

THE CAPE TO CAIRO TELEGRAPH.

BY ENGLISH CORRESPONDENT OF SCIENTIFIC AMERICAN.

The work of constructing the great telegraph line across Africa from Cape Town to Cairo is proceeding rapidly. The surveying party itself is now engaged in mapping out the last section of the route so far as the African Transcontinental Telegraph, as it is called, is concerned, namely, from Ujiji on the eastern shore of Lake Tanganyika to Mombasa on the eastern shore of the Albert Nyanza, the inland terminus of the Uganda Railway. It will be remembered that the idea of thus connecting the northern and southern extremities of this vast continent, and also providing a new trunk overland telegraph route to England, emanated from the Rt. Hon. Cecil Rhodes, and it is mainly through his energy and enterprise that the scheme is being realized. Certainly the construction of such a line, which when complete will measure approximately 5,600 miles in length, is a momentous achievement, especially when it is remembered that the greater part of the line extends through practically unknown country.

The two end sections of the line have been in operation for several years past, namely, from Cape Town through Cape Colony to Umtali in Matabeleland in the south; and from Cairo downward toward Khartoum in the north. The African Transcontinental Telegraph starts from Umtali, forming a junction with the Cape Colony Telegraph at that point. The portion of the line already constructed north of the Zambesi is divided into the following sections:

Chiromo to Chikwawa.....	67 miles	0 poles.
Chikwawa to Blantyre.....	26 "	10 "
Blantyre to Zombra.....	47 "	10 "
Zombra to Fort Johnstone.....	77 "	10 "
Fort Johnstone to Dolmira Bay.....	95 "	5 "
Dolmira Bay to Kolakola.....	50 "	0 "
Kolakola to Bandawe.....	78 "	0 "
Bandawe to Florence Bay.....	94 "	17 "
Florence Bay to Karonga.....	59 "	17 "
Karonga to Fife.....	93 "	15 "
Fife to Abercorn.....	104 "	0 "

From Abercorn the line will strike in a northwesterly direction to the southern extremity of Lake Tanganyika to Bismarckburg, the frontier station of German East Africa. It will then continue along the eastern coast of Lake Tanganyika to Ujiji and thence stretch northeastward to Mombasa.

The survey party comprises the chief surveyor, Mr. Otto Beringer, two white assistants, and a sufficient army of blacks to carry their apparatus and necessities. The arduous nature of the task of this diminutive expedition can scarcely be comprehended. Their route extends through one of the most obscure, unaccessible, and pestilential parts of the dark continent. Fortunately the company possesses an indefatigable and thoroughly experienced African explorer in Mr. Beringer. He has devoted many years of his life to tramping through this country, and has thus become thoroughly acclimatized and acquainted with its natural conditions. This little band has often been completely isolated from civilization, in one or two instances being as much as 200 miles ahead of the constructional party. Natives have to be requisitioned by the surveyors for the conveyance of their baggage and also to assist them in their work. In the latter task Mr. Beringer has found them to be of exceptional use. They have grasped the nature and the peculiarities of the work very quickly, and have proved valuable assistants. This has been an inestimable boon, since had the natives not been available it would have necessitated the employment of more Englishmen, followed by a correspondingly increased death-rate. The natives are immune to the majority of those maladies, incidental to the tropics, which invariably prove fatal to Europeans.

The surveying has been carried out with commendable celerity, considering the difficult nature of the country traversed.

The material for the line is being wholly manufactured in England, and shipped to South Africa. Owing to a species of ant indigenous to the country, poles have had to be built of steel. Those for general purposes weigh about 160 pounds and measure 60 feet in height. In places, however, where the nature of the country necessitates an abnormally long span, longer and heavier poles are utilized. They are built in sections to facilitate transport. The material is shipped to the coast, transported to shallow-draught vessels, which proceed as far inland by means of the rivers as possible, and are then carried overland by oxen or natives.

The question of transporting the material up country has proved one of the greatest and most expensive

difficulties in connection with the scheme. The country is so rugged or swampy on the whole that the inauguration of an oxen transport is almost impossible, so the natives have to be employed for the work. Quite a large army of several thousand blacks are requisitioned for this part of the work alone. Each man carries a load not exceeding 60 pounds.

In connection with the two lakes—Nyassa and Tanganyika—special vessels have been built for service upon them. Upon the latter lake there is now quite a small fleet of steamboats owned by the African Lakes



ERECTING THE FIRST POLE IN GERMAN EAST AFRICA ON THE RHODESIAN FRONTIER, SEPTEMBER, 1900.

Corporation and the African Flotilla and Transport Company. These vessels were built in England and Germany, and being of the shallow-draught type, were built in sections, taken to pieces, shipped to the African coast, conveyed across country to the shores of the lakes, and the parts there reassembled.

