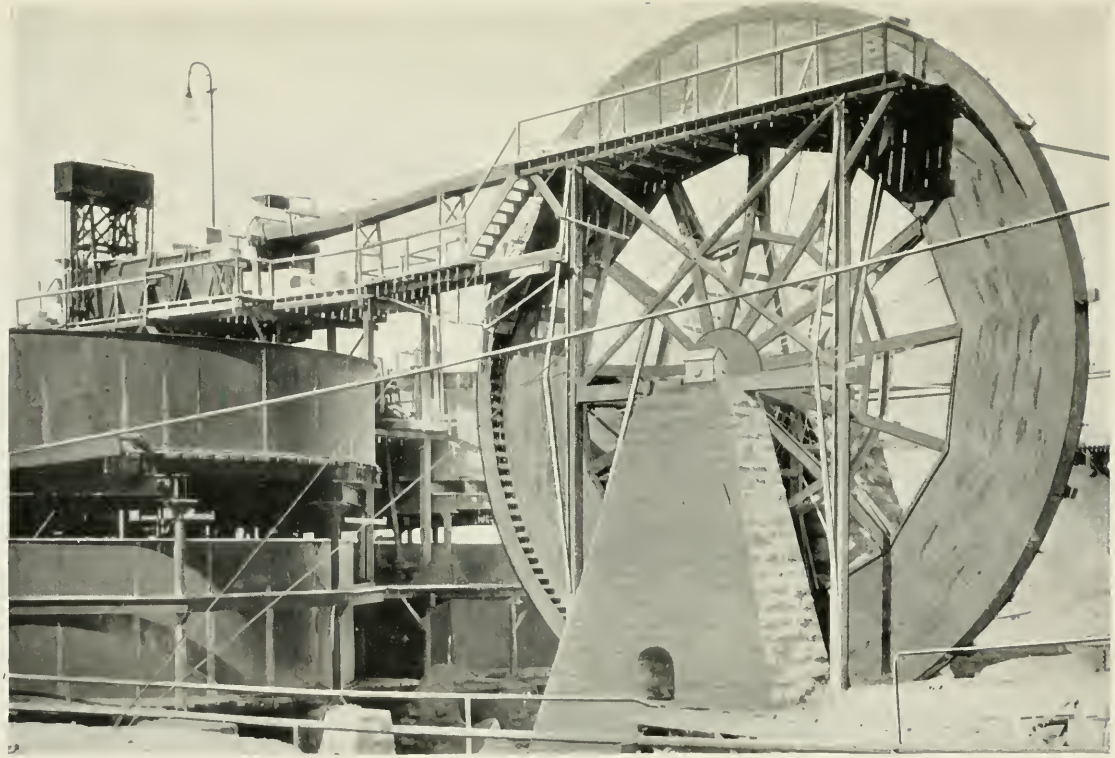
This material is known as "concentrates," and is produced only when the process of chlorination is to be used. I need not lengthen this chapter by describing the chlorinating routine. It is precisely similar to that followed on the high-grade ore in America, and is not in any sense of the word either a characteristic Rand method, or even suited for Rand requirements except in very rare instances. In fact, in the eighty odd gold mines here there are only two that still employ it.

We have to revert, then, to the point at which the pulp leaves the mercury separating plates. These plates have, as I stated above, arrested, or "caught," 60 per cent. of the gold, and the tailings which flow over the plates consequently contain the other 40 per cent. This has to be extracted by the cyanide process. The tailings at this stage are made up of concentrates, sands, and slimes—all mixed together. There is no attempt to separate the first two of these in cyaniding. They are treated together. But the solids in the slimes are such minute particles that they have to be treated separately. All the pulp is lifted by the bucket wheel, and the process of separating the slimes from the heavier material takes place in the troughs at the top of the wheel.

To go back a little, the tailings, on their way to

the tank from which the wheel lifts them, are automatically and continuously sampled by a simple and effective process. In the trough at a certain point is a hollow iron rod, with a thin slot in it. Into this slot a very small portion of the tailings find their way as they flow. Through the rod they pass into a receptacle which is, perhaps, capable of holding a gallon or two when full. The size of the slot admits enough to fill the receptacle in an hour. When full the weight occasions it to turn over on its side and discharge its contents into a tub. As the tailings, which eventually find their way into the sample tub, are fed gradually and regularly into it all day long, they represent a fair specimen of the quality of the ore that has been milled. Thus the authorities are able to arrive at a very accurate estimate of the value of the commodity on which they may be working at any particular time.

The bucket wheel, as above stated, delivers the whole of the tailings into a trough or series of troughs, the height of which, and consequently of the wheel, is determined by the level which must be attained in order to allow the stuff to flow down naturally into the cyanide vats. At a point on their course along the troughs the tailings pass into tapering boxes, where the process of separating the heavier grades from the slimes takes place. The small end of the taper or cone is downwards. While the tailings pour in at the top of these boxes a certain amount of water is admitted at the bottom. This assists the over-



A RAND CYANIDE PLANT

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flow of the lighter stuff, the slimes, at the top of the boxes, while gravitation causes the heavier stuff to descend.

