

railway construction carried on north of that point, one hopes that perhaps the rate of construction further north in the future will be far more rapid than I dare to hope. I should like again to express my thanks to the lecturer for the most interesting glimpse he has given us of those regions in Central Africa, and also thank the President for giving me this opportunity of putting before you my impressions.

The PRESIDENT: I think you will agree with me that we have not only listened to a very interesting lecture, but have had a most delightful evening. We could hardly have hoped to get so many expert opinions on a subject such as we have had before us. For my own part, I hope the time will come when the Cape and Cairo will be linked together by the railway. But the statements of those who have been kind enough to speak convince me of what, as a matter of fact, I have always been convinced ever since my experience on the Indian Frontier: that it is exceedingly risky to prophesy what should be the line of a railway until thoroughly sound geographical surveys are complete of the whole country. I will ask you to join in a very cordial vote of thanks not only to Major Steel for his able and instructive lecture, but to those gentlemen who have been so very kind as to take part in the discussion.

THE NILE-CONGO WATERSHED

Major Cuthbert Christy, R.A.M.C. (T.C.)

Map following page 240.

TRAVELLING south from Khartoum the navigation of the Nile ends at Redjaf, a few miles above the old station of Gondokoro, but on the west side of the river. Further on are a hundred odd miles of broken water and the Fola rapids ending at Nimule, beyond which again there is a navigable stretch of about the same distance before reaching Lake Albert, 1300 miles from Khartoum. Redjaf is noteworthy as a centre of seismic disturbance, and for its "earthquake hill," a conical rocky isolated kopje commanding a truly magnificent view up and down the Nile—a great green strip with a silvery streak running through it—and over a vast expanse of bush-covered plain fading away into the blue distance, its apparent sameness relieved here and there by rocky hills.

When I first saw Redjaf Hill in 1903 I was on my way from the "Birth of the Nile" in Uganda to Egypt. When it was sighted again in 1914, I had journeyed from the Atlantic *viâ* the Congo River and through the Ituri and Welle forest regions. On my third visit in October 1915 Redjaf was the starting-point on a ten months' journey westward along that portion of the Nile-Congo divide which serves as boundary between the Sudan and the Belgian and French Congos, a journey undertaken partly in order to explore and map the watershed, much of which previous to my visit was unknown, but mainly on behalf of the Sudan Sleeping Sickness Commission, for the purpose of studying the conditions along the frontier and the chances of preventing the introduction of sleeping sickness into the Sudan.

Redjaf to Meridi.

From Redjaf the route was by cart-road through the Lado Enclave, now part of the Mongola Province of the Sudan, passing the stations of Loka and Yei to Libogo on the Belgian Congo frontier. The vegetation in this far corner of the Empire is bush and grass, with one or two areas of bamboo. Game is by no means scarce, and giraffe, wild dog, hartebeeste and elephant were seen on the roadway, but inhabitants are few. At the Yei River, some 40 yards or more wide, one finds a difficult crossing, the carts having to be dragged bodily through the water, whilst the cattle swim, and the loads, since the loss of the small ferry boat, are hauled across on an overhead wire, passengers going with the loads. From the Nile Valley, with its mosquitoes, moist heat, and fever, there is a gradual rise to Libogo with its bracing climate on the divide, at an altitude of 2000 or 3000 feet. Situated among desolate bush scenery and broken kopjes, Libogo is well named, the word meaning stones in Bangala, the common language of the district and in fact of the greater portion of the upper Congo area. Facing westward on leaving one enters the Congo on a downhill grade, and during the three hours' walk to the Belgian post and customs station of Aba, villages and plantations are met with on either hand. The contrast between it and the Lado Enclave is very noticeable. One is inclined to conjecture whether, on retiring from the Enclave, the Belgians did not take most of its population with them. This region however, extending for 30 miles north of Aba, in which the powerful chief Maruka rules, and for 50 or 60 miles south of it, in which are the two big chiefs Sukme and Masikini, has for long been thickly populated, and it is just this area which is one of the two regions in the Haut Congo so heavily infected with sleeping sickness in its most serious epidemic form.

From Aba I travelled on to Faradje and then northward, crossing the Dungu, Garamba, and Akka rivers. The paramount chief of this district, which is rarely visited even by the Congo officials, is Bwendi, whom I found a most intelligent, civil, and obliging man, though his people, albeit willing enough to please, were rather wild and untamed. Some of the country between the Dungu and the Akka was, from a sporting point of view, as perfect as any I have visited, full of rhinoceros, elephant, giraffe, buffalo, warthog, and antelope, but it contains some bad fly (*G. morsitans*) areas. It was the dry season, before the burnt and blackened bush afforded any shade, and the flies were driven to the khors and khor heads, in some of which we were attacked as by a swarm of bees. I was never able to find one of their breeding-places. My diligence in hunting in holes, delving in sand, and scraping beneath the bushes only gained for me the reputation of being a prospector, "one hunting for money" as my men put it. The 10 to 12 mile strip of uninhabited country along the divide north of the Akka River in the Meridi district was equally good.

Few places could compare with it for the amount and variety of its great game. The white rhinoceros, the square-lipped and only species in this region, is still numerous. I frequently came upon these animals three or four times in a morning. Unlike the common hook-lipped species he is a comparatively inoffensive brute. The natives shoot and spear numbers, their bleached bones lying about everywhere in the bush.

All this country from Faradje northward as well as that on the watershed is bush-covered, mostly open scanty bush on the uplands, with occasional grass patches or intersected by wide grassy khors. The only forest trees are along the banks of the rivers or in the khor heads, the vivid green foliage of the latter in the dry season affording relief to the eye in the surrounding blackened waste, and welcome shelter from the sun. In some of the khors in the Meridi district on the Bahr-el-Ghazal side wild coffee trees are abundant, and the beans make quite useful coffee, though somewhat bitter.

Meridi to Yambio.

After a visit to Meridi I returned to the frontier. Travelling westward along it the first point of interest is Mount Baginzi, described in some detail by Schweinfurth in his 'Heart of Africa.' It is a great bare round-topped granite or gneiss hill broken into three pieces, the main portion rising to a height of perhaps 800 feet above the plain. The word Baginzi (pronounced Barginzi) in Azande means the Snail mountain (Ba=mountain, and ginzi=snail), the great boulder at some distance having a close resemblance to a huge snail-shell. The western face of the mountain is bare and precipitous, but its eastern, in parts almost perpendicular, is broken by several deep clefts, and huge masses of rock lie about in confusion. It is most easily climbed from the north side, a ridge affording a gradual ascent from the base to the summit of the main block. Two or three hundred feet from the top is a path leading over the pass between the main and the other portions, down to the base on the south-south-east. About halfway down this path on the Congo side is a glen, probably an old vent or crater, now an acre or so of soft and level ground, sheltered by cliffs, shaded by trees, and watered by a spring coming from the rock. It could be made impregnable from attack from without; it could accommodate quite a large camp; and from it a magnificent view is obtained of the country to the east and south. For the greater part of the year the hills in this region, as in many other parts, are infested with swarms of the little torment known as the "eye fly," a minute black bee, and Mount Baginzi is unfortunately no exception, its eastern side being the worst. A few camp fires and a little disturbance, however, of the normal state of things, and washing the face and hands to get rid of the salt perspiration, do much to lessen the annoyance. The natives dread sleeping on the hill owing to the centipedes or some similar creature which, according to them, issue from the cracks in the rock at night. The source of the Sue

River is a cleft on the north-west side. From the summit the sources of ten streams can be seen round about the base and their courses easily followed, especially on the south side, as they are outlined by trees. The backbone of the hill seems to be a vein of solid granite running north and south through the ridge into the main block. The rest is chiefly gneiss, full of mica and with veins of white quartz or felspar up to a foot in thickness. Schweinfurth speaks of the white crystals from these veins as cyanite.

Five or six miles north-north-west of Baginzi is Damvuru Hill, conical and conspicuous in its apparent isolation on the plain. On high ground on the divide to the westward, a little beyond Zingadi Hill, is the old Belgian fort of Bagbora or Nambia which the Belgians preferred to call "Les Belles Sources," for at least five considerable streams have their origins in the immediate neighbourhood. This small fort, probably not more than 60 or 70 yards square, seemed to me most ingeniously constructed, having inner and outer ditches cut in the solid ironstone conglomerate, and a raised Y-shaped sentry walk in the centre.

Barawa Hill, another great round-topped mass of once molten mineral, standing 600 feet or so above the general level, and 25 miles further along the divide westward, is geographically and in most other respects similar to Baginzi. Two miles east of it is the conspicuous ironstone hill called by the natives Mesue. From Barawa Hill onwards, past the sources of the Wo, Yebbo, Singbi, Puru, and Lingassi, until the Khor Bombuka, the boundary between Yambio and Tembura districts, is reached, the divide has more or less the same characteristics. Though high ground it is practically a continuous, level, unbroken, though tortuous strip of bush from a few yards to two miles or more in width, with stream sources on either hand, some merely trickles from patches of upland swamp, others springs in deep leafy hollows, delightful spots that invite a halt.

