

been obtained principally from Belgium, with the exception of the engines, which are made by a German firm. The rails were supplied by the American Steel Trust, by a French firm domiciled in Russia, and by the firm of Cockerill, in Belgium.

The engineers in charge of sections were also of various nationalities—French, Poles, Hungarians, etc.—while the guiding spirit in the construction has been Meissner Pasha, a very able German engineer. But besides these, the general direction has been under Marshal Kiazim Pasha, to whom the greatest credit is due in bringing the line successfully into Medina, and to Hajji Mukhtar Bey, a brilliant Turkish engineer who has absorbed all modern methods of construction, and completed the last section into Medina without European assistance.

In conclusion, it is difficult which to admire the most, this far-reaching conception of his Majesty the Sultan to build the line and thus to further the interests of his religion and bind together the outlying portions of his empire, or the silent unswerving devotion of the Turkish soldier who has carried the matter to a conclusion, and who watches without complaint over miles of line through a country almost without water or inhabitants.

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## DR. SVEN HEDIN'S EXPEDITION IN TIBET.

By Major C. H. D. RYDER, R.E.

DR. SVEN HEDIN has returned from another two years spent in explorations in Tibet, and as I have had the opportunity of hearing from him a fairly full account of his work, I am sending this paper, which has been authorized by him, for publication in the *Geographical Journal*.

After a preliminary journey through Persia and Seistan, Sven Hedin arrived in India, and after overcoming rather more than the usual difficulties, left Leh on August 14, 1906, with the strongest caravan he has ever had: 25 men and 94 ponies and mules, as well as 30 ponies he hired for the first month; of the 94 ponies, only 6 completed the journey. He was accompanied by a babu Robot, who proved of much use in assisting in scientific observations, as well as Mahomed Isa, who acted as caravan bashi; this man had accompanied Younghusband in his travels, and to Lhasa, was with De Rhins when he was murdered, and was with Rawling and myself in 1905. Sven Hedin speaks in the warmest terms of the invaluable services of this man. He also constantly refers to the kindness he received from the Maharaja of Kashmir, the state officials, Sir Frank Younghusband, Captain Patterson at Leh, and others.

After leaving Leh, Sven Hedin travelled north-east over the Mar-simik-la, crossed the Karakorum east of Changlung-yogma, traversed

Ling-shi-tang and Aksai-chin, crossed Deasy's, Rawling's and Wellby's routes; he then kept east and east-north-east, and turned south-east between the routes of Bower and De Rhins. On the heights of the Buka-mangna route, 9 mules were lost in one day, but to the south the country became more and more hospitable, with plenty of grass and water. After eighty-three days they met nomads for the first time; but then their black tents were visible most days, and they were able to buy yaks to replace the ponies they had lost *en route*. They left De Rhins' Ammoniac lake to the east, and continued straight south to the Bog-tsang-tsanpo, which they followed for a couple of days to get a connection with Sven Hedin's map of 1901. Turning again south-east they crossed two considerable ranges, from one of which a small portion of the Dangra-yum-tso could be seen to the south. Sven Hedin reached Ngangtse-tso on December 28, and here he was met by Hladje Tsering, governor of Nak-tsang, who had already stopped him on his previous journey, and who, though at first inclined to stop him, allowed him to continue south-east. With great good fortune, or probably with the instincts of an experienced Tibetan traveller, Sven Hedin hurried on, and, without halting, and making long marches, struck the Tsanpo 50 miles west of Shigatse, and, following down the left bank, crossed the river and reached that town late on the evening of February 9, 1907. Two days later a lama and official arrived from Devashong; they had received orders to stop Sven Hedin at Ngangtse-tso. Not finding him there, they had followed him to Shigatse; but it was now too late, Sven Hedin had reached that town and accomplished one of the objects of his journey.

The most important geographical discoveries on this journey were (1) the discovery of a very high and complicated mountain system, and (2) south of it the Mu-chu, which joins the Raga-tsanpo; the latter is the smaller of the two, and most of the water which joins the Tsanpo just west of Pindzo-ling comes from the Mu-chu. The discovery of the high mountain system set Sven Hedin thinking, and it very soon struck him that this must be a continuation of the Nien-chen-tang-la range south of Tengri Nor, the highest peak of which I fixed from near Lhasa at 23,900 feet. The Khalamba-la, on the road from Shigatse to Tengri Nor, is also on this range. Thus was forged the first link in what Sven Hedin regards as his greatest discovery.

