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## Railway Development of Africa, Present and Future

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boundaries were defined. The re-survey established the great accuracy of the work of Mason and Dixon, whose latitudes were only two or three seconds in error—a very creditable result for the time.

While the descent of our Theodolite from Jeremiah Dixon is completely established, it is not quite clear that the instrument was actually employed upon the boundary work, though research into the records of the survey preserved in Philadelphia and Baltimore may, it is hoped, throw light upon this question.

The instrument is in any case a welcome gift, as a personal relic of a man so well known in the history of Geography, and as a beautiful example of the workmanship of the period. Such gifts help to realize the ambition expressed by Sir Clements Markham in his recent paper, that the Society might possess a collection of instruments for navigation and survey representative of all periods.

A. R. H.

## RAILWAY DEVELOPMENT OF AFRICA, PRESENT AND FUTURE.

Sir Charles Metcalfe, Bart.

*Read at the Meeting of the Society, 29 November 1915. Map, p. 80.*

THE outstanding feature of Africa has been its inaccessibility. This vast continent, covering one-fifth of the world's land area, with its enormous treasures of diamonds, gold, copper, tin, iron and coal, with its products of oil, rubber, coconuts, and such a wealth of tropical fruits that its millions of inhabitants can exist with a minimum of labour, with a great central plateau running for thousands of miles at such an altitude that white races can live and thrive in a climate that makes them reluctant to leave it, has yet, in spite of all these advantages, remained untraversed and unknown to the civilized world until comparatively recent times. The only accessible part of Africa, the Valley of the Nile, gives us our earliest historical record. A navigable river in a fairly temperate zone defended on either side by deserts gave all the factors that produced a high state of civilization when, as far as we know, the rest of the world was in a state of barbarism. South America and India resemble Africa in shape, but differ from it in this respect, that whereas they have in each case a mountain range running north and south on their western shore only, Africa has a formidable barrier varying in altitude generally from 3000 to 8000 feet all round its coastline, both on the west and on the east. The rivers south of the equator are very few and impossible for navigation except in some instances for a short distance, above which rapids, caused by the abrupt rise of the country, stop all access by boats to the interior,

The large rivers, the Senegal, the Gambia, the Niger, and the Congo, are in the tropics, and though navigable for long distances, the dense forests, fever, and the unhealthy climate have prevented outsiders from penetrating at all far away from the rivers, whilst the native, having no stimulus for storing energy, did not emerge from barbarism.

Protected then on the north by the Sahara and all round its west and east coasts to its most southern point, the interior of the great continent of Africa remained unknown. It is possible that central Africa was explored in very early times by some foreign race, but the mystery of Zimbabwe remains unsolved. We know nothing of the people that exploited the gold-mines of South Africa. The fact that old workings have been discovered over an area of more than 40,000 square miles, and that many million pounds' worth of gold have been taken out of those mines without our having any information about it, show clearly that the mining must have been continued over a very lengthy period and that it must all have happened a long time ago, for such an output would have attracted considerable notice, and would indeed have upset the markets of the world if it had taken place at any time in the last two thousand years. These old workings were stopped at water-level, generally 50 or 60 feet below the surface of the ground, and what became of that mining race we do not know. Perhaps they were a small dominant class using slave labour and were exterminated by some sudden rising of the natives. Possibly they left because below the water-level they could not work the gold.

Galton says that energy, an attribute of the higher races, is eminently transmissible by descent, and a race that showed such a capacity for labour in Rhodesia must have made history if it had remained in that country, but there was no sufficient inducement when gold production ceased for any energetic race to stay in the country where there was no means of communication. There was no navigable river; a Via Appia if constructed would have been almost impossible to maintain in the country between Rhodesia and the port of Sofala, where 13 inches of rain frequently fall in a few hours. The camel for the same reason was impossible. The horrors of the slave trade, against which Livingstone and Cardinal Lavigerie raised such a stirring appeal, were mainly due to the fact that ivory from Central Africa could only be carried to the coast on human heads. The difficulty of access locked up the African continent. When tempted by the riches of the East the Portuguese sent Bartholomeu Diaz and Cavilhao, Vasco da Gama and Dom Francisco de Almeida to find and secure a route to India round the coasts of Africa, resting-places were established by them at Benguella, Sofala, and Mozambique, but only two attempts were made by them to penetrate the interior, and both of these, the one to Prester John's country and the other under Barotto to the kingdom of Monomatapa, ended in disaster.