The cyanide method of treating tailings is, I believe, the one and only important departure in gold-getting that owes its origin to the Rand. Necessity, as usual, has proved itself the mother of invention in this case. For all other purposes at these mines existing appliances were found to answer the purpose, and consequently nothing strikingly new had to be created. No doubt the existence of the Rand mines as a market has induced inventors to improve on existing appliances from time to time, and undoubtedly mine-owners have been quick to adopt any new plant, and to offer suggestions for improved machinery. The cyanide process, however, may be said to be the direct outcome of the peculiar necessities of the Rand mines. With a low grade ore to start with, it did not pay to treat tailings which had been robbed of 60 per cent. of the gold by the costly process of chlorinating. And yet, as these tailings, however low their grade, represented 40 per cent. of the total value of the ore, they could not be wasted. It was therefore essential that a cheaper method should be discovered which would extract this gold satisfactorily.

The chemical process of "digesting gold ore in tubs," by means of cyanide of potassium, was known to Californian miners as far back as 1843, and practised by them in a crude manner. After this the German scientific chemist tackled the subject on

theoretical lines, and paved the way for the hard-headed British industrial engineer, who proceeded to turn the process to commercial account. He was taught that an intimate affinity existed between cyanide of potassium and gold, and in a lesser degree between cyanide of potassium and the iron pyrites and other base metals which surrounded it in the banket formations. This was all he wanted to know. It then became merely a question of arriving at a solution of cyanide which was sufficiently strong to act upon the gold, and sufficiently weak not to affect the baser metals. By this means the separation of the gold from the surrounding bodies in these tailings could be effected.

It is the working out of this problem on practical commercial lines which resulted in the MacArthur-Forrest patent in 1887. Though since that date the process has undergone certain modifications which have tended to improve it, it is still habitually referred to by that name. The first cyanide installation was put up on the Rand by Mr. Arthur James in 1890. Since that date, although the system is used extensively elsewhere, the Rand has been the centre of practical knowledge on this subject. I believe that in the early days of cyaniding about 70 per cent. of the gold which remained in the tailings was extracted. Now I understand the yield is about 87 per cent.

People outside Johannesburg do not as yet realize what an enormous boon the cyanide process has been to the Rand. It is said that without

it there would barely be half a dozen mines which would be yielding dividends to-day, even if there were no labour difficulties. A high authority states that in 1898, when the dividends on the whole of the Rand mines amounted to an average of 13*s.* 2*d.* per ton milled, the value of the gold extracted from sands, without the slimes, was 16*s.* 8*d.* per ton. This is borne out by later statistics. For the nine years which terminated with the commencement of the late war, another authority states that the yield of cyanide ore was 4,000,000 ounces for 14,000,000 tons.

One cannot help thinking that the cyanide process has not yet been worked out to its end. The costly installation of enormous and complicated vats, troughs, separators, zinc tanks, and all the rest of the cumbersome paraphernalia which are now used, must some day give way to a simpler and cheaper method. It is to this more than to anything else that I would draw the attention of our engineers and inventors. And, pending the development which must eventually take place in this way, I would suggest that they should try to secure the orders for these elaborate vats, which are now nearly all made in Belgium. Space has only permitted me to give a brief outline of the general methods of milling and dressing ores at the Rand mines.

In a way I prefer this just now, for this and many other things out here are in a period of transition. The war, if it has had the effect of closing mines, creating a slump in "Kaffirs" on

the London Stock Exchange, and a scarcity of labour on the spot, is having one effect which will be good in the long run. It has at once made it a dire necessity for mine managers to cast about for every means of improving their methods and their plant, and created the opportunity for doing so.

Mining plant which will be put up from now onwards may differ very materially from that which now exists, both in actual appliances and in arrangements. Meanwhile, let our manufacturers who would cater for the requirements on the Rand bear in mind the fact that the following are the points to which they should devote their attention :—(1) An improved machine rock-drill ; (2) improved methods for very deep hauling ; (3) the growing tendency to supplant trucks and sorting-tables by belt-conveyors ; (4) a simplification of the cyanide plant.

Chapter XIX

WELL-BORING IN CAPE COLONY

IN a recent chapter I mentioned the fact that one firm of machinery importers in Cape Town habitually supplied all the year round an average of one windmill a day for pumping purposes on farms and elsewhere.

The windmills in question, as is practically the case with every windmill imported into South Africa, come from the United States.

There is another and kindred industry in which the British manufacturer up till now has not appeared on the scene ; and that is well-boring.

The requirements as to plant for this purpose throughout South Africa to-day are as nothing compared with what they must be in the near future ; and yet they are considerable. Before the war it had been practically demonstrated that below the surface of the greater portion of that hitherto drought-stricken area in the interior of South Africa lay a plentiful supply of water, which only required tapping to be brought into use.

