

It is possible that there were some good verses in some of the locked-up Sennhütte; though in any case these inscriptions would have no antiquarian interest, since all the huts seemed relatively modern—a hundred years old at most. Apart from this I think I can say that the above are the most interesting of the Upper Loetschenthal inscriptions; though I should have liked to have had room for more.

MR. COLLINS' TRIANGULATION OF TERAM KANGRI.

By T. G. LONGSTAFF.

IN the January number of the *Geographical Journal* (vol. xxxix. p. 71) I published a communication from Colonel Burrard on this subject. By inadvertence this did not appear in the *Alpine Journal*. Having since received through the further courtesy of the Surveyor-General, Mr. V. W. B. Collins' report, computations, triangulation sketch and photographs, I now take the opportunity of sending some further details of his remarkable mountaineering achievements, which I believe will be of interest to readers of the *Alpine Journal*.

Mr. Collins is a junior member of the Survey of India and had had no previous mountaineering experience. His achievements are all the more noteworthy, though they are only in keeping with the traditions of his Department. The long series of mountain ascents carried out by the officers of the Survey of India has been often alluded to in this Journal (cf. A. J. vol. xxiv. p. 133 and vol. xxv. p. 398).

Mr. Collins commenced operations by visiting six stations of Montgomerie's Indus Series on either side of the Indus about Leh, namely, Pachuspha 19,557 ft., Tayar 19,625 ft., Arzu 18,659 ft., Parchakanri 18,362 ft., Himis 18,719 ft., and Lasirmau 18,270 ft. No satisfactory sight of Teram Kangri being obtained from any of these he crossed the Kardong Pass 17,500 ft. to the Shyok River and attempted the ascent of Skanpuk 20,288 ft., a station of Johnson's tertiary triangulation shown as Skanpak No. 1 Stn. 20,302 ft. on the map. The G. T. S. maps of Kashmir 45 S.E. 45 N.E. and 44A S.E. on the scale of 4 miles to one inch should be consulted, or my sketch map (A. J. vol. xxv. p. 488). Mr. Collins continues:—

'Bad weather came on by the time I had reached the snow-line at 17,600 ft. and I had to camp at this spot, just under the

snout of the main glacier till the weather improved. Fortunately we were able to get wood about two miles lower down. It snowed almost continuously for three days. The fourth morning was cloudless and I left camp at 3 A.M. meaning, if possible, to climb to the summit, take some observations if the view was good and open in the direction of Teram Kangri, and return to camp by nightfall. A climb of half-an-hour took us on to the glacier and from here we began the real ascent, in long zig-zags up the centre of the main glacier. The going was very hard and tiresome; there was from three to four feet of soft snow on the surface of the glacier, and, although lightly laden, we sank in almost up to our waists at every step. After five hours' hard work we reached a point 19,600 ft. in height and were brought up short by a snow drift lying about 10 ft. deep across the whole of the glacier. For three hours we endeavoured to find a ford across this drift, at various points, but failed, and as by this time the snow was very soft I had to abandon the climb and return to camp. I revisited this hill in September and succeeded in reaching the summit and taking some observations with my theodolite. Teram Kangri was not visible, the view in that direction being quite shut out by the lofty peaks in the vicinity of Shelma, but the peak was of great value as an intermediate station between my more northerly stations on the Nubra-Shyok watershed and Montgomerie's stations along the Indus.

'On leaving Skanpuk I proceeded to Panamik, the last village in Ladakh on the Yarkand trade route. I questioned some of the older men here about the surrounding hills, endeavouring to ascertain whether they could guide me to any lofty peaks from which a good view of the Siachen glacier could be obtained. They could not, however, give me any useful information.

'Starting from Panamik on the 14th July I passed through Taksha and worked my way up the first nala to the east, locally known as the Wusak nala. I climbed several high peaks along this nala and eventually succeeded in obtaining a view of Teram Kangri from a peak about 19,700 ft. high, at the head of one of the northern tributaries of the Wusak nala. I immediately got to work with my plane table, and, after locating the Teram Kangri peaks, selected and located two other peaks to the north and north-west of me, from which I thought it very likely I should be able to see Teram Kangri again. By evening, and before I could get my theodolite up, bad weather came on. The next morning the clouds had

settled down to about 16,000 ft. and observations of any description were quite impossible. I camped at the top of the hill for six days so as to be able to take advantage of any break that might occur, but all to no purpose. On the seventh morning, as there was no sign of an improvement in the weather and everyone was half frozen and beginning to feel the strain of living at that altitude continuously, I erected a cairn on the summit of the hill and started back for Taksha, arriving there late the following night. I called this hill Wusak station.