The Dutch, French, and English ships all used Table Bay as a halfway

house on the road to India, but they none of them made any effort to go in from the coast. The Dutch who settled at Cape Town in 1652 were very slow in extending their farms inland, but they did push the Huguenots into the Drakenstein Valley, some 30 miles from Cape Town, which was then on the outskirts of the civilized area, and from that time onward the farms were gradually extended inland; but there was very little done in this way until after the English, who carefully secured every one of the places that Napoleon had marked out as the vital spots of the world, bought the Cape Colony from the Dutch in 1806. Gradual settlements were made from that time on all along the coast from Cape Town to Natal. But no settlements were made beyond the mountain barrier until the few irreconcilable Boers broke away and trekked to the Orange Colony and the Transvaal, and the ox-waggon remained the only means of transport.

George Thompson, in his book called 'Travels and Adventures in South Africa,' discusses the possible means of communication whereby an export trade could be developed, and states that in South Africa "canals and railways are entirely out of the question." This book was published in 1827, only two years after the opening of the Stockton and Darlington Railway, the first that was ever opened for traffic; and this opinion of Thompson's was reasonable enough. The small locomotive of that period did not give much promise of hauling trains of merchandise over the great mountain ranges that encompass South Africa. It was not till 1857 that an Act was passed for the construction of 54 miles of railway from Cape Town to Wellington. A contract was made by Sir George Grey, Governor of the Cape Colony, with the Cape Town Railway and Dock Company in December 1858 to make this line under a six per cent. guarantee from the Government, for whom Sir John Hawkshaw was the referee. Sir Charles Fox was the consulting engineer of the company, William George Brounger was the engineer of the company in South Africa, and Edward Pickering was the contractor. The gauge was 4 ft. 8½ in., and the weight of rails was 70 lbs. per lineal yard, and the cost was about £400,000. The branch from Salt River to Wynberg was also constructed by this company, which was finally wound up after the purchase of these railways by the Government of the Cape Colony in 1873, the year after they first got responsible government.

In 1869 the Diamond-fields were discovered 650 miles inland from Cape Town, and there was a rush to the Vaal River and to Kimberley in 1870. But there was evidently no conception on the part of the Cape Government of the great industry that would result from this discovery, for after purchasing the Cape Town and Wellington Railway, which was of the same gauge as we have in England, they converted it into a 3 ft. 6 in. gauge, which has unhappily remained until now the main line gauge in South Africa. This has been a great handicap to the trade and

development of a country of great distances, as the speed on a 3 ft. 6 in. gauge is only half what it is on a 4 ft. 8½ in. gauge. All efforts to change this gauge to the standard gauge of Europe have been ineffectual. It was pointed out that the extra cost of 4 ft. 8½ in. as against the 3 ft. 6 in., as shown by alternative tenders, was very small. It was shown that a break of gauge, which is a serious matter on lines of short distances, is of no great account when the runs are 1000 or 2000 miles long, and that in Egypt the cost of transfer of goods per ton where there is a break of gauge is estimated to be about a piastre or 2½*d.* of our money. But it was of no avail and no change has been made yet; it will have to be made some day, and the longer it is put off the greater will be the expense of effecting the change.

In 1874 the commencement of a line north from Port Elizabeth was made, one from East London in 1876, and one from Durban in 1878. The Cape Town-Kimberley line was added to section by section and reached Beaufort West in the Karoo country in 1880. There has always been a certain amount of jealous competition between the ports of Cape Town and Port Elizabeth, and so we are not surprised to find that the railways from these places towards Kimberley which met at De Aar Junction 500 miles from Cape Town were opened on the same day, 31 March 1884, and on 28 November 1885 the railway was opened to Kimberley. This year was memorable for the Warren Expedition and the successful effort of Cecil Rhodes to prevent Kruger from pushing his people across the main road from Cape Colony to the north. To most people at that time the north was merely the happy hunting-ground of adventurous sportsmen in the pursuit of big game, but Rhodes always laid it down as a sort of dogma never to despise any great stretch of country, and he steadily kept his eye on these northern territories; but for him our leading statesmen would have gladly consented to give away the whole of the interior and to have let German South-West Africa link up with German East Africa. After 1885 there came a lull in railway construction. Kimberley was for the time the limit of the civilized world in South Africa, but the discovery of gold in Johannesburg made that place a fresh centre of attraction further inland, and as the value and prosperity of the gold industry steadily improved a new factor was introduced into South African politics. The four chief ports, Cape Town, Port Elizabeth, East London, and Durban, all wished to compete for this new centre of trade. Kruger, however, who saw what a difference the gold industry of the Rand was going to make in the financial and political importance of the Transvaal, and who was suspicious of the advance from the Cape Colony, declared that he would have no railway until that from Delagoa Bay was made. He wished to isolate his country from the rest of South Africa until he had got an independent outlet. Rhodes, writing to the *Argus* in 1887, said: "I feel that the present is an opportunity that may not recur; the Free State is in the humour to join hands with us to mark its resentment at the policy of isolation pursued by the Transvaal, and if