The importance of this is at once apparent in a country where natural agricultural and pastoral

advantages have been counteracted by a dearth of water.

Of course these wells will not solve the problem of irrigation in the larger sense of the word. In fact, there is nothing, as far as is known at present, to point to the supply available from this source being anything like adequate for that purpose.

The value of this well-supply lies in the fact that it is applicable in all sorts of places where it will be impossible to irrigate on a large scale. It will fertilize its few acres in tens of thousands of localities, while the larger schemes will fertilize their hundreds and thousands of acres in a few districts. Above all, it will open up country which has hitherto been unworkable, and will obviate that terrible mortality to cattle and to flocks, and the heavy expenses that have been entailed in certain districts by the necessity of shifting them over vast tracts for the purpose of "dodging the drought."

To those who would have full details as to what has been done in this way in Cape Colony, I would recommend a perusal of a paper by Mr. Bernard W. Ritso, M.Inst.C.E., on "Boring for Water in Cape Colony," which is to be found in the *Minutes* of the Institution of Civil Engineers for 1901–1902, vol. cxlvii.

Mr. Ritso is at the head of this particular branch of engineering in the Cape Government Office of Works. It is he who has organized and developed this work, and to him I am indebted

MILITARY WATER SUPPLY ON THE VELD

VELD WATERWORKS

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for some of the particulars which follow, and for the photographs which illustrate this subject.

Prospecting for water began in a tentative manner in 1890, but was discontinued owing to the Government having only two drills and requiring them at the time more urgently for coal-finding. In 1893, however, eleven hand-drills and one "jumper" drill were boring for water, and the Government, which has always shown a tendency to favour the farmer in this Colony in a domestic way, while neglecting the larger industrial problems which would open up the Colony in a general manner, undertook to bear half the cost of boring for water in approved agricultural districts, the individual farmer bearing the other half.

The immediate result of this was that hundreds of applications came in, and in 1900 there were 32 drills boring for water in various parts of the Colony. In that year 489 holes were bored, and 366 of them were yielding a supply of 3,759,266 gallons per diem. Of this amount about two-fifths flowed at the surface, and the balance was easily raised by pumping.

In 1901 work was, of course, greatly impeded by the rebellion in the Colony, but in spite of this fact the well-water supply was nearly doubled. During that year, however, a considerable portion of the boring-plant was used on behalf of the military authorities all over the country. For the military over one hundred bore-holes were made, which aggregated to 6,060 ft. of drilling.

These yielded daily 900,000 gallons. Operations were often carried on under fire of the enemy, and in other dangerous circumstances, and the greatest credit is due to those civilian engineers who performed this unobstrusive but vitally important work. The effect of it was to reduce materially the mortality and suffering of troops and horses by obviating the drinking of contaminated surface-water. In 1898, 1899, and 1900, applications averaged about 500 yearly. In 1901, for reasons given above, there was a big drop. But now that the war is over the number has increased so rapidly that I am told by the Government that, were they to receive no further applications, they have more work on their books at the present day than they can hope to complete in three years with their existing plant. There are now between forty and fifty water-boring plants in operation.

At the present moment the political deadlock in Cape Colony hampers this particular work, as it does every other form of progress, and the moment, therefore, is entirely propitious for the private contractor who would equip himself properly with boring-plant and undertake this work on his own account. There is any amount of work to be done in this way. I have it on good authority that, even were the Government to refuse to bear any portion of the costs of boring, the number of applications from the farmers would not be materially decreased, and certain it is that rather than wait three years

for water, a very great number of those who have already applied would willingly pay a higher price to be served within reasonable time.

Then, again, I am told that the Government would be extremely glad to let out certain districts to private contractors, if suitable men were forthcoming. At present the farmer pays to the Government 15*s.* per diem for a steam-power drill, or 10*s.* per diem for a hand-power drill. He further pays the transport from the nearest station, or from the place where the plant was last at work. He also finds unskilled labour and fuel. The Government delivers the plant to the station, and provides a skilled foreman and an engine-driver. In the days when this arrangement was made it was reckoned that this method divided the cost about equally between the Government and the farmer. Such is no longer the case, as not only have the wages of skilled workmen increased very much since that time, but the cost of diamonds has gone up so materially that stones which could be purchased for 3*s.* 6*d.* per carat now cost £7 per carat. The net result of this is that the Government pay about two-thirds of the cost, and the farmer one-third.

The average cost of boring at the present day is about 12*s.* per foot, exclusive of lining. The holes vary between $2\frac{1}{8}$ in. and $4\frac{1}{2}$ in. in diameter, and are only lined through such portions as pass through friable or soft formations. The average speed of work of the steam-power plants is said to be 10 ft. per diem.

The drills used by the Government are of three descriptions :—

(1) Steam-power diamond-drills, weighing about 5,000 lb., and capable of boring a $3\frac{1}{2}$ in. hole to a depth of 500 ft. to 600 ft.