Sven Hedin stayed one and a half months at Shigatse, during which time he made great friends with the Tashi Lama, and constantly visited the Tashi-lunpo monastery. Although so close to Gyantze, he did not think it advisable to visit Captain O'Connor there, but speaks in the warmest tones of the kindness he received from that officer. After much difficulty he obtained permission to go up the Raga-tsanpo route, and, turning northwards, recrossed the main range by the Chang-la Pod-la pass, thus fixing another 50 miles of the range. His next objective was

the Dangra-yum-tso, discovered by Nain Singh; but when within two marches, and in sight of the lake, he was stopped by a force from Shan-sa Dzong and forced to go down south to Raga-tasam, but he was able to fix the position of Targo-gangri, Targo-tsanpo, and Sershik-gunpa, all three heard of but not visited by Nain Singh. The Shuru-tso was also discovered, a rather big lake at the northern foot of the main range, another 60 miles of which being also fixed, as the range had to be once more crossed. At Raga-tasam Sven Hedin touched our route for the first time since leaving Shigatse. Dangra-yum-tso is much too big on Nain Singh's map; and his Mun-tso, two small lakes, are situated not south but west of the southern Dangra-yum-tso. The latter lake, and Targo-gangri, which Sven Hedin describes as one of the most magnificent snow-mountains with glaciers he has ever seen in Tibet, are both holy, and form the same combination as Mansarowar and Kailas in the west, and Nam-tso and Nien-chen-tang-la in the east. Sershik-gunpo is inhabited by monks of the Pombo (non-orthodox) sect. From Raga Sven Hedin went to Saka-dzong; needless to say, not by the route followed by our party, but round the north side of the beautiful snows of Chamo-uchong. At Saka Mahomed Isa died, to the great grief of Sven Hedin and his followers, and to all those to whom he has been of such assistance in the Tibetan explorations.

Sven Hedin again wished to strike north, but could not get permission to do this, although he sent messengers to Lhasa. He, however, turned north from Saka Dzong up a western tributary of the Chaktak (called Charta on our maps) Tsanpo, behind the hills north of our route to Tradom. He then kept south of the river, touching our route at Lak-tsang, and marching up the main branch of the Brahmaputra to its source, which he located accurately and surveyed. In the *R.G.S. Journal*, vol. 38, p. 146, Nain Singh mentions being in sight of the gigantic glaciers which give rise to the Brahmaputra. On our journey we surveyed, though only roughly, the main branch; but as Sven Hedin was the first to actually follow the main branch to its source, we obtain a survey much more accurate than mine, which was only a distant sketch. Crossing the watershed, which is very low, Sven Hedin proceeded to the Mansarowar lake, where he spent some weeks making careful soundings. Owing to dangerous gales, it was impossible to sound the Rakas Tal, but both lakes were carefully surveyed. Following down the bed of the old outlet, Sven Hedin found several springs, which probably are underground channels from the lake. There was no sign of these when Rawling and I were there in December; but as the Rakas Tal was then frozen over, doubtless the springs were also frozen. This, however, proves that the lakes are still connected, though underground, with the Sutlej system. After an interesting circumambulation of the holy peak of Kailas, Sven Hedin managed to get permission to go north, where he discovered the source of the

northern or main branch of the Indus, returning *viâ* Yumba-matsen to Gartok.

The gap of 300 miles in his exploration of the main range north of the Tsanpo called Sven Hedin for yet another long journey. All attempts to go north-east from Gartok failing, he decided to make a long *détour* and come into the unexplored country from the north. He gave out that he was going to Khotan, in the mean time arranging for an entirely new caravan, with new men, to be organized at Leh. He met his new caravan at Durguh, and left that place on December 4, 1907. Several caravans from Yarkand were used, the members of which advised Sven Hedin to wait till the spring. However, although winter had set in, he passed on. At Burtse he discovered that, owing to the stupidity of his headman, only a supply of eight days' corn for the ponies was left. It was not till at the crossing of the Dapsang that he gave orders to turn due east, leaving the Karakorum pass to the north. On January 11 they camped on the shore of the Aksai-chin lake. By January 18, a quarter of the caravan ponies had died, and the cold was intense. To improve matters a storm arose, which lasted for weeks; the caravan, however, pushed forward steadily, but very slowly. On the northern shore of the Shemen-tso they were nearly snowed up, no meat was left, and the ponies shared the men's rice rations. On February 8 the first hunters were met with, after sixty-four days' loneliness, and they were able to buy sheep, milk, and butter. Here Sven Hedin burnt all his European clothes, and appeared as a Ladkhi; this entailed blacking his face and hands every morning, and forbade washing. Passing the Lemchung-tso, they now entered unknown country. On February 24 three ponies and seven mules only were left, a quarter of the caravan. On the 29th they reached Lumburringmo-tso, where nomads were met with; these men, although at first suspicious of the presence of a European, soon made friends and sold twelve sheep to carry loads. For several days the storm was so bad that a move was impossible. On March 7 Sven Hedin camped on a river flowing to the south-west, but frozen over.