'From Taksha I crossed the Nubra by ferry and marched up the right bank, through Kubet, Aranu, and Kimi villages to Ningstet. The weather cleared again on the 25th July and I made a start from Ningstet with the purpose of attempting to climb Shelmakanri, a beautiful snow peak, sacred to the Ladakhis and lying about 5 miles N.W. as the crow flies, from the village.*

'The first 7000 ft. of the ascent, from Ningstet to the snow line, was quite easy, and making a long day of it I was able to complete this part of it in one march. Leaving my camp at this spot I set out with a couple of Kashmiris and four of the best climbers from amongst my Ladakhi coolies and stayed out for two days trying to find a practicable route to the summit of Shelma. There was too much snow—most of it new and soft too—and as the main mass of the hill was only accessible across dreadful-looking knife ridges I had to give up all hope of ever getting an instrument to the top of the hill. However, from a knoll below the main peak and at a height of about 18,750 ft., I was able to get a fine view of Teram Kangri, my Wusak station, the third hill I had selected as a likely observation station, and many peaks to the N., E., and S.E. and so made my second station here and called it Ningstet station after the name of the nearest village. I remained at this station the whole of the following day and was able to take many observations of the surrounding peaks with my theodolite.

'I then returned to Wusak station and the weather being good was able to complete the observation work there.

'I now had horizontal and vertical angles to Teram Kangri from both Ningstet and Wusak stations, and so measuring the

* This is the Kangri Shelma of Henry Strachey's large MSS. of 1851 in the R.G.S. collection. It was located by him in 1848. It is shown on my sketch-map but not on the G.T.S. A most inaccessible looking peak.—T. G. L.

distance between these two points as a base, from my plane table and using the angles I had observed, I roughly computed the position and height of the highest peak of the Teram Kangri group. The results obtained were :

Distance Ningstet to Teram Kangri	56 miles
„ Wusak to Teram Kangri	68 „
Height of Teram Kangri	26,422 ft.

thus making my values differ from Dr. Longstaff's by 12 miles in position and 1188 ft. in height ; the point when plotted according to my values falling 12 miles N.W. of the position given by Dr. Longstaff.

' I now made my way back to the Nubra and marched up the right bank—about 20 miles—to Strongstet which is the northern-most village on the right * bank of this river.

' I tried to climb the range by way of some of the small nalas to the N. of Strongstet, but in every instance found that I could not go more than a few miles up the nala owing to unscalable granite cliffs and waterfalls. I at length found a practicable way up the nala which goes back into the hills between Henachi and Strongstet villages, and after two days of scrambling over large boulders and piles of old moraine, camped at the snow-line at 18,700 ft. The main peak towered up above us and seemed quite impossible to climb. I left my camp standing here and taking a dozen coolies and all the picks and spades I had, attacked the hill from the S.W. Descending about a hundred feet on to the glacier we were able to traverse it quite easily, the snow being in good firm condition, and climbed about 400 ft. along a ridge of rocks. We now had a solid wall of ice, at an angle of about 70 degrees, from here to the summit of the hill, to negotiate ; so, roping up in threes, we began cutting our way up. Progress was very slow as the ice was extremely hard and to cut each foothold meant at least five minutes' labour. We had to cease work at about midday, as by that time the ice had begun to melt rapidly and there were cascades tumbling down the ice face in many places. We managed to regain camp late that night. The following day I started very early and by sunset had reached the summit of the hill.† I had been able to bring up with me only my instruments and sleeping bag, and for the two nights spent on the hill had to shelter in a hole in the snow. Fortunately, the weather kept good, but there was a high wind blowing all the time which it was

* Left.—T. G. L.

† Apparently 19,750 feet.—T. G. L.

almost impossible to face. The first day was spent in taking observations to my stations, and several peaks, as Teram Kangri, were in cloud the whole day. On the second morning I was able to take some observations to Teram Kangri. On completing work here I found that one of my angles at either Ningstet or Wusak was in error, as the three angles of the triangle formed by the stations Ningstet, Wusak, and Strongstet, when totalled, amounted to some degrees in excess of 180 degrees.

