Moreover, there is further evidence than Graham's of high peaks to the N. of Everest. Pundit No. 9 and Babu 'S.C.D,' who travelled through the country, say that it contains mountains of enormous height. There are also persistent native beliefs in the existence of rivals to Everest in the country N. of it.

It is also worthy of mention that Mr. Freshfield in his book, *Round Kangchenjunga*, p. 204, writes: 'The Kang La Peak is only a week's travel from Darjiling. Will not the Surveyor-General send up an officer who can climb and is competent to settle the question at issue?' The question at issue being the existence of the two mountains mentioned by Graham. That was twenty-one years ago. Dr. Kellas has been there and has obtained tele-photographs of very high peaks, just where Graham said they were. That they are higher than Everest is exceedingly doubtful, still the proof of their existence adds considerable interest to the expedition that next summer will be passing quite close to them.

One more word about Dr. Kellas's dash into the Himalaya, practically in December. He is to be heartily congratulated on the result, and admired for the pluck in undertaking a journey at such a time of year. One only wonders, for he says nothing about it, what were the temperatures he had to endure, at that season of the year, at altitudes sometimes higher than the summit of Mt. Blanc.

Himalayan Hints for Mountaineers.

By C. F. MEADE.

[The following notes, though based merely on an experience of British Garhwal where I spent three seasons, may, I hope, be to some extent useful for climbers in other districts of the Himalaya.]

PERSONNEL.—In my last attempt on Kamet my party consisted of two Europeans, namely, my Alpine guide Pierre Blanc and myself. I am aware of the drawbacks of so small a European party, but when all goes well everything is much easier. In case of illness or accident it would be otherwise. Blanc is one of the few professionals ideally suitable for a Himalayan expedition, and he has been out three times, but I do not know whether he wants to go out again. If a guide be taken (and on Kamet a first-class step-cutter may be essential) the question of his selection is of extreme importance. A guide in the Himalaya must combine the rare qualities of the cream of the first-rate professionals with all those advantages which an Englishman usually possesses in dealing with natives.

For high altitude transport the tribe of nomads who inhabit British Garhwal and are known as Bhotias are excellent. Once their confidence has been gained I cannot imagine better men for the job. Kumaunis and even Garhwalis (with exceptions) do not seem to compare with them. It is better to be accused of spoiling the men than to fail in supplying them with warm clothing and equipment on a very generous scale. Boots should be included. The Bhotias took kindly to them at once. The men should be made to understand clearly that the kit is only to be theirs as long as they remain in the employ of the expedition and continue to give complete satisfaction. It may be explained to them that only those whose service has been entirely satisfactory will be allowed to retain their kits on the termination of the engagement. As to spoiling the coolies it is worth remarking that the present of a pair of boots alone, apart from clothing, is probably the equivalent of a month's pay. At the same time they naturally will not accept boots in lieu of pay. In deciding the question of pay it is well to remember that the Bhotias are not mere baggage coolies, but can be relied upon to do all and much more than the work of Alpine porters. They are brilliant crag-climbers without any knowledge of snowcraft. Under an admirable trainer like Blanc they soon become efficient mountaineers. I employed about a score, of whom seven accompanied us to our 23,000 ft. camp.

As to the ideal trainer he should not only have ' personality,' but should equal the Bhotias in rock climbing, and only the best performers can reach this standard.

For the journey from railhead two chuprassis are taken to organise the necessary relays of coolies, but these chuprassis should not be retained after the base of operations is reached as they are useless at great altitudes. It is best to give the Bhotias their own head man, who will be absolved from carrying a load.

The choice of agents at or near railhead is important, as it may be necessary for the agents to forward additional supplies after the expedition has started, if the villages on the line of march are likely to be short of labour and unable to furnish sufficient coolies for the whole of the bandobast. Any such arrangement would have to be very carefully planned out in detail beforehand.