the right steps are taken promptly the Delagoa Bay Extension Railway, which would send all the Witwatersrand traffic through Lourenço Marques will not be made for years. It is emphatically a case of the first in the field ; if we are first and make good our grip we shall not be soon or easily disposed of." This opportunity was not, however, taken advantage of. It was in this year that Piet Grobelaar was sent up by Kruger to try and come to terms with Lobengula, the chief of the Matabele. Rhodes urged the High Commissioner to stop this flagrant breach of the Convention of 1884, upon which the independence of the Republics rested, and to proclaim a formal protectorate over all the country to the north. This the High Commissioner refused to do, but he did agree to send Mr. Moffat up to Lobengula, and the latter signed a treaty with him that he would not give any concession of his country to any foreign state or power without the previous knowledge or sanction of Her Majesty's High Commissioner in South Africa. In the following year Lobengula signed the concession which, with the amalgamation of certain other interests, was the basis of the British South Africa Company incorporated by Royal Charter in October 1889. One of the points in the charter was that railways would be made in connection with the new territory. And in that same month of October 1889 an agreement was signed by Rhodes for the British South Africa Company, and by the Cape Government, by which the Cape undertook to construct the railway from Kimberley to Vryburg. This agreement was used by the Cape Government as a lever with the Orange Free State to allow the extension of the Cape Railways into their country, and in December 1890 the line from Kimberley to Vryburg and the line from Naauwpoort to Bloemfontein were both opened for traffic. The eagerness of the Cape to get to Johannesburg with their railways led to an agreement in 1891 with Kruger, who in consideration of money to be furnished by the Cape Colony, to enable him to extend the Delagoa Bay line to Pretoria, consented to the Cape Colony extending their line from Bloemfontein to Germiston in the middle of the Rand goldfields. This latter line was opened in September 1892. Natal had still to cart goods for Johannesburg by ox-waggon from Charlestown, and was not connected by rail with Germiston till 1895. The fight between the ports of the Cape Colony and Natal and Delagoa Bay for the Johannesburg traffic continued from that time until the Union of South Africa. On the route to the north the line from Vryburg to Mafeking was opened in 1902, and in the same year a line from the Port of Beira in Portuguese East Africa was commenced towards Rhodesia, where the settlers were in urgent need of better communication than that afforded by the ox-waggon. Our experiences in the construction of the Beira Railway give one a good idea of the inaccessibility of the country at that time. The Administration were receiving messages that people were starving—partly it must be admitted because they were not inclined to eat native food when the English food to which

they had been accustomed was unobtainable. Without a railway it took three weeks to go even the 300 miles from Bulawayo to Salisbury, and to make the railway was imperative. Money was very scarce, and in order to get the line as far as possible it was necessary to utilize such stretches of river as were navigable. For the first 30 miles the ground was under water, the mosquitoes were very bad, and a path had to be cut through the jungle, where then one could not see a yard ahead, and where now it is difficult to believe that there had been any trouble. Sickness carried off half the staff. The value of quinine was not known and all the people were thin and yellow. Now one passes through the country in a beautiful railway carriage and cannot realize the original difficulties. Everybody looks rosy-cheeked and healthy simply because now they have proper food and attention. In 1893 Matabeleland was occupied and several proposals were made to connect Mafeking with Bulawayo by a light railway, but it was not until 1896, after the Matabele rebellion and after rinderpest had caused such ravage amongst the cattle of the country, that freight from Mafeking to Bulawayo, a distance of 600 miles, was costing £200 a ton, that Mr. Rhodes at last saw that railway communication was an absolute necessity; he therefore sanctioned the construction of the extension of the 3 ft. 6 in. railway to Bulawayo. The people were urging their starvation. They were paying 4s. a-piece for eggs. Mr. Rhodes therefore sanctioned the construction of the extension to Bulawayo, and within a year, by the great efforts of Mr. George Pauling, the contractor who has done so much for the railway development of South Africa, the line was opened in November 1897.

From that time forward Mr. Rhodes was a convinced believer in the necessity of railways for opening up a country, and he put his great energy and will power into the financing of railway construction. The line from Beira to Salisbury was completed in 1899, and the section between Salisbury and Bulawayo was opened in 1902. From Gwelo, a town on that section, it was proposed to run the main northward extension of the railway across the Zambezi River at the beautiful Kariba Gorge, some 250 miles below Victoria Falls, and continue along the Luangwa Valley through North-East Rhodesia to Lake Tanganyika, but the difficulties beyond the Zambezi were very great, and this proposal was abandoned. It was thought more advisable to continue the line from Bulawayo past the Wankie Coal-mines to the Victoria Falls, and this line was opened in 1904. From the Victoria Falls the railway has been extended through North-West Rhodesia past the lead and zinc mine of Broken Hill and the Bwana M'Kubwa copper-mine for a distance of 507 miles to the Congo border, which was reached in 1909; it was thence extended through the great copper districts of Katanga, passing from Elizabethville to Kambove through 100 miles of copper-mines, and has since been further constructed to the Biano plateau on its way to Bukama, from which it is now 100 miles distant, the length of the line from

