



PLATE I.—Telephoto of Mount Everest, from the Base Camp.

EVEREST 1933

BY

HUGH RUTTLEDGE

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TO ALL
“EVERESTERS”

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Grateful acknowledgments are due to my comrades of the expedition who found time to write all but one of the additional chapters in this book ; to Dr. S. N. Sen and Mr. N. P. Chatterjee, who contributed a valuable chapter on Himalayan Meteorology ; to my wife, who afforded me constant help and encouragement ; to Professor Kenneth Mason, who verified all the place-names ; to Mr. A. R. Hinks and the staff of the Royal Geographical Society, who gave me much assistance with maps and references ; to Mrs. Wade, whose typing was a model of accuracy ; and, most of all, to Sir Geoffrey Corbett, who read and re-read the proofs with scrupulous care and gave me the full benefit of his scholarship and his knowledge of mountaineering.

HUGH RUTTLEDGE.

GOMETRA ISLAND,
ARGYLLSHIRE,
May 1934.

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CHRONOLOGY

- January 20. Main body of expedition left England.
March 3. First party left Darjeeling.
March 8. Second party left Darjeeling.
March 25. Expedition left Phari Dzong.
March 29–
April 2. At Kampa Dzong.
April 3–5. At Tengkye Dzong.
April 10–13. At Shekar Dzong.
April 16. Arrived Rongbuk.
April 17. The Base Camp established.
April 21. Camp I established.
April 26. Camp II established.
May 2. Camp III established.
May 8. Camp IIIa established.
May 15. Camp IV established.
May 20. Attempt to establish Camp V.
May 22. Camp V established.
May 25. Camp V evacuated owing to bad weather.
May 26. Camp IV abandoned. Camp IVa established.
May 28. Camp V reoccupied.
May 29. Camp VI established.
May 30. First assault, by Wyn Harris and Wager.
June 1. Second assault, by Smythe and Shipton.
June 7. Whole expedition back at the Base Camp.
June 15. Camp III reoccupied for the third attempt.
June 21. Camp III evacuated and operations discontinued.
July 2. Expedition left the Base Camp for the return march.
July 19. Expedition crossed the Sebu La.
July 26. Expedition reached Darjeeling.

FOREWORD

BY SIR FRANCIS YOUNGHUSBAND, K.C.S.I., K.C.I.E.

For me it was a very real pleasure when Mr. Ruttledge asked me to write some words of introduction to his book, for my heart has long been in these Everest expeditions, and I was grateful for this further opportunity of helping the world at large to understand a little better the inmost meaning and purpose of these tremendous undertakings.

Looking back, then, over the twelve years since we in the Royal Geographical Society and the Alpine Club began to put the idea of climbing Mount Everest into practical effect, I notice how the inner significance of the enterprise has come to stand out in clearer definition. To climb the highest mountain is an idea which naturally makes immediate appeal to the public. The North Pole and the South Pole have been reached by man, so why not try the loftiest peak? And any man who had devoted himself to mountaineering would naturally jump at an opportunity of immortalising himself as the man who had first placed his foot on the summit of the earth. The appeal to the man in the street and to the skilled mountaineer was obvious. And as soon as it became publicly known that an expedition was being organised to reconnoitre and, if possible, ascend Mount Everest, the greatest interest was shown not only in this country, but on the Continent and in America as well.

But interest grew as it became apparent that this was something more than a mere expedition of mountain experts, and something more than a mere British expedition. It had to be composed of experienced mountaineers, for terrible mountaineering difficulties and dangers had to be expected. And it had to be all-British because a mixed expedition of different nationalities is difficult to weld together as a whole, and we did not wish to add another strain on the leader. But it was more

than an experts' expedition and more than a British expedition. It was an attempt of the human race itself feeling its way in its natural surroundings, measuring its capacities against physical obstacles, seeing how far it could go, testing the extreme limits of its capacities. Could, or could not, human beings stand an altitude of 27,000 feet, of 28,000 feet, of 29,000 feet? Until men tried they could not know. They could not know how far the human organism would adapt itself to these unusual conditions. Twenty-five thousand feet might be the limit at which a human being could sleep, or 26,000 feet; and if he could not spend a night higher than 26,000 feet, he might be unable to climb the remaining 3,000 feet and back in the day.

Then, as the different expeditions proceeded, man found to his satisfaction that his organism did adapt itself to some extent to the higher regions. As he exercised his organism to the extreme limit, so did his capacities to some extent increase.

The people of the world became more interested now in the enterprise. The race took pride in seeing how men bravely faced and resolutely overcame one obstacle after another, how with indomitable spirit the climbers stood up against the icy hurricanes and every missile which the mountain would hurl against them, and how in danger and disaster they would stand by one another and at risk of life itself support each other.

And then came slowly into view the real significance of the whole enterprise. Those who would presume to pit themselves against the highest mountain in the world must not only be at the top of their physical development and be possessed of the highest mountaineering skill, but, more important still, be animated by an invincible spirit—a spirit firm and tenacious and ambitious enough to drive on the body to its seemingly last extremity, yet selfless enough to throw away all hope of the prize in order to stand by a comrade or give place to another if through him the goal might the more surely be achieved.

So gradually there emerged the figure of Everest as a symbol of the loftiest spiritual height of man's imagination. And the sight of the Everest climbers struggling ever upward, never losing heart, never despairing, but returning again and again to the

struggle, was found to hearten many an aspirant to the heights of the spirit. If these men could fit and train themselves to suffer and sacrifice and endure merely to achieve a great physical height, how much more readily ought they to face the suffering and tribulation and sorrows of life in order that they might attain the highest spiritual height—the whitest, purest, holiest heights of the spirit? This is what many came to think.

Man's supreme adventure in the material world was seen to be symbolical of supreme adventure in the realm of the spirit. And this record of the Everest climbers' undaunted efforts has come to be an inspiration not only to mountaineers and geographers, but also to that far more numerous host of humble yet ambitious strivers after the topmost pinnacle of achievement in the varied branches of human activity. It has even given new heart to many a lonely invalid struggling through all adversity to keep his soul steadfastly set on the highest. Its appeal is universal.

A word about the leader. An Everest leader cannot afford to be even a "little lower than the angels." He must be considerably above them. A merely angelic quality will not suffice. For in the midst of all the strain of contest with the physical elements, and among men with nerves frayed to shreds by high-altitude conditions, he must preserve an unruffled composure. Even before he gets to the mountain he must have kept his head level amidst all rival opinions showered on him by those who each believe that his and his only is the one way of achieving success. He will have had to bring together and not amalgamate but harmonise the men, strangers to each other and caught up from the ends of the earth and of very varied callings in life, who will form the climbing party. He will have had to select his corps of porters from amongst the rough hillmen of the Indian frontier and inspire them with an ardour to do the absolutely impossible. He will have had to weld climbers from England and porters from Nepal and Sikkim into one party animated by one spirit. Lastly, and most burdensome of all, his duty will have been to telegraph clear, concise despatches from the mountain and, when he comes home, wind up the

expedition affairs, deliver lectures, attend dinners, make speeches and, through it all, write a book.

How far Mr. Ruttledge was endowed with the high qualities necessary in an Everest leader, readers must judge for themselves. My own mind is in no doubt. Nor, I gather, is the mind of any member of the expedition.

I
NARRATIVE

CHAPTER I

HISTORICAL

The story of the Mount Everest Expedition of 1933 would be incomplete without a historical background. It describes but one of the four attempts which have been made to climb Mount Everest, and those attempts themselves were only a part of man's effort to reach the higher summits of the world. No such expedition stands alone. It is a stage in the evolution of mountaineering, in the adaptation of the body to exotic conditions, in the mastery of matter by the spirit. It starts equipped with experience dearly won by other men through toil and danger, sometimes at the cost of valuable lives. If it succeeds, it must pay tribute to those who went before ; and if it fails, consolation will be found in the hope that it has sown what others may worthily reap.

Many still seek the causes lying at the root of these endeavours. Within living memory the great Swiss peaks were regarded with fear as the abode of unfriendly spirits, made manifest in the destroying avalanche. The bold chamois-hunters, in whom originated the best of the early guides, had the high hills almost to themselves, and even they rarely ventured into the regions of everlasting snow. In the Himalaya to this day the summits of the foot-hills are the scene of propitiatory sacrifice. It is not long since Hindu devotees used to go forth not to climb the mountains but to die, while poets sang their praise. Every year some 40,000 pilgrims from the hot plains of India face the cold and fatigue of the ascent to Badrinath in the Kumaun Himalaya, and the more resolute continue over the high passes to the snows of Mount Kailas, where they are joined by the Buddhists of Tibet and even of distant China. It is all holy ground : hardship and exposure will bring them remission from their sins and the favour of the gods.

The English, having no high mountains of their own, lacked this ingrained fear and desire to propitiate. Their long apprenticeship to the sea taught them to face the convulsions of nature in a spirit of adventure and enquiry. When travel brought them among the mountains, they wished to explore, to test themselves against difficulties, to enlarge the boundaries of science. Then, true to their nature, they made a sport of this new experience, and Switzerland became "The Playground of Europe."

At the time when Mount Everest was "discovered" by the Great Trigonometrical Survey of India in 1852, the sport of mountaineering had scarcely attained its majority. The Matterhorn was to remain inviolate for another thirteen years; the Caucasus was practically unknown, save to poetic imagination; and, although certain officers of the Indian Survey had reached some remarkable altitudes in the Himalaya, they had done so in the course of their work and not in pursuit of any mountaineering object. During the next sixty years all the greater peaks in the Alps yielded to assault, while men began to look farther afield. The great ranges of the Caucasus were explored by Freshfield, Donkin, Mummery and others; of the Himalaya, by the Schlagintweits, Smythe, Graham, Young-husband, Conway, Mummery, Bruce, the Workmans, Freshfield, Rubenson and Monrad Aas, Longstaff, and the Duke of the Abruzzi, to mention but a few. The pioneers quickly discovered that they had to contend not only with the technical difficulties of rocks, snow and ice, but also with the difficulties of acclimatisation to high altitudes and extreme cold, to say nothing of the total absence of travel amenities. Preliminary and most valuable work had been done in the Himalaya by travellers and sportsmen whom exploration or the habits of ibex and markhor compelled to acquire a certain mountain technique. It is to the eternal credit of the Survey Officers that, hampered as they were by lack of time and by the exigencies of budgets, they produced such remarkably accurate maps of that colossal range which stretches for 2,000 miles from the Karakoram to the Brahmaputra.

In every age will be found men who look beyond the standards of the present to those of the future. Among them were Brigadier-General Hon. C. G. Bruce and Sir Francis Younghusband, who in 1893 formulated a plan to explore and, if possible, climb Mount Everest. But a mountain which stands on the frontier between Nepal and Tibet could not be easy of approach. Nepal, no doubt for valid political reasons, has steadily discouraged strangers. Tibet pursued an even more consistent policy of isolation till fate decreed that Sir Francis Younghusband, denied access as traveller and mountaineer, should enter Lhasa at the head of the Political Mission of 1904-5.