As to cooks, I preferred to teach two Bhotias from the party whom we sent for to meet us near railhead. They cooked under our supervision. The Indian cook probably, or the Indian job cook certainly, is capable of accounting for the bad health of an entire party for a whole climbing season, for although he is skilful he will not learn hygiene and should not be trusted.

As bearers we employed two Bhotias. Indian job servants from the plains have a bad reputation and are a mischievous disruptive force in an exploring expedition.

For similar reasons, in spite of the obvious advantages of an interpreter, I preferred not to engage one, but to trust to luck and a smattering of Hindustani. The late Pundit Bidya Datt Dimri of Badrinath was most helpful when we were in his neighbourhood. A hired interpreter is too likely to be a rascal with a strong distaste for exploration, and his presence may have a devastating effect.

Material.—I had all my stores packed by the London 'Army and Navy Co-operative Society' in Venesta cases screwed down and fitted with padlocks. Half a dozen master keys were supplied. The padlocks should be packed together and only fixed on arrival at the Hill station, otherwise they are liable to be damaged in transit. Each of the victual cases held food for the two Europeans for five days. The provisions were weighed and sampled at home, and no load (except the tents) exceeded 40 lb. Light loads mean that coolies arrive punctually in camp. Moreover, the Government load is only 40 lb.

Whymper tents were used. They deserve their high reputation. An outer fly is, in my opinion, essential at high altitudes or the tent becomes uninhabitable when the sun shines. The arrangement for the outer fly requires altering. The tent poles require lengthening, and shoulders should be cut in them close to the top in order that the tips of the poles may project through strong eyelet holes made in the fly which should rest on the shoulders. If this modification is not made, the outer fly soon tears to pieces by fraying on the tips of the poles. To provide a sufficient air space as protection against sun the prolongation of pole and shoulder above the ridge line should provide a distance of at least six inches between the outer fly and the ridge line.

An 80 lb. Kabul tent is useful for the Bhotias at low elevations. The party who reach the very great altitudes should all sleep in Whymper tents with outer flies and ground sheets sewn in. Even so, the sun is fearfully oppressive, and if I returned to the Himalaya I should try darkened material for the high altitude tents.

A good medicine chest is useful, as many natives will come to be treated if they receive any encouragement.

Several dozen articles of more or less value can be taken as presents for natives of various degrees of importance.

A few features of personal kit may be of interest. I took elaborate precautions against frost-bite. One of the most useful was a pair of cloth bags or toe-caps to slip on over the toes of the boots. They were held on by tapes passed behind the ankles and tied in front. The cloth was sufficiently weak to allow the boot nails to bite through it into snow, ice, or rock. This contrivance when worn out could be thrown away and spares could be carried.

Lifebuoy air cushions were invaluable for resting the hip, for we always slept on the ground.

At great heights we used big eider-down sleeping-bags in balloon silk outer bags and wore all the clothes that we had. A hot-water bottle was most useful at the highest camps, and Primus cooking stoves were always used there. It is most desirable to try special fuels or modifications of the Primus itself in order to make it effective in rarefied air, for under these peculiar conditions the Primus is a constant nuisance.

Helmets should give very thorough protection against sun, likewise should snow spectacles. The helmets should have good pugarees as additional protection, and strong chin straps.

Sun umbrellas were most useful at great heights also on the return journey in the rains. They should either be specially strong to be used as walking-sticks or have a fitting for a strap to carry them slung across the shoulder. I believe that by their use mountain sickness would be greatly mitigated.

In the low villages we marched in shorts and shirt sleeves. Stocking tops can be turned up over shorts to keep off biting flies, or the kind of shorts used in the war in the East may be worn. During the rains we carried featherweight oil-silk waterproof capes. These were fixed by tabs to buttons sewn on the back of the braces, and thus could be flung back, so that whenever the sun came out the encumbrance was imperceptible. Pith helmets require waterproof covers of oil-silk which can be put on whenever it rains.

In 1910 we carried a somewhat primitive apparatus containing oxygen cartridges which could be inhaled merely through a tube without a mask. Our experience of it led to no conclusion.