'I had noticed from Strongstet that the cairn I had built on Wusak station had been almost obliterated by snow, and as I was convinced that the error lay in my observation of Wusak from Ningstet I returned to Ningstet with the object of re-observing my angle there. I sent men to Wusak station at once to clear the cairn and found when I reached Ningstet station that I had not observed to the cairn on Wusak on the occasion of my first visit, but had intersected a prominent rock by mistake. The angle at Ningstet between Ningstet and Teram Kangri was corrected, so bringing the position of the peak 15 miles nearer to Ningstet and Wusak than I made it before.

'This change in the position of the peak alters the value of the height of the peak as given above, reducing it about 2000 ft. I was now quite certain that my observations at these three forward stations were all right, and so marched up towards the Sassar pass with a view of obtaining observations from some peak out in that direction so as to lengthen the base for fixing Teram Kangri as much as possible. I was not successful in finding a peak to suit me: the view in the direction of T. K. was shut out by P. K. 32 (24,690 ft.) and lofty peaks in its vicinity, from peaks which I could connect with my other stations. It was now fairly late in the season, so I determined to let Teram Kangri alone, having obtained observations to it from three places and hoping to see it from a fourth peak which I had located near Tiggur village, and to devote the remainder of the season to connecting up these three forward stations of mine with the existing triangulation, viz., Montgomerie's Indus series. In order to do this I climbed a peak, to which I had observed from all my forward stations, in the vicinity of Tiggur, lying about nine miles N.W.* of the village. I had expected to get a view of Teram Kangri from this peak and was not disappointed. I now had Teram Kangri from four

* ? N.E.—T. G. L.

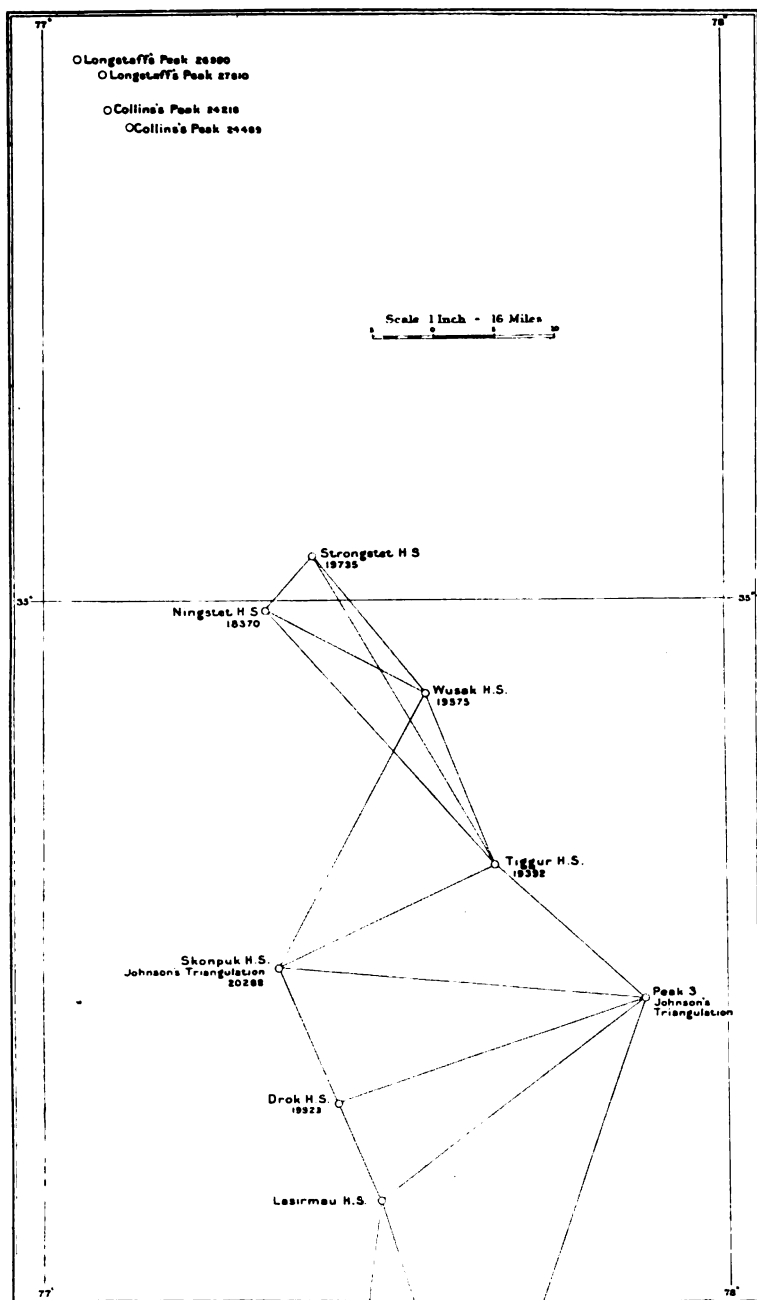
places and considered this quite sufficient for fixing its position and height without any margin for doubt.