During a normal season in this region the fires lighted by the natives in January make a clean sweep of the long dry grass and the bush foliage. Nothing remains but trees and bare sticks in a blackened waste, through which, if elephants or other animals wander, their presence may be indicated by a cloud of dust. A month or two afterwards, about March or April, after a few showers of rain the bush throws out tufts of green spring foliage and bunches of white or pink blossom; new grass springs up, and one's daily march through vivid green and often orchard-like surroundings, in which the red coat of the frisky hartebeeste shows up at any distance, again becomes a delight.

The tendency of the streams to hug the divide along this Nile-Congo watershed, that is, to flow parallel with and close to it, is worth mention here, for although marked instances of the same thing occur further north, the peculiarity is more noticeable in this section, and especially on the south or Congo side. A reference to the map accompanying this paper will show how close and parallel to the divide are the upper reaches of

the Akka, Bwere, Baiyau, Tau, Makussa, and Werre rivers. By an international convention signed at Paris in August 1894 it was laid down that the actual divide between the basins of the Congo and the Nile should be recognized as the boundary of the Belgian Congo, and the natives on the Sudan side are told that if they draw their water from a stream running north into the Bahr-el-Ghazal they are under British administration, while if from one going south they belong to the Congo. On the Congo side, however, the Belgians in practice find that it is more convenient to make those streams such as the Akka which hug the frontier the boundary-line, utilizing the divide as boundary when there is no stream parallel with it.

Along both the Meridi and the Yambio sections of the frontier divide there is in places a large population, in spite of regulations forbidding the natives to live within a certain distance of it, a distance which differs in each district, and may be anything from one to six miles. Until the boundary is properly demarcated no regulations of the sort could be effective. The two or three officials within reach of it on either side rarely have occasion to visit it, and the people well know that the rich red soil will produce a far heavier crop of teleboon, their chief grain, than can be grown at lower levels. In making one's way along it one frequently finds the source of two streams, one going north and the other south, within a few yards of each other, and people belonging to both dependencies, or to one or the other as it suits them, living close together.

Yambio to Tembura.

Between the sources of the Bombuka and the Pengba lives Sheikh Doruma, a brother of the more powerful Sheikh Tarri further north, and at his village I stayed for several days. Doruma at one time, and I believe his father before him, lived on the Congo side and held sway on both sides of the divide; but at the time of our taking over the upper Bahr-el-Ghazal from the Belgians he chose to come under British rule, with the result that, although he still has a large following, many of his former people live in the Congo, between the frontier and the Belgian post of Doruma on the Gurba river. This post I visited, had *déjeuner* with the Chef de Poste, and returned in the afternoon, a 28-mile walk, the interest of which was enhanced by the fact that in some of the deep forested khors I noted tracks of both Bongo (*Boocercus eurycercus*) and the great yellow-backed duiker, and probably also the forest hog (*Hylocharus meinertzhageni*). I have seen many Belgian stations in the Congo, but few of them could compare with Doruma, with its 20 acres of parade ground, its fort, its houses and offices, its long mango avenue approach, the extensive cultivation around it, the number of well-to-do natives in its neighbourhood, and the great cleared road to Pupwandi running past it.

As one proceeds along the divide from Khor Bombuka it becomes more prominent and is probably at a higher altitude. Ironstone hills and ridges are frequent, and here and there escarpments affording extensive

views of the country north and north-eastward, apparently a vast bush-covered plain with clusters of bare rocky hills in the distance. The most distinct escarpment, where all around is a mass of ironstone, as elsewhere along the divide, is a little east of the sources of the Bekki. On its edge overlooking the country to the north are the remains of what once was probably a small Belgian post. Here an extensive native iron industry seems to have been carried on, for the foundations of a smelting furnace with heaps of slag are to be seen. The place was called by some men accompanying me "Bata Moki." In spite of this escarpment the actual divide here still retains, as it does in fact all the way, its original characteristic, a strip of nearly level brush-covered upland between the numerous khör heads. Ten miles further it appears to break up into ironstone hills and ridges, but on examination the same strip of nearly level ground is discernible. Close round about these hills and ridges are the sources of the Sugba, the Yobo, many streams flowing into the Bekki, and the Mbomu River, the latter marking the spot at which the frontier between Belgian and French Congos meets the Sudan (Bahr-el-Ghazal) frontier.

The source of the Mbomu within half a mile of the divide is a deep wooded khor-head, near which the French have built a small rest-camp and a house for the storage of food brought in by the natives for the use of porters when officials occupy the camp. The young boundary river at first flows northward parallel with the divide for 2 or 3 miles, and then turns north-west and west. It is here, in dangerous proximity to the Sudan, that the second serious outbreak of sleeping sickness in epidemic form in the Haut Congo is now in progress, extending along both banks of the Mbomu in both French and Belgian Congos to Semio and probably beyond. Fifty or sixty per cent. of the people in the regions bordering the left bank of the river are said to be infected, and recently the disease has spread through the French Congo districts on the right or north bank, many cases having occurred as far north as Gubere.

Closing and guarding the Tembura section of the frontier, by no means a difficult matter, would appear to be the chief means indicated for preventing the introduction of the disease into the Bahr-el-Ghazal, for *Glossina palpalis*, the tsetse fly implicated in the transmission of the disease from man to man, as far as my observations have gone, is rare in the khors and khor-heads on the divide, preferring the shady pools and open reaches at the lower levels. It is of course known that *G. palpalis* finds its way further up the streams in the rainy season when there is abundant leafy shade, but even so it is probable that the watershed with its considerable altitude and its continuous strip of dry bush acts as an effectual natural barrier to the fly's northward incursions. Preventive measures, therefore, need embrace only those which aim at preventing the flies on the Sudan side from becoming infected by the presence of persons who cross the frontier from the epidemic area with the trypanosome, the causal agent of the disease, in their blood.

A few miles north of the Mbomu River source the watershed for a stretch of 8 or 10 miles is more broken and interrupted by ironstone hills, ridges, and escarpments than at any other spot; but even here the divide itself is continuous and at much the same level, though parts of it instead of being bush are bare ironstone flats with an abrupt drop on either side. For several miles around Chief Wando's village at the source of the Dabba there is an extensive forest of *Borassus* palms and an abundance of game, including the giant eland (*Taurotragus derbianus gigas*).

At Benabundi, a conspicuous conical ironstone hill near which are the sources of the Mongu, the Yubo, and the Balinsa (Congo), I left the watershed and travelled north to Tembura, passing on the way the Pambia Hills, a great cluster of bare, round-faced gneiss and granite rocks with a more or less central wooded depression which possibly at one time may have been a volcanic crater. Lions are common round about these hills, and not infrequently, it was understood, have accounted for two or three natives in a night; yet the surrounding inhabitants take no steps to interfere with them and resent any one else attempting to do so, for the reason that on the death of the old Sultan Tembura his spirit was supposed to have passed into a lion.

Tembura to Deim Zubeir.

At Tembura I set to work to arrange for the next and most interesting stage of the journey, that from Tembura to Deim Zubeir, about 140 miles direct, at least a hundred of which is through entirely uninhabited country with no pathways other than elephant tracks, and where travelling has to be done by compass. This district, in fact nearly the whole of the country within the triangle formed by Wau, Tembura, and Deim Zubeir up to the frontier divide, was practically unmapped and almost unknown. The only maps giving any idea of the region, as far as I have been able to learn, are those of Marchand, and the only person it seems who has previously traversed the area since the old slave caravan days is the Egyptian Medical Officer at Deim Zubeir, who in 1915 walked from his station to Tembura and back with a guide and a few porters, during the driest time of the year. He experienced considerable difficulty in obtaining sufficient water. His route both ways was similar to mine on my outward journey, 30 miles east of the old caravan post of Deim Bekeir. He unfortunately made no serviceable route sketches nor any useful notes. About 1905 Captain Comyn, at that time Inspector at Deim Zubeir, travelled for twelve days with donkeys in the country between Deim Zubeir and the Pongo River; and in 1904 M. Pierre crossed the divide from French Congo and travelled to Wau in search of a possible railway route to the Jur River.

After some time spent at Tembura in an attempt to make a systematic microscopic examination of the blood of the natives of the surrounding district for trypanosomes, waiting for dura (millet) to be ground into flour for food on the way, and in selecting porters for the journey, I was at last

ready to make a start, and sent on twenty-two loads of flour to await my coming at Keir-el-Sid, a place four days' march north of Tembura and beyond which there are no inhabitants. At first there was a good deal of difficulty in obtaining the requisite carriers, owing to the distance of Deim Zubeir and fear of the unknown country; but with the assistance of Captain White, then Inspector and Commandant at Tembura, and of the local chief, together with a promise to the men that I should come back with them, and largely also to a reputation I had purposely taken pains to gain for shooting meat for my men whenever possible, and feeding them well in other ways, I was eventually able to collect a sufficient number, and left Tembura on May 24.

A fairly good track leading almost due west takes one to Chief Bekki's village, only 2 or 3 miles from the boundary. Afterwards one follows it north and north-westward through light bush country, crossing khor after khor at short intervals of a mile or two, all running east from the divide, which is 2 to 4 miles on the left, until one comes in sight of an isolated, conical, bush-covered, ironstone peak called Bardo Hill. On the divide 2 miles or so west of Bardo Hill is the source of the Jakomi River, and close by it the source of its affluent, the Bardo. At the junction of the two is Chief Mbittima's village, whence our track continued northward, part of the way following the Jakomi until we reached Keir-el-Sid on the 30th, having delayed two days on the way for observing, exploring, and sketching.

