SURVEY IN THE NANDA DEVI DISTRICT

BY E. E. SHIPTON

Read before the Alpine Club, March 9, 1937

OUNTAINEERS will have been interested to learn that the Survey of India is now engaged on a new 1-inch map Lof the mountain regions of Kumaon and Garhwal. Previous surveys, as produced on the present 4-inch sheets 53 N and 62 B, had been confined almost entirely to the populated and revenue-producing areas in or near to the great arterial valleys. Most of the glacier-covered country and the remoter valleys of these sheets are very sketchily drawn, in many places, indeed, so sketchily as to bear no resemblance whatever to the ground in question. Over much of the country, too, it has been found necessary to extend the primary triangulation. While engaged on this task in the Badrinath-Kedarnath range, Major Osmaston found that the whole trunk of the Gangotri Glacier was, in fact, several miles W. of the position allotted to it on the map. I hope that now at last we shall have a final solution to the topographical problems of this area which have excited so much discussion as a result of the various expeditions which have recently brought back a lot of vague data about the range.

The usual method employed for hill surveys in India is planetabling by Indians, who are each responsible for a section of the area. These men work with remarkable speed and neatness and, under the close supervision of their officers, they produce very good work. But in the high Himalaya they are faced by unusual difficulties which they are not used to. Not being trained mountaineers they have great difficulty in moving their parties about in the glacier regions and in reaching suitable stations.

Owing to the peculiar difficulties presented by the country round Nanda Devi it was decided to depart from the usual practice and to send Major Osmaston, who is in charge of these mountain surveys, to carry out a photographic survey of the basin drained by the Rishi Ganga. As I had made a reconnaissance of the region in 1934,¹ the Survey Department invited me to accompany the party in order to assist Major Osmaston with the route and in the selection of suitable stations.

A Wild photo-theodolite and 100 plates were taken as well as a plane-table. I took with me the Watts-Leica photo-theodolite belonging to the R.G.S., partly to supplement the main survey, and partly in order to give a further test to this novel instrument.

Six Sherpa porters were brought from Darjeeling, including Angtharkay. The name Sherpa has become almost generic for all porters engaged in Darjeeling. Actually one of these men,

Gyalgen, came from two months' journey north of Lhasa.

We left Ranikhet on August 27, 1936. We had to take an unusual route to the Kuari Pass, as one of the bridges on the Wan route had been carried away by floods. We had terribly bad weather all the way to Joshimath. The rains reached their climax on the night of August 29 and our camp was flooded out. Later we heard that 10 inches of rain had fallen in Mussoorie that night. Incidentally, the 29th was the day on which Nanda Devi was climbed!

We reached Joshimath on September 3 and left again on the 6th. On the 7th we camped at Lata, near the mouth of the Rishi Ganga. As we were sitting in camp a bearded and tattered figure appeared rushing down the steep path. This proved to be Peter Lloyd, the first of the returning Nanda Devi party. From him we heard of their splendid achievement. In my opinion the climbing of Nanda Devi is perhaps the finest mountaineering achievement which has yet been performed in the Himalaya; certainly it is the first of the really difficult Himalayan giants to be conquered. This expedition was a model of what such an expedition should be; the party was a team consisting exclusively of mountaineers; they avoided the great mistake which, to my mind, nearly all the major Himalayan expeditions since the war have made, and did not handicap themselves with a vast bulk of stores and superfluous personnel. Each man was prepared to carry loads up to any height, and indeed all were called upon to do so during the most arduous part of the climb; above all, they avoided newspaper publicity. I was delighted to hear that Tilman had been one of those to reach the summit. He had accomplished more than his share of the donkey work, having earlier in the year ascended the Rishi Nala and dumped provisions in the 'Basin' and then returned, all the way to Ranikhet, to organize the transport of the party. Later that evening Graham Brown turned up. The rest of the party we met on the cliff track to Durashi, except for Tilman and Houston who had crossed a very difficult pass to Milam—' Longstaff's col.'

The passage of the Rishi gorge was now quite devoid of difficulty. There were cairns at every turn, a small but adequate path wound across the steep slopes and any rock steps were cleared of loose rock and earth; above all, it was now not necessary to hunt for a way. The monsoon was still active and we had a lot of bad weather. However, when we reached the basin on September 16 the days were gloriously fine and the nights clear and frosty. The rivers were already fast sinking to their low autumn level and they presented us with no difficulties.

Osmaston decided to tackle the Northern section of the basin first. I was keen to examine the ridges and valleys leading from the main basin up to the peaks bounding the western flanks of the Rhamani and Bagini Glaciers as we had not had the opportunity in 1934 of exploring this area. This I was able to do while Osmaston was mapping this part of the basin. The peaks in this vicinity are mostly composed of a beautiful pale granite, and soar to their 21,000 ft. in clean curving lines, supported below

by wonderfully carved ice flutings.

Tensing, one of our Sherpas, had developed some sort of fever in the Rishi Nala and every day for more than a fortnight he ran a very high temperature—often as much as 105°. Even when he had recovered he was no more than a passenger as the fever left him very weak and thin. Owing to this we kept on two of the Lata men who had accompanied us into the basin. They worked splendidly and with a little training would be as good as the Sherpas. It is quite time that someone undertook the task of training these people of Garhwal as mountaineers. There is any amount of splendid material in the higher valleys. They have one tremendous disadvantage, however, and that is that their religion forbids them to eat either with Europeans or anything cooked or touched by Europeans or Indians of other castes. When a party is engaged in a long and difficult task, this taboo would produce an impossible situation. With the Sherpas, I am in the habit of eating out of the same dish and drinking out of the same mug, and no one loses caste or feels embarrassed. Later in the year when we were employing some Dotial porters and the party ran short of food, the Dotials, who had finished their own food, allowed themselves to become feeble with hunger rather than eat the rice which we had been carrying in our rucksacks. Angtharkay always becomes infuriated by this prejudice, and taunts the victims unmercifully.