Several distribution depots and repair stations have been established at various points along the route to serve certain areas with the necessary materials. Karonga, at the northern end of Lake Nyassa, constitutes the depot station for the Tanganyika section, and here several thousand tons of material and stores are awaiting dispatch up country.

The construction expedition comprises 10 whites and 1,000 native laborers. The latter are engaged for two months at a time, and work from 5 A. M. to 6 P. M. As a rule the local currency is calico.

After the route has been surveyed, a broad track about 15 feet in width is cleared. The poles are

obtained local labor, and work can only be carried on for short periods.

From Bandawe to Florence Bay the route passes over extremely mountainous country. The sides of the hills are particularly steep, in many instances dropping sheer into the lake, with correspondingly wide ravines. To bridge some of the latter successfully, long spans have had to be made, in one or two instances amounting to as much as 750 feet.

The best constructed section of the line is that from Kolakola to Karonga. Although very mountainous and difficult to build, the telegraph between these stations can be worked with less battery power than on any other section, and with the exception of one or two spans which are strained a little too tightly, the line is well built.

During the year 1899 the contractors erected 325 miles of wire, of which 202 miles was the trunk line. The cost of the year's working amounted approximately to \$99,925, exclusive of the purchase of the material in England and cost of transporting it up country. At Mombasa, the trunk line will join the Egyptian trunk line, which is being rapidly pushed southward from Khartoum to the Bahr-el-Ghazze, and the southern Egyptian frontier. It is anticipated by the provision of this new overland route to England that the cost of transmitting messages will be reduced to about 25 cents per word, as compared with \$1.06, which is the present rate of the sea cable companies. The line will be much cheaper to maintain, and messages will be dispatched with greater celerity.

Swiss Hydraulic Plant.

The Sublin hydraulic plant, which has been recently installed in Switzerland, is used to furnish light and power for several towns and also supplies current for the new Bex-Gryon-Villars electric railway. The motive power is supplied by the Avançon, an Alpine torrent whose flow is relatively constant throughout the year, as it is fed by numerous springs. It is already utilized by other hydraulic plants. Above the present site is a 600 horse power plant at La Peuffaire, which furnishes current for lighting several towns, and below are several other installations, including that of the Salines de Beviex, which also takes 600 horse power. Between these is a difference of level of 570 feet, which is utilized by the new Sublin plant, and it obtains an average flow of 200 gallons per second. A masonry dam 24 feet long, 10 feet high, and 8 thick has been laid across the stream, and from here the water is brought by an underground canal 4,500 feet long to the main reservoir, constructed in armed cement, which is 25 feet in diameter and 10 feet deep, and serves as the starting point for the conduit which supplies the turbines. In this way a constant pressure is secured, regardless of the variations in the main stream. The turbine conduit is formed of tubes of sheet steel in sections 18 to 22 feet long and 3 feet internal diameter. It is laid along the ground to a distance of 1,350 feet. Branching from it is an overflow conduit which is underground and built in armed cement, of circular section, 26 inches in diameter. In the generating station on the bank of the stream are six Escher-Wyss turbines of 400 horse power and 600 revolutions; they have governors to regulate within 5 per cent, and give 75 to 80 per cent efficiency. The turbines drive six dynamos, including four Westinghouse three-phase alternators, used for the light and power system, and two direct current Thury dynamos for the electric railway. The machines are directly connected to the turbines. The new electric railway passes through Bex, Gryon and Villars, and is divided into three sections, according to the grade. The middle section has a steep grade and requires the rack-and-pinion system. The end sections use the ordinary rails. The road starts from the Jura-Simplon station, near Bex, and the first section ends at Salines de Beviex, a distance of 11,000 feet. Here the rack-and-pinion begins, and mounts for 16,900 feet from Beviex (altitude, 1,470 feet) to Gryon (altitude, 3,840 feet). The end section in ordinary rail continues for 14,500 feet to the hotels of Villars, 410 feet above Gryon. The trolley system is used, at 600 volts. At present the road uses four cars of the tramway type, two larger cars for the express service, and two locomotives for the rack-and-pinion section, besides the baggage cars. The electric locomotives have their equipment furnished by the Geneva Electric Company. The cost of the railway, including the rolling stock, amounts to \$280,000.



SHALLOW-DRAUGHT STEAMER FOR CONVEYANCE OF MATERIAL FOR CAPE TO CAIRO TELEGRAPH.

erected down the center of this path, so that the wire has a perfectly uninterrupted passage.

The most difficult section of the line from the constructional point of view was that between Fort Johnstone in the south end of Lake Nyassa, Bandawe, Florence Bay, and Karonga. From Fort Johnstone to Bandawe is a succession of thick undergrowth, marsh, and dense forests. During the rainy season, the major portion of this part of the country is immersed to a depth of seven or eight feet. The district is deadly pestilential, even to the natives, so that it is difficult to