On the morning of June 1 we left Keir-el-Sid, pushing off into the unknown northward, a long line of fifty-five persons consisting of porters, an escort of three askaris, servants, etc., following a man who was said to know part of the way. That night we camped by a big comparatively sluggish stream with high banks, which I took to be the Wau River that ultimately joins the Sue just south of Wau, thereafter forming the Jur. For three days we followed our guide more or less northward until it was discovered that his plan was to keep on going north until he reached the Wau-Deim Zubeir road which runs due east and west. This would have landed us nearer to Wau than Deim Zubeir, so I took matters into my own hands and steered by compass for Deim Zubeir. It was easy going day after day, through open bush and scanty short grass country intersected at mile or two-mile intervals by wide grassy khors, open short grass areas or ironstone flats, with now and then a watercourse outlined by trees, or a considerable stream with many trees and with grass flats on either side. There had already thus early in the season been several heavy storms, and most of the watercourses, those outlined by trees, had pools of clear water here and there, though sometimes these required a good deal of searching for, and we were rarely at a loss for water. Rock basins on the ironstone flats often supplied all our needs.

As we marched northwards the bush changed in character, both the bush and the grass becoming scantier while the trees got bigger. Often

we passed through groves of mahogany and "lulu" (*Buterospermum parkii*, the Shea-butter tree) where there was practically no scrub, and where hartebeeste, giraffe, eland, and other animals could be seen far away through the white stems of the trees. The fruit of the "lulu," the "Sudan date," is about the size of a walnut, with a succulent green pericarp an eighth of an inch or so in thickness. Just at this season it was ripe, and at every halt there was a rush to gather it.

The amount of wax that might be collected in this region astonished me. In a bush country, subject to raging fires annually, every tree is more or less hollow or has some hole in it, and here it seemed that every tenth tree had either honey-bees in it or a nest of the little "eye fly" bee, which seems to produce as much wax as the honey-bee. Every day when camp was formed my men spread out all over the surrounding bush looking for honey, and soon one would hear from every direction sounds of chopping far and near. They generally worked in pairs, and each pair must have robbed on an average two or three bees' nests each afternoon, devouring comb and everything just as they took it from the tree. Their camp, which I always insisted on being at least 100 yards from mine, was generally a mass of bees and unapproachable. Owing to this fondness for honey, which at first I tried to check, it was seldom possible to shoot anything after camping. If the daily supply of meat was not obtained during the morning at the head of the column the men had to go without it, so that after a time they were induced to march fairly quietly. But even then there was always some one with a cough, or some talkative servant at the rear, who at the crucial moment warned elephant, eland, or roan of our coming. With half a hundred people in one's trail one cannot expect much sport. My aim on this outward journey was to get through to Deim Zubeir, and sport had to take a second place. I had no exact information as to the distance or how long it would take, and my supply of flour was limited. Once having reached Deim Zubeir and gained all the requisite information regarding distance and difficulties, if any, I intended to take time in returning along the divide, but as it turned out we were just a month too late in the season and had some difficulty in getting back at all.

On the tenth day after leaving Keir-el-Sid we saw a bees' nest recently chopped out, then discovered a faint pathway which led us to the camp of some lulu-nut collectors, and later to a small village from where next day a guide was procured to Deim Zubeir. My compass direction could not have been better.

Deim Zubeir to Tembura and Yambio.

After remaining three days at Deim Zubeir, and loading up a fresh supply of flour, we set out again on the return journey, travelling by compass due south from the village of Mangaia, beyond which there are no inhabitants. The first objective was the three hills marked on Marchand's

maps as Taia, Tala, and Vendel, and these we sighted during the third day's march. The following morning, on leaving camp on the Mana River, I made direct for Taia, the most northerly of the three. It is a gneiss and granite hill, though all around is ironstone, and is grass covered with very little bush. From it was obtained the first view of the surrounding country and of the divide in that section, for on the northward journey there was no hill or even ridge between Keir-el-Sid and Deim Zubeir from which a view could be obtained. Having studied the divide and taken compass bearings of everything to be seen, I went on to Vendel, which was found to be merely an outcrop of gneiss and quartz rock covered with bush. Tala, the most southerly, was not visited. It looked more thickly wooded than either of the other two. Not one of these three hills is more than perhaps 150 feet above the surrounding ironstone base, which, however, is considerably above the general level, so that the hills are fairly conspicuous from a distance.

At Deim Zubeir it had been evident that the rainy season was beginning in earnest, and earlier than usual. For the first three days of our return journey it rained incessantly. The grass, before scanty and short, was now knee-high and the bush fast becoming so leafy and thick that our progress was considerably hindered.

From Taia two conspicuous conical hills about 20 miles south-south-east were located. These, I had no doubt, were Tshito and Yandu on the Pongo River, shown on Marchand's maps as close by the site of the old caravan halting-place Deim Bekeir, once a well-known spot.

Halfway to these hills we crossed the Kuru River running due north, already a fairly big stream in a wide valley, and with long grass and clumps of trees on either side. The Pongo, as it flows north by the western base of the small cluster of ironstone hills, of which Tshito and Yandu are the biggest, is here smaller than the Kuru, being (as I saw it on 21 June 1916) almost empty, but outlined by trees and in a considerable valley. Tshito and Yandu are both flat-topped, an invariable characteristic of these ironstone hills, and are bush covered. On climbing Yandu I at once noticed amongst the grass blocks of stone placed in circles, clearly the remains of dwellings, and the men with me pointed out granite grinding-stones and picked up two old spear-heads. There had evidently been at some time a considerable village on this hill, not merely an encampment, and it must have been a very strong position, except for the fact that the water-supply was a good way off in the dry season. I came to the conclusion that this hilltop settlement was not old Deim Bekeir, for Marchand's maps clearly indicate that this was north of the hills, and on the left bank of the Pongo, probably not far from where we crossed it; but I could not stay to search for it, for at this point I was obliged to change my plans.

The weather had become so bad, the grass so long—one could almost see it growing day by day—and the bush was getting so thick, that instead

of continuing south as was intended, and exploring the divide at least as far as Bardo Hill, I decided to set my course south-east for Keir-el-Sid. It was a great disappointment not to be able to reach the divide at this point and follow it southward, one of the chief things I had hoped to do, but under the circumstances it seemed too great a risk, for I had many people with me but only a limited supply of flour, and owing to the increasing blindness of the bush it became more and more difficult to shoot the daily ration of meat. If you feed him well the cheery little Niam Niam (Nyam Nyam) makes a first-rate willing porter, and if you try and remember his name, pay him a little personal attention, and prevent his being overloaded, he will follow you anywhere and do anything for you in spite of his reputation and cannibalistic propensities; but, like other natives, he objects to being driven or worked on short rations.

During the next six days' march between the Deim Bekeir hills and Keir-el-Sid we had many troubles, and I was obliged to push on as fast as possible, myself leading and making the path day by day. If any of my barefooted followers attempted to lead they soon got their feet cut by the grass. As it was too hard to be carried part of the way. So heavy and continuous was the downpour that the streams became torrents which we had to bridge. The grass got so long that, before we could reach inhabited country and a pathway, it was well over our heads, and the labour of forcing a way through it was extremely trying. Twice our way was disputed by rhinoceros. On one occasion, on some broken ironstone flats, I and two of my escort passed within a few feet of one of these animals without seeing it, but the fourth man, the leading porter, was not so fortunate. The brute, with his tail in the air and throwing his great head up and down, charged straight at him, nearly succeeding in tossing him as he fell backward with his load; it then continued down nearly the whole length of the line, scattering men and loads in all directions and disappeared in the bush. An electric light switch could scarcely have dissolved a scene quicker than that line of men dissociated themselves with their loads and made themselves scarce; but cheery enough they were on reassembling, more cheery than I was with the knowledge of serious breakages.

The whole of the country passed through is composed of ironstone. The khors and watercourses gradually wear their way first through the red soil and then through three layers of iron formation. As one crosses the intervening strips of more or less level bush-covered country, bare ironstone or open ironstone flats invariably indicate the proximity of a khor or valley. In approaching or leaving a dip in the level one crosses bare ironstone somewhere. One layer may be a hundred or only a few feet above the next layer, but the three layers are nearly always distinguishable.

The Wau, one of the biggest streams on the route, was in flood 30 feet

wide and 10 feet deep, but we found a place where some trees nearly met across it, and through these we built a bridge. My cheery Nyam-Nyams worked like ants, cutting poles, dragging them to the river, and lashing them in position with rope made of the bark. After four hours' work we were able to cross safely and camp on the other side. On the following day travelling south-east I knew that we must be near our northward track from Keir-el-Sid, now more than three weeks old, though it was doubtful whether we should be able to find it in the long grass. Before leaving camp the men were warned to look out for it, and about noon the fourth porter from the rear end of the line detected it and word was sent forward to me. We had very nearly missed it. Its discovery saved us time and trouble, for on following it back we found that we were only a little over 2 miles from Keir-el-Sid, much to the astonishment of my party, who had no idea where they were, but who had learnt to trust the little compass that I carried in my hand all day as some truly astonishing "medicine."