We had a delicious camp by the lake at the junction of the two great glaciers of the Northern section. We had brought a goat with us from Lata, and at this camp we gave orders for it to be executed. It was a sad business as we had all become very attached to the animal. It had shared with us the fatigues of a

long journey and the warmth and comfort of our caves and camp-fires. It had been no easy task getting it up the gorge, and Angtharkay, who had been its keeper and principal helper, was particularly distressed at the idea of killing it and had defended its life for some days with arguments for keeping it alive—the chief of these being that it might as well be made to carry its meat as far up the glacier as possible. That night, however, when eating fried liver and kidneys, he had no regrets. The execution itself was performed quickly by the two local men before the animal had time to bleat.

We crossed the Great North Glacier, which was a severe trial to poor Tensing, who was now so weak that he found difficulty in walking. His temperature was still alarmingly high in the evenings, and we were beginning to get very worried about him. However, in the large ablation valley on the other side of the glacier we made a base camp from which the remainder of the Northern section could be reached. After a week's rest at this camp the fever left him. Angtharkay, Ang Dawa and I set out to climb a fine triangulated PEAK (21,770 ft.) on the watershed overlooking the Milam Glacier. We camped at about 17,500 ft. in a subsidiary valley and started before dawn the following day (September 23). We climbed up a steep and quite difficult ice ridge which involved a great deal of step-cutting. The conditions were excellent, however, and the climb was pleasant and safe. Ang Dawa was quite the strongest of our six Sherpas; in fact, he used to entertain us in camp with feats of strength. In the Rishi Nala too he had displayed considerable skill on steep rocks and would run about over precipices without turning a hair. On this ice ridge it was very surprising to see him crack up. He could not adjust his movements to the ground he was on and was terrified on steep snow slopes. He became exhausted early in the climb and a few hundred feet from the summit gave up the struggle. This delayed us a good deal, and by the time Angtharkay and I had reached the top the Milam Glacier was filled with cloud and I did not get the view I had hoped for. We looked down on two gorge-like glacier valleys running eastward from the two cols on the watershed on either side of the peak. Lower down we could just discern their junction with the Milam Glacier. It would be possible to cross either of these two cols and so to reach the Milam Glacier from the Nanda Devi basin; but it would be a difficult undertaking with the loads it would be necessary to carry.

Although the peak we had climbed is the highest on that part of the watershed, in common with most of the great peaks of the

Nanda Devi basin it has no name. With the new survey of the range a complete revision of the nomenclature of the district is being made. It is no easy task to decide on the most appropriate names for peaks and glaciers. Each group of villages has a different name for the same feature and they do not agree upon the names of even the great peaks which dominate the whole district. Thus all the peasants of the Dhaoli Valley, in the vicinity of the mouth of the Rishi Ganga, call Nanda Devi Nanda Ghunti, and have never even heard of the former name. The peak known to us as Dunagiri is called by these people Tolmai Pahar, and it is only in the vicinity of the village of Dunagiri in the Bagini valley that one hears the name Dunagiri used for the mountain. On the other hand, the shepherds of the Rishi call the glacier which flows down the Changabang into the Rishi Nala, the Bagini, whereas Bagini is the name given by the Dunagiri villagers for the great glacier in their valley; and so on. This state of affairs is found throughout the district—and indeed throughout all mountain districts I have travelled in, in Africa as well as the Himalaya. It is not surprising that it should be so. The peaks and glaciers are as yet of no economic value to the peasants, and to them only the grazing grounds, streams and forests are worth naming. Thus the most prominent peak standing above a grazing ground would simply take the name of that grazing ground as indicating roughly its direction when seen from afar, while the shepherds on the opposite side of the peak call it after their nearest grazing ground. In this way the traveller is confronted by several peaks known by the same name and several different names given to each of the peaks. It seems to me that the best solution is for the pioneer traveller to adopt the pleasantest sounding of the various names, for geographers to accept their suggestions, and for subsequent travellers to refrain from futile discussion. In the case of uninhabited areas, of course, such as the Nanda Devi basin, none of the glaciers or lesser peaks has a local name and there are a great many 22,000 and 23,000 ft. peaks which, though triangulated, cannot be seen clearly from the inhabited valleys and remain consequently unnamed. In these cases it is the duty of explorers to invent suitable names for all prominent features, and map producers should make an effort to adopt their suggestions.² A tremendous amount of confusion and misunderstanding is caused by procrastination in this matter. We have produced a list of names for peaks, glaciers, lakes, etc., of the Nanda Devi region, which will be considered by the authorities when the map has been drawn.