The high-altitude coolies should have kit on a very generous scale, as the success of the expedition depends on their being well housed, fed and clad. Their clothing at great altitudes ought to be as warm and light as that of the Europeans and they should have good warm sleeping-bags. They soon accustom themselves to boots. Their kit must include snow spectacles, and I believe that shady hats or helmets with pugarees would keep them stronger and more efficient. A specially big size of rucksack is useful for these permanent coolies when carrying at great altitudes. I think that they should also be given a Primus stove and be taught how to use it.

Organisation.—A golden rule is to dispense with headmen, cooks, bearers, and interpreters. Our cooks were Bhotias who cooked humbly and honestly under supervision, while we frequented the cook-house as a smoking-room. Thus we escaped the poisonous activities of an Indian professional cook. Our headman was one of the Bhotias. Many trials had proved him to be pre-eminent among his fellows. As for bearers, the two Bhotias very soon learnt the simple duties required in camp, and enjoyed their jobs which entitled them to carry half loads. They never gave trouble. Indeed, I have never known a troublesome Bhotia.

Three other Bhotias marched with us always and carried half loads. One carried a light picnic meal and hot tea in a Thermos for consumption on the march. Sweaters and featherweight mackintoshes were included in his load. The other two (the cooks) carried a light awning and materials for cooking an emergency meal on arriving at the new encamping ground pending the arrival of the coolies.

A good plan in organising the daily marches on the way up-country is to have a quantity of counters, one for each coolie load, stamped with a number corresponding to a number painted on the load. The coolies are formed into a queue at the beginning of each march and a load with its corresponding counter handed to each man as he comes up to the pile in his turn. At the end of a march the coolies have to present their counters before receiving their pay. This device will frustrate any false claim on the part of a coolie who may have shirked carrying his load. It also facilitates the prompt payment of the coolies in small groups as fast as they reach camp. Nothing is more discouraging to a punctual coolie than having to wait hours for the arrival of dilatory companions before he can get away home with his pay. A hole with a string through it in each counter enables the coolies to carry their counters without losing them. For any loads, such as tents, which may be over 40 lb. coloured counters may be used and a fraction over the usual tiny backsheesh allowed.

As the loads are generally piled in stacks it pays to paint the numbers on each case in very large figures on each of the six faces. Various contents may be indicated by painting the cases various colours, for instance—red for petrol and money, yellow for victuals, blue for altitude kit, and so on. It is wise to distribute the cash among several loads. An index in duplicate can be kept of all loads with their numbers and contents.

A party of Bhotias came down to meet us at the Hill station that we started from. The party included the headman and the two cooks. The two bearers and the tiffin coolie were also chosen from it.

One secret of success will surely be in paying the greatest attention to the comfort of all the party, native as well as European. It is false economy to stint any of those engaged in work at great heights. As stated, I believe that the Bhotias (or permanent coolies) should have a first-rate outfit, including even a Primus cooking stove for use at high camps. It would be a good plan to think out a selection of light wholesome foods for the coolies to cook and eat at high altitudes, not forgetting the restrictions of caste. In the case of the Bhotias at high camps the restrictions become more elastic. When mountain sickness is feared the men may justifiably be exhorted to take certain European delicacies (never beef) in the guise of 'dawa' (medicine). At great heights the more substantial kinds of meat seem to be just as bad for Bhotias as for Europeans. The Bhotia habit of taking a nap in the sun must be firmly checked, as it is frequently a cause of mountain sickness.

Health.—I consider that the sun's rays passing through rarefied air have a peculiar potency and are a factor of extreme importance hitherto underestimated in causing mountain sickness. Umbrellas, pugarees, extra dark spectacles, darkened tent canvas, and other precautions should be taken. It is well to avoid marching in the heat of the day whenever possible, and especially when at great heights. I think that at heights above fifteen or sixteen thousand feet exposure to the sun affects the digestive organs and that a consequent need for aperients may become very urgent and chronic. There is perhaps a tendency to make light of mountain sickness *after it is over*. It is surely fair to combat this tendency, if only for the sake of others who may undertake similar expeditions.