Men do not readily relinquish an ambition once firmly held. Treaty obligations forbade pressure, however friendly, upon the Nepalese Darbar, and hopes of access to Mount Everest from the south were the more readily abandoned because it was suspected that the southern face presented mountaineering obstacles of the highest order. But the idea of an approach through Tibet was encouraged by that great Viceroy and traveller, Lord Curzon, and by his successor, Lord Minto. It occurred to the indefatigable General Bruce, Dr. T. G. Longstaff and the late Mr. A. L. Mumm that the jubilee of the Alpine Club could not be better celebrated than by an attempt on Everest. Colonel C. H. D. Ryder and the late Brigadier-General C. G. Rawling had already reported that the mountain looked accessible from the north, and in 1906 the Secretary of State for India, Viscount Morley, was invited to approach the Tibetan Government with proposals for an attack from that side. It was hoped that the Tibetan authorities, reassured on the subject of military or economic exploitation, might grant permission. Unfortunately Lord Morley would have nothing to do with the project; but in 1920 the Royal Geographical Society, having first ascertained that the India Office would have no objection, invited Lieutenant-Colonel C. K. Howard-Bury to proceed to India to negotiate personally with the Viceroy, Lord Chelmsford, and the Political Agent in Sikkim, Sir Charles Bell. Their friendly co-

operation secured the Tibetan Government's consent to an expedition.

Sir Charles Bell, who was a personal friend of the Dalai Lama and is still spoken of with affection in Tibet, has kindly permitted me to publish the following account of his negotiations :

“Until I received orders to go to Lhasa, I was unable to recommend to our Government that I should ask the Tibetan Government for permission for an expedition to Everest. The deep seclusion of Tibet breeds among its people a deep mistrust of those living in other lands and under other religions, and especially of the powerful white foreigners coming ever nearer and nearer. But when I came to Lhasa the problem of asking for this permission was greatly simplified. Letters are slow and incomplete, but speaking to your friends you can put your points and answer questions. So, as the Government of India left it to my discretion, I decided to place the matter before the Autocrat of Tibet.

“My interviews with the Dalai Lama took place in the inner sanctum of his palace at Nor-bu Ling-ka, one mile outside Lhasa. This large room, where he sits and works for the greater part of each day, is fitted up half as a Tibetan chapel, half as an English sitting-room.

“At my first interview, in the latter half of November, nothing could be said or done. The diplomatic situation that I had come to discuss, not even that could be mentioned. This first reception is purely ceremonial and personal. ‘Why, why did you not come in the summer, when the weather is warm and the flowers are out? In Tibet the winter is very cold.’ So said His Holiness as he walked across the floor of the room to meet me and grasped both my hands in welcome. To discuss business at the first meeting would transgress the laws of courtesy and make the path uneven.

“At my second visit, after the diplomatic chessboard had been set, I raised the question of Everest and produced a map showing its position. When putting the western point of view before His Holiness, I agreed that Tibetans generally would

not understand it and might suspect that some sinister motive lay behind.

“ ‘ But,’ I continued, ‘ I have been engaged for many years on Tibetan affairs, high and low, and I cannot remember ever doing anything to harm Tibet.’

“ ‘ Only benefits ; harm you have not even once done,’ replied the Dalai Lama. And then, after a short interval of thought, ‘ Please leave the map with me, that we may consider and understand this new thing.’

“ On the following day the Lama’s Chief Secretary came and studied the map and the whole question with my Personal Assistant, a Tibetan from Sikkim, who had worked with me for sixteen years and understood the politics of Tibet as well as the feelings of the people.

“ During my next visit, on December 9th, it was the Dalai Lama who raised the subject. He told me that he gave his consent to the expedition. At the same time he handed me a little brown strip of the parchment-like paper made in Tibet. On this was written in the cursive Tibetan script a sentence which may be translated as follows : ‘ To the west of the Five Treasuries of Great Snow, in the jurisdiction of White Glass Fort, near Rocky Valley Inner Monastery, is the Bird Country of the South (Lho Cha-mo Lung).’ ”

The imagination lingers over those first meetings between the ruler of a secluded people, remote on the wind-swept roof of the world, last stronghold of antiquity, and the representative of those distant islanders whose restless energy had spanned the seas to disturb the East. In what direction would that force turn next? Already, fifteen years ago, it had advanced relentlessly to the Potala. Would it return, this time to remain? What was this talk of climbing the highest mountain in the world, of entering the abode of the gods? These strangers had even a map of the region and could find unaided that “ Bird Country of the South.” What possible, what conceivable object could they have? Such may have been the thoughts of the Dalai Lama as he watched the man who

pleaded this strange cause, yet who never once, over many years, had done harm to Tibet. The Dalai Lama's consent was undoubtedly a gesture of friendship to a man whom he trusted. Years of diplomatic correspondence could not have effected the removal of that barrier against the unknown. The episode is creditable no less to the recipient than to the giver.

The mountaineering world sprang into instant action. By the joint efforts of the Royal Geographical Society and the Alpine Club a party was rapidly organised under the command of Colonel Howard-Bury. Its fortunate members must have felt a sincere regret that opportunity had come too late for the pioneers to share the great adventure.

It has been well said that the first three rules of Himalayan mountaineering are: "Reconnoitre, reconnoitre, and again reconnoitre." Many of the great Alpine peaks only yielded to repeated assaults. Kamet was not conquered at the first attempt. Though the southern face of Mount Everest, for both political and mountaineering reasons, might be ruled out of account, the remainder would demand much of surveyor and mountaineer before the ascent proper could begin. The far-flung ramparts of the Himalaya are of bewildering intricacy; the peaks are usually hidden after midday by the cloud-screen rising from the hot plains of India, or from the hot sub-tropical valleys of the foot-hills; and the high plateau of Tibet, westwards from Kampa Dzong, was practically unknown. The expedition of 1921 was therefore very properly termed "The Reconnaissance," and preparation was made for "The Assault" of 1922.

Colonel Howard-Bury's party left Darjeeling on May 19th. Though the monsoon of 1921 did not develop full intensity in Tibet till July 7th, operations were much hindered by rain, snow and mist, yet they were magnificently successful. Morshead and Wheeler mapped the environment of Mount Everest to north, east and west, as well as the Tibetan plateau en route; and Mallory, Wheeler and Bullock, after months of exposure and high mountaineering, discovered the Chang La or North Col, the key to the position. Unfortunately they missed the best ap-

proach to this point by way of the Rongbuk Monastery, sixteen miles to the north, and the East Rongbuk glacier, and arrived there over the high Lhakpa La Pass on the east. They had already ascended the main Rongbuk glacier, only to find the north face of Everest towering in a series of unclimbable cliffs above them. Mallory, however, saw the western side of the Chang La from this point, and his mountain instinct led him to suspect the presence of an easier approach from the east. To reach it he had to go round into the Kharta Valley, unaware that the insignificant-looking little torrent, crossed on the left during his ascent, drains the long East Rongbuk glacier and marks the best way to the mountain.

Much was learnt by this expedition, besides the lie of the land and the direction of assault. Long association with the Sherpa and Bhutia porters produced a high respect for their endurance, capacity for load-carrying, adaptability to high mountains and cheerful acceptance of discomfort; also a knowledge, so far as it went, of their limitations. Not less valuable was the study of weather conditions in this part of the Himalaya, and especially of snow precipitation on Mount Everest. Mallory's Chapter XVI in *The Reconnaissance* is a model to explorer mountaineers, with its close scrutiny of the particular and intelligent deduction of the general. Lastly, Tibetan fauna and flora and the geology of the region were carefully examined.

Thus the stage was set for the drama of the assault. Subsequent expeditions could concentrate on the one object of climbing the mountain, undistracted by the need for prolonged reconnaissance of its intricate approaches. Wheeler's photographic survey placed beyond doubt the advantages of the East Rongbuk glacier as a means of advance; and of Mallory's capacity to choose a line of attack there was no question.

For the expedition of 1922 the leader, General Bruce, naturally collected a party strong in climbers, and his unrivalled knowledge of Himalayan peoples ensured a fine body of porters. Mallory would, of course, go again, and Morshead. Strutt, Longstaff, Wakefield, Norton, Somervell, Finch and

Crawford were seasoned mountaineers. Geoffrey Bruce, the unrivalled transport officer, was soon to show himself a climber also. They left Darjeeling on March 26th.

Much knowledge and experience had still to be acquired. For instance, though the monsoon of 1921 was late in arrival and in departure, so far as the Everest region was concerned the observations of a single season could have no statistical value. It was thought that the period of May and early June should afford the best climbing weather, assuming that a normal monsoon might be expected to reach Everest about the middle of June. A break in the rains might be utilised for further effort, and September and October could not be altogether ruled out of consideration, despite Mallory's experience of 1921 and the certainty of shorter days and cold.

Again, the capacity of men to reach very high altitudes was still matter for conjecture. The Duke of the Abruzzi's expedition had reached a height of 24,600 feet in the Karakoram Himalaya. Further progress would be experimental. Some physiologists were inclined to suppose that the limit would be reached somewhere about 25,000 feet and that an artificial supply of oxygen would be essential if men were to go higher. Their experiments were, of necessity, conducted in pressure chambers and on men unacclimatised to high altitude, or on pilots of the Royal Air Force whose machines carried them up quickly without exertion.

The monsoon of 1922 reached Mount Everest during the first week in June, but by that time a tremendous amount of work had been done. Three camps had been placed on the East Rongbuk glacier; a fourth near the crest of the North Col; and a fifth, the highest, on the north ridge above the Col at about 25,000 feet. Mallory, Norton and Somervell, without oxygen, had reached a height of 26,985 feet, while Finch and Geoffrey Bruce, using a heavy and cumbrous oxygen apparatus, had reached 27,300 feet. The result offered fine scope for argument between two schools of thought and the issue was somewhat confused, for Everest had not been won: bad weather and an accident to Bruce's oxygen apparatus had delayed

Finch's party, and Mallory and his companions had climbed on a minimum of acclimatisation. Operations were brought to a close on the sad day of June 7th, when the snow slopes of the North Col, softened by the warm winds of the monsoon, avalanched and killed seven porters.

Whatever arguments might be raised among men of science by the results of the second expedition, mountaineers were satisfied that a great step forward had been taken. Much was now known about the structure of the mountain, and so far no difficulty had been encountered which need stop a strong party, given good weather, ample time, acclimatisation and, if necessary, an improved oxygen apparatus. One obstacle to progress had been the presence of snow on the outward-shelving limestone slabs of which the north face is composed. Should this snow consolidate or, better still, should the rocks be found dry, there appeared to be no reason why the climb as such should not "go." It remained to be seen if porters could be induced to carry a camp higher than 25,000 feet, and if climbers could sleep in a camp so formed and withstand the cold and fatigue and oxygen-lack of the last 2,000 feet or so. Everest was still considered to be, in a technical sense, an easy mountain.

On the other hand, medical examination very soon showed the toll which these high climbs exacted from the hardest constitutions. Whether he had used oxygen or not, every member of both climbing parties, with the single exception of Somervell, was found to be suffering from a temporarily dilated heart. Clearly, if the last 2,000 feet were to be surmounted, further study was needed to improve equipment, food-supply, acclimatisation and apparatus, and to prepare the climbers for a yet harder ordeal. Inevitably considerations of time and pace must govern the tactics of the final assault. Data were still, in some respects, few and imperfect.