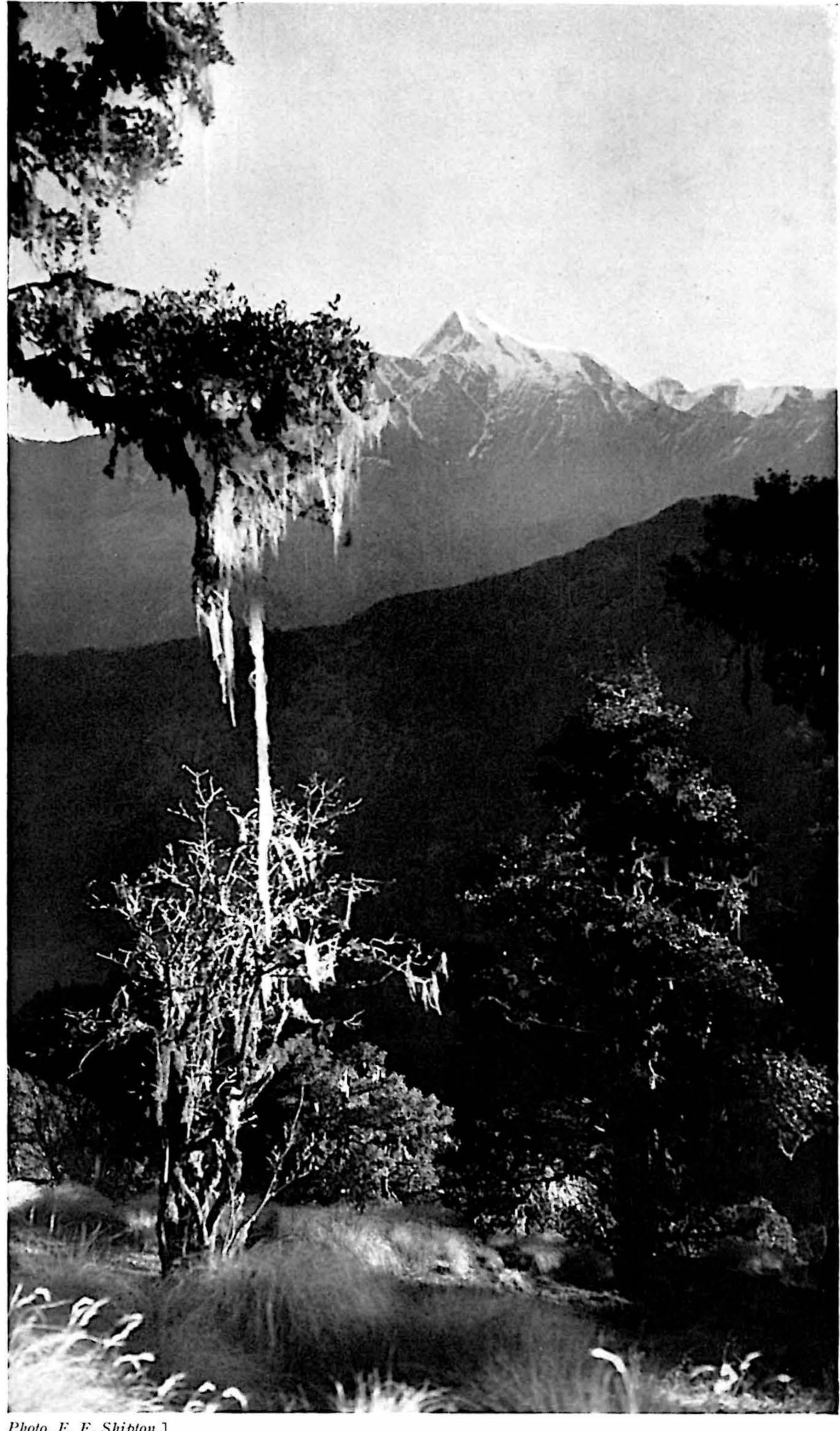
² See pp. 106-7.

After accompanying Osmaston up the Great North Glacier (which, by the way, will be given a more suitable name in due course), I returned to the lake, and from there went with Rinzing Bhutia up the Changabang Glacier. The moraine covering the greater part of the surface of the ice is made up of huge blocks of that remarkable white granite of which the cliffs of Changabang are composed. Halfway up we camped on the flat top of a glacier table. Except for the fact that the table might have collapsed, it made an excellent camp site. The weather turned bad, and that evening a good deal of snow fell. Starting before dawn the following day (September 27) we reached the head of the glacier which rises in a cirque of stupendous granite cliffs. We were making for a saddle at the foot of the southern ridge of Changabang which I hoped would offer a practicable route to the head of the Rhamani Glacier. A gully in the granite slabs led us to the crest of the col without much difficulty, and from there we looked down on to the great snowfield which Dr. Longstaff had reached after crossing the Bagini Pass in 1907.3 We were separated from it, however, by a vertical wall of rock whose smooth face was quite impossible to climb down. Although by now most of the peaks were covered by cloud, the view was quite magnificent and I sat for an hour fascinated by the gigantic white cliffs of Changabang.4 The great snow dome of Dunagiri appeared now and then from across the Rhamani Glacier, but I did not get a view of the main mass of the mountain. We returned to our camp in the afternoon and thence, in heavily falling snow, down the glacier to the lake. We returned to the glacier junction camp the following day to find that Osmaston had been delayed by the bad weather and still had one more station to do in the Northern section. He had been right up to the head of the Great North Glacier and had completed the survey of that valley and its tributaries.

We descended the main glacier and crossed the rivers into the Southern section. There I left Osmaston and went down the Risgi gorge to Dibrughata with Angtharkay and Sen Tensing, reaching there on October 3. We left again on October 4 and on the evening of the 5th reached a high pasture in the ablation valley of the Rhamani Glacier. I was hoping to reconnoitre the S.W. ridge of Dunagiri and, if time permitted, to make an attempt to climb the peak. On the 6th we went up a side glacier and camped on its moraine at about 17,000 ft. The following day we managed to reach a col nearly 20,000 ft. high connecting the S.W. ridge of Dunagiri with a peak which on the old 1-inch maps

³ A.J. 24. 108-33.

⁴ Ibid., illustration facing 111.