Cape Town being 2500 miles. During these latter years various railways were constructed in the Orange Free State and the Transvaal, opening up and developing those districts. The position now is that under the administration of the British South Africa Company there are about 2465 miles of railway, and under the Union Government about 8500 miles, to which, I presume, we may now add, thanks to the successful campaign under General Botha, about 1400 miles of railway in German South-West Africa. In August last General Botha, speaking at the South Africa Party Congress at Bloemfontein, stated that of the public debt of the Union, which amounted to £131,000,000, over £114,000,000 was reproductive expenditure, being the value of railways, harbour, telegraphs, and telephones. The Union Government Railway Department played a most important part in the recent German South African Campaign, and they deserve great praise for the way in which they linked up the Union Railway system from Prieska past Upington to the railways in German South-West Africa, some of this construction being made at record speed.

In Portuguese East Africa, besides the main Delagoa Railway from Lourenço Marques to the Transvaal frontier, a short 3 ft. 6 in. line of 44 miles has been built from that port to Goba, a point 7 miles from the Swazi border. The Inkomati Railway from Moamba on the main line to Shinavane was opened in November 1914; there is a Decauville 75 metre gauge line about 70 miles long from Chai Chai to Jenabai; and from Inhambane a 3 ft. 6 in. railway has been made southward to Inharrime.

One of the projects of Mr. Rhodes was a Transcontinental Telegraph to extend from Cape Town to Alexandria. In connection with this matter and with the Cape to Cairo Railway scheme he interviewed King Leopold at Brussels, in the beginning of the year 1899, but he could arrange nothing with him. King Leopold's terms were impossible. In March of that year Mr. Rhodes had several interviews with the Kaiser in Berlin, and an agreement was come to by which the Transcontinental Telegraph was allowed to be constructed from the northern border of North-East Rhodesia through German East Africa to Nairobi in British East Africa; permission was also granted to construct a continuation of the Cape to Cairo Railway through German territory, and the permanent-way material for this line was to be carried over a proposed German line from Dar es Salaam. The German Colonial group had proposed to make their main line from Dar es Salaam to the north-east corner of Lake Nyasa, but it was pointed out to them that a line of wider scope would be from Dar es Salaam through Tabora to Ujiji halfway up Lake Tanganyika. This was the route finally adopted, and this railway of metre gauge 778 miles in length was opened for traffic in February 1914, from Dar es Salaam to Kigoma, near Ujiji, having cost nearly seven millions of money. The Germans have also constructed a line called the Usambara Railway



from Tanga to Moshi at the foot of Kilimanjaro of 220 miles in length. In Nyasaland, which was much handicapped by the difficulties of navigation on the Zambezi and Shiré rivers, a railway of 3 ft. 6 in. gauge was constructed by the Shiré Highlands Railway Company from Port Herald to Blantyre, which was last year extended down to the Zambezi River at Chinde, and a line is being constructed by the Portuguese from Kilimane to the Shiré River. To the north of Kilimane the Inhama-curra and M'Kuba railway, 32 miles in length, has been built to a 75 metre gauge. British East Africa, rescued by the efforts of Sir William Mackinnon and others from the German clutch, was taken over by the British Government in 1895, and a metre-gauge railway from Mombasa, on the east coast, past Nairobi to Victoria Nyanza was completed in 1902, a distance of 582 miles. No statement has ever been made of the reason why the railway was built upon the metre-gauge, but it may be noticed that in case of military necessity the scanty rolling-stock of the Uganda Railway might be most quickly supplemented from the metre-gauge railways of India.

From Jinja the Busoga Railway to Namasagali, a port on Lake Kioga, (a distance of 61 miles) was opened in 1914. This line has been made to open up cotton districts. A branch line has also been made connecting the great soda lake of Magadi with the Mombasa railway near Kiu, and a line has been made from Nairobi to Thiki towards Mount Kenya. In French Somaliland a line of metre gauge was commenced in 1897 by a private company from the Port of Jibuti which reached Diré Dawa, a distance of 192 miles, in 1902. This company was finally taken over by the Franco-Ethiopian Company in 1909, and the railway has now been extended to Addis Abbaba in Abyssinia, a further distance of 300 miles. At this point the line is at an altitude of 7732 feet. In Eritrea (Italian Somaliland) a short line of 95 miles has been made from Massawa inland through Asmara to Cheren.

In the Sudan, which has an area of a million square miles, Ismail Pasha forty years ago started a railway from Wadi Halfa southwards, but only 33 miles were made and it was then abandoned. In 1884 an abortive attempt was made by the British Government during the military expedition to make a line from Port Suakin, soon abandoned.