Much care was devoted to the examination of these problems during the next two years; and when, on March 25th, 1924, General Bruce led forth the third expedition from Darjeeling it was felt that everything possible had been done to ensure

success. To begin with, there was a very strong nucleus of acclimatised men, Mallory, Norton, Somervell and Geoffrey Bruce ; for proof was quickly forthcoming that acclimatisation lasts over a period of some years, or that men who have been high have a greater acclimatising power. Again, the oxygen apparatus had been improved and lightened, and more time had been available for collection of equipment and stores and for discussion of climbing plans. Lastly, the new climbers, Beetham, Hazard, Odell and Irvine, showed every promise of strength and endurance, and Shebbeare had come in to assist Geoffrey Bruce in transport work.

The story of this expedition is one, so far as is known, of heroic failure, of misfortunes bravely met, of immense exertion, of tragedy, of defeat perhaps more glorious than success.

Scarcely had the expedition left Phari, on the plains of Tibet, when the General collapsed with fever. His absence was a sore trial to the party, but happily he found in his successor, Norton, a man of immense strength, moral and physical, under whose leadership there would be no weakening of spirit. Then dysentery attacked Beetham. He defeated this by sheer will-power, only to fall a victim to sciatica at the Base Camp. Still the party as a whole arrived at Rongbuk in good heart, and earlier than its predecessor.

A dominant wish, resulting from the accident of 1922, was to climb the mountain before the monsoon rendered the slopes of the North Col unsafe. So the work of establishing the lower camps was pressed on with a minimum of delay. Tibetan labour was enrolled to save the regular porter personnel for the climbing higher up, and everybody worked at the highest pressure. Camp III, at 21,000 feet, was actually set up and occupied six days after arrival at the Base Camp. Then trouble began. A series of western disturbances, originating probably in Persia and quite unconnected with the monsoon, swept one after the other across the Everest region. They brought the worst kind of blizzards and very low temperatures, and imposed an intolerable strain both on climbers and on porters. The expedition tents, strong as they were, gave insufficient pro-

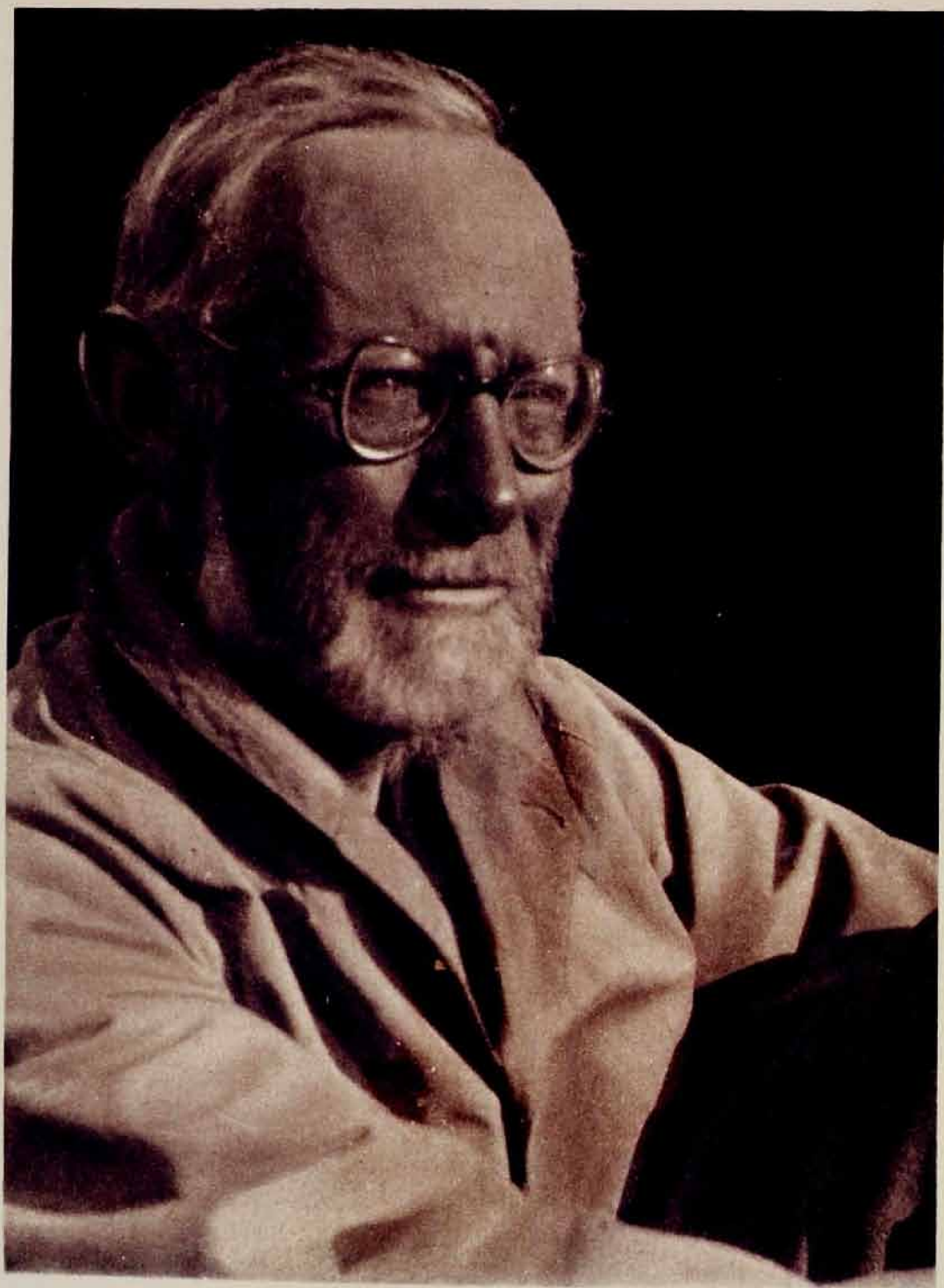


PLATE 2.—H. Rutledge.

tection against these unexpected conditions, and it may be that the rapid advance up the glacier contributed to reduce the men's power of resistance at these altitudes. They were perhaps short of acclimatisation. The breaking-point of a Sherpa porter's spirit can be very suddenly reached. In this case, at Camp III, a collapse set in which nothing but the most resolute leadership was able to get under control. A retreat to the Base Camp, however, soon set the men on their legs again, camps up the glacier were quickly re-established, and the North Col was reached in good time. But the bad weather from the west continued, and on one occasion four porters were marooned on the North Col, having failed to follow down their companions and the escorting climber. This entailed a most exhausting and dangerous rescue by Norton, Mallory and Somervell, who were thus subjected to great strain at the very moment when all their energies were most needed for the attack.

Again the expedition had to retreat to the Base Camp ; but again the refusal to be beaten, fortified by the blessings of the old Lama of Rongbuk and by an improvement in the weather, brought the porters up. By this time only fifteen could be found able and willing to go higher. With these fine fellows' help the three assaults of 1924 were launched, followed by Odell's two great efforts in support. It was a performance of which any mountaineers might be proud, an example to all who would essay the greater Himalaya.

On June 1st Mallory and Bruce led the first wave of attack up the north ridge above the North Col. Watching from below at Camp III, Norton recorded in his diary that it was a perfect day. He could not be aware that the terrible north-west wind of Tibet was raging over the ridge, taking all the heart out of the porters. Camp V was established with difficulty at about 25,200 feet, but next morning the men, though carefully picked and led by the climber who best understood them, refused to go on, and there was nothing for it but retreat.

Norton and Somervell, with fresh porters, reached Camp V on June 2nd in slightly better conditions. But only those who have experienced the cold of these regions can realise the effort

which it cost Norton on the morrow to stand for four hours outside the porters' little tent, persuading them to continue. The establishment, for the first time, of a Camp VI at 26,800 feet was a tremendous advance.

There were two opinions as to the best route to the summit. Mallory always intended to climb straight up to the great north-east arête and follow it to the final pyramid, trusting to be able to climb the two nearly vertical steps which guard the way. Norton and Somervell, convinced that the second step was unclimbable, preferred a traverse across the north face, keeping some 300 feet below the north-east arête. This would involve crossing the steep snow couloir or gully just east of the pyramid, and perhaps some difficult climbing beyond it, but the last 900 feet or so looked practicable. They followed this route on June 4th. Only too soon it became evident that their exertions on the glacier below during the month of May had told severely upon them. Somervell was suffering torture from an "altitude" throat, which brought about his collapse at about 28,000 feet, close under the second step. Norton began to be affected by double vision, the precursor of snow-blindness. This was due partly to the fact that he had removed his snow-goggles in the effort to see exactly where to place his feet, and partly perhaps to exhaustion and oxygen-lack. But he struggled on alone, passed beneath the second step, crossed the couloir with its treacherous powder snow, and was brought to a standstill at a height calculated afterwards by theodolite to be over 28,100 feet. The slabs in the neighbourhood of the couloir dip steeply outwards, the angle increasing steadily towards the west. They afford little or no hold for the hands, and the climber is forced to rely for safety on the mere friction of his boot-nails. One slip, and only the main Rongbuk glacier, 10,000 feet below, can arrest his fall. When powder snow of the consistency of castor sugar lies on these slabs ready to slide off at the first touch of the foot, the difficulty and danger of the passage are, of course, immensely greater. It was a mercy that Norton, in his exhausted and half-blind state, was able to return. Both he and Somervell were at the

end of their resources when they reached the North Col that night.

The end was not yet, for the indomitable Mallory had meanwhile planned one more assault, in which Irvine was to be his companion. Oxygen was used this time, so that every possible factor of success should be brought into play. Leaving the now totally snow-blind Norton at the North Col, the two climbers reached Camp V on June 6th and Camp VI on June 7th. The weather was perfect, and a last note which Mallory sent down to Odell from Camp VI indicated that all was well. After that, silence complete and unrelieved; and for nine long years men longed to solve the mystery of their fate, hoping that, although two valuable lives were sacrificed, at least the summit was attained. The expedition of 1933 made a discovery which will be related in its proper place.

Odell had the task of following up this party in support. He had acclimatised very slowly, but now, after seven days spent at the North Col, he was to put up a performance which has never been surpassed. In the course of four days he twice ascended to a height of about 27,000 feet, alone. On the first occasion he believed that he saw the two climbers near the second step. But clouds were moving over the north face and the north-east arête, and he could not be absolutely sure of their position. The matter will be fully discussed in a subsequent chapter. Odell's second ascent was in search of the missing men. It was just possible that they had dragged themselves back to Camp VI, but had been too exhausted to signal their arrival there or to continue the descent. Alternatively, some trace of their passage might be found, some indication of their fate. Odell did all that a man could do, alone and in bad weather. He could only make sure that Mallory and Irvine had not returned to Camp VI. They must therefore have perished. He closed the little tent at Camp VI, signalled the news of the tragedy to the watchers below, and descended through the gathering storm of the monsoon.