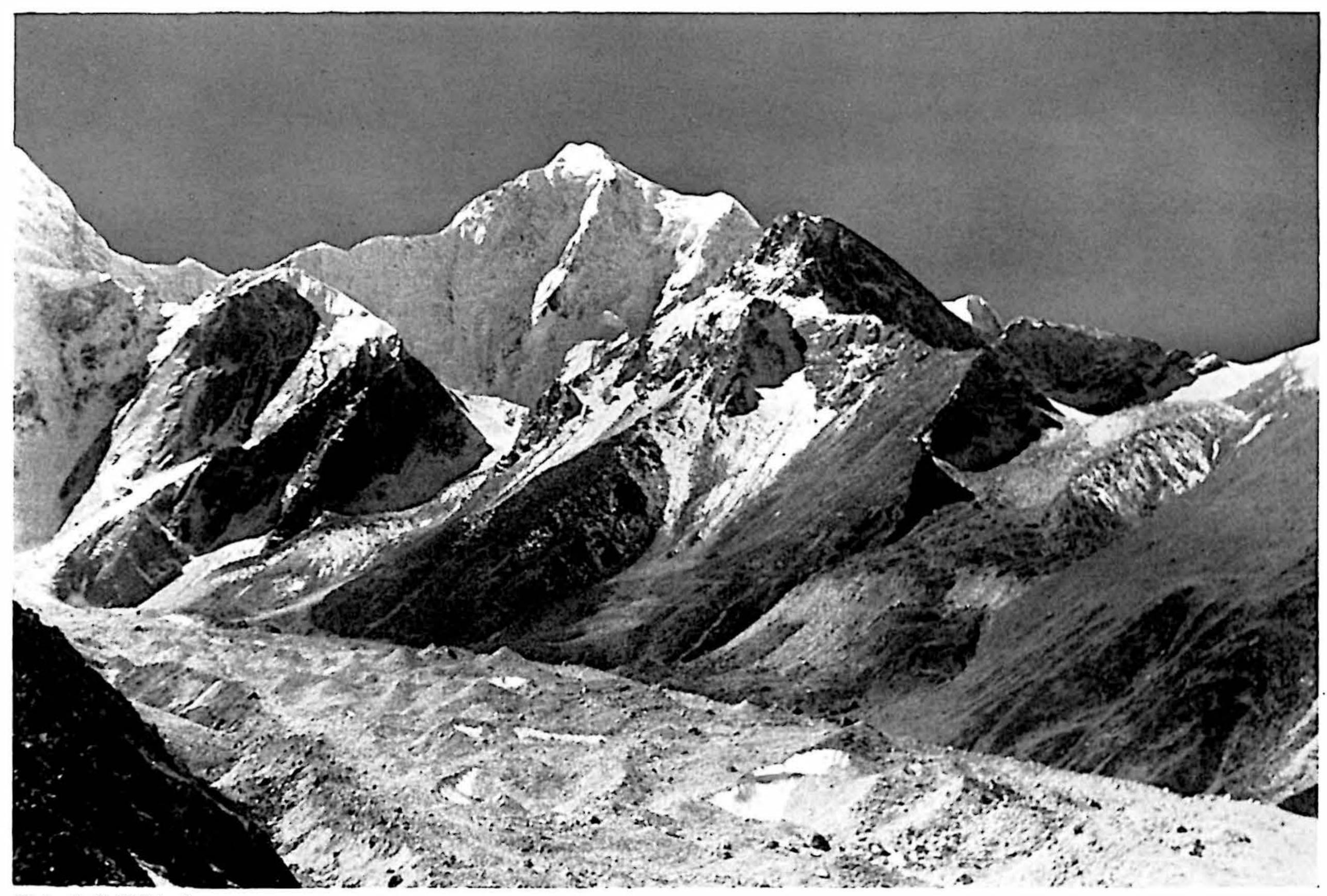
Photo, E. E. Shipton.]

NANDA GHUNTI FROM WAN PASS.



Photo, E. E. Shipton.]

DUNAGIRI FROM S., 1936.