In connection with the Sudan expedition against the Mahdi the railway from Wadi Halfa was completed to Abu Hamed in 1897, to Atbara in 1898, the year that Khartum was captured, and to Khartum, a distance in all of 578 miles, in 1899. In connection with this military railway made by Lord Kitchener it may be noted how one part of the British dominions can and does help another. When Lord Kitchener could not get locomotives the Rhodesia Railway, which was then called the Bechuana-land Railway, handed over to him for his work in Egypt five locomotives that they had ready in England, which assistance Lord Kitchener said saved him a year's campaign.

In 1904 the line between Atbara and Suakin, 305 miles in length, was commenced from both ends and completed in 1906, a branch being made to Port Sudan, which gave better facilities than Suakin for handling traffic. In 1910 the railway was extended from Khartum to Sennar on the Blue Nile, from which point the railway was made due west to Kosti on the White Nile, a distance of 238 miles from Khartum, and has since been extended a further 192 miles to El Obeid, the centre of the gum trade in the province of Darfur. From Aswan to Wadi Halfa, a distance of 210 miles, there is as yet no railway, the traffic being carried on the Nile.

In Egypt proper the line from Alexandria southwards was started by Abbas Pasha in 1852. It has now been built past Cairo as far as Luxor with a 4 ft. 8½ in. gauge and from Luxor on to Aswan with a 3 ft. 6 in. gauge. In the delta there is a network of railways connecting Alexandria and Cairo with Port Said and Suez, and narrow-gauge railways have been made to Kharga past Fayum; the Khedive also commenced a railway on the Decauville system from Lake Mariut westwards along the coast towards the Gulf of Sollum, which was constructed for some 120 miles to Abu Hagag and later taken over by the State Railways.

The State Railways own 1828 miles of 4 ft. 8½ in. gauge and 137 miles of 3 ft. 6 in. gauge; of the light narrow-gauge railways there are 823 miles in all.

To the west of Egypt there is a short railway of 19 miles from Bengasi to Benine, which perhaps was intended to join the late Khedive's railway from Lake Mariut to Abu Hagag.

In Tunis there are about 1144 miles of railway, of which 278 miles are of broad gauge, and in Algeria there are 1180 miles of broad gauge and 1118 miles of narrow gauge. Algeria and Tunis have chiefly coast-lines connecting up Oran with Algiers, Constantine, Tunis, and Sfax, with branches towards the desert. The line which has been constructed from Oran to Colomb-Bechar, a distance of 465 miles, is spoken of as the first section of the trans-Sahara railway.

In French Morocco the railway from Casablanca to Fez has been completed, and work commenced on the Casablanca-Marrakesh line.

In Senegal, famous for its produce of ground-nuts, a railway 165 miles in length, was made from Dakar to St. Louis at the mouth of the Senegal River in 1885. This river after the rainy season is navigable as far as Kayes, but in the dry season only as far as Podor. From Ambidedi, near Kayes, a line to Kulikoro, 346 miles in length, was opened in 1904, and between Thies and Kayes, a distance of 425 miles, a railway is being constructed from both ends, of which about 248 miles have been made, and a short branch has been made to Kiolak. Southwards of Dakar the Gambia River being navigable is utilized for traffic. To the south of the Gambia, in French Guinea, a railway from Konakri was finished to Kurussa in 1910, a

distance of 367 miles, since extended 43 miles to Kankan. At Konakri ocean steamers can discharge and load alongside the wharf.

In Sierra Leone from the fine harbour at Freetown the first railway in British West Africa was commenced in 1896, and has been constructed on a 2 ft. 6 in. gauge to Pendembu, a distance of 228 miles, and also a branch of 90 miles has been made from Boia to Makene. Further east the next railway is in the French territory of the Ivory Coast, where there are only surf harbours at Port Bouet and Grand Bassam, and goods have to be twice transhipped before reaching the commencement of the railway at Abijan. This line is of metre gauge, as are all the French railways in West Africa, and extends to Bwaké, 194 miles.

In the British territory of the Gold Coast the railway from Sekondi to Kumasi, 168 miles in length, was commenced in 1898 and finished in 1904 with a gauge of 3 feet 6 inches, and was built in the interests of the gold-mining industry and the cocoa and timber trade. There is also a branch line of 20 miles to Prestea. There is also a line from the bad port of Accra of 39 miles to Mangoase, since extended another 13 miles to Koforidua. In Togo Land, which was recently German, there is no good port, but a metre-gauge line of 118 miles was constructed from Lome to Misahöhe in 1907, and also a line from Lome to Atakpame of 104 miles, with a coast railway of 27 miles from Lome to Anecho.

In the French territory of Dahomey there is a surf harbour at Kotonu, and from there a metre-gauge line, 162 miles, has been made to Savé, a portion of a line of 458 miles proposed to Gaya on the Niger River. There is also a branch from Paku to Lake Aheme of 20 miles, and a tramway from Porto Novo to Sakete and Pobe of 46 miles.