Unfortunately the appalling cold at great altitudes before dawn is a formidable drawback to marching at that hour. At 20,000 ft. I have known the temperature *inside* a small tightly closed Whymper tent, in which three men had cooked and slept, to drop to 20 degrees below zero Fahrenheit before dawn. The danger of frost-bite in the high Himalaya seems greater than the risk run in the lower ranges like the Alps, where the climber's power of resistance is stronger. In spite of this I think that the power of the sun is a more likely cause of failure than the cold.

In the inhabited valleys we only drank boiled water, usually in the form of weak tea, and we carried biscuits in order to avoid eating the local chupatti, which is made from flour that often contains fragments of grindstone and other foreign matter. At any wayside dak bungalow met with, it is prudent to inspect food before eating it. Special precautions should be taken against the risk of chills. With such reservations and with the exception of the cholera-stricken pilgrim routes on the Ganges (and these might be avoided) we found the hill climate a good one; that is, after we had foresworn the Indian professional cook and all his works. As far as fever is concerned, I think it more likely to be contracted from mosquitoes when the train halts at stations in the Terai. We were not troubled by it in the hills.

Difficulties.—If at great altitudes step-cutting in ice becomes necessary, or if the party have to wade through powdery snow, the consequent exhaustion of the climbers is likely to make a big ascent impossible. During three seasons I have invariably encountered powdery snow when above 20,000 ft., but I have had no experience of autumnal conditions. I doubt whether the cold high up is any worse in early autumn. Snow-shoes and even the smallest skis would seem to be too unwieldy for use at the great heights, and if powdery snow be met with, success would probably be impossible.

In the Alps a slope or couloir is generally less steep actually than a distant view of it would imply. In the Himalaya the converse seems to be the rule. The greater scale in the Himalaya results in greater complexity of detail; the topography is consequently more intricate; not only are distances at first more difficult to judge, but the features of the landscape are more deceptive. I believe too that apart from their greater scale the Himalayan peaks are more formidable than the Alpine summits. They strike me as steeper, and I suggest that, with greater extremes of heat and cold than in Europe, their rocks may disintegrate more rapidly and ice may cling to slopes at steeper angles. Cornices as well as avalanches of all kinds are commoner and more extensive.

Dr. Kellas' Expedition to Kamet in 1920.

DR. KELLAS, who has remained in India with the intention of making another attempt on Kamet next summer, but has now agreed to join the Everest expedition, has sent a copy of the report he has made to the Oxygen Research Committee; and in view of its immediate importance to the Mount Everest expedition, we assume his permission to print the following extracts from it:

'At the end of the first week in August part of the expedition started from Kathgodam, and on August 19 joined Major Morshead at Chomoli, about 150 miles to the N. The permanent members of the expedition included Major Morshead and his transport officer, with eleven attendants—the latter being intended chiefly for survey work, and also for transport at high altitudes—and myself with two servants. There were about eighty-three coolie loads.

'From Joshimath, 29 miles N. of Chomoli, transport work was difficult, and repeated unavoidable delays occurred. Four bridges had been washed away in the Niti Valley by floods, but the Deputy Commissioner of Garhwal, Mr. P. Mason, made such arrangements that we had only to build one bridge over the river Dhauli.

'On August 29 we started from Niti, the highest village on the route (12,000 feet approx.), with about twenty-one yaks and forty coolies (each yak carrying two coolie loads), and on August 31 reached a base camp at the end of the Raikana Glacier at an altitude of 15,380 feet.

'Above this point the route was very rough, and all baggage had to be carried by coolies. Carriage of wood, which could be obtained about a mile below the camp, became of special importance. Even at this base camp want of acclimatisation to altitude began to be evident in certain cases, and incidence of malaria was also troublesome.