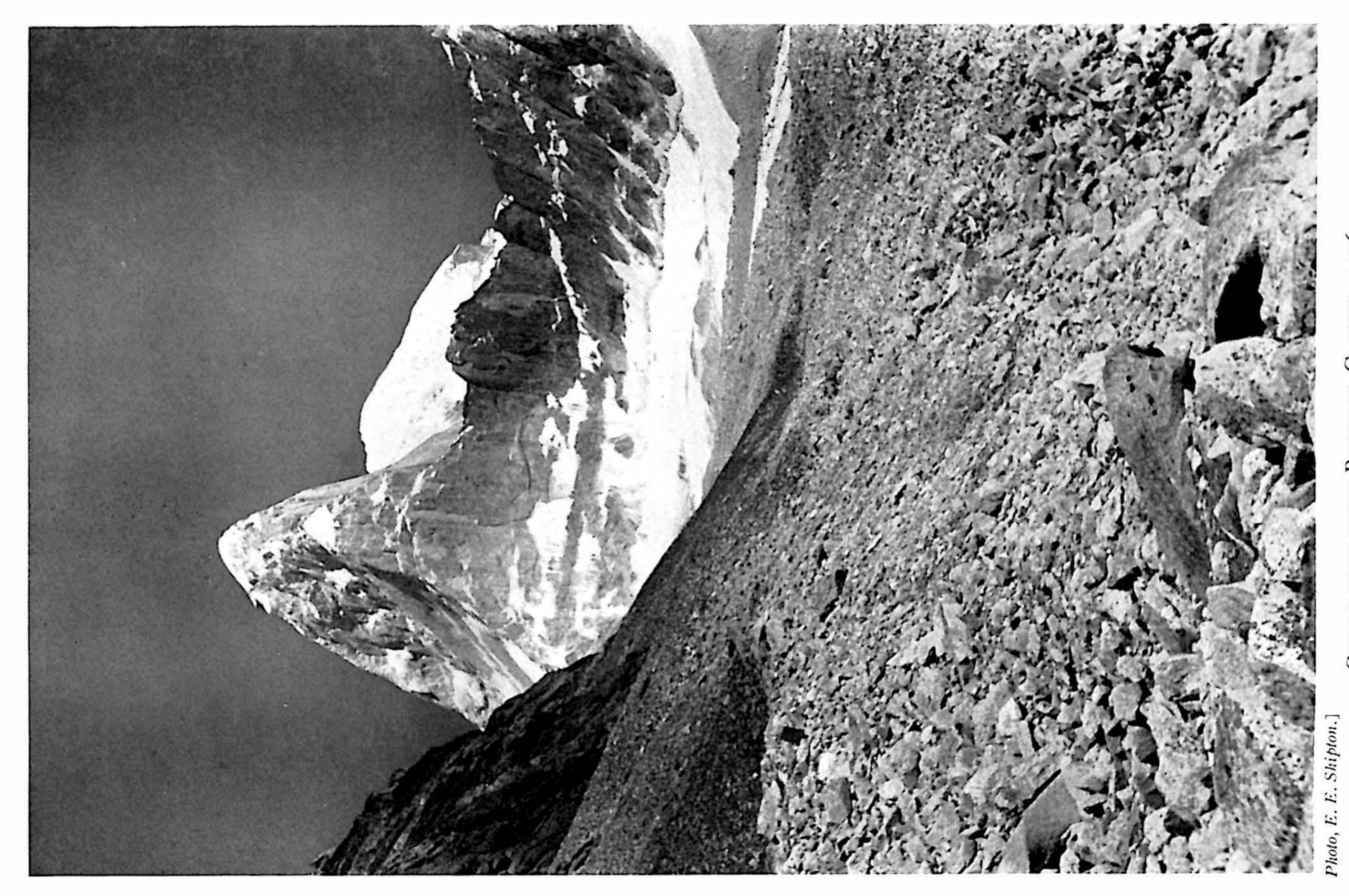
Photo, E. E. Shipton.]

Dunagiri from N., 1936.

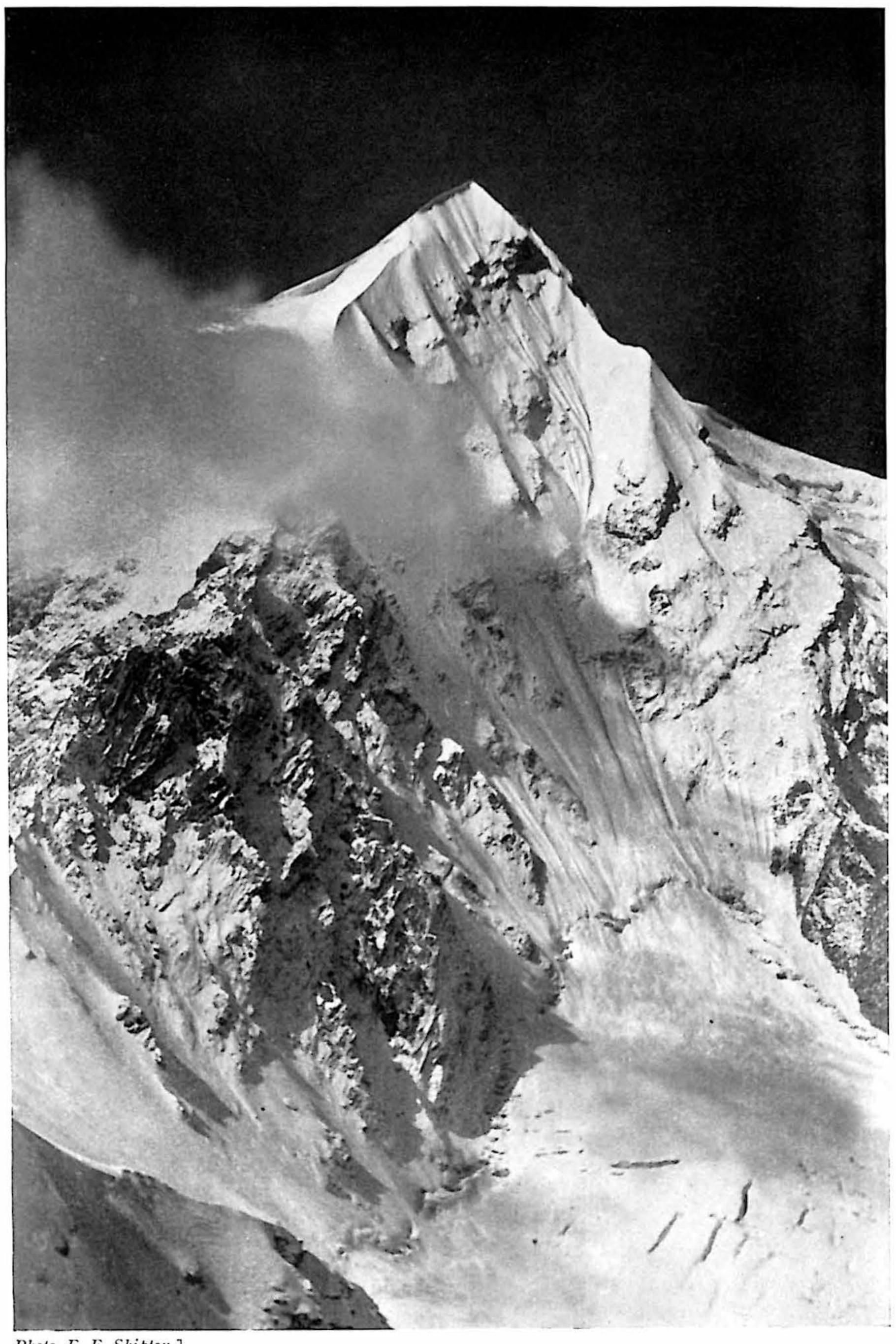


Photo, E. E. Shipton.]