The events of the expedition of 1924 have been narrated and discussed in greater detail than have those of the previous

expeditions, because they provide such wealth of data. *The Fight for Everest, 1924*, is a storehouse of information, and we in 1933 were deeply indebted to the authors of that book. Moreover the surviving members of that expedition have spared no pains or trouble to place their experience at the disposal of their successors, and to hand on the torch undimmed. If that torch has been at all worthily carried in 1933, the example and precept of all previous Everest expeditions, and especially that of 1924, have shown the way.

I cannot close this chapter without paying a tribute to the tenacity of purpose which Sir Francis Younghusband has devoted to the pursuit of this great venture. No difficulty, no discouragement, has had the power to divert him by one inch from the path of steadfast endeavour. When success is at last attained, as it will surely be, I trust that men will not forget what they owe to his patient work and tireless resolution.

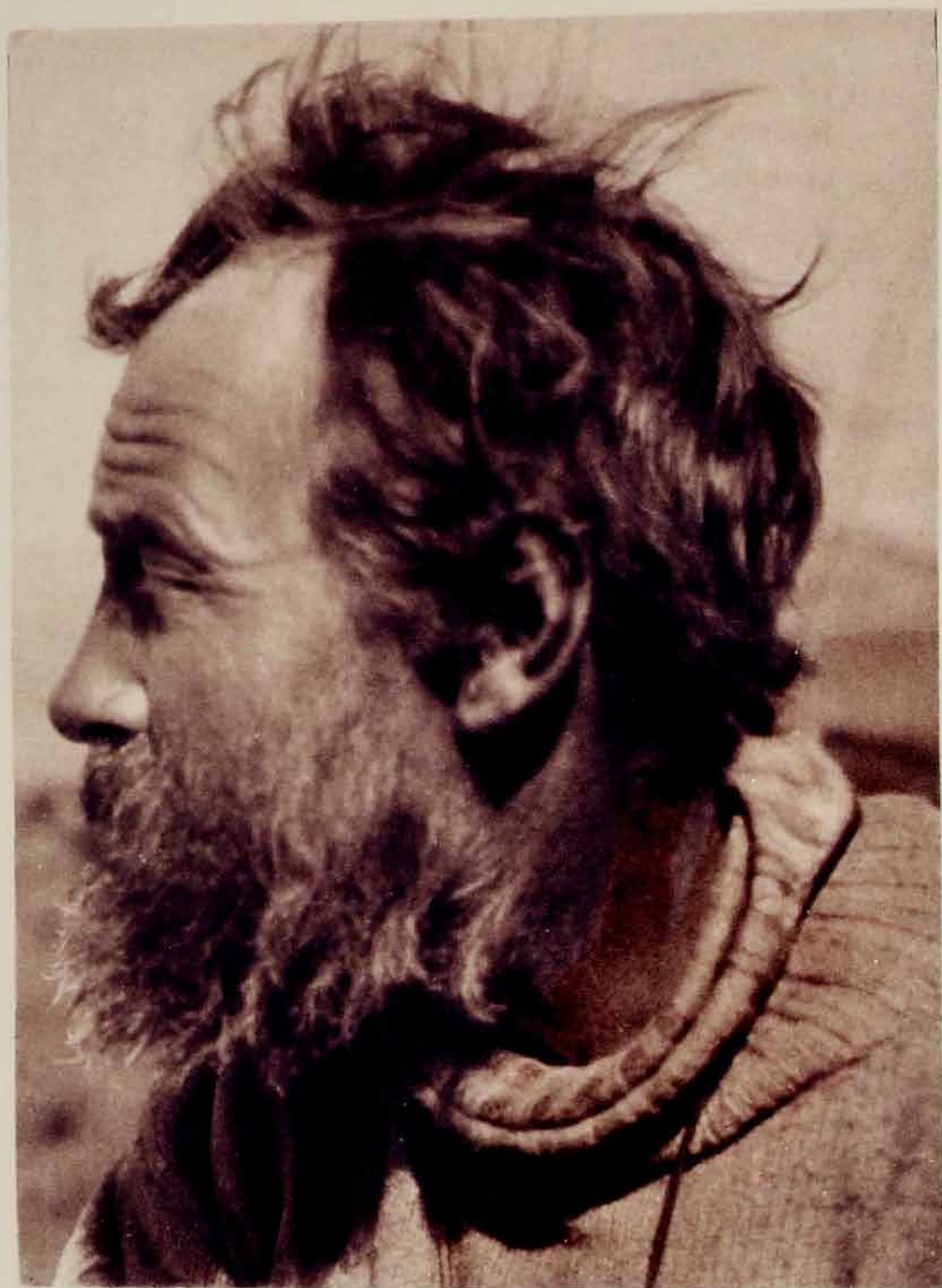


PLATE 3.—E. O. Shebbeare.

CHAPTER II

PREPARATION

After eight years of hope deferred, the friendly endeavours of the India Office, of the Government of India and of Lieutenant-Colonel J. L. R. Weir, Political Agent in Sikkim, secured at last the consent of the Dalai Lama to another expedition to Mount Everest. The welcome news came through towards the end of August 1932, and it was obvious that the work of organisation would have to begin at once to enable the new expedition to leave England in January 1933.

The Mount Everest Committee, composed of Fellows of the Royal Geographical Society and Members of the Alpine Club and presided over by Admiral Sir William Goodenough, met without delay. Their first task was to choose a leader. General Bruce, whose name is still one to conjure with throughout the Himalaya, was no longer available in an active capacity. The obvious man for the post was Brigadier E. F. Norton, who was still capable of repeating his exploits of 1922 and 1924. But he had recently taken up an important appointment at Aldershot and did not feel justified in relinquishing it. The next possibility was Major Geoffrey Bruce, whose work in 1922 and 1924, both as transport officer and as climber, had won golden opinions. He, however, was about to go out to India as an instructor at the Staff College, Quetta, and so was not free. It was essential to choose someone with an adequate knowledge of Himalayan peoples, as well as mountaineering experience. Eventually the lot fell upon me. I had had the good fortune to serve for nearly five years in the Himalayan district of Almora and had climbed a good deal with Gurkhas and Sherpas. I had also spent vacations and subsequent periods of service leave in Switzerland, where a chance meeting with Edward Whymper at Zermatt in 1906 first turned my thoughts

to the great mountains. Now, at the age of forty-eight, I was requested not to attempt the higher ascents myself.

My right-hand man in England was J. M. Scott, the secretary to the expedition, who had been the friend and companion of Watkins in Greenland. His experience of expeditions, his knowledge of men, and his imperturbable temper were invaluable to me in the work of preparation.

The composition of the party for Mount Everest required, of course, the most earnest consideration. Here a free hand was given me, on the principle that the man who is to be responsible for a team should choose it. An application file was opened, the contents of which are ample evidence that the spirit of adventure is still very much alive in England. In it are represented the Navy, the Army, the Civil Services, University professors, undergraduates, schoolmasters, men of science, pugilists, a barber, a steeplejack and last, but certainly not least, schoolboys. Many of them had never been on a mountain in their lives and had no idea of what a big Himalayan climb means. However, it was pleasant to realise that such keenness existed. The Tibetan Government had stipulated that the European personnel of the expedition must be British. We could not, therefore, include any of the fine mountaineers of the Continent and of America. But there was no lack of trained talent in Great Britain and the Dominions, especially in the school of young guideless climbers which has grown up during the last twenty years.

Though not perhaps as remorseless to mountaineers as to the votaries of many other sports, Time cannot be denied, and more than one first-class man, still tireless in the Alps, had to be passed over. The middle-aged could but hope that some special qualification might be pressed into the service, such as Himalayan experience, knowledge of Eastern languages, or scientific attainment, and that long training in the hard school of mountains would enable them to look medical boards in the face. The young proffered in all modesty their records of many a hard-fought climb. Nothing could be more pleasing than the generous way in which one man would

recommend another, at the risk of himself missing the judge's eye. It was indeed difficult to choose from so rich a field of talent. Mountaineering capacity and fitness were, of course, essential. For the rest one had to judge, partly from hearsay and partly from personal interviews, whether a candidate had the character to withstand the terrific strain of such an enterprise. An advisory sub-committee, consisting of Brigadier Norton, Dr. Longstaff and Mr. Sydney Spencer, Honorary Secretary of the Alpine Club, gave me much valuable assistance, and I was privileged to have the co-operation of Mr. Geoffrey Winthrop Young, himself the finest English climber of his time, who trained Mallory, who has done more than any man to encourage British talent, and who knows all the best young mountaineers of to-day. Without this help I could have done little, for my service in India had kept me out of touch.

In the unavoidable absence of Norton and Geoffrey Bruce, the first obvious choice was N. E. Odell, whose performance in 1924 was so outstanding. Fortune served us no better here, for domestic obligations compelled Odell to return a reluctant refusal. But for the long interval since the last expedition we might have had the services of that great mountaineer, T. H. Somervell. But he had devoted ten years to the work of a medical missionary in Travancore, and no man, however tough, can come out of that ordeal unscathed.

One of the veterans was, however, available in C. G. Crawford, now retired from the Indian Civil Service. He had a long mountaineering record: in England, Scotland and Wales, in the Alps, on Kangchenjunga with Raeburn in 1920, on Mount Everest in 1922, and with Odell in the Canadian Rockies. On Everest he had been found to acclimatise slowly, but we knew from Odell's record how well a slow acclimatiser could go, given time. Crawford had no chance in 1922, for operations were then brought to a premature close by the avalanche of June 7th, in which he was himself involved.

Most fortunately some well-acclimatised mountaineers were to be found in members of the party which climbed Kamet, in

the Kumaun Himalaya, so recently as 1931. This was the highest summit yet attained. The leader, F. S. Smythe, first made his mark as a mountaineer by two very difficult new ascents on to the southern face of Mont Blanc. He was a member of the international expedition which attempted Kangchenjunga under the leadership of Professor Dyrenfurth in 1930. We had, therefore, in Smythe a mountaineer of established reputation, of great experience in all branches of the art, and splendidly acclimatised.

Another member of the Kamet party was Eric Shipton. Though only twenty-five, he was already known as a fine climber. After much experience in Switzerland he became a settler in Kenya. He made four ascents of the very difficult Mount Kenya, and also climbed Kilimanjaro and the highest summits of Ruwenzori, the "Mountains of the Moon." Of magnificent physique and a beautiful rhythmical mover on difficult ground, he was certain to go high.

Thirdly, there was Dr. Raymond Greene, our principal Medical Officer. He was an ex-President of the Oxford University Mountaineering Club and had climbed much in England, Wales and Switzerland. Incidentally he was the tallest member of any Mount Everest expedition. He was thought to be the only representative of Oxford among a horde of six Cambridge men, until we discovered that the much-travelled Boustead had contrived to put in a year at Oxford studying Russian.

Lastly came Captain E. St. J. Birnie of Sam Browne's Cavalry. Like most officers serving in India, he had had little leisure for climbing at home or in Switzerland, but he had made a good name for himself on Kamet, both as transport officer and as climber.

So much for the Kamet party. A name frequently brought to my notice, invariably with the preface "You simply must take him," was that of Wyn Harris. He was now in the Kenya Civil Service and had made two ascents of Mount Kenya with Shipton. While at Cambridge he got his Blue for cross-country running and, as Secretary of the Cambridge Univer-

sity Mountaineering Club, he did much to encourage proficient guideless climbing among undergraduates.