After a rest at Keir-el-Sid we pushed on again to Tembura by the same path we had traversed previously. Thence with a fresh lot of porters I returned to Yambio, going this time direct by the post-road instead of along the divide. From Yambio I set out again northward on the last but by no means the least interesting stage of the journey, to Tonj 180 miles and then on to Wau, whence I was able to travel by steamer down the Jur River to the Nile and so back to Khartoum, having walked over and mapped about 1500 miles of territory.

Yambio to Wau and the Nile.

The direct route from Yambio to Tonj, on the Ibba or Tonj River, is comparatively new and unknown except to the natives and to traders sending goods from Wau to Yambio. The usual route, along which are resthouses at regular intervals, is *via* Tembura. From Tembura to Wau, however, a twelve days' march, most of the country is uninhabited, food cannot be obtained for porters, and loads must be reduced to 45 lbs., each man having to carry, in addition to his load, 15 lbs. of grain which, if he has friends near by, he gets ground into flour before starting. For these reasons the new and more direct route was selected. On this the uninhabited portion, from Toin's on the Ibba River northwards, can be traversed in six days. Food for porters may be bought from Toin, a powerful sheikh whom I found a most intelligent and obliging man. August is a rainy-season month, the grass in the uninhabited area was long, and the pathway overgrown. Streams and rivers were full of flood-water, and several had to be bridged before we could pass. Although the whole country is covered with spear grass and scanty hush, and "fly" (*G. morsitans*) was an intolerable pest, game was fairly plentiful, giraffe especially so. From Tonj to Wau the track is a good one in dry weather, but in wet considerable difficulty may be experienced. Both at the Mulmul and Arum

rivers one has to traverse more than a mile of swamp and flooded track with water one to four feet deep, and in crossing the Ibba at Tonj 2 miles of flooded grass flats have to be negotiated before the river itself is approached.

The Jur River, formed by the junction of the Sue and the Wau just above Wau, is navigable to Lake No on the White Nile for only three or four months in the year when the Nile and its affluents are at high water, the first steamer usually arriving towards the end of July. At other times the landing has to be made at Meshra-el-Rek and the journey to Wau made with porters. Even when the water is at its highest stern-wheel steamers have the utmost difficulty in making a passage through the masses of floating vegetation in that portion of the river which meanders through the sudd regions, where scarcely any stream is discernible. In the "narrows," a series of lanes in a far-reaching sea of swamp-grass, double-decked barges are towed by a launch or small screw steamer. The great blue-grey boat-billed aberrant stork (*Balæniceps rex*) is common on the Jur, and as many as five or six may be in view at one time. Game also is abundant where dry ground exists. Vaughan's kob, white-eared kob, and waterbuck are seen, and occasionally a herd of the beautiful *Cobus maria*. Lions also are frequently shot from the deck of the steamer.

The Administration of the southern or upper Bahr-el-Ghazal is carried on from three small posts, Meridi, Yambio, and Tembura, the headquarters of the Bahr-el-Ghazal province being at Wau. Most of the region, except part of the Meridi district, is sparsely populated, and is so remote from any convenient water transport or railway that little or nothing can be attempted in the way of development.

Maps.

For practically the whole of the journey I took pains to gather sufficient notes on the march, making entries in my notebook every three to five minutes, to compile a daily route map or prismatic compass traverse. Distances were obtained by time marching, checked from Yambio to Wau by a pocket pedometer. It is astonishing how correctly one can, after some years' experience, gauge distances walked by carefully deducting for bad ground, adding during the first hours of the day when the porters are fresh, noting the exact length of stoppages or delays, deducting again later when the men get tired and so on. Bearings from commanding points were taken with a "Radiant" night-marching compass with sights on ring and lid which enabled it to be used as a prismatic compass, but the bearings of the traverse were taken with an ordinary compass having a graduated circle. Marches were plotted to magnetic north daily, and finally replotted to true north on large sheets on returning to Khartoum, while adjustments were made to the following points in reference to the 1/250,000 scale map issued by the Sudan Survey Department: Yei and

Kheiralla's in the Lado Enclave; Faradje and Bwendi in the Congo; Meridi, Yambio, Tembura, Deim Zubeir, Tonj, and Wau in the Bahr-el-Ghazal; and Doruma in the Congo. Of these probably Wau, Deim Zubeir, and Meridi are accurately fixed, while the others are somewhat doubtful. No astronomical observations were taken. My photographs are unfortunately still with many of my things in Cairo.

My original maps are with the Royal Geographical Society. Most of the work has been recently incorporated in the new map (1/250,000) of the Bahr-el-Ghazal now being brought out by the Sudan Survey Department, Khartoum. The route map accompanying this paper, though lacking a great deal of the detail to be found on the originals owing to the very reduced scale, nevertheless is sufficient to illustrate the position and main characters of this great divide, the backbone of Africa, which, in the not very distant future, is doubtless destined to become a much more prominent feature on the map of Africa than it has been hitherto.

The watershed as a railway route.

During the journey along the watershed several discoveries were made, the most far-reaching of which was that this Nile-Congo divide, from the Lado Enclave north-westward, as far at least as Deim Bekeir, which is as far as I have actually seen it, is not merely high ground composed of ironstone hills, broken ridges, and nullahs, but is a continuous and more or less level strip of bush-covered country, sometimes as much as 2 miles in width, but often only a few yards. The fact that it is continuous and nearly level seems to me of great interest and importance, not only geographically, but from the point of view of the future development of Africa, since the question at once arises, "Is it suitable for a railway?" I answer that it certainly is; a railway that would probably cost only hundreds per mile instead of thousands to construct; one that would need no bridges, and for most of its length comparatively few culverts, cuttings, or embankments. For many miles in fact the mere clearing of the bush would be sufficient. This would mean no more than the cutting of perhaps five small trees and fifty bushes to the acre. Moreover, there is a sufficient water-supply from many springs during most or all the year, and an unlimited quantity of excellent timber near at hand, not only for sleepers, but for house and carriage building.

Mr. Rhodes's original intention was to carry his Cape to Cairo railway to the south end of Lake Tanganyika, and so make use of its 400 miles of waterway to the north. He perhaps had no definite idea what direction the route should take from the north end of that lake, for the geography of the Nile Lakes Rift and the Semliki valley was at that time comparatively little known. I think also that he could not have realized the enormous extent of the Sudd regions of the Middle Nile, a vast area of swamp and papyrus-sudd stretching across from the Bahr-el-Arab to the Sobat River,

and forming, as a glance at a map will show, a barrier to any direct route from Redjaf to Khartoum. It might not be very difficult to find a more or less direct route on the Abyssinian side of the Nile by extending the Khartoum-Sennar line along the Blue Nile southward, and then across the Sobat at some point, through the Nuer and Dinka countries, down to Redjaf; but the natives are as yet untamed and their vast swamp and grass regions imperfectly explored.

But the chances of finding a route, though less direct, on the west side, skirting the Sudd regions, are now much more promising. Previous to my visit no one had travelled along the Nile-Congo divide for any distance; it was unmapped and almost unknown; and I do not think that any one dreamed of its being a suitable route for a railway. The discovery very considerably alters the geographical outlook. A reference to any recent map of Africa will show that this divide continues northward into Darfur, as far as the Amara Hills near El Fasher, the capital. If this northern portion of the divide proves on examination to have the same character as the southern part explored by me, there would be no difficulty in making a very cheap and easily constructed railway from Darfur direct to the old Lado Enclave. Now the present Khartoum-El Obeid line, which crosses the White Nile by Kosti bridge, is being extended as fast as possible to El Fasher, and it would be a simple matter when completed to connect it with any railway built as I have suggested along the Nile-Congo divide, thus allowing of through communication by rail from Khartoum to Redjaf or Wadelai on the Nile.

Railway routes in Central Africa.

Southward beyond lat. 3° N., in the old Lado Enclave, the divide becomes involved in hilly country and high impracticable plateaux extending the whole length of the western side of Lake Albert as an escarpment 1000 feet or more in height, up which the Belgians have constructed a zigzag motor-road, a fine piece of engineering, but quite impossible as a route for a railway. Consequently any railway on the Sudan-Congo divide continuing south of lat. 3° N. and intended to reach the north end of Tanganyika by traversing the floor of the Semliki Valley—a route involving few constructional difficulties—and thus linking up the Cape to Cairo transport system, would probably have to join the Nile say at Redjaf or Wadelai and follow its course to Lake Albert (altitude 2037 feet), then along the almost continuous grass flats on the western shore of that lake beneath the escarpment until the mouth of the Semliki were reached.

I have made three journeys to different parts of the Nile Lakes Rift, and am able to write with some personal knowledge of most of it. The lower portion of the Semliki traverses a wide valley. The gorge through which a portion of the Upper Semliki runs, though at places scarcely 100 yards wide, would present no great obstacle, for its sides are not rock cliffs but red earth, and only here and there would cuttings be necessary.

The western shores of Lake Edward present little more difficulty than those at Lake Albert, for, as in that lake, the extensive grass flats at both ends only give place to cliffs or sloping rocks for short stretches towards the middle, and even here there is always sufficient width of tumbled rock-débris to allow of the formation of the permanent way.