Col between Changabang and Rhamani Glaciers, 1936.



CHANGABANG FROM RHAMANI GLACIER, 1936.



Photo, E. E. Shipton.]

END OF E. RIDGE OF NANDA GHUNTI, 1936.

bore the strange name 'Niti No. 3.' On the northern side of the col the ground fell away with tremendous steepness to the Tolma glen and we found ourselves looking straight down to Surai Tota in the Dhaoli valley. We turned right-handed and followed a narrow icy crest towards Dunagiri. Sen Tensing succeeded in dropping his ice axe. We recovered it two days later, but its temporary loss produced a horrid feeling of insecurity for the whole party. Reaching a point where the ridge sweeps up with considerable steepness we pitched our tent under a great rock buttress. Later in the evening Angtharkay and I climbed several hundred feet further up the ridge to reconnoitre the route. We found that the going was over hard ice and that steps would have to be cut every foot of the way.

Our camp was in a superb position and commanded views from the great peaks of the Nanda Devi basin and Trisul ranges to the mountains of Badrinath and Kamet. After a bitterly cold night we started before dawn, a very painful performance from which there was no relief until the sun appeared. We had left Sen Tensing behind in camp and Angtharkay and I took the labour of step-cutting in turns. It was very slow and tiring work, and when after some difficult climbing we reached the long, almost level ridge leading to the summit it was late in the day and we had not time to cut our way along the knife-edged crest to the top. The route, however, is quite feasible and, as far as I have been able to see, by far the best way of climbing this grand peak. We got to a point within a thousand feet of the top (23,184 ft.).

We returned to the Rhamani Glacier and camped at its head below the col which Rinzing and I had reached from the Nanda Devi basin. On October 10 we started to cross the Bagini Pass. I was a bit confused by the topography at the head of the glacier. The western face of Changabang falls with its characteristic sweep of white granite to a col some 2500 ft. below the summit. West of this the watershed ridge rises to a sharp conical peak, and further still falls again to a long, serrated granite ridge which, nearly a mile further on, abuts on to a peak 21,290 ft. of the great N.E. ridge of Dunagiri. Between this peak and Dunagiri itself is another low depression forming the watershed between the Rhamani and Dunagiri Glaciers; this one, however, is almost inaccessible from this side. I was by no means certain which of these cols was the Bagini Pass which Dr. Longstaff had crossed in 1907 and as far as I know had not been crossed since. We chose the middle one and reached the crest of the serrated rock ridge at 12.30 on October 11, only to find that from where we stood there was no chance of descending on the northern side.

We spent nearly the whole of the rest of the day moving ourselves and our loads along the knife-edged crest of the ridge before we could rope down into a gully from which a descent could be made. We were overtaken by dark when only 200-300 ft. down and had to construct a tiny platform on which to camp for the night. Early next morning we completed the descent of the rocks and ran down the snow-covered head of the Bagini Glacier. The valley we were in was bounded on the E. by a most magnificent wall of peaks which form the N.W. rim of the Nanda Devi basin on which we had stood two years previously. From lower down we could look up a small side glacier to the col under the western face of Changabang. I was extremely glad that we had not tried that route as it would have been almost impossible to descend from the col with our loads. The first crossing of the Bagini Pass must have been an anxious business, as apart from the difficulty of the climbing, Longstaff and his companions had no idea of where the pass would lead them, and even when they had negotiated the Rhamani valley they were still many days from habitation. We had none of these anxieties and thus our passage was vastly easier.

The Sherpas were eager to reach fuel before nightfall and we sped down the glacier without halting anywhere. Every step of the way was vastly interesting to me, and I spent an absorbing day fitting in the topography of the Bagini Glacier with our explorations of two years previously. We had magnificent views of the huge unnamed peaks of the Garhwal-Kumaon watershed. Immediately N. of these peaks is the Girthi river which makes such a strange intrusion into this line of elevation. The sun had long set before we reached the first juniper on the southern side of the glacier, and we were lucky enough to find a stream running down the ablation valley and soft turf on which to camp. The excitement of reaching juniper after some time on the higher glaciers never loses its force. In spite of the hardihood of this plant it is peculiarly sensitive to its position and at higher altitudes never grows on slopes with a northern aspect. For some miles that evening we had seen it growing on the opposite side of the glacier in tantalizing profusion, and it was not until the lateral moraine on our side became sufficiently large to produce a fertile southfacing slope that we came across any. The reverse is the case with rhododendron and birch, and at lower altitudes the aspect of one's camp is indicated by the different effect these woods have upon the food.

Next morning below the snout of the glacier we found a blaze of autumn colours. The bare, almost feathery branches of the

birch woods contrasted deliciously with the brilliant green of rhododendron and juniper, and the whole valley was interlaced with vivid patches of red, flame, and copper. The glades were filled with long wavy grass, the colour of ripe corn in the morning sunlight. In place of the raging torrents of muddy water which issue from Himalayan glaciers throughout the summer we found sparkling crystal streams. The air too had a sparkle of frost, enhancing the beauty of a myriad autumn tints. Early in the day we reached the village of Dunagiri, where we found all the population busily engaged in reaping their crops and storing the grain for the winter. The houses were decorated with huge yellow marrows and cucumbers. The whole valley seemed steeped in sunshine and the rich colourful ripeness of autumn harvest.