(2) Horse or hand power diamond-drills, weighing about 3,000 lb., and capable of boring a $2\frac{1}{8}$ in. hole to a depth of about 400 ft. or a $3\frac{1}{8}$ in. hole to a shorter depth.

(3) Combined hand-power diamond and "jumper" drills, weighing about 3,500 lb., and capable of boring a $3\frac{1}{8}$ in. hole to a depth of about 300 ft.

The above, which cover practically all the ground which is necessary for the ordinary requirements of the farmer, are made, including the crowns and tools, in Cape Town. They are strong and serviceable, and have been found to be more suitable than any others in the market at the present day.

In the cutting crowns, Brazilian black diamonds are used on the harder rock formations—these are the stones which now cost £7 per carat. Kimberley brilliants and bort are used on the softer rock. These cost from £2 to £4 per carat. The Brazilian stones are far harder than the others, and, in spite of their price, are found to be more economical for crystalline rocks. The Brazilian stones have the advantage of wearing much less rapidly than the others. When fractured, only small portions are chipped off, and the remainder of the stone is good, whereas

WELL-BORING PLANT

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when the Kimberley stones part or split up they are of no further use for resetting.

Wherever these boring plants may be working—and at the present day they are dotted all over the 277,151 square miles of this Colony—the crowns are always sent back to Cape Town to be reset. No local foreman or fitter is ever allowed to tamper with them, even for the purpose of rectifying a slight defect.

A very elaborate and carefully thought-out method exists with regard to the setting and distributing of these crowns. They are issued by registered post direct from the Cape Town office to the farms on which they are required, and returned in a similar manner. A careful report in schedule form accompanies each crown when it is sent back to headquarters. The nature of the work on which the crown was employed, the amount of work it has done, the supposed cause of the accident—if accident there has been—all are carefully noted.

The diamond-setters are placed in a small locked workshop adjoining the Chief Inspector's office, and the nature of their work, and the weird assortment of tools which they use, remind one forcibly of scientific dentistry. The value of the crowns, with their diamonds set, varies between £40 and £500, according to the size, quality, and number of diamonds used. Spare stones, sometimes to the value of £5,000, are stored in a safe in the office.

With regard to the nature of the water supply

obtainable, it is not, strictly speaking, artesian. The formations in which it is found are not cretaceous, and, although the water rises in the bore considerably above the level at which it is tapped, it seldom spurts at the surface. It has now, however, been clearly proved that almost all over the Colony a plentiful supply of subterranean water is to be obtained at depths varying between 50 ft. and 500 ft., and that in cases where the water does not flow at the surface it rises within easy pumping reach.

I need not deal with the question of the geological formations which these boring plants have to penetrate beyond saying that they offer almost every variety which is calculated to test the temper of the operator and of the tools he is employing.

As a rule the cost of boring a 100 ft. hole has been found to be about the same with a steam or hand-power plant, but for greater depths the former is preferable. With the steam-power plant currently used a depth of 600 ft. is regarded as the maximum.

Recently, however, there has been a demand for deeper borings, and the Government have adopted the Sullivan—American—type of diamond-drill, with sliding head and hydraulic feed, for this purpose. The machine in question bores to a depth of 3,000 ft. Experiments are being made near Grahamstown with a view to ascertain whether it will pay to undertake deep borings on the lines which

have proved so successful in Queensland and other waterless districts in Australia.

Similar experiments are being carried on in the Transvaal and other colonies, and the Transvaal Government have, I understand, recently appointed a Canadian expert in these matters to make exhaustive tests throughout the two new colonies.

In Australia the plant used for deep boring all hails from the United States, for the simple reason that that is the only country from which suitable machinery can be obtained for the purpose. Here, again, with South Africa and Australia, both needing these plants, it would seem to be well worth the while of some of our manufacturers seriously to investigate this subject with a view to supplying this increasing market.

I have dealt thus fully with the machinery which is at present used in South Africa for water-boring, not for the purpose of implying that everything about the systems employed is perfection, nor because there is much in a general way which is new. A very great deal that I have said about the details of working and of the machinery is much the same as one would say about boring for water elsewhere. My object has been to afford information as to how things have been done and are being done in this Colony, and the conclusions arrived at as to the best means of carrying on the work, by practical and competent engineers who, in a

Government department, devoted exclusively to this subject, have had a steady experience of it for the last ten years.

In conclusion, I would say that there is distinctly room for an improved drill for the ordinary farm-work. The rapidly increasing price of diamonds, to which I have alluded already, is constantly enhancing the cost of diamond-drilling. There is consequently a tendency to employ the "jumper" system wherever possible, reserving the diamond crown for use only on the closest of rock formations. It would appear that the tool of the future for this purpose will be that which will combine in the most simple and effective manner the operations of the "jumper" and the drill, utilizing wherever possible the former method, and only reverting to the latter in cases of emergency.