'I then took observations at Skanpuk, Parcha-kanri and Himis of Montgomerie's triangulation, and as Mr. Wyatt, my colleague, had taken some observations at Lasirmau h.s. and at a new intermediate peak which he named Drok h.s.,* the whole of the work was based on Montgomerie's triangulation. Mr. Wyatt selected a high peak (21,780) of Johnson's tertiary triangulation as a station, but, as he was unable to climb it the angles at this station have been deduced.'

From the above it is evident that it has been a difficult problem to fix Teram Kangri. These peaks are not only remote from any previously determined stations of the Himalayan Survey, but their outlying defences for fifty miles present a series of obstacles only to be overcome by the exhibition of the greatest resolution in the face of constant disappointments to the surveyor. For it is not only necessary to see the peak required, but also to connect the station of observation with the previous triangulation. Thus eight ascents—four over 18,000 ft., three over 19,000 ft., and one over 20,000 ft.—were made without getting a sight of Teram Kangri. Three out of the only four stations from which Teram Kangri was sighted were over 19,000 ft. At Wusak h.s. 19,575 ft. Mr. Collins camped out through a week of bad weather and had to revisit the station subsequently. He passed two nights on Ningstet h.s. 18,370 ft. on the shoulder of Shelma Kangri; nevertheless the exigencies of his task compelled him to revisit this station also. He slept out for two nights on Strongstet h.s. 19,735 ft. after taking two days to cut up the final ice-slope. Finally, despite bad snow conditions which defeated him at 19,600 ft. earlier in the season, he set up his theodolite at over 20,000 on Skanpuk. Only a mountaineer can appreciate the perseverance which such a task involved.

The computations are not quite complete yet, but for the present, the highest peak of Teram Kangri is given as 24,489 ft. and the position as Lat. $35^{\circ} 34' 37''$ N, Long. $77^{\circ} 07' 31''$ E, about four miles S. and two miles E. of where I placed it and 3000 ft. lower. There appears to be no doubt that Mr. Collins has correctly identified the peak shown as Teram Kangri on my sketch map. The serious error in the altitude which I attributed to this peak perhaps arose from a mistake in

* Apparently 19,923 feet.—T. G. L.



TRIANGULATION OF TERAM KANGRI.

identifying the true summit from the eastern end of my base-line (cf. *Geogr. J.* vol. xxxv. p. 632).

Mr. Collins' results are, it need hardly be said, decisive and final, but it is difficult to account for the apparent great height of the peaks seen by Slingsby and myself from the Rgyong La (*Alpine Journal*, vol. xxv. p. 487 and *Geographical Journal*, vol. xxxv. p. 336 and plate p. 640) and for the remarkable corroboration obtained from Sella's photographs taken on the Sella Pass (*Alpine Journal*, vol. xxv. p. 448, and *Geographical Journal*, vol. xxxvii. p. 21 and p. 94). From the Rgyong La I could do no more than take a compass-bearing to these peaks, and it is conceivably possible, though for many reasons extremely unlikely, that the peaks which we then saw and photographed, are somewhat further to the E. and beyond the containing wall of the Siachen Glacier.

Dr. and Mrs. Workman visited the upper Siachen Glacier last summer and are again engaged upon a further exploration of it this season, so that we may shortly expect a comprehensive account of this long-neglected region.

CAUCASICA.

By DOUGLAS W. FRESHFIELD.

IN recent years there has been a lamentable falling-off in the number of English mountaineers visiting the Caucasus. As far as our countrymen go its exploration has been abandoned. Various causes have contributed to this sad neglect; first among them must be reckoned the exaggerated reports of disorder in the mountain districts, and next the counter-attractions of the Canadian Far West. If the Rockies or the Selkirks take twice as long to reach, the English traveller, when he gets there, finds himself in a country free from any political troubles or embarrassments and among people speaking his own language. The climber, however, will, when he leaves the main routes, find more difficulty in getting through the valleys, and, on the whole, less formidable peaks to conquer. If there are still any delusions abroad such as that 'there is no rock-climbing in the Caucasus,' or that 'all the good things have been done,' the sooner they are dispelled the better. The Caucasus is still worthy of Virgil's description 'saevis cautibus horrens.' It will always be a noble playground for the gymnast as well as a superb resort for the lover of mountain landscape.