The remainder of the day was spent basking in the sun outside one of the houses, chatting with the villagers who, to celebrate our arrival, indulged in a half-holiday. We were besieged with questions about our doings and the reasons for them; to these we gave the usual unsatisfactory answers, in return for which we received much interesting information about the valley and its people. It appears that in the autumn all the inhabitants descend as far as Karnaprayng and even further with their flocks, and the whole valley is deserted. All the farm produce is stored in the village for consumption the following summer. This winter exodus takes place by slow degrees and was already in progress. The Sherpas spent a happy day trading old tins for food, and after some hours of hard bargaining had obtained, without spending a single pice, enough to keep us supplied for a week. The children in these villages are made to work from a very early age. In the evening I watched some tiny mites supervising with extraordinary skill the herding of enormous flocks into pens. There were innumerable lambs, each of which had to be placed beside its mother. The children worked until long after nightfall, settling the disputes and attending the bleated complaints of the sheep.

The following day I went up with Sen Tensing to investigate the so-called Dunagiri Glacier and to reconnoitre the northern approaches of the peak. The glacier terminates in an immense wall of moraine-débris which has been thrust into the birch forest high up the side of the main valley a mile or so below the snout of the Nagini Glacier. It is very much alive and appears at the present time to be advancing, though in former ages it must have flowed far down into the main Bagini valley. It rises, not at the foot of the peak of Dunagiri as I had expected, but in a rocky cirque culminating in a peak 21,290 ft., whose acquaintance

I had made on the opposite side. The N. face of Dunagiri itself was half hidden from view by this cirque, but from what I saw I should say that any route on this side would be a great deal more difficult than that which we had reconnoitred a week before. The best approach to the foot of the N. face would probably be up the nala which joins the Dhaoli about 3 miles below Jumagwar.

I do not know whether anyone has been up this nala.

I regretted leaving our friends of the Bagini valley and their charming village; their hospitality and kindness matched their beautiful surroundings. Further down the valley the autumn tints were even lovelier than they had been near the glacier. I spent nine months in the Himalaya last year and at no time did I see such a wealth of lovely things as during that October; even flowers were not wholly lacking, and occasionally in some wellwatered glen we would come across drifts of primulae defying the rule of the seasons. In my opinion there is no better time to travel in Garhwal than the autumn; the days are cool, the nights not too cold, snow conditions are good (except high up on northfacing slopes) and the weather is usually fine. An added advantage is that, with the newly reaped crops, it is very easy to live off the country. In the forest we came upon several small encampments of peasants, busily engaged in collecting the stones of wild apricots, from the kernels of which they make oil. Further down, the Bagini torrent enters the main Dhaoli valley through a fine canyon which is not the least impressive feature of the very beautiful valley down which we had come. Two more marches took us to Joshimath, where we rested for two days. I had been there only a couple of hours when Professor Arnold Heim arrived with Dr. August Gassner, and I was delighted to be able to spend the two days in their company. They had just completed a tremendous season of geological work in the vicinity of the Almora-Tibet frontier.5

I left Joshimath with the two Sherpas and three Mana porters on October 18. Halfway to Tapoban I met Osmaston returning from his work in the Nanda Devi Basin. The excellent weather of the last three weeks had enabled him to complete the survey of the Southern section a great deal sooner than we had expected and he had been supported in the Rishi Nala by Fasil Eligh, probably the most competent of his plane-tablers. Fasil Eligh had surveyed the Trisuli Nala at a remarkable speed, averaging nearly 5 square miles a day, which is fast going for such difficult country. He was now working in the Rhamani Nala and, later, completed the mapping of the lower part of the Rishi gorge.

⁵ Die Alpen, 1937, pp. 81-5, well illustrated.

Only one section of the outer basin remained; this was the valley running N. from glaciers between Trisul and Nanda Ghunti. It had been decided, therefore, that I should make a survey of this area with the Watts-Leica photo-theodolite, with the dual object of rounding off the Nanda Devi survey and of trying out this instrument in an independent survey. Osmaston went off up to Badrinath with the object of inspecting his surveyors in that district. Most unfortunately one of his camp officers had died in the Arwa valley, and although Captain Crone had gone up to deal with the situation, a lot of reorganization was required.

We camped our first night out of Joshimath at Rini, which is situated at the mouth of the Rishi Nala. The following day we enlisted the help of a local man to show us the best way to the highest pastures in a valley we were making for, and to help me in naming some of the prominent features. Dr. Longstaff has referred to this valley as the Rinti Nala, though the name used by the people of this district is more like Ronti. We followed the main gorge for a bit by a path which has been very cleverly engineered by the peasants, but soon the going became difficult and we turned right-handed and climbed up over steep, heavily forested slopes past another tiny village basking happily in its rich, self-contained isolation. Higher up, the Rini man introduced us to a variety of wild fruits which grew in the forest, some of which were new to the Sherpas. The commonest of these resembled a crab-apple on the outside, though its internal construction and taste were more like those of a persimmon. All through the forest there was a wonderful profusion of autumn colours. Every few yards we put up some Monal pheasants, which sailed over our heads, screeching noisily. During the two days we were going through this forest we must have seen nearly a hundred of these birds. Even in this remote valley they were very wild and very rarely gave us a chance to get near to them.