South of Lake Edward (3000 feet), a portion of the rift I have only looked down upon from a distance, where are the highest levels on the route, and the Mufumbiro volcanoes rise from the floor of the rift to an altitude of over 14,000 feet, the line would again have to traverse the western side and continue along the western shores of Lake Kivu (5000 feet) to the Rusisi River, which drains that lake into Tanganyika. Twenty miles south of Kivu the level of the Rusisi falls abruptly 2000 feet nearly to the level of Lake Tanganyika (2625 feet), and it is here I should imagine that the only real difficulty would be likely to arise if the line is required to descend to the level of the lake. The whole route has been prospected by Belgian engineers, and a useful map showing the levels is to be found in the *Geographical Journal* for November 1908 (Projected Railways, Congo State).

On the completion of a line such as I have suggested *via* El Fasher, the Nile-Congo divide, and the Lakes Rift, there would be through railway communication, with the exception of the short Shellal to Halfa reach, from Alexandria and Cairo to Lake Tanganyika, as well as from Port Sudan. The route as above described along the rift is the easiest for construction, though it may not be the best for adoption. It is, however, for its whole length from Dufile, south of Redjaf, in Congo State territory. To build a line on the eastern side of the rift, to the east of the lakes and the Ruwenzori mountains, would be a far more difficult undertaking.

Mainly owing to the discovery of mineral wealth in the Katanga region of the Congo, the Cape to Cairo Railway has of late years been shelved in favour of a Cape to Congo route, which, with the exception of less than 50 miles of line from railhead to Bukama, the most southerly limit of useful navigation on the Congo, is now an accomplished fact. When this small link is complete there will be through communication by rail from Cape Town to the Congo, a distance of 2600 miles. One may then embark upon that great river and ultimately, by steamboat and rail, reach the Atlantic, a further distance of 2300 miles, in which there are three railway links:—from Kongolo to Kindu, 217 miles; from Ponthier-ville to Stanleyville, 78 miles; and from Leopoldville to Matadi, 247 miles.

By the short 166 miles of line from Kabalo on the Congo, south of Kongolo, to near Albertville the Belgians have, since the beginning of the war, joined up the Cape to Congo transport system with Lake Tanganyika and the Cape to Cairo system, in order to facilitate their operations in German East Africa. It has been proposed to make two additional connections between these two systems.

The first is between Stanleyville (Stanley Falls) on the Congo and

Mahagi on Lake Albert, *viâ* Bafwaboli and Irumu. The construction of this line has already been begun from Stanleyville. It will be a difficult undertaking and costly, requiring many bridges, much clearing of dense forest and extensive earthworks. The Nile-Congo divide, moreover, has to be crossed before the Nile system and the lake can be reached. The line is of course intended to tap the prolific gold-bearing regions in the Ituri district, and for much of its length it will follow the Ituri River. The intention is to construct as rapidly as possible a permanent way along which motors may be run, and having the same levels as would be required by the railway to come afterwards.

The second is by a much easier and more feasible route, one which would traverse fertile regions and some populous areas, *viz.* that from Bumba on the Congo to Buta on the Rubi River, thence *viâ* the existing motor road from Buta to Bambili on the Welle, and subsequently due eastward, south of that river, *viâ* Amadi, Niangara, Dungu, Faradje and Aba in the Congo, and Libogo, Yei, Loka and Redjaf in the old Lado Enclave. From Buta to Bambili a motor road has been in operation for some years, and so also from Bambili all the way to Redjaf is a good level road, which, however, on the Congo side of the divide lacks bridges over many of the small streams and the Dungu and Bomakandi rivers. That portion of it traversing the Lado Enclave, built originally by the Belgians during their occupation, has been bridged and improved by us, and has a service of motor lorries on it. I have travelled along both this and the Ituri forest route, and there is no question in my mind as to which would be the easier and cheaper line to make, since the construction works of the latter are partially completed. It may not be long before the rails are laid on the Congo side of the divide, but long enough before the Lado Enclave section is completed, unless the importance of encouraging railway development is recognized by British statesmen to the extent that it is by Belgians and others.

A Cape to Cairo railway, or rail and steamer transport system, from north to south of Africa, would not at first be likely to be a sound commercial proposition, except perhaps in its tourist department. Produce from Central Africa is more likely to follow the shorter routes to the sea east and west, and the completion of these east and west lines is all important. In planning railway development in Africa it has too often happened that the needs of a district or colony alone are taken into consideration, without sufficient forethought for the greater necessities of the Continent as a whole; and now that Africa is for the first time practically in the hands of allied Powers, it seems a fitting opportunity for the establishment of an international agreement by which every projected railway may conform with some carefully planned scheme of transcontinental lines linked with a north and south grand trunk Cape to Cairo railway; and preference should be given to those projects which might help to complete an approved transcontinental system.

The inset on the route map accompanying this paper is intended to illustrate not only the position of the region covered by my journey along the Nile-Congo watershed, but also the grand trunk Cape to Cairo project as suggested above, and the transcontinental routes which it seems to me are of the most vital importance. These latter are three:—

1. All rail, from Lagos to Port Sudan, *viâ* Lake Chad, El Fasher, and Khartoum.

2. All rail, from Lobito Bay or from Leopoldville to Beira, *viâ* Elizabethville and Salisbury.

3. River and rail, from the Congo mouth to Mombasa, *viâ* the Congo, Lake Albert, the Ripon Falls and the Uganda Railway in East Africa, utilizing either the Ituri or the Welle river route.

The success of a railway does not depend only upon traffic from local produce. Of far more importance is the civilization and consequent trade development which the railway is certain to bring, with the opening up of markets for outside products, and the increased facilities for prospecting and working mineral discoveries. It is not even always necessary that the line should traverse a thickly populated region, as the history of several railways, notably those in Nigeria, has shown. When the railway is made both passenger and freight traffic will come to it, until other competing lines change the aspect of affairs.

As to the Cape to Cairo project outlined above, the proposed section along the Nile-Congo watershed would not be merely a link in a grand trunk system, but would from the outset open the upper Bahr-el-Ghazal, an extremely fertile region, for Indian and European produce. It would also open up the Shari-Chad region of the French Congo as well as the Welle regions of the Belgian Congo, inhabited by powerful tribes owing allegiance to the Avungura chiefs and constituting the Azande nation, than whom there are in my opinion no finer or potentially more important people in the whole of Equatorial Africa. Their ironwork, wood and ivory carving is wonderful; their handsome build, their dress and manners, their respect for the power of their chiefs, their intricate code of laws and morals, their display on ceremonial occasions, their numbers, and their arts and crafts generally, made a great impression upon me when travelling in the Haut Uele in 1913-14. They have been rarely visited except by Congo officials, and only comparatively recently have they allowed themselves to be brought under the sway of Bulamatadi. All this thickly populated region, in the very centre of Africa, would be brought into touch with the outside world by this one link in the Cape to Cairo chain of railways.

Deim Zubeir

Kindogo

Orchardlike
Open
Bush

Wau Road
Pongo or Ji or Gee
Open Bush
Big Trees
Scanty Bush
Grass

G. Tala

G. Vandal

Open Bush

Old Deim Bekair

G. Tahita

G. Hindu

Big Trees
Heavy Bush
Grass

Orchardlike

Scanty Bush

Big Trees
Scanty Bush
Grass

Open Bush

Big Trees
Scanty Bush

Big Trees
Heavy Bush
Grass

Big Trees
Heavy Bush
Grass

Big Trees
Heavy Bush
Grass

Big Trees
Heavy Bush
Grass

Ken-el-Sid

Nangomi's

G. Rua

Open Bush
Euphorbias

Pukbar's

Mbittima's

Heavy Bush
Long Grass

Tolai's

Mahmud's

G. Daragumba

G. Bard

Rocky &
wooded peak

F R E N C H

GUBERE

Caro's

Heavy

7°

6°

Warra

Heights of Watershed 2000 to 3000 ft approx.