In this country, however simple a matter the bore may be, a thoroughly skilled foreman at a high rate of wages is employed. Such is also the case in Australia, and in all countries where I have seen this class of work carried out.

Chapter XX

IRRIGATION: A DISAPPOINTING SITUATION

THERE are two sorts of people in South Africa. The one will tell you that the salvation of the country lies in irrigation, and that it would be a simple matter to irrigate the whole continent; and the other will tell you that it is absurd to think that irrigation could be applied successfully, as the country does not lend itself to a practical system of the sort. Both are wrong.

Of all the engineering problems in South Africa, that of irrigation is at once the most difficult and least satisfactory. Difficult, because of its comprehensiveness, and the impossibility of laying down a general rule which will cover all situations. Unsatisfactory, because the little that has been undertaken has seldom been carried out scientifically or well, and the prospects of improved conditions are slight. In order to account for this disappointing situation I must touch as briefly as I can on the causes which have led up to it. At the outset I would mention that I should have been glad to omit some of the

facts which follow, were it possible to convey an appreciation of the state of affairs without them.

Without foodstuffs grown on this continent, South Africa will always be dependent on the outside world for her provisions, and without scientific irrigation, practically applied, she will never be able to grow her foodstuffs. With irrigation, she might easily not only supply her own wants in this respect, but to a great extent those of the Mother Country too. Under the present *régime* we must not look to Cape Colony to take the lead in any progressive measure. She does not trouble to develop her mineral wealth, she looks upon her railways as an electioneering lever, she neglects her harbours, and, as was to be expected, she has conscientiously shirked irrigation. To do Cape Colony justice, however, she has certainly a sort of excuse for hesitating to spend money on irrigation. This excuse is to be found in the fact that up to the present the tentative work carried out by the Cape Government in this way affords an almost unbroken record of futility and disaster.

I have no wish to insist on the reasons for this, beyond emphasizing the fact that, whatever the capacity of a Cape Government engineer may be, his position is such that it is usually impossible for him to do justice to himself or to his work. The curse of Cape Colony to-day is that public works, like everything else, are hampered by their being used for political and sometimes even private

ends. When such is the case, the position of the engineer, who is a public servant controlled by a politician, is an unsatisfactory one. Once again I would emphasize the fact that the Government engineers of the various colonies in South Africa are as a class a thoroughly competent set of men.

At the time when this article appeared in *The Engineer* there was no such post as Hydraulic Engineer to the Government in Cape Colony. The office was vested, for the time being, in that of Chief Inspector of Public Works. This state of affairs has, I understand, been remedied now. It was time that this should come about, for the absence of a specialist in this most important department has been a standing obstacle to progress.

To descend from generalities to a definite instance of the futility in irrigation work, I will take the case of the Kenhardt Dam, commenced in 1898 and completed some twelve months later. At the time Sir James Sivewright was Commissioner of Public Works. It appears that, for a reason which has never been divulged, he conceived the idea of damming the waters of the Zak River. He instructed Mr. Joseph Newey, Chief Inspector of Public Works, and *ipso facto* hydraulic engineer to the Government, to draw up a scheme, and design an earthen dam. So far so good. No proper survey was authorized however ; no calculations as to the nature and capacity of the catchment area were made, and against the advice of the engineer a contractor, who

admittedly had never constructed a dam in his life, was employed to carry out the work. Fortunately for all concerned, the scheme involved only £40,000. I need not give particulars of the dam. When completed a few feet of water were admitted to it, but had to be run off again owing to defective work. Then came a flood, and the whole structure was washed away.

Even in Cape Colony, where the public expect their money to be frittered away, inquiries are sometimes held in cases of this sort, though they usually end in nothing. In this case an inquiry was held, and though the evidence was instructive, nothing came of it.

When asked how it was that he undertook this work without satisfying himself as to the ordinary fundamental conditions of the water supply, Mr. Newey explained : " We did it to oblige the Commissioner, Sir James Sivewright." " None of us knew anything of the Hartebeeste or Zak River above Kenhardt before the work was undertaken," continued Mr. Newey. " We knew nothing of the area, or of the character of the watershed, rainfall, river-flow, or anything else but what was gathered from local people."

Later on Mr. Newey explained his relations with the contractor as follows :—" Frequent conplaints were made about the conduct of the contractor, and about his people, and about nearly everything he did. Deviations from instructions were constantly going on, but we had to allow the work to go along, because Sir James Sivewright

said, ' Give the poor devils a chance. They know how to make dams better than we do.' "

" Better than we do." Well, well; what a reflection! And so this famous dam was put in hand by a Commissioner of Works for no very definite object, designed by an engineer who " knew nothing about the area or the nature of the watershed, or of the rainfall," etc., and constructed by a contractor who, though he had never built a dam before, knew more about it than anybody else concerned. Naturally enough the dam burst, and naturally enough too, for it was in Cape Colony, the contractor was paid his full contract price. And the moral of it all is that when working for the Cape Government it is better to be a contractor than an engineer. Better than either it is to be Commissioner of Public Works, for the position appears to allow of an indulgence in personal fads without incurring any practical responsibility. So when irrigation is mentioned, Cape Colonists cry, " Hold! enough! " And when a new scheme is proposed in Parliament, it meets with but scant consideration. Now, if Cape Colony, which should have taken the lead in irrigation work, has only succeeded in making a muddle of this problem, it is not that her engineers have not studied the question, but that they do not get a chance to prove their capabilities in this direction.