On March 16 they pitched camp on the Tong-tso, and turned south leaving the beautiful Gangri Shakang-sham to the east, and crossed two small passes. They here heard that Karma-Pun-tso, the governor of the Bongba province, was near, but they avoided him, and proceeded through a labyrinth of mountains, crossing the Kang-shan-tsanpo, Chaklam-la, Sangchen-chu, Sangchen-la, and Ladung-la. On April 1 Sven Hedin crossed the Satsot-la, and came down to the Chunit-tso, following its western shore for one day. Here a large salt caravan was met with coming from Tabié-tsaka, from whence most of Central and Eastern Tibet obtain their supply of salt. Still keeping straight south, Sven Hedin crossed the Nima-lung-la, and reached the district of Kemar. From here, once more, he was in sight of the range north of the Tsanpo, a beautiful sight of great snow-fields and glaciers. He

now turned south-east, having the magnificent Hlunpo-gangri on his right, and for six days followed the big river Buptsang-tsanpo up to the Samye-la, a pass in the main range. It was here that the name Trans-Himalaya struck him as most suitable for this range. Although Tibetan names are obtainable for every conspicuous peak in this range, the Tibetans have no name for the whole range, and I therefore think the name proposed by Sven Hedin should be accepted. Until Sven Hedin has had time to work out his observations and plot his map, it would be advisable to postpone any discussion as to the extension of this range east and west; but Sven Hedin has very thoroughly explored it throughout that region marked "Unexplored," on the R.G.S. map of Tibet, and there is no possible doubt that the range exists, and is the watershed between the Brahmaputra on the south and the lake region on the north.

Sven Hedin now carried out a thorough exploration of the Chaktak (called Charta on our maps) Tsanpo; however, near Raga he was met by Tibetan soldiers, and considered it advisable to reveal himself. He at once became great friends with the Tibetans, who allowed him once more to select his own route. It was arranged that Abdul Karim, his headman, should go with the main caravan *viâ* the Samye-la, to meet him again at the Buptsang-tsanpo, while Sven Hedin himself, accompanied by only five men, left his Saka friends on May 6, 1908, and went straight north, to what he describes as the most interesting of his crossings of the Trans-Himalaya range.

By the Gyegong-la he crossed the Kanchung-gangri range, which is not the head range, but broken through by the Chaktak-tsanpo. In the Lapchung-tso, situated to the north of this range, many rivulets coming from the main range collect and form the headwaters of the river. On May 12 Sven Hedin crossed the Sangmo-bertik-la surrounded by glaciers, and the Soma-tsanpo, which he describes as the biggest river in the interior of Tibet, emptying itself into the Teri-nam-tso. On May 19, after crossing the Teta-la, a most brilliant view unfolded itself of the whole Teri-nam-tso, Trans-Himalaya range, Targo-gangri, and Shakang-sham, the latter a particularly magnificent mountain. The lake has been almost correctly placed by Nain Singh, although only from native reports; but his Ngangon-tso nobody had heard of. Two days' march took them to the western end, and following the Soma-tsanpo past Mendong-gunpa, they crossed the Goa-la, and leaving the little Karong-tso to their left, struck one of the great salt roads leading from Raga to Tabié-tsaka. Chunit-tso was left to the right, and a junction should have been made with the main caravan on the Buptsang-tsanpo, in Bongba-kebyang; the caravan, however, had disappeared. On June 5 Sven Hedin said good-bye to his escort and followed the river down to where it joins the Tarok-tso. He was not allowed to visit the great salt depression of Tabié-tsaka, but turned

west, past the Lunkar-gunpa, crossing the Nyapchu-tsanpo, flowing from the Men-la in the Trans-Himalaya range to the Poru-tso. West of this lake they crossed the ice and snow-covered Sur-la range to Rigi-changma, then down the Pedang-tsanpo, a big river, to Shobo-tso. From the Tayep-parva-la one can see nearly the whole of the Nganglaring-tso (wrongly called Chalaring-tso on the map), on which there are five islands, but no monasteries on them as marked on the map. The shape is also wrong, as its length is from east to west, not north to south. They skirted this big salt lake for two days, and reached Selipuk on June 26. Here Sven Hedin was received with the greatest hospitality by the lamas, and, the main caravan rejoining him, he made his way south-west to Tokchen, crossing the Trans-Himalaya range for the tenth time by two passes, Ding-la and Surnye-la. Sven Hedin had at last had enough of Tibet, and he made his way down the Sutlej to Simla, keeping, however, while in Tibetan territory somewhat north of our route.

The geographical results of his journey may be summed up as follows:—

(1) The discovery and careful exploration of the Trans-Himalaya range, and the filling in of the large white space on our maps north of the Brahmaputra from Gartok to Shigatse, and the discovery of the provinces of Bongba and Chokou, which he has been the first to discover, that of Dokthol, on the map, not being in existence.

(2) The discovery and exploration of the source of the main branch of the Indus.

These, I believe, are two absolutely new and most valuable discoveries.

(3) Sven Hedin also visited and surveyed the true source of the Brahmaputra. This, however, had been approximately located, I think, by Nain Singh, and fairly well surveyed by Rawling and myself, though Sven Hedin having actually visited the real source, his map will be more accurate. I hope this paper, written in a great hurry, may give the readers of the *Geographical Journal* some small idea of the value of Sven Hedin's discoveries and the treat in store for them when he delivers his lecture. He has brought back with him innumerable observations and maps, which will enable him to draw a map of the whole of Tibet and Turkestan on the 1 : 1,000,000 scale. Some years must elapse before his scientific report and results can be published, but they should exceed in interest those of his 1899-1902 journeys. In the mean time he will publish as soon as possible a popular account of his travels.

Sven Hedin is not responsible for any opinions expressed in this paper.

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