Kette

Yomastilla or Kawa

Kawagais

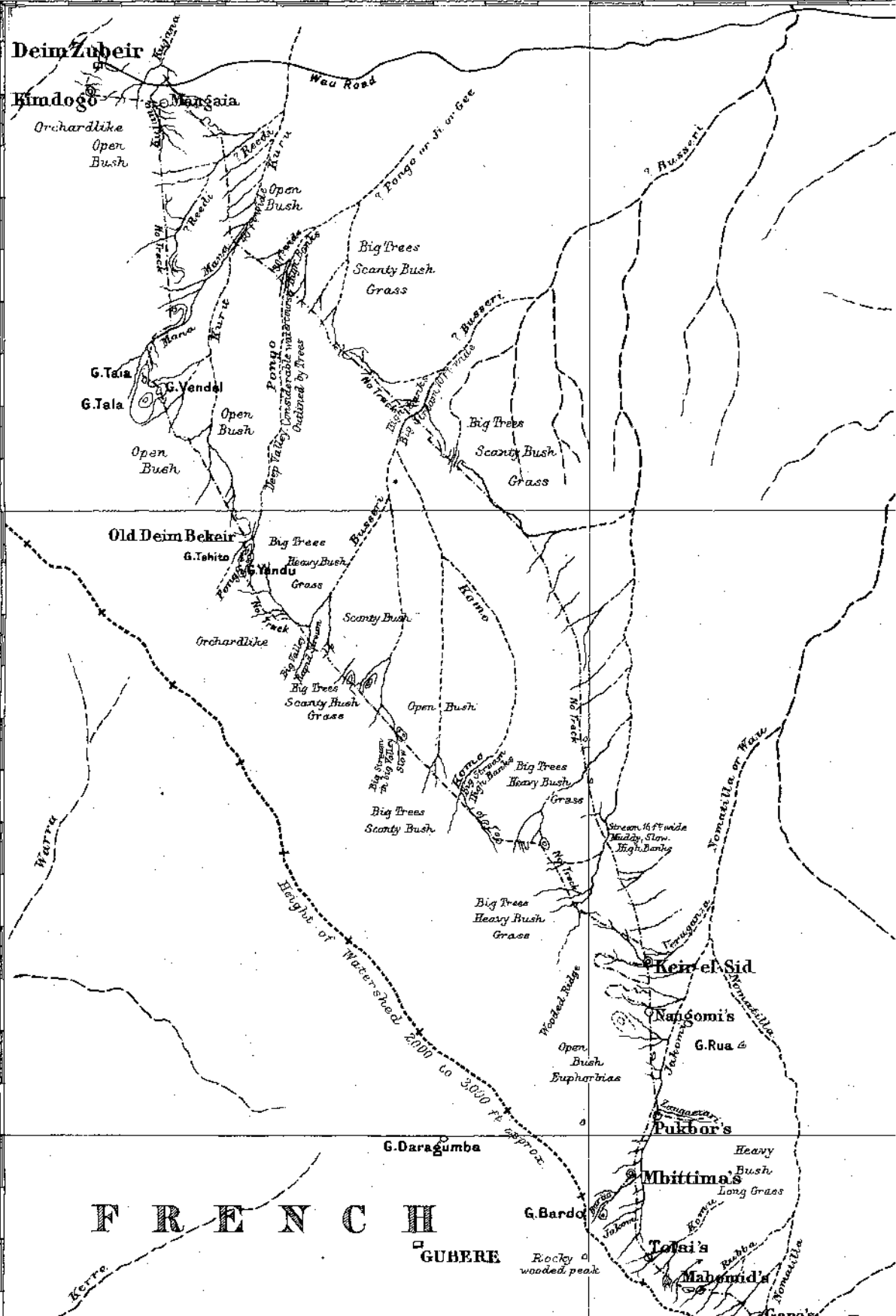
Wooded Ridge

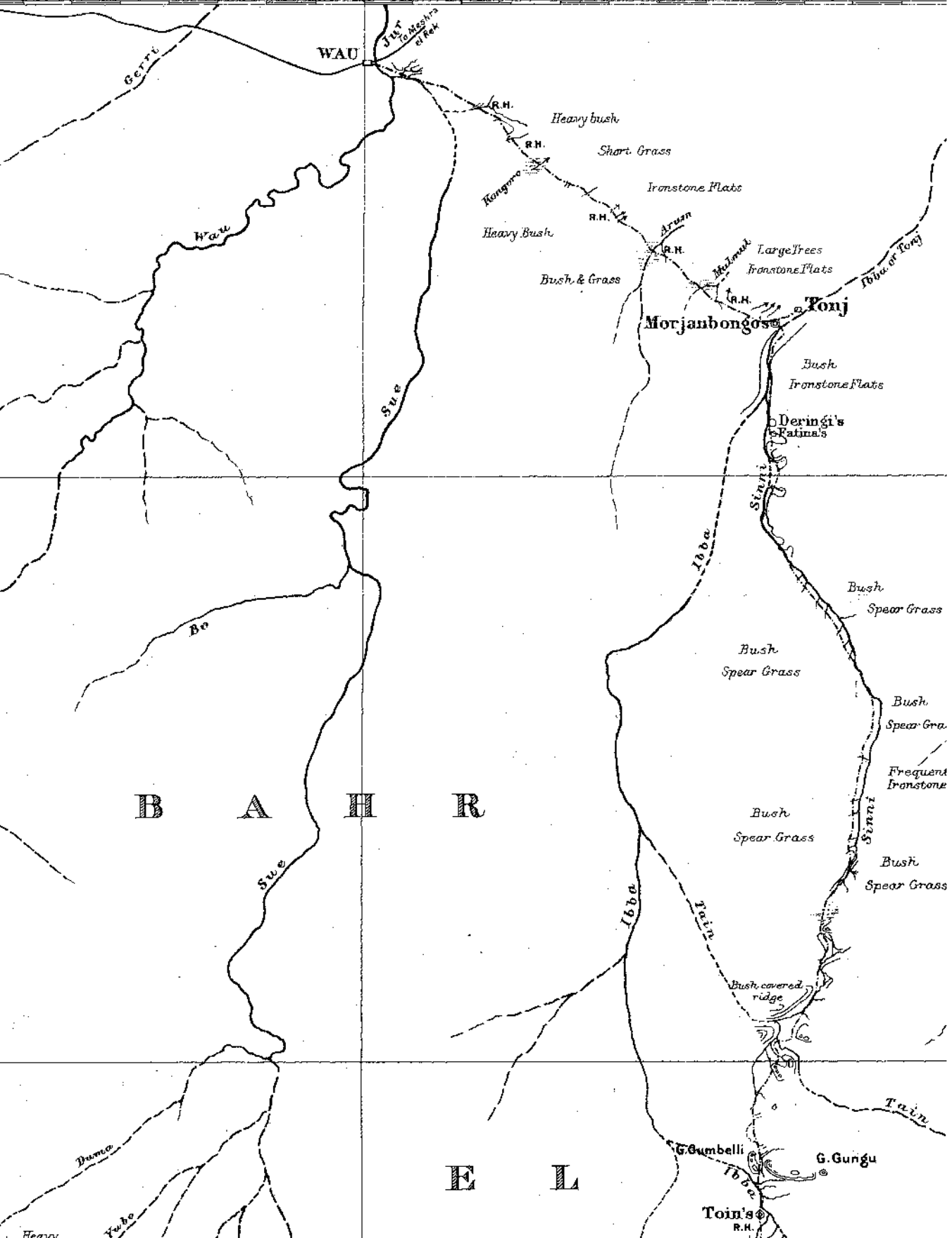
Stream 16 ft wide
Muddy, slow
High banks