Irrigation, if properly carried out, affords so obviously the most important of all engineering possibilities for Cape Colony that successive

Governments have felt obliged to make a show of deliberating how to prepare to begin to take it up. With this view, certain investigations have been going on for upwards of thirty years at Government expense. These investigations have, as a rule, been in the hands of competent engineers, and have been carried out conscientiously and well. They have often resulted in practical schemes and suggestions, but these schemes and suggestions have not been acted upon. They have been pigeon-holed.

The catastrophe which I have recorded above was not primarily due to the engineer, whatever his share in the responsibility may have been, for his hands were tied. Other experiments in irrigation by the Cape Government have not all resulted in so prompt and complete a fiasco, but there is not one which can be pointed to as being in any manner a success.

The late Mr. Cecil Rhodes, who in turn experimented in everything which was likely to advance the interests of South Africa, naturally enough at one time dabbled in dam making. Near the spot where he now lies buried amidst the solitary grandeur of the Matoppos is Rhodes's farm, irrigated artificially by a dam.

This dam is situated at Sauerdale, seventeen miles from Bulawayo, in Rhodesia. It is the largest thing in dams ever attempted in South Africa, and has a catchment area of forty-five square miles. The wall is 75 ft. high by 1,200 ft. long, with a top width of 15 ft. and a base of

390 ft. The storage capacity is 950,000,000 gallons. Up to the present this dam can hardly be described as a success. This is not due to any structural defect, but to an underestimate of the necessary catchment area. At present there is not enough water to fill the dam. By means of an expensive channel, which is now being cut, the waters of the Malena River are being pressed into the service to complete the supply.

The most interesting dam recently constructed in South Africa was that built by the Boers just below Ladysmith at the time of the siege of that place. The object, of course, was to irrigate artificially the beleaguered garrison of that town. Fortunately, it was a failure. When I visited the spot there was hardly a trace of the bags of ballast of which the dam wall was constructed. A little engineering knowledge would have made it clear to the Boers that, with the means at their disposal, it would have been impossible to effect their purpose. Even if the wall had been able to stand the pressure, the neutral camp and the hospital only would have been flooded—not Ladysmith.

Another obstacle to irrigation throughout British South Africa is to be found in the fact that the laws of the various colonies are so strict with regard to tampering with a neighbour's water supply that it is practically impossible, save in a few exceptional circumstances, for the private individual to do more than play with the subject. These restrictions apply often when the neighbour in question may be miles away, and

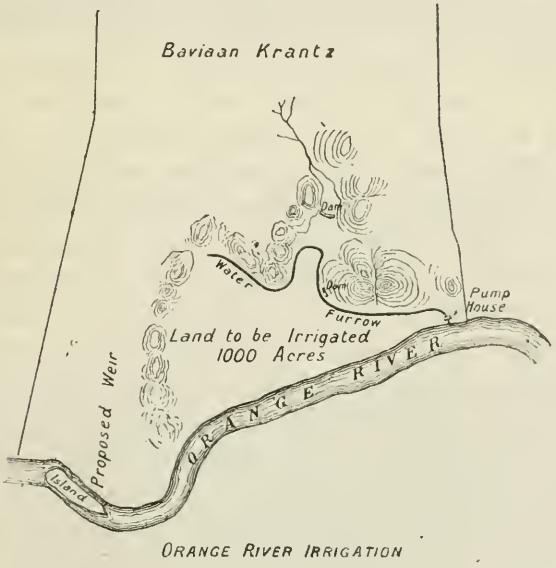
may have no intention or means of utilizing the water on his own account. Small dams, built on the rule-of-thumb principle by individual farmers, are to be found dotted over many parts of South Africa. Some of them have served their purpose in a way, but it is seldom that the best results have been obtained from them. This was owing more particularly to a want of knowledge as to the best methods of applying the water to the soil. Too much has been poured on at the top of the land, and allowed to find its way down, leaving the upper portion washed and water-worn. Generally speaking, no discretion has been used as to the periods of watering, and crops have often been drowned or rotted by applications which were too frequent and too copious.

Private enterprize in irrigation, even in cases where there was no legal obstacle, was hardly to be expected of the average Boer. All that he cared about, as a rule, was to grow as much grain as he required for his own use, and a few fruit trees. A bore-hole, which would provide him with sufficient water for this purpose, was, as a rule, all that he considered necessary.