In British Nigeria the railway commences at Iddo near Lagos and goes through Yoruba, a province with densely populated towns, to Jebba, a distance of 307 miles. This was commenced in 1896 and finished in 1909. Northern Nigeria, with an area of 255,000 square miles, was taken over from the Royal Niger Company in 1900 by the Government.

In 1907, when Sir Percy Girouard was High Commissioner, money was advanced by Southern Nigeria to construct the line from Baro on the Niger River, through Minna and Zaria to Kano, 356 miles in length. This was opened in 1911. Since then the line has been completed from Jebba through Zungeru, the capital, to Minna. The whole of this railway is 3 ft. 6 in. gauge, but a branch of about 141 miles from Zaria towards the Bauchi Plateau is constructed on the 2 ft. 6 in. gauge. Sir Walter Egerton did much to improve the Port of Lagos, but the port of Forçados at the mouth of the Niger is said to be very much better and can accommodate ocean steamers. In 1913 Lieut. R. H. Hughes of the Nigeria Marine discovered a good harbour on the River Bonny, now named Port Harcourt, and from this port a railway is being constructed northwards to cross the Benue River between Loko and Ibi to join the main

line to Kano at Kaduna, south of Zaria, a distance of 450 miles. 147 miles of this railway was opened for goods traffic in March 1915 as far as Enugu-Engwo near the Udi coalfields. The Cameroons, with its area of 290,000 square miles, was left without railways for some time, the traffic being carried on the rivers, but the *Mittellandbahn* of 175 miles has been made from Duala to the Njong River, and the *Nordbahn*, 100 miles in length, commencing on the opposite side of the Wuri River from Duala to Kongsamba, a neck in the Manenguba Mountains, was opened in 1911.

In the French Congo a line has been commenced from Brazzaville to Pointe Noire, a distance of 362 miles.

In Belgian Congo a short line has been built from Boma to Buku Chela which was opened in 1914. From its mouth the Congo River is navigable for ocean steamers for 85 miles up to Matadi. From Matadi to Dolo and Leopoldville on Stanley Pool a line of 75 metre gauge, 247 miles in length, commenced in 1890, was completed in 1898. From Stanley Pool, which the French line from Pointe Noire to Brazzaville will also tap, the Congo is navigable for about 1000 miles as far as Stanleyville, and is used by steamers of 500 tons. From Stanleyville to Ponthierville, a railway 78 miles long was constructed in 1907 to avoid the Stanley Falls. From Ponthierville to Kindu, a distance of 200 miles, the river is navigated by tugs and barges. From Kindu to Kongolo a railway 217 miles in length was constructed in 1907 to avoid the rapids. From Kabalo, south of Kongolo, a railway has been made eastwards connecting the Lualaba River with Lake Tanganyika at Albertville. From Kongolo the river is navigated by tugs and 200-ton barges for 400 miles up to Bukama, the point which the railway from Cape Town through Kambove is approaching.

In Portuguese territory there is a railway from Loanda to Ambaca, 226 miles in length, extended now for another 8.7 miles to Malange, of metre gauge with a short branch to the north. In Portuguese Angola the Benguella Railway, commencing at the fine harbour of Lobito Bay, has been, through the initiative and resource of Mr. Robert Williams, constructed of a 3 ft. 6 in. gauge for 392 miles to Bihé on the high Angola plateau at an altitude of 5000 feet above sea-level. Further south in Portuguese Angola there is a line of 105 miles from Mossamedes to Lubango and the Chela mountains.

In German South-West Africa, which has an area of 322,446 sq. miles, the first railway was a light military line of 6 metre or 23.6 inch gauge. It was commenced in 1897, and built without any regular survey from Swakopmund to Karibib, a distance of 121 miles. From Karibib, after a proper survey had been made, it was completed in 1902, a distance of 116 miles to Windhoek, which is at an altitude of over 5500 feet above sea-level. The railway from Swakopmund to the copper-mines of Otavi and Tsumeb, a distance of 354 miles, was commenced in 1903 and completed

in 1906. It was built by the Otavi Mines and Railway Company, who also built a branch from Otavi to Grootfontein, a length of 56 miles, in 1909 in connection with their large land grants. These railways were taken over by the German Government, and a junction has since been made from Karibib to Onguati on the Otavi line. The line from Windhoek to Keetmanshoop, a distance of 317 miles, was made by the Government chiefly for military purposes on a 3 ft. 6 in. gauge in 1912. The line from Lüderitzbucht to Keetmanshoop, 227 miles in length, of a 3 ft. 6 in. gauge, was completed in 1908, and later extensions were made from Seeheim to Kalkfontein, 115 miles, and from Kalkfontein to Warmbad, 25 miles, and from Kalkfontein to Nababas, 65 miles. A line was also made 60 miles in length from Kolmanskop to Bogenfels along the coast in connection with the diamond fields industry. These railways, which have cost nearly six millions of money, are about 1400 miles in length in all, and have now been taken over by the Union Government of South Africa and connected up with their own system of railways.