Jokoma

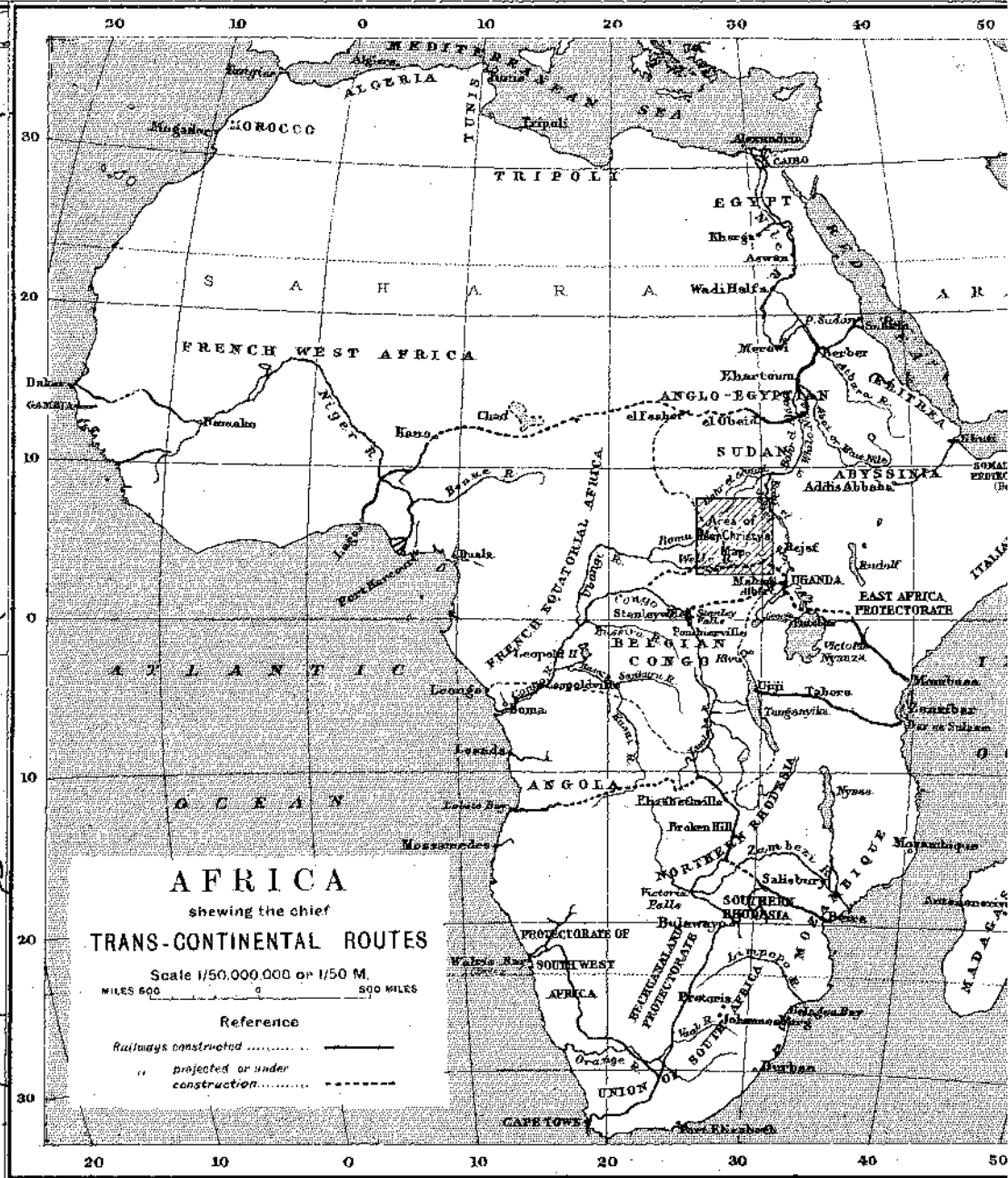
Rakha

Yomastilla





29°



AFRICA
showing the chief
TRANS-CONTINENTAL ROUTES

Scale 1/50,000,000 or 1/50 M.
MILES 500 500 MILES

Reference
Railways constructed
" projected or under construction

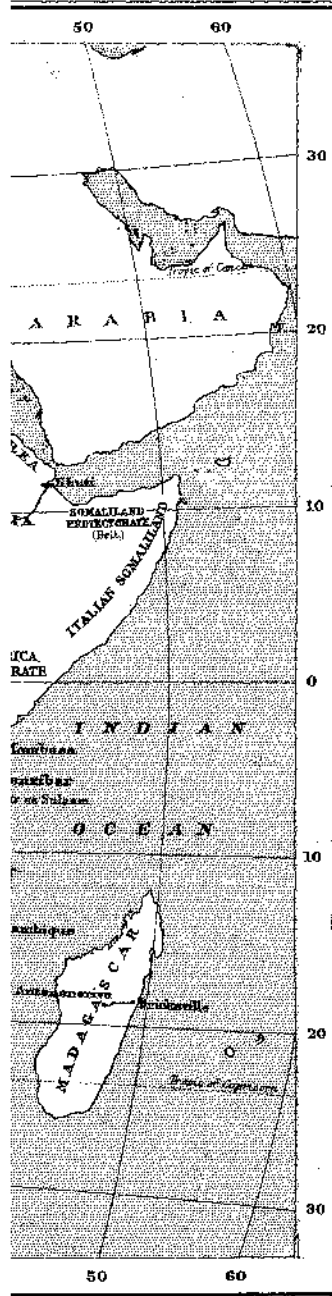
Note

This map has been constructed from Major Christy's and pocket compass bearings, together with distance and rate of marching, checked from Y. pedometer. At the Survey Department, Khartoum, the traverse was adjusted to the following points a sheets of the 1:250,000 map of that Department: Bwendí, Meridi, Yambio, Tembura, Deim Zubeir, T. The rivers away from Major Christy's route are best existing maps, and where only conjectural, by a broken line. For further information, see Major Christy's paper in the Geographical Journal.

Mvolo

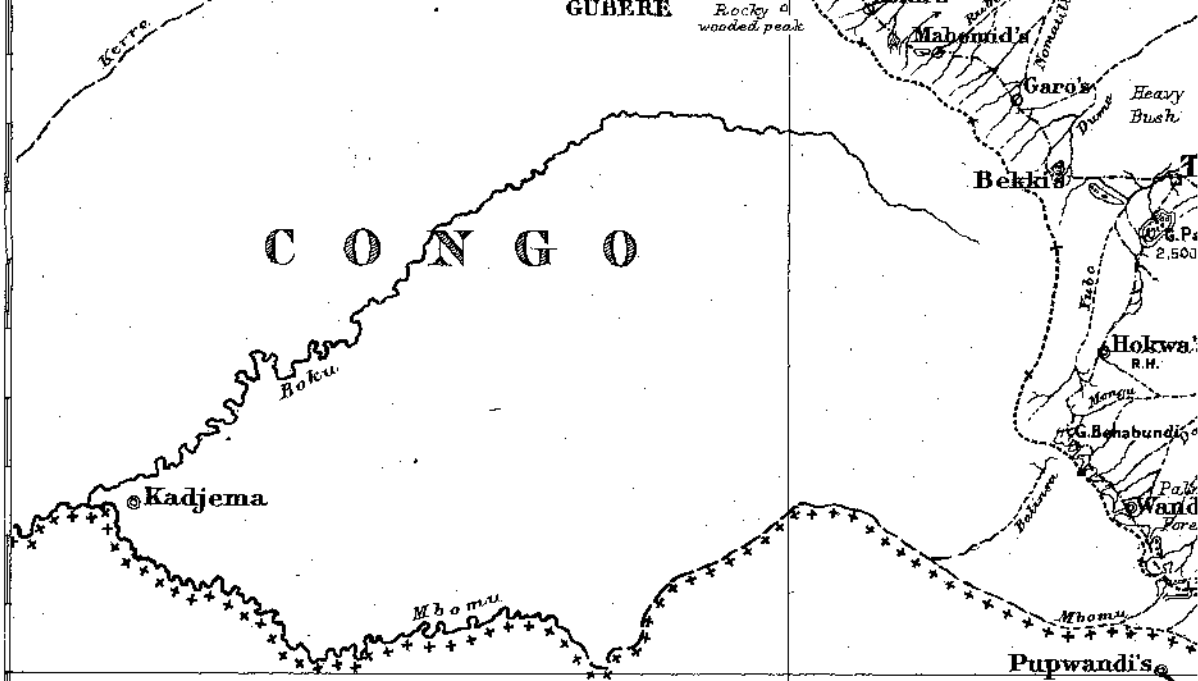
Nyuan

of Torij
Gull on Meridi
near Grass
Bush
Spear Grass
Frequent Ironstone Flats
Bush
near Grass
Tain



from Major Christy's prismatic
 her with distances obtained by
 ed from Yambio to Wau by
 ment, Khartoum, the compass
 ing points as laid down on the
 at Department:—Yel, Faradjé,
 rim Zubeir, Tanj, Wau, Doruma.
 y's route are taken from the
 conjectural, they are indicated
 mation concerning this map,
 raphical Journal for Sept. 1917.

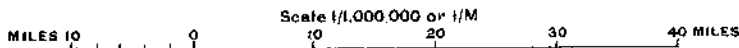
6°



NILE-CONGO WATERSHED

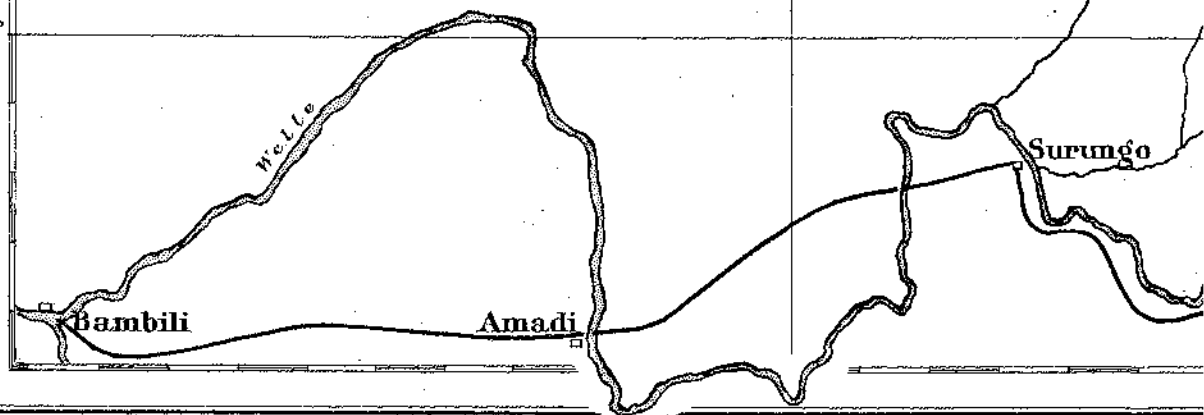
by
MAJOR CUTHBERT CHRISTY, R.A.M.C. (T.C.)