An object lesson in simple scientific irrigation, applied successfully by private enterprise, is afforded by the Orange River Farming Company. As it may be interesting to record here a definite instance of the sort of scheme which lends itself to the requirements of the larger farmers in South Africa, I quote here *in extenso* a detailed description of this particular scheme. The writer is an

engineer who has had much experience in these matters :—

" Along some of the large rivers there are extensive alluvial fields which adapt themselves to easy irrigation. On the banks of the Orange River, for instance, plains of 2,000 or 3,000 acres of alluvial soil are found on some of the farms. One farm, ' Baviaan Krantz,' has been bought by the Orange River Farming Company, for the object of irrigation, and about 1,000 acres put under cultivation. The whole farm is 10,000 acres in extent.



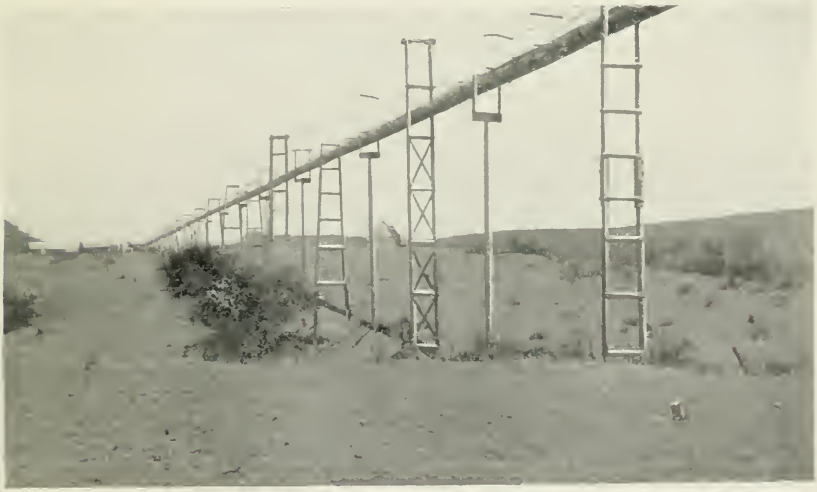
ORANGE RIVER IRRIGATION

" The method of irrigation is as follows :—Two circular shafts, 60 ft. in depth, have been sunk through the sand of the river bank, at a distance

of about 200 ft. from the river, and a drift put through from the shafts to the river. A siphon pipe, 10 in. in diameter, was then laid down from the river to the shafts, and the drift was allowed to fall in. The shafts have been lined with masonry throughout. A small pipe leads from the bend of the siphon up the shaft to a small air pump, which exhausts the air from the siphon, and allows the water to fill it. This exhausting is performed every morning before pumping commences.

"The water is lifted from the shafts by means of chain-buckets, driven by a Crossley oil engine of twenty-one indicated horse-power. There are two sets of buckets in each shaft. With the two shafts at present in use only about ten horse-power are used, so that this one engine is capable of doing double the quantity of work. The buckets empty into launders, which are led round to the main water-furrow. This latter is constructed of galvanized iron sheets, 8 ft. long by 3 ft. 2 in. wide, bent into a semicircle of 2 ft. diameter, and riveted together. It is carried across a shallow gully on wooden trestles, and then laid on the ground, following the contour of the hills. The fall is 6 ft. in a mile, and the total length at present laid just over one mile. It commands half the ground to be irrigated, and will be extended later to the full length. The working capacity of this furrow is 218 cubic feet of water per minute, leaving 4 in. of freeboard on each side.

IRRIGATION : MAIN WATER FURROW AND LOCAL SYPHON



IRRIGATION : TEMPORARY WOOD AND WIRE SUPPORTS FOR WATER FURROW

To face page 314]

"The reason for sinking pits for the water supply and leading it in by a siphon is that when the river is in a flood after rains it sometimes rises as much as 17 feet above its normal level, and would wash everything away that was near that level. Besides this, the present water channels often get filled up with silt, and the course of the river is changed. Thus a pool to-day may be a sand bank next month. With this siphon arrangement all that is necessary to tap the deviated water is to add on a length or two of piping to reach the point in question.

"Working as at present, it takes five days of nine hours to water a hundred acres, so that twenty acres are watered per day of nine hours. In very dry weather—from mid-November to the end of January—it is necessary to water the ground to this extent at least every ten days. A crop of oats planted in April will be brought to the reaping stage with four or five waterings. The first watering, immediately after ploughing and just before sowing, requires two hundred tons —equal to two inches of water—per acre. The seed is then sown, and another watering given in perhaps a month's time. This requires only fifty tons of water to the acre. In October the oats are ready for reaping, having required altogether from four to four and a half inches of watering. The ground is ploughed up immediately after taking in the crop, and potatoes are planted at once.