Having dealt with the existing railways in Africa, which are mostly coast lines being gradually extended into the interior, we will now examine the various projects in order, working from the south up the east coast and round by the north and west coasts back to Cape Town.

Inaccessible Africa has been made accessible through the efforts of explorers, missionaries and shipping companies, private companies and governments and their engineers. By the expenditure of much money and at a great cost of life, the barriers around Africa have been surmounted and the way opened to the plateau of the interior.

The Union of South Africa are constructing during this year some 810 miles of local railways, of which 300 are in the Cape Province, 163 miles in the Orange Free State, 212 miles in the Transvaal, and 135 miles in Natal. In Rhodesia there are about 550 miles of local lines projected. From the Port of Beira a line is proposed to Chindé on the Zambezi River to connect Blantyre and later Lake Nyasa with that port. From the harbour of Mokambo Bay, close to Mozambique, a line is projected to the Namuli Mountains and Nyasaland. From Port Amelia on the south shore of the fine harbour of Pemba Bay a line is proposed to the southern end of Lake Nyasa. A line from Karonga on the north end of Lake Nyasa to Kituta on the southern end of Lake Tanganyika, practically along the Stevenson road, the boundary between North-East Rhodesia and German territory, has also been mooted.

The German East African projects were a line from Kilwa Kivinje to Wiedhafen on the north end of Lake Nyasa, a railway from Bismarckburg near the southern end of Lake Tanganyika to Kilossa, and an extension from Moshi to Nassa on Lake Victoria Nyanza, in order to tap traffic now going by the Mombasa railway. Also a line from Tabora to the Kagera River in the Ruanda Province, with a branch to Mulesi on the

southern end of Victoria Nyanza. In British East Africa a line is being surveyed from Nakuru on the Mombasa railway towards Busoga.

From Itala on the coast of Italian Somaliland a line has been projected to Addis Abbaba in Abyssinia, from which point an extension is proposed to Gambela, a town on the river Baro leased to the Sudan Government. The river Baro is navigable for a few months and is used for trade between Gambela and Khartum. From Diré Dawa a branch is proposed to Harrar. From Asmara in Eritrea a line is projected southwards to Addis Abbaba and one from Cheren to Agordat.

In the Sudan a line is to be built from Thamiam, a point on the Suakin-Berber railway to Kassala, with a probable extension to Gedaref and Sennar, and also an extension from El Obeid to El Fasher in the Province of Darfur, and a line of 50 miles has been surveyed from Suakin to Tokar. In Tripoli some extensions of the existing short lines are projected, and two large schemes are talked of, the one from Tripoli to Lake Chad and another from Benghazi towards the oasis of Kurfara.

In Algeria it is proposed to connect the iron-mines of Wenza and Bu Kadra with Bone Harbour, and there are proposals for extending the line from Constantine and Biskra and Tuggurt southwards to Wargla, and from Algiers to El Golea and from Ujda to Fez, part of which is already built. A railway has also been authorized from Tangier to Fez. The French proposals in West Africa are a line joining the railway in Senegal from Dakar to Kayes with the line from Konakri in French Guinea; extensions from Bamako on the Niger near Kulikoro to Buguni and from Kankan to Buguni; an extension from Buguni to Boromo and Wagadugu on to Ausongo; a line from Kankan to Dimbokro on the Abijan-Bwaké Railway; an extension from Bwaké to Boromo and a line from Wagadugu to Paraku, on the proposed extension of the line from Savé to Gaya on the Niger, and also a short connection between Porto Novo and Kotonu.

In the Gold Coast a junction between Koforidua and Kumasi has been projected and also a cross line joining the two railways from Sekondi and Accra on the 6th parallel north. In Togoland there was a proposed extension from Atakpame to Sansane Mango. In British Nigeria there is the proposed extension from Enugu-Engwo to Kaduna.

In the Cameroons the Germans had suggested a line which left the existing railway at the Njong River and went in a north-easterly direction through Bertua, Kunde, and Bibene to Lake Chad, with several branches east and west. There is also a projected line from Bertua to Singa on the Ubangi River, and another from Njong River south-west to Wesso on the navigable Sanga River.

In French Congo there is a scheme for a line of 125 miles from Njole on the Ogowe River to Kanjama, and also for a line 216 miles in length from Bangi to Fort Crampel, connecting the Ubangi and Shari Rivers.