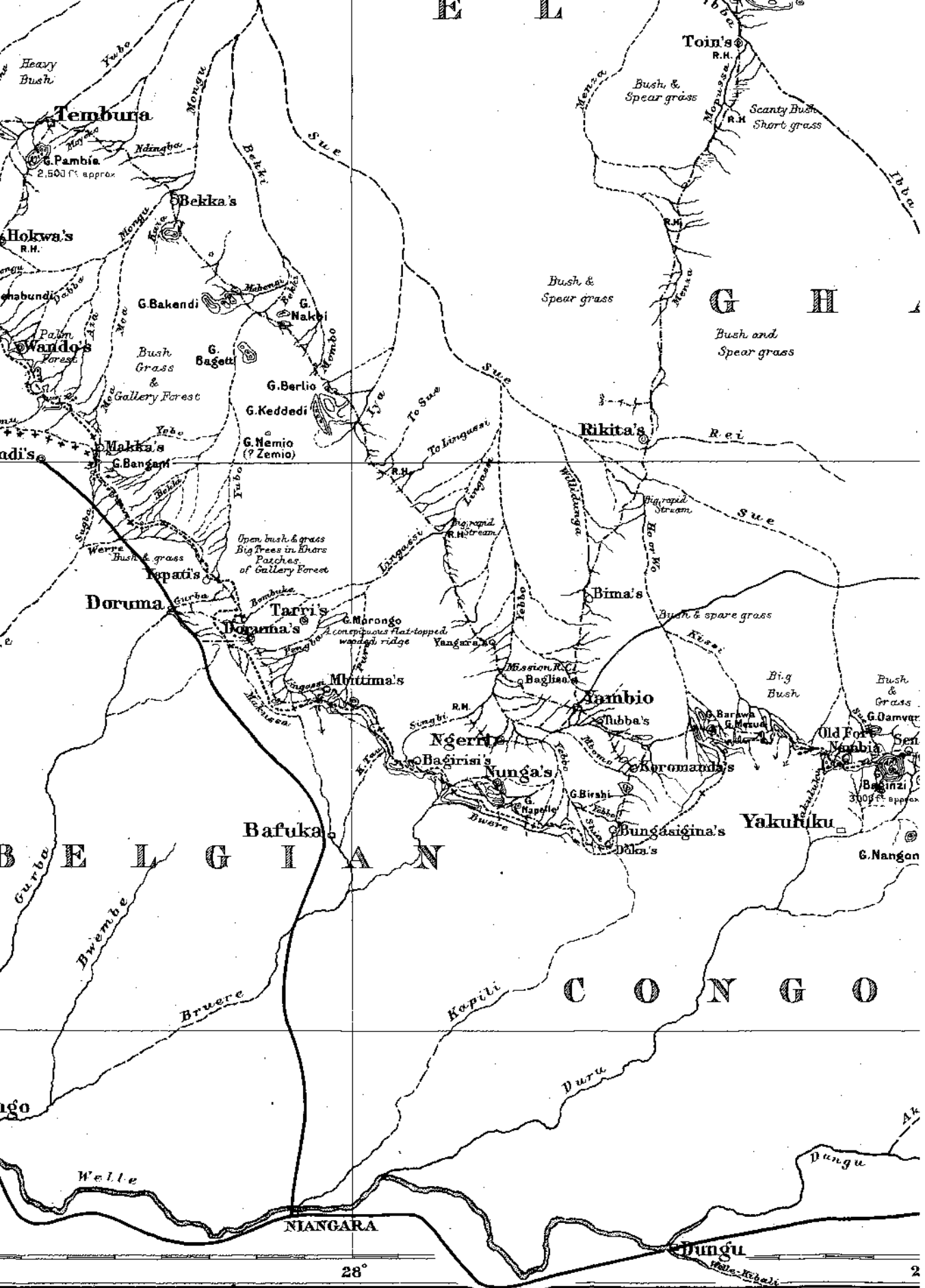
1910



Reference

Rising Ground. Approximate Formlines only.....	
International Boundary.....	+++++
Nile-Congo Watershed. Boundary by Conventions of 1894, 1898 & 1906, but not delimited or demarcated	-+--+--
Author's Route.....	-----
Roads. 1st Class	=====
" 2nd Class	=====
Rivers Explored	~~~~~
" From information supplied to Major Christy by natives	~~~~~
Rivers, Conjectural	~~~~~
Names of Peaks and Hill Ranges	G. Bagetti
Places of 1st Importance	□ GUBERE
" 2nd	□ Meridi
" 3rd	○ Keir-el-Sid
" 4th	○ Bekka's
" 5th	○ Yangara's
Rest House	R.H.





E L

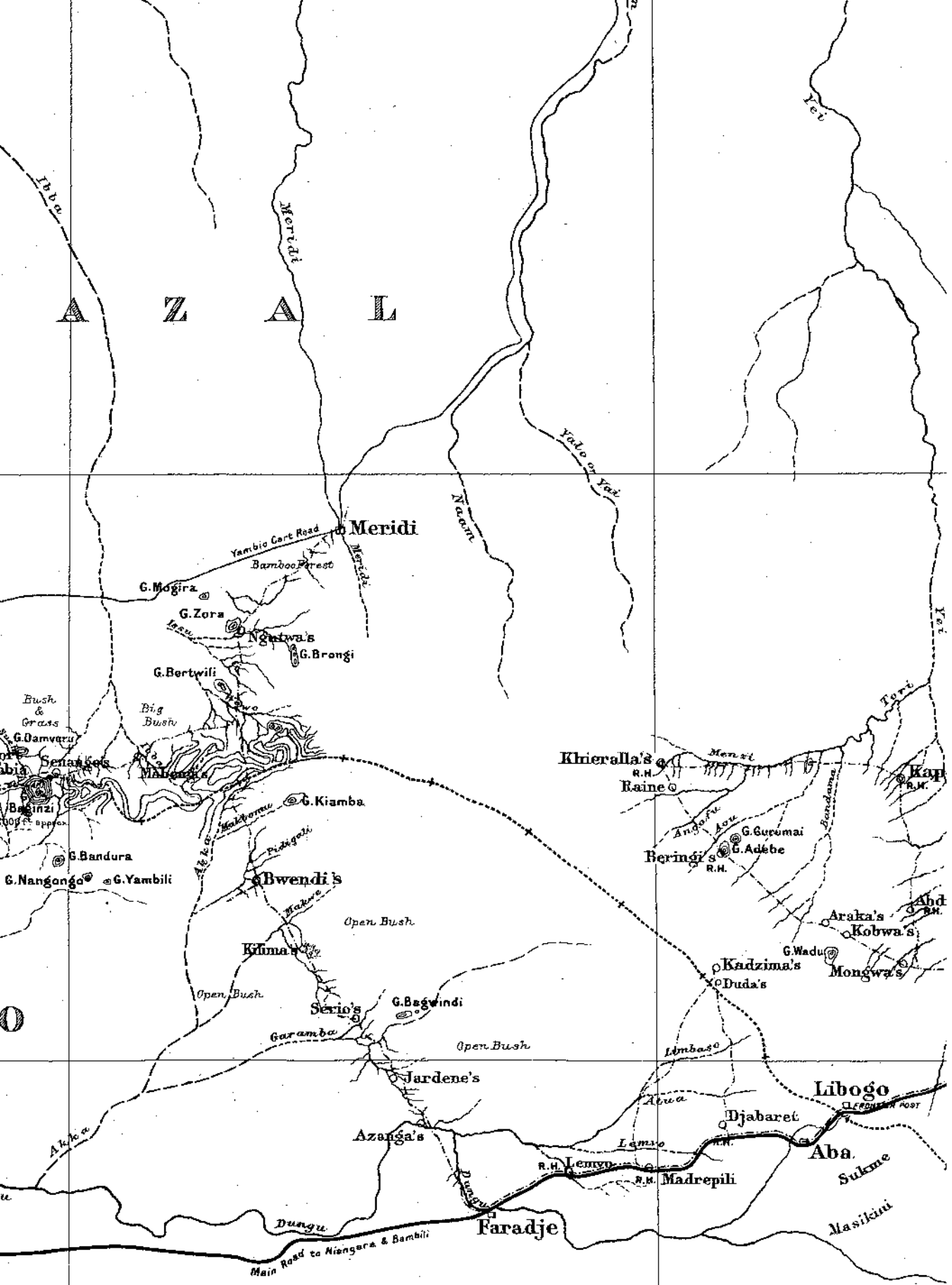
G H

B E L G I A N

C O N G O

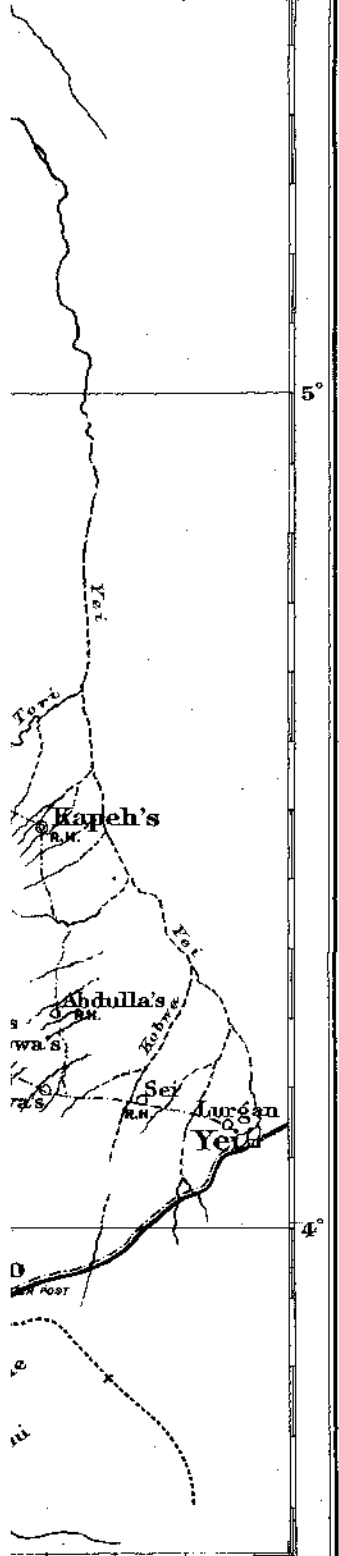
NIANGARA

28°



29°

30°



3- CONGO WATERSHED



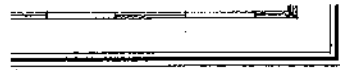


Published by the Royal Geographical Society.

29°

30°

NILE-CONC
Ch.



1-CONGO WATERSHED
Christy