"The manager estimates that a quarter of a

million gallons per acre are required per annum —equal to ten inches of water—per acre with a normal rainfall, but in some years more is required. For example, in the year 1900 375,000 gallons per acre were required for a certain piece of ground, and in 1901 much less than a quarter of a million gallons. The average rainfall for this district is about ten inches per annum. A reservoir is in contemplation, and will be started immediately, to hold water equal to about ten days' pumping. The pumps will then be run at night to fill this reservoir, and during the day for direct irrigation, thus getting double capacity.

"Also two more engines of the same size as the one at present working are lying on the property. These will be erected and started as soon as possible, when there will be two constantly running and one auxiliary. This will, of course, necessitate sinking two more shafts to connect with the others, but the cost of these will be very small, as the ground is sandy and easily worked, and sinking, masonry, etc., is all done by the people living on the farm.

"At the lower end of 'Baviaan Krantz' there is a fall of several feet in a hundred yards in the river. This, with the large volume of water available, will be sufficient to operate a low-pressure turbine which will generate sufficient power for pumping, ploughing, etc., and it is the intention of the management to instal such electric plant in the future, thus doing away with the oil engines

already in use, though even these are wonderfully economical.

"Regarding costs, the whole outlay, up to the present, including shaft sinking, machinery, three engines, piping, and water-furrow, has been only £3,000. The engine, as running at present, uses 1,079 gallons of paraffin per hour for fuel. The actual cost of paraffin landed on the property, and bought at retail prices, works out at 2*s*. 3*d*. per gallon. Taking figures for the cost of irrigating 100 acres at the commencement of cultivation, when transport, etc., was dear owing to the war, the total cost per acre per annum for irrigation comes to 31·6*s*. per acre, allowing 1·95*s*. for attendance, etc., 1*s*. for overseer, 22·32*s*. for fuel, and 6·4*s*. for depreciation. But from quotations which the manager has just received, he considers the cost of fuel will not be more than 1*s*. per gallon when shipped direct from America. This will bring the cost of irrigation—on the 100 acres basis—down to 19·27*s*. per acre.

"Cultivation was only started in 1899, and one good crop was gathered, but had to be destroyed owing to the Boers coming into the district, consequently no financial results are to hand as yet. Moreover, the young fruit trees, vines, etc., which had just been planted, had to be left at the most critical period of their lives; consequently many of them died off.

"There are thousands of acres of irrigable land lying along the banks of the Orange River between Norvals Pont on the Johannesburg line and

Orange River Station on the Kimberley line, a distance of 140 miles, and when all this ground is taken up for farming purposes, as it is almost certain to be when the results at Baviaan Krantz become known, a railway could easily be constructed between these two points to tap all this rich country, and the great markets of Kimberley, Johannesburg, Pretoria, etc., could be supplied with the best of everything at a much lower figure than at present. Beyond this similar fields can be opened up in the same manner all over the country. There are lots of small farms on the river banks suitable for individuals who could put in their own irrigating plant at a comparatively small cost. Unirrigated land is worth from £1 to £2 per acre at present, and labour is plentiful and cheap.

"It is evident that the idea has made a good impression in the locality already, as the manager has had a great many applications from farmers in a small way to buy single acre plots of irrigated land from the Company at £60 or £70 an acre. If it decided to sell such plots, a water due of perhaps £5 per annum will be charged on each plot, which will soon pay the cost of pumping and bring in a considerable revenue."

It was, perhaps, to be expected that we should be indebted to the High Commissioner for the first practical steps in the way of ascertaining the possibilities of scientific irrigation in South Africa. The tentative efforts of the late Mr. Rhodes,

though costly, can hardly be claimed as scientific, and those pigeon-holed statistics of the Cape Government will be valueless as long as they remain in their pigeon-holes. A few years ago Lord Milner instructed Sir W. Willcocks, managing director of the Daira Sania Company of Egypt, to visit, study, and report upon this problem in Cape Colony, the Orange River Colony, and the Transvaal. The result was an exhaustive report on *Irrigation in South Africa,* issued in November, 1901 (Eyre & Spottiswoode). I strongly advise all who are interested in this question to lay hands on this pamphlet if they can. It is the best, and, as far as I know, the only work worth reading on this subject which is at present available. And it is immensely valuable.

And here I shall leave the subject of irrigation in South Africa. If my views of the situation appear to be pessimistic, let the reader turn to the report of Sir William Willcocks. There he will find a gentle tone of optimism running throughout the book. It is the optimism of the expert who knows how the thing *could* be done. And he bases his arguments on the work carried out successfully by himself and others in India, Egypt, Italy, and elsewhere. But his optimism is qualified from the start by certain conditions, which he rightly lays down as essential before success can be obtained. Of these the most important is a drastic and sweeping alteration in the laws relating to water throughout these colonies. I see no sign of these conditions being

fulfilled. It is for this reason that I have confined my remarks to endeavouring to explain how matters actually stand, and to pointing out the many obstacles to a progressive policy in irrigation which now exist. For until they are removed I am afraid that but little will be done.

THE END.

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