In Belgian Congo it is proposed to extend the Boma Lukula Railway to Buku Dungu. There is also a big project of a line from Stanley Pool *viâ* Lusambo to Bukama, with a branch to Kabalo, and another from Kabalo on to Lake Mweru. There is also an alternative route surveyed from Dolo to Bukama. From Stanleyville a line has been surveyed to Albert Nyanza and also a line to connect this railway with Lake Tanganyika.

In Portuguese West Africa an extension is proposed of the Loanda Malange Railway to the Kasai River on the frontier of the Congo territory. Further down on the 12th parallel the Benguela Railway, which has reached the high plateau, is being extended over a level stretch of country to the frontier of the Belgian Congo where it will be linked up with a line of the same gauge that is to be constructed from Ruwe and Kambove, the centre of the copper and other mineral deposits of Katanga. It is also proposed to extend the Mossamedes Lubango Railway to the Kubango River.

In German South-West Africa a line was projected from Otjiwarongo on the Swakopmund-Otavi Railway across the Kunene River to Great Fish Bay in Portuguese Angola, part of which has been completed, and also a branch from Windhoek to the east to Gobabis.

These are the railways—commercial, political and military—which have been built and projected, and we now come to the more difficult task of gratuitous prophecy of the railways of the future. The history has been that, owing to the difficulty of getting funds, wherever it has been possible to utilize rivers, traffic has been carried on by steamer or boat, railways being made to work in conjunction with river traffic. Naturally, as trade increases the railways will be made continuous, the rivers being still used as feeders. This network of veins of railways which are steadily being pushed forward into the centre of Africa must inevitably connect, in the future, with great arteries going north and south through the continent.

When the line from Kambove to Bukama is completed and the railway from Stanleyville to Albert Nyanza is made by the construction of a short line of 100 miles in length from Dufile to Rejaf near Gondokoro, communication will be effected by rail or steamer from Cape Town to Alexandria and Port Said, and a short connection between Port Said and Jerusalem would link up railway communication between Africa and Asia Minor. From Stanleyville it is almost certain that a railway will be made to Lake Chad, and as French surveys have already been made from Algeria to Lake Chad, it seems possible that even across the Sahara Desert, so painfully traversed by Barth and others, a railway will be made which will join up Cape Town with Algeria, and which with a tunnel from Ceuta to the Spanish coast would give an overland connection with Europe. From this Trans-Saharan line connections will of course be made, probably with Timbaktu on the west and the province of Darfur on the east.

Very rich men are often in great doubt how to leave their wealth in such a way that it shall be beneficial and not harmful to humanity; they cannot do better than follow the example of Mr. Alfred Beit, who besides bequeathing large amounts for education, left two millions of money in trust for the purpose of financing railways in Rhodesia. The idea in this very fine will was that the money should be expended in the construction of railways which were necessary, but which possibly would not pay for some years, and as soon as these railways were paying their four per cent. and five per cent. interest, which appeals to the public, the money should be utilized again for further railways. It is hoped that this money may be available for the construction of a railway from Broken Hill in North-West Rhodesia, through North-East Rhodesia, one of the great cattle producing countries of the world, to the south end of Lake Tanganyika, and extended thence through Tabora to the railway in British East Africa, and by a further extension from that railway to Senaar in the Sudan another all-through-Africa route will be provided.

It would seem scarcely necessary to point out that these great arteries are not made for the purpose of reaching Cape Town; they will be great channels of trade passing through vast territories capable of enormous development and occupied by millions of people, whose numbers are increasing rapidly now that slave raiding is done away with and that tribal wars are almost a thing of the past.

They will be great arteries connected with the coast on all sides by a network of railway veins to and from which there will be a constant and ever-increasing flow of traffic until what was inaccessible Africa will lie open to all, a smiling, prosperous, and civilized continent.

The PRESIDENT: We are going to listen to-night to a lecture which I am sure will be of great interest on the Railroad Development of Africa by Sir Charles Metcalfe, who is as well qualified as any one in this country to tell us all that can be known on that subject. Sir Charles Metcalfe was from very early years an intimate friend of Mr. Rhodes, and was in constant contact with him all his life. He has done as much as any man living for the development of Rhodesia. I believe, if I may introduce a personal element, that when the British Association went to Rhodesia it was largely due to Sir Charles that we owed our delightful visit to the Victoria Falls. I will ask Sir Charles to read us his paper.

*(Sir Charles Metcalfe then read the paper printed above and a discussion followed.)*

Sir FRANCIS FOX: It is with pleasure I take this opportunity of saying that it is now something like forty years since Sir Charles Metcalfe, Sir Douglas Fox, and I first began work together, and we have been working together ever since. We engineers generally have to select the route of our railways by sending a theodolite party with levels over the country through which the line is to pass, but Sir Charles has a peculiar faculty about him, and can do this by walking or riding over the district. He thinks nothing of starting off on a walk of from 200 to 300 miles, and he invariably proves to have chosen the right route.

There is one other thing I should like to mention in connection with Africa.

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