Just in time, L. R. Wager returned from his second Greenland expedition. He had been one of Watkins's companions, and was known to be not only a good traveller but a thoroughly competent, sound mountaineer, who had climbed a good deal with Wyn Harris and Longland, always without guides. He was a lecturer in geology at Reading University.

J. L. Longland was already well known as one of the best of the modern school of British rock-climbers, whose technique must surely be nearing the limit of which human beings are capable. He had also plenty of Alpine experience. The activity which had gained him a Blue for pole-jumping at Cambridge made him a fast and safe rock-climber. He was a lecturer in English literature at Durham University.

Major Hugh Boustead, now Commandant of the Sudan Camel Corps, had long cherished the ambition to join a Mount Everest expedition. In pursuit of this aim he climbed and ski-ed for some seasons in the Alps, and then organised on his own account, in 1927, an expedition to the Lhonak region of the Himalaya, in the course of which he reached "Windy Gap" in bad weather. As he was the only European in the party and brought his Sherpa porters back safe and in good heart, it was evident that he had managed them well. His career had been remarkable. Beginning in the Navy, he transferred to the Army and served on many fronts during the War. He also won many Service boxing championships and captained the British Pentathlon team at the Olympic Games of 1920.

T. A. Brocklebank was initiated during his Eton days into the delights of guideless climbing and spent many of his school holidays and University vacations in this way. The fact that he stroked the winning Cambridge boat on three occasions gave promise of determination and staying power. He was twenty-four, the youngest member of the party.

Dr. W. McLean was invited to join as second Medical Officer. He had a good athletic record at school and college,

and quite a long list of Alpine peaks to his credit. Desiring to see something of the world, he had recently abandoned a good practice in London to join the staff of the Mission to the Jews at Jerusalem. He served in the Royal Artillery during the War.

George Wood-Johnson's history clearly marked him out as a valuable member of the expedition. In early youth he did much rock-climbing in the English Lake District. Then his imagination was fired by the history of the sieges of Mount Everest, and a talk with Shebbeare, the transport officer of the 1924 expedition, decided him to take up tea-planting in the Darjeeling district, where he would learn Nepali, the lingua franca of the hills, and have opportunity for mountaineering in the Sikkim Himalaya. He carried through this programme with steady determination, and showed himself to be a hard worker on Professor Dyrenfurth's expedition of 1930. On that occasion he went to a considerable height with Smythe on Jonsong peak and might have, like Smythe, reached the summit but for a sudden attack of illness.

All members of the party with the exception of the leader had, so far, been selected with the definite idea that they were potentially capable of taking part in the final assaults on the mountain. Scientific or other attainments were secondary considerations, and everything had to give way to mountaineering proper. But it remained to choose a transport officer. Clearly this should be E. O. Shebbeare, who had a fine record of work in this capacity in 1924. Shebbeare was now forty-nine, the oldest of us all ; but he was not expected to go high, or in fact to climb at all, and he was known to be an extremely tough customer. An officer of the Indian Forest Service, he knew and understood the people of the hills, and of course spoke their language.

Thus was completed a party of fourteen, of an average age of thirty-four years. Those at home had still to pass the searching tests of the Royal Air Force, while those serving abroad were of course examined locally. We envied the latter, for our overhaul by the R.A.F. Medical Board was an

ordeal indeed. For three mortal hours the trembling candidates were subjected to every test which could possibly reveal a weakness, of mind or body. Their dreadful pasts were dug up, their every movement and reaction analysed. I defy any man to retain dignity and composure when balancing on one foot with his eyes shut, or when required to step on to and off a chair several times in succession while his inquisitor hangs on to his wrist, counting the heart beats. Again, it is difficult to remain unself-conscious when, your face rapidly turning from crimson to magenta, you endeavour to hold your breath for a couple of minutes. Heart and lungs, of course, received the closest attention. We were X-rayed, pummelled, kneaded, and almost turned inside-out. Yet our inquisitors, though sternly devoted to their duty, were human. They knew exactly what was wanted in a pilot of the Royal Air Force. An Everest candidate was terra incognita. Who could say definitely if a man would acclimatise well on the mountain, or what would be the result on the individual of the change of climate, of the long preliminary marches across Tibet, of months of intense strain, physical and moral, and of cold, wind, loss of appetite and sleep, and all the inevitable discomforts of a Himalayan expedition? Provided that he had no pronounced failings, he might serve. So with some provisional reservations, some shaking of the head, a favourable verdict was pronounced, and we breathed again with what little breath was left to us after blowing up columns of mercury and inflating machines with their dial recorders.

But this was not all. Dr. Claude Wilson, himself a famous mountaineer and ex-President of the Alpine Club, is also a heart specialist, and to him we had to go for a final trial. But he was a kindly judge and acquitted us all. When my turn came, General Bruce came along for the fun of the thing. Of malice prepense, Dr. Wilson gave us a magnificent lobster lunch and examined us immediately afterwards. If a man could stand that, he could stand anything. The General and I had an amusing competition. I forget which suffered the more.

The bogy of the medical examination once well and truly laid, we could turn with relief to matters of equipment and stores. The Committee left these to my discretion, and the valuable advice of members of previous expeditions was always at my disposal. The room at the Royal Geographical Society's House, kindly set aside for us by Mr. A. R. Hinks, became a hive of industry wherein laboured Scott and our stenographer and typist, Mrs. Wade. These two were to do most of the work and to have none of the fun.

The Mount Everest Committee had still at its disposal the sum of nearly £5,000. The coming expedition might, it was thought, cost between £11,000 and £13,000 ; perhaps a little more than the expedition of 1924 for the reason that, this time, it might be found advisable to stay on in Tibet during the monsoon season should the first attempt fail. To this end a larger party would be required, possessed of sufficient reserves. A happy augury was the receipt of a generous gift of £100 from His Majesty the King, accompanied by a gracious message of encouragement and goodwill. The balance of the sum required had to be raised by the previous sale of newspaper articles, and of a book to be written after the return of the expedition. These matters were left in the hands of a sub-committee which, with the assistance of Messrs. Christy and Moore, literary agents, eventually came to terms with the *Daily Telegraph* for the newspaper articles and with Messrs. Hodder and Stoughton for the book. In addition, many firms generously undertook to supply equipment and stores free, or at reduced prices.

An expedition which expects to be away from its base in a country like Tibet for six months or more has an infinity of needs. The lists made in 1924 were fortunately at hand ; it was hoped to improve upon them in some respects. For instance, the hardships endured by the 1924 party at Camp III, when blizzards actually drove them out, might be avoided, or at least mitigated, could an improved pattern of tent be devised. After much thought, discussion and bad drawing, a wonderful pattern was devised, a combination of

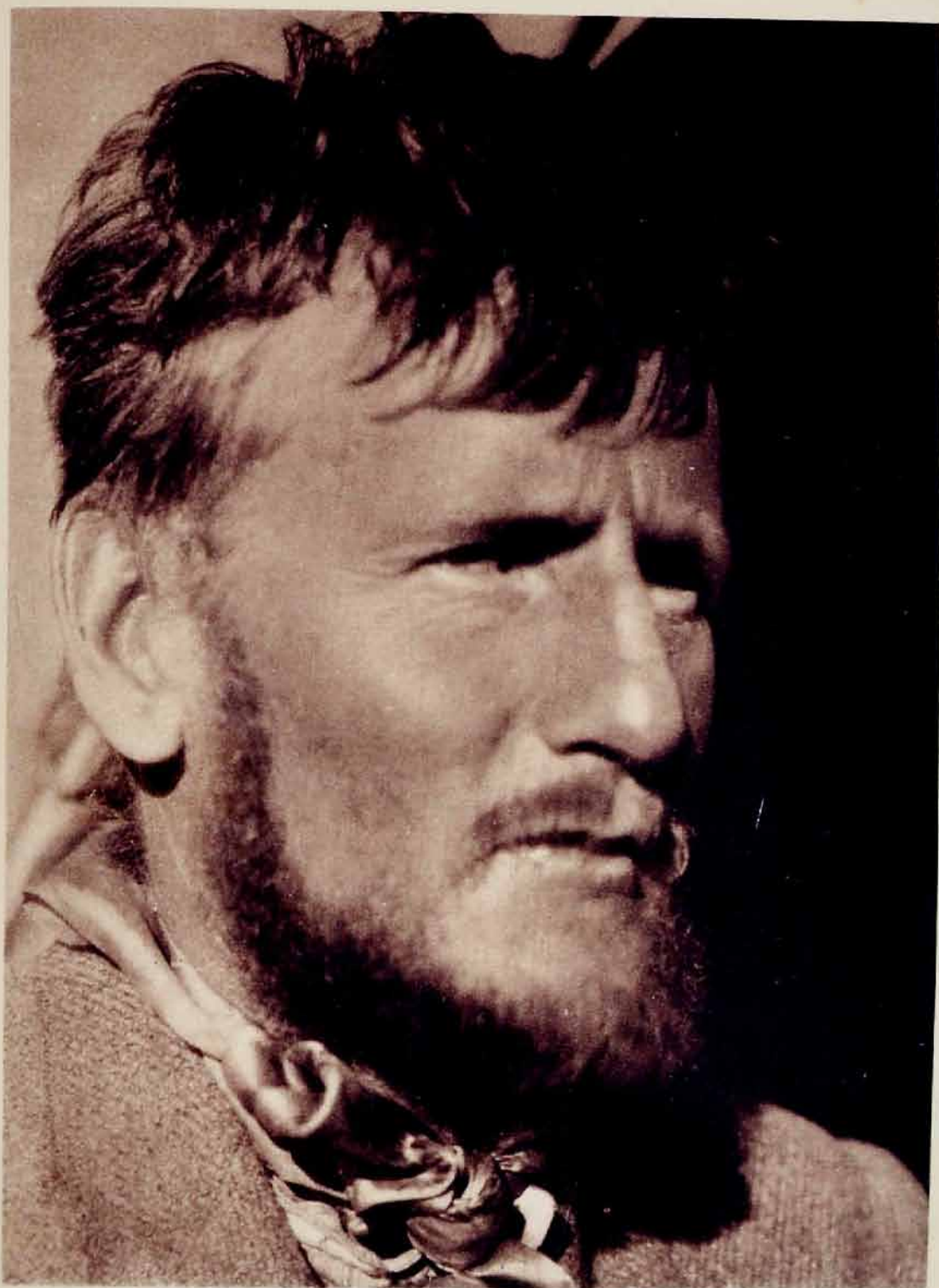


PLATE 4.—F. S. Smythe.

Tartar "yurt" and Watkins's arctic tent. Messrs. Camp and Sports, who made the latter, entered upon the plan with zest, and the result was a double-skinned octagonal tent of Jacqua material, looking, as Greene remarked, like a plum-pudding without the sprig of holly. It had eight curved struts, jointed in the middle to make easy portorage, a sewn-in ground-sheet, which was supplemented later by a separate ground-sheet made by the Hurricane Smock Company, lace-up doors, two mica windows, and a ventilating cowl which could be turned in any direction according to the wind. In addition to guy-ropes there was an outer flap which could be weighted down with snow or stones. The tent accommodated six men in reasonable comfort at night. Many more could squeeze in for the day. The inventors of this contraption are justly proud of their effort, for our three arctic tents were one of the real successes of the expedition. But for them, we should undoubtedly, like our predecessors, have been driven out of Camp III when the blizzards raged across the East Rongbuk glacier, blowing fine snow into, and even through, the Meade tents. For the porters' use, in addition to Meades, a good bell-tent was made by the Muir Mills of Cawnpore. I took three of these, calculating that they would hold fourteen men each. But the Sherpa likes company and warmth and despises ventilation. More than once I have counted twenty-one men in a single bell-tent, lying head to tail like so many sardines and supremely happy in an atmosphere which defies analysis.

For the mess, much the same pattern of tent as that used in 1924 was provided by Messrs. Silver and Edgington, together with its complement of folding three-ply wooden tables and folding chairs. It accommodated sixteen men and never once blew down, though offering considerable resistance to the wind. An improvement was a small ante-room in which the porter mess-servants could carry on their duties out of the wind.

The same firm again provided the high-altitude Meade tents of aero-wing canvas. This material, though light and

strong enough for most mountaineering work, cannot provide full protection against the winds and driving snow of Mount Everest, and I think that a stouter, though inevitably heavier, material should be substituted another time. These tents weighed, some fifteen pounds, some ten.

A modified Meade tent designed by Mr. Burns of Manchester was also tried. Special care was taken over its ventilation, for at high altitudes headaches are the common result of stuffiness. We had three of these tents, and one of them was pitched eventually at our highest camp and stood up manfully.

Longland brought three very light tents of a pattern designed by a climbing friend, Mr. Marco Pallis, for use in emergencies, such as a breakdown of porters. Should all else fail, climbers might be able to carry them.

The question of high-altitude boots required close study. Few of the men who have gone high on Mount Everest have escaped frost-bite on their toes or on the soles of their feet. The matter was enthusiastically taken up by Mr. Lawrie of Burnley, himself a climber. He devised a boot having a sole of two thicknesses of stout leather, with an intervening layer of asbestos sheeting. The boot-nails were driven only through the lower leather and then turned over, being thus insulated from the leather above. Round the whole interior of the boot was sewn a thickness of felt, and the toes were "blocked." Special clinker nails were used, placed at wide intervals to ensure lightness. Mr. Lawrie was nothing if not thorough, and he did much of the work, including the nailing, with his own hands. He also provided a very stout, somewhat heavier, boot intended for porters on high climbs. The success of this may be deduced from the competition for them which raged among our men. They were a strong inducement to work, and one suspects that more than one porter, toiling up the long slope to Camp V with an air of conscious rectitude, was in reality calculating the chances of his being permitted to retain in private life the issue which happened on that particular day to adorn his feet.

For the march across Tibet and for glacier work as far as Camp III, a few pairs of special boots were given by Messrs. John Marlow and Son of Northampton ; the rest were obtained through Messrs. F. P. Baker and Company.

Mr. Carter of South Molton Street also made some very good boots for various members of the party.

Finally, something was needed for wear in camp in the bitter cold of evening. I sent a rough design to Messrs. Clarke, Son and Morland of Glastonbury, who turned out a boot of which the uppers, made of sheepskin with the wool side inwards, reached to the knee, while the soles of "Darex" were well insulated. We found these boots a great comfort, though one would hardly care to go to a dance in them.

From boots to goggles seems a far cry, but the latter were just as important in their way. Snow-blindness is a most painful complaint, and the wearing of goggles was always insisted upon above Camp II, and encouraged above Camp I. Men of science do love to experiment upon the hapless traveller. It was soon evident that an Everest expedition was just the chance for a benevolent conspiracy between Dr. T. Magor Cardell and Mr. Hamblin of Wigmore Street. Between them they produced an orange-tinted glass, the curious property of which was that, though one could see through it from one side, the other had the appearance of a mirror. The effect apparently was to discourage the most penetrating of ultra-violet rays. By careful shaping both of this and of a plainer model, a good field of view was secured—an important advantage for the mountaineer when climbing steep rock or cutting steps in ice.

Messrs. Melson Wingate of Wimpole Street also made, and presented to the expedition, an excellent goggle let into a mask which effectively protected the nose and cheeks from the wind.

Ice-axes and crampons—those arrangements of spikes which when tied to a boot enable you to walk on fairly steep ice without the trouble of cutting steps—are not made in England. Crawford volunteered to go over to Austria and buy them from Messrs. Horeschowsky and other firms. The porters must be

as well fitted out in this respect as the climbers. But the latter already had their own axes, as important to them as his bat to a cricketer.

High-altitude sleeping-bags, obtained from Mr. Burns of Manchester and from Messrs. Silver and Edgington, were an important item. The best consisted of two separate quilted bags filled with eiderdown, one fitting into the other, with an outer jaconet bag over the whole. In addition, Messrs. Jaeger kindly presented fourteen sleeping-sacks of their own design; and Sir George Lowndes invented a wonderful bag which would enable three men, in case of a breakdown of porters, to sleep out on the mountain-side without the protection of tents.

Much inventive genius was expended upon windproof clothing. One has yet to find the man brave enough to appear publicly in England in this dress, but of its utilitarian value, indeed of its necessity, there can be no question; for the winds of Mount Everest pass through woollen tweeds as if they did not exist. Two designs were evolved, one of Jacqua material made up by Mr. Flint of Avery Row, the other of "Grenfell cloth" provided and made up by Messrs. Baxter, Woodhouse and Taylor of Manchester. Windproof helmets of the same material were so made that they could be pulled over woollen "balaclavas," protecting the ears and much of the face. Both materials served their purpose admirably.

Messrs. Silver and Edgington made good windproof overalls of a very light canvas for the porters.

It has long been known that two layers of thin woollen material are warmer than one layer of thick. This was remembered in buying underclothing and Shetland pullovers, stockings and socks, and so forth.

Suitable gloves are difficult to design. The hands must be kept warm while retaining a fairly sensitive hold on the ice-axe. Otherwise accurate step-cutting becomes impossible. Perhaps the best combination is a pair of thin silk fingerless mitts covered by woollen mitts and, over all, easy-fitting sheepskin gloves.

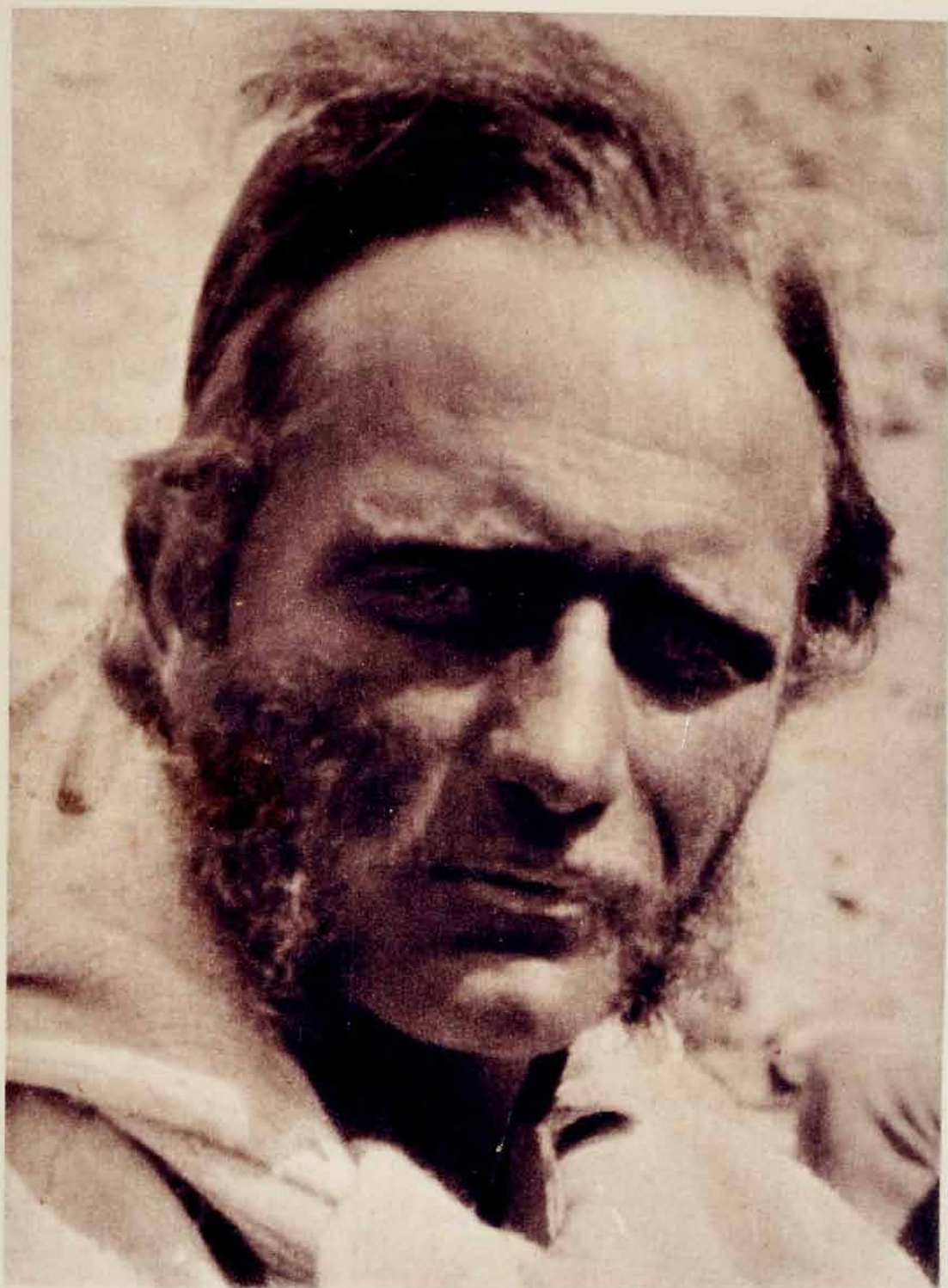


PLATE 5.—E. E. Shipton.

General Bruce has introduced in England what is incomparably the best puttee for mountaineers. It is made in Kashmir and consists of a long strip of loosely woven and therefore elastic woollen material. It is warm, and it never constricts the leg. Constriction of any part of the body tends to interfere with circulation and to promote frost-bite.

The expedition of 1924 took out a light bridge ladder made by the McGruer Hollow Spar Company of Gosport. There was always the possibility that an impassable crevasse might be found among the ice of the North Col. We followed this precedent, but in fact the ladder was never needed, in 1924 or in 1933. This was rather a pity, for it was a most ingenious contrivance, having many of the properties of a suspension bridge. Parts of it were used at Camp I, when the glacier torrent became an obstacle to any but a long-jump champion, and the whole was a source of speculation to our Tibetan friends—one of many puzzles, for we ourselves, to say nothing of our kit, were a problem sufficient for them.

The same firm produced some hollow wooden pitons or stakes, used for fixing ropes on the slopes of the North Col for the safety of laden porters.

At one point on these slopes, in 1924, it was found necessary to use a rope ladder 120 feet long. As none had been brought, the native genius of Odell and Irvine evolved a magnificent affair made from climbing rope and tent pegs. Unsure of our capacity to reproduce this masterpiece, I consulted those experts in the art of "pot-holing," the Yorkshire Ramblers' Club, who most kindly made and presented a beautiful set of three light but strong rope ladders, each sixty feet long. One of them was in constant and effective use on the ice wall which confronted us in 1933.

About 2,000 feet of Alpine Club rope and light line were ordered from Messrs. Beale of Shaftesbury Avenue, and a further 2,000 feet of rope from Messrs. Jones of Liverpool. This sounds a lot, but many separate climbing and working parties had to be provided for, and in the event we found it necessary to secure fixed ropes on at least 1,000 feet of the

North Col slopes. There was no knowing when these ropes would require renewal.

The oxygen problem is still with us. In 1922 Finch was convinced that oxygen greatly increased climbing power at high altitudes. In 1924 Odell, after several days spent at the North Col, found that oxygen did him very little good in the ascent to 27,000 feet, and that on the whole he climbed better without it. Norton and Somervell dispensed with it altogether, and Mallory and Irvine, who took up the apparatus for their last effort, never returned to describe its effects.

Physiologists, I believe, do not now assert that men cannot reach the summit of Mount Everest without carrying oxygen, though I received by post one or two warnings, almost peremptory in tone, of the dangers that might attend such an ascent. After all, the question was still open. Nothing should be omitted which might contribute to success, and lives must not be played with. We decided to carry oxygen, without using it, as far as the North Col, where it would be available as a last resort in case acclimatisation alone proved insufficient.

Greene, who was fully occupied with his practice in Oxford and with ordering medical equipment and stores for the expedition, nevertheless set stoutly to work, in consultation with his fellow-members of the British Association Committee of Oxygen Supply and with Messrs. Siebe, Gorman and Company. The result has been described in technical detail elsewhere; here it is sufficient to say that a highly efficient apparatus was produced weighing only $12\frac{3}{4}$ lbs. This was a great improvement on the cumbersome contrivance which weighed down the backs of unhappy climbers in 1922 and 1924.

Sir Robert Davis generously presented a set of oxygen cylinders, only asking that we should bring them back if possible.

Flow-meters were dispensed with, in order to cut down weight, but it was desirable that a climber should know if his apparatus was working properly. A whistle was installed, which acted as soon as the oxygen began to pass through the valve. The outfit was now complete.

In the past, two things had lowered efficiency at high

altitudes : loss of body heat, due to rapid breathing, and a form of sore throat, considered to be due to the very cold and dry air affecting the delicate membranes of the larynx. Mr. Bryan Matthews of Cambridge came to the rescue with a clever device in the shape of a mask fitting over the nostrils and mouth. It contained several layers of fine copper gauze. The idea was that exhaled breath would warm the gauze ; inhaled air in its turn would pass through and be warmed and moistened in its passage to the nostrils and throat. Thus the dual purpose would be served of retaining body heat and preventing a cold and dry air from impinging on the throat. The Physiological Department of Cambridge University very kindly presented a number of these outfits.

Other scientific equipment was restricted to a few aneroid barometers, maximum and minimum thermometers, a small astronomical and a marine telescope.

A great deal of attention was paid to food supplies, and here precedent was, to a large extent, our guide. For it seemed that there was little to complain of in 1924, except that almost any kind of food was unpalatable at Camp IV on the North Col, and nauseating above that. Climbers were obliged to force themselves to eat, and frequent were the references to the recurrent hatefulness of this proceeding. There need be no particular difficulty, of course, about rations for use on the march or in the lower camps ; but if food could only be taken as a duty high up, and therefore presumably in small quantities, we should at least take expert advice on vitamin and calory content. The human machine must be kept going somehow. Accordingly Dr. Zilva of the Lister Institute was consulted, and he generously devoted much of his time to our problem. A high-altitude ration was put together, combining the required vitamins and calories with the greatest possible palatability. Carbohydrates, of course, predominated in this diet. There was a liberal provision of Truda's toffee, Kendal mint, maple sugar, tinned and preserved fruits, jams, tinned café au lait, Ovaltine, cocoa, Bourn-vita, Messrs. Huntley and Palmer's biscuits and Brand's essences.

Dr. Zilva pressed us to include pemmican, a fatty substance prepared by Messrs. Bovril; but many members of the expedition, though by no means all, professed an inability to cope with so rich a food, and though you may lead a horse to the water you cannot make it drink. The pemmican was allotted to the porters, whose high-altitude ration was thereby pronounced to be better than ours.

In the event all our preconceived notions went by the board, probably as a result of acclimatisation. The painful spectacle was observed of climbers, who should have been languidly complaining of loss of appetite, in fact riotously demanding the commons of an ordinary robust Englishman at the altitude of London. This state of things prevailed even at Camp V, at 25,700 feet. It was only at Camp VI, at 27,400 feet, that a serious change occurred.

There is some evidence to support a theory that high-altitude deterioration is due, not only to oxygen-lack, unsuitable food, loss of appetite, sleeplessness, cold, fatigue and general discomfort, but also to incipient scurvy. Fresh vegetables can only be secured with great difficulty in Tibet, fresh fruit is unknown. On Dr. Zilva's advice we had a very highly concentrated lemon-juice prepared by Messrs. Lyons.

Rations were calculated according to probable requirements on the march to and from the Base Camp; on the East Rongbuk glacier; and at the higher camps. They were arranged beforehand for so many man-days, care being taken that there should be variety. The nucleus of each day's food was a basic ration containing all necessary vitamins and calories. This would be supplemented by "Christmas boxes," many of them containing special delicacies obtained largely from Messrs. Fortnum and Mason, from which members could select according to taste, and, whenever possible, by fresh meat, eggs and vegetables.

Fuel is a difficult problem in Tibet. On that high wind-swept plateau trees are few and far between and are usually protected by religious taboo. The fuel in most common use is yak dung, and to light it and keep it burning call for



PLATE 6.—Sherpa porters, Da Tsering and Nima Dorje;
“tigers” who carried loads to Camp VI, 27,400 feet.

both ingenuity and patience. The first sound that greets one's waking moments in camp is usually the roar of the clumsy bellows used by the men. The smoke of this fuel is pungent and adds an indescribable flavour to food and tea. Yak dung and uncertain supplies of wood and scrub would serve our needs up to, and including, Camp II, at 19,800 feet. Above that, kerosene and the solidified spirit known as Meta would come into play. The Meta Company very kindly presented 1 cwt. of their product. The combustion of kerosene in Primus stoves at high altitudes has in the past been attended with considerable difficulty, and it was found that a mixture of paraffin and petrol gave the best results up to 23,000 feet. Above that, Meta alone was used. In 1933 we found that a good-grade kerosene, burnt in a Primus stove with a silent burner, gave admirable service up to 25,700 feet. Meta could be used as before, and also "Tommy" cookers. A misplaced timidity regarding weight caused me to omit pressure cookers, which might well have been used, at least as far as the North Col.

We were well supplied with nests of aluminium cooking vessels, for both climbers and porters, presented by Messrs. N. C. Joseph of Stratford-on-Avon.

The expeditions of 1922 and 1924 secured a good cinematographic record, due to the energy of Captain Noel. It was decided to dispense with this in 1933, but Wyn Harris, Shebbeare and I took 16-mm. cinema cameras. Almost everyone carried a camera for still photography. Cinema film, film-packs and roll films were presented by Kodak Limited, and panchromatic plates and cinema film by Messrs. Ilford.

Longland went to considerable trouble to see that the expedition was well equipped with a travelling library, the books of which should generally have more than a passing interest.

The principal innovation of 1933 was the provision of wireless equipment. The expedition could not afford anything of the kind, but Mr. D. S. Richards, Honorary Secretary of the Joint Committee of the Incorporated Radio Society of Great

Britain and the Wireless League, undertook to finance and work it independently, with the co-operation of the military authorities in India. Provision was to be made for wireless transmitting and receiving stations at Darjeeling, the Base Camp and Camp III, and it was expected that by this means the expedition would receive regular weather reports from the meteorological station at Alipore, enabling it to regulate tactics in accordance with the movements of the monsoon. In addition much valuable knowledge would be acquired by wireless engineers as to the possibility of exchanging messages across the ranges of the Himalaya. Mr. Richards even provided us with a light field telephone, which greatly facilitated communication between Camp III and the North Col. For signalling above the North Col we took Véry lights, and later on Boustead worked out a separate code which could be worked by means of rucksacks placed against a background of snow. Electric torches and a very light form of "button" torch were also obtained from the Ever Ready Company.

Inventors were much stimulated by the preparations. One gentleman offered to lay a system of gas piping up the mountain for the delivery of oxygen at the high camps. Another had strong views on windlasses. A third produced a magnificent man-raising kite, inscribed with the legend "Buy New Zealand butter," which nothing but sheer mountaineering conservatism prevented us from taking.

The packing arrangements were in the hands of the Army and Navy Co-operative Society, under the personal supervision of Mr. E. Little, who devoted a large proportion of his time to this work. All provisions were packed in Venesta three-ply wooden boxes, each with padlock and key. Each box intended for the march or for the glacier camps was to weigh about 40 lbs. when full, and those for the North Col about 30 lbs. Thus there would be no delay in apportioning loads to porters or pack animals. Light tubular-steel carrying frames, designed by Messrs. Camp and Sports, were taken out for the use of the porters. Each box had a number and colour stripes to facilitate identification. Unfortunately colours have

a tendency, when exposed to wind, rain and snow, to fade or run into one another.

Time slipped by quickly in these and other activities, and by Christmas 1932 most of the stores and equipment were on board ship en route for Calcutta. Meanwhile the problem of campaign was under discussion. Norton had long ago laid down that it was a great advantage to work this out, in its main features, before leaving England. Improvisation is not easy, or desirable, during the march across Tibet.

A study of the climbing experiences in the previous two expeditions suggested that the keynote of our strategy in the coming campaign should be a slow acclimatisation. To ensure this, yet come to grips with the mountain before the arrival of the monsoon, an earlier start was clearly required. We should have to overcome the difficulties of securing Tibetan transport in the early spring, and be prepared to face the rigours of that season on the plateau. Shebbeare, whose headquarters were at Darjeeling, was asked to explore these possibilities, and also to send recruiters to Sola Khombu, the home of the Sherpas, so that there should be no delay in obtaining a body of porters.

When I speak of the keynote of our strategy being a slow acclimatisation, I do not mean that progress throughout the operations on the mountain was to be slow. I mean that the march across Tibet and the work of establishing the camps on the East Rongbuk glacier and the North Col were to be conducted at such moderate speed as would allow the maximum possible number of climbers to reach an attacking position unstrained and at the very top of their form. The quick acclimatisers, it was thought, would be none the worse for a comparatively slow advance as far as 23,000 feet; the others would require it. But once we were firmly established on the North Col, the advance must be speeded up for two reasons: firstly, having as far as possible timed our arrival to coincide with the most likely period of fine weather, we must profit by any such spell, inevitably short, to establish the higher camps and go for the summit; secondly, experience

showed that deterioration rapidly sets in above 23,000 feet. It was hoped that carefully acclimatised men might be able to keep this deterioration at bay for a longer period, but this would have a bearing rather on the number of attacks to be made than on the speed of any one ascent.

Our tactics, therefore, were designed to allow of a rapid series of "hammer blows" within a short time. Two questions at once asserted themselves :

1. Should more than two camps be established above the North Col, which is about 6,000 feet from the summit?
2. Should the climbing parties consist of two or of three men?

The first of these questions would depend for its answer upon the number and capacity of porters available, upon the existence of adequate ledges high up on the north face, upon the condition of the parties, and upon the weather. It could not be decided a priori. There was general agreement that the Camp VI of 1924, at 26,800 feet, was too low to allow of a fair chance at the summit. A party starting from there would have to climb over 2,200 feet, besides traversing a horizontal distance of nearly a mile.

The answer to the second question would also wait upon events. The right composition of climbing parties would be dictated by individual rate of acclimatisation, temperament and climbing speed, and by ability to get the best out of the porters, all matters for observation on the spot.

Still, tentative plans could be drawn up, with the proviso that they were sufficiently elastic to allow of modification and of improvisation when necessary. Crawford, Smythe, Longland and I set to work independently and produced schemes which disclosed a remarkable similarity of opinion. Longland's was the most detailed and formed the basis of many of our subsequent discussions. We were all impressed by the very long carries necessitated by any plan which arranged for only two camps above the North Col, yet insisted on Camp VI being placed much nearer the summit than it was in 1924.

We postulated, therefore, a Camp VII not far from the second step, at a height of nearly 28,000 feet.

Again, three of the plans allowed for parties of two men. But Smythe preferred parties of three, at least as far as Camp VII, on the ground that there should be a "transport officer" to look after the porters and bring them down safely.

We all considered that the party intended for the first assault should be spared the fatigue of establishing Camp V, and attached great importance to a complete system of supports up the mountain. The first assault would be delivered after five days' work above the North Col. It could be followed by two more in the course of the next three days, provided the weather held. In short, an immense concentration of effort in a period of nine days might bring the campaign to a successful close. The period could be extended if necessary. Details of camps and portage were worked out, permitting of four tents at Camp V, two at Camp VI, and one at Camp VII.

Clearly it was advisable to invite Norton to examine these plans, for he, more than any man, was qualified to do so. He did better than just examine; he put up a most valuable plan which embodied constructive criticism of our own. Its salient features were these:

1. Postulating that a party should be able to climb at least 1,300 feet on the last day, the highest camp should be at 27,700 feet, i.e., at least 900 feet higher than in 1924.

2. This might be done—

(a) By making an average ascent of 450 feet more than was done in 1924, on each of the first two days above the North Col; or

(b) By adding a third camp and a third day's climbing above the North Col.

3. The first of the above alternatives is recommended, because—

(i) It is exceedingly doubtful if porters will consent to start on a third morning (i.e. from Camp VI), to

make a Camp VII, whereas they are perfectly capable of carrying an extra 450 feet on each of two days ;

- (ii) The climbers themselves will deteriorate more by spending an extra day and night above the North Col than they will by doing an extra 450 feet each day ;
- (iii) The number of loads to be carried above the North Col is smaller ;
- (iv) Every day spent above the North Col adds to the risk of encountering a storm.

4. The advantages of the second alternative are that it admits of more scope for the selection of a suitable site for the highest camp nearer the summit, and provides time for the construction of a satisfactory camp site.

5. Parties of three are safer and preferable to parties of two, except that the latter move quicker, and this decreases the danger of being benighted. It would seem best, if sufficient numbers are available, to start from the North Col with parties of three ; one member can be regarded as a reserve and employed, if necessary, to escort returning sick porters or to remain in one of the high camps as a supporter.

6. The first attempt should be made as early as possible, the party establishing Camp V at 25,700 feet (4 tents), and Camp VI at 27,700 feet (2 tents), and then going for the top. If they cannot reach the top, they should at any rate reconnoitre the route on to the final pyramid.

7. If the first attempt fails to establish Camp VI high enough or fails to reach the top, the three-camp principle can be tried, a new Camp VI being placed somewhere short of 27,700 feet and a Camp VII pushed up as high as possible.

8. High camps should not be established by parties sent up for this purpose alone. This is uneconomical in climbers and porters.

9. Parties which have been very high should do their utmost to return direct to the North Col.

10. Everything depends on establishing personal influence over the porters.

Norton's advice laid emphasis on the need for rapidity of action above the North Col, for a somewhat quicker advance than we contemplated. He was quite right.

Shortly before sailing, those of the party who were in England assembled at the Royal Geographical Society's House, where Norton and Longstaff gave us a few words of encouragement. At last everything was ready. Our passages had been arranged with generous assistance from the Peninsular and Oriental Steamship Company. On January 20th a cheerful company, resolutely optimistic, came to see us off from Liverpool Street. The Mount Everest Committee and relatives and friends loyally endeavoured to distract the attention of the pressmen what time we tried to creep into our carriages unobserved, or at least looking as much as possible like invalids on their way to a Continental cure. But it was no good. We were compelled to face the music, to be photographed, to "say something" extempore. Crawford was presented with what looked remarkably like a bookie's umbrella to protect him from the inclemencies of Tibet. We had not nearly time enough to return thanks for innumerable kindnesses before the train began to move. At Tilbury the indefatigable Press was ready for us again, this time with "movietone" recorder. A few last farewells; then came the call "All friends ashore," and the mail-ship *Comorin* steamed slowly out into the fog of the river.

SPECIMEN HIGH-ALTITUDE RATIONS PREPARED IN 1933

I. A climber's ration for one day at Camp IV and above :

Brand's essence	1 $\frac{1}{2}$ oz.
Heinz' beans	2 $\frac{1}{2}$ „
Sardines	2 „
Biscuits	1 „
Nestlé's milk	8 „
Ovaltine	2 „
Café au lait	1 „
Barley sugar	1 „
Horlick's malt tablets	1 „
Fruit drops	1 „
Kendal mint	2 „
Jam or honey	4 „
Ginger	1 „
Butter	1 „
	<hr/>
	29 oz.
	<hr/>

In addition, a small ration of tea and rum ; and selection could be made according to taste from a " Christmas box " containing pemmican, dried and crystallised fruits, sugar and various kinds of confectionery.

II. A porter's ration for one day at Camp IV and above :

Pemmican	2 oz.
Tsampa or pea-flour	2 „
Jam	4 „
Meat (tinned)	4 „
Sweets, assorted	2 „
Biscuit	4 „
Chocolate	2 „
Ovaltine	2 „
Nestlé's milk	6 „
Butter	2 „
	<hr/>
	30 oz.
	<hr/>

In addition, a small ration of tea and sugar.

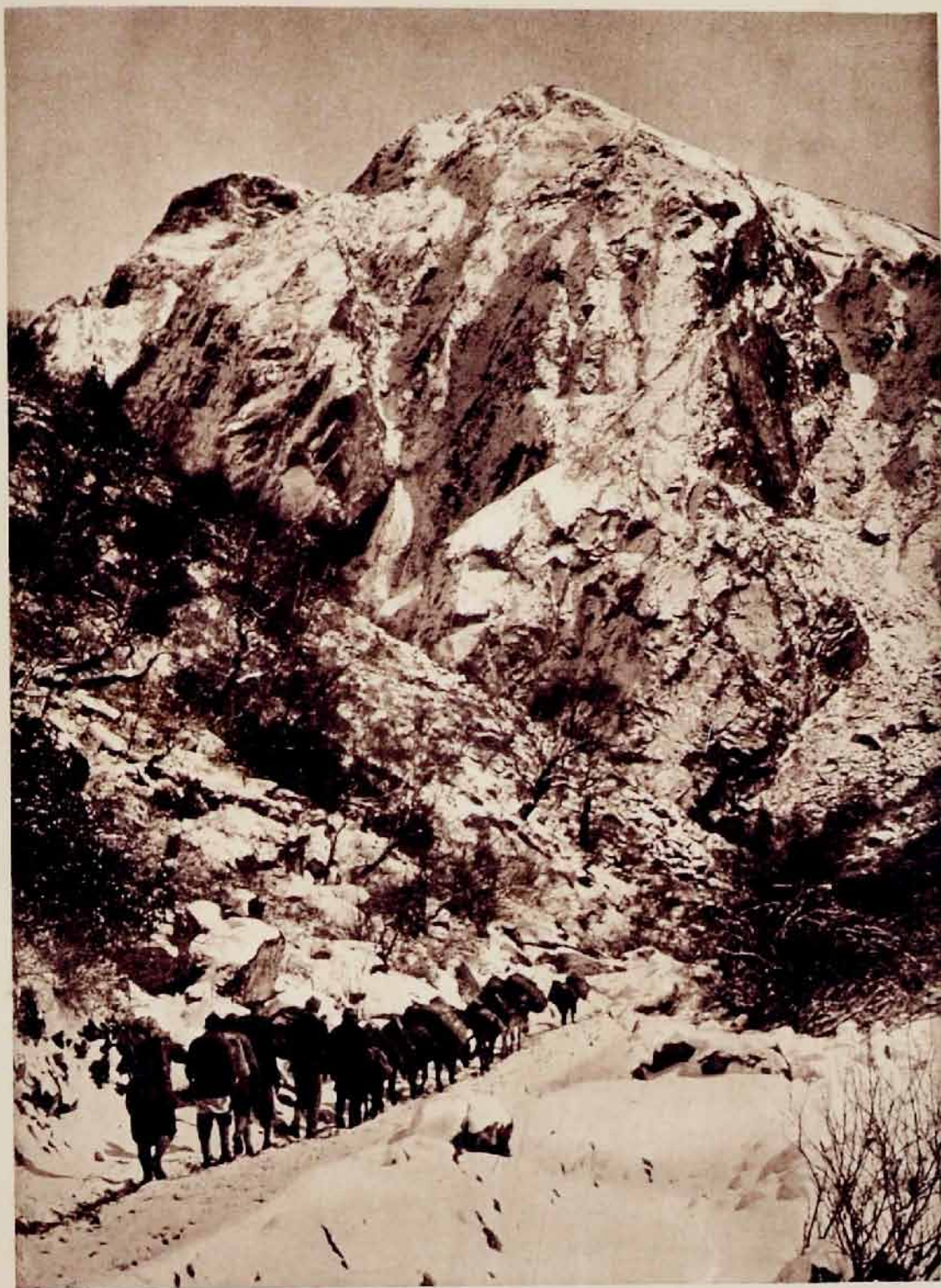


PLATE 7.—The Chumbi Valley in Spring.

CHAPTER III

ASSEMBLY

A voyage to India is very much what you choose to make it. Even during the busy months of preparation at home* most of us had endeavoured to maintain some small degree of training, and now with three weeks of sea-travel ahead we felt that we must not spend all that time sitting about in deck-chairs. We walked round the ship, skipped, played deck-tennis, and elaborated an appalling form of football in which a quoit took the place of a ball. Then the ship's