We entered the Ronti valley several thousand feet above its floor and on October 20 camped in a cave high up on the side of the nala commanding a magnificent view of the surrounding country. The lower section of the valley in which we found ourselves is bounded on the E. by huge precipices culminating in a line of jagged aiguilles; but the western slopes are gentle, well wooded and frequented by shepherds from the villages in the neighbourhood of Rini. Their grazing ground was pointed out to me by the Rini man, who called it Chamba Kharak. This part of the valley is enclosed by a great ice-covered wall which forms the E. ridge of a peak 19,893 ft. Round the eastern end of this wall the valley runs up through a narrow gorge to a large glacier

basin forming its upper section. Through this gorge we could see the tongue of the glacier protruding. There has been a good deal of confusion regarding this peak, 19,893 ft., and its southern neighbour (20,700 ft.) which is such a prominent feature seen from Ranikhet and Almora. The present map labels the former Nanda Ghunti and the latter Nandakna. Dr. Longstaff, however, has always referred to the higher peak as Nanda Ghunti, and certainly that is what it is called by the inhabitants of the valleys to the S.W. of the range. We found that the Rini villagers refer to the northerly peak as Ronti, and I hope that these two names

will be adopted on the new map.

One of the Mana porters had been with Tilman's party and entertained us in the evenings by voluble descriptions of their adventures in the Rishi gorge during the monsoon. I was amused to find that these men had nicknamed Tilman 'Balu Sahib' (Balu meaning a bear) owing to the speed with which he moves over steep forested ground. On reaching the Ronti Nala I discharged the local men and set to work with the two Sherpas on the survey. But the weather broke and we were confined to our cave for three days. A good deal of snow fell and it began to look as if winter conditions would prevent any further work. Also I was afraid that our food supply would run too short to allow us to attempt to cross the pass across the watershed. However, we had brought another sheep with us and occupied ourselves concocting fancy meat dishes. The morning of October 24 was fine, and by starting before dawn we managed to reach a high spur in time to take a round of angles and photographs before the mists rose out of the valleys and swamped the view. The dawn views were magnificent and showed nearly all the great peaks of this section of the range like islands washed by an ocean of flame-coloured cloud. In the afternoon we humped our heavy loads over to Chamba Kharak, from which I was able to do another station. We repeated this procedure every day until five stations had been completed in the lower section of the nala. Owing to the fact that the view was invariably obscured by 9 A.M. it was difficult to put the stations sufficiently high, and we had to do twice as many as would have been otherwise necessary. The great advantage of this method of photosurvey over plane-tabling is the very short time that it is necessary to occupy a station. Plane-tabling in the conditions we were experiencing would have been almost impossible. The phototheodolite which I was using weighs a total of 18 lbs., including its stand and cases; also it is extremely simple and convenient to use, and if it is found possible to plot with sufficient accuracy

from the tiny photographs, it will bring photographic survey within the scope of even the most lightly equipped parties. Moreover, the use of roll films instead of plates makes it a great deal easier to bring back one's results intact. The film is held flat while being exposed by means of a pressure glass in the back of the camera.

On the afternoon of October 27, in a heavy snowstorm, we made our way through the bottle-necked gorge lying between the lower and the upper section of the Ronti Nala. We were climbing on the moraine-covered ice of the glacier which squeezes itself through the gorge. Our great difficulty was to find any water, as at this time of the year all the glacier pools are hardfrozen day and night and we could not afford the fuel necessary to melt ice at this stage, being now above the limits of juniper. I was surprised to find Monal pheasants far up the glacier. Up here they seemed extraordinarily reluctant to embark on their gliding downward flight and we got so close to them as to tempt the Sherpas to chase them with a fusilade of stones. Although the Sherpas threw with amazing accuracy, the birds seemed to have a cunning knack of hopping over the missiles, and we failed to replenish our larder in this way.

Fortunately the next day the weather became finer and we were able to make the best use of the short time in the upper glacier basin. We found it to be divided into three sections. First, there was a large ice-stream coming down from the saddle between Nanda Ghunti and Nandakna. This saddle must lead to the head waters of the Bireh Ganga. I was very tempted to visit it, but could not spare the time. Next there is a small tributary glacier rising under the W. ridge of Nandakna; at the head of this is the saddle reached by Longstaff and Ruttledge from the other side. Thirdly, what is probably the main glacier flows under the ice-terraced cliffs of the N. ridge of Trisul. Although the upper part of this was out of sight, I decided, when the survey was finished, to look for a way across the watershed in this direction. It proved to be the right line and we encountered no difficulties whatever. Our last camp and station were on the saddle itself and commanded glorious views on both sides of the range. The glaciers on the southern side are very small and we were soon back in heavily forested country. In the upper part of the Nandagini we saw large herds of game. Near the entrance to the Nandagini gorge, where we camped, we found signs of the visit of the surveyor who had been working in this area. In spite of this we found it quite difficult to follow his track in the jungle. Sen Tensing became separated from us, and Angtharkay and I retraced our steps for a long way in search of him. Instead of him we found a good path, which we concluded he must have been following. It was not until late in the evening that we discovered him, however. He had not struck the path and had been struggling along some hundreds of feet below it. Angtharkay and I told him, untruthfully, that we had visited a village in the afternoon and had been sitting there imbibing milk and baked potatoes. Angtharkay told him to go back to get food for himself from the mythical village. However, I thought that was carrying the joke too far and stopped him.

From Sutol we crossed the Wan Pass to Gwaldam; and later from Wan we crossed into the valley of what, on the existing map, is called the Kurumtoli Glacier, which Dr. Longstaff explored in 1905. He calls it the Keil Glacier. In this region I did several photographic stations, which were intended to supplement the work of the plane-tabler who had not had time to complete

his work in this part.

On my way to Bombay I went to Dehra Dun, where I met Osmaston and Captain Crone, whom I had met previously at Joshimath. Osmaston's photographs had come out well, except for a certain amount of fogging round the edges. Crone calibrated the camera I had been using and appeared to think that there would be no difficulty in plotting the data I had brought back. He is working on it now and I am anxiously awaiting his report on the work of this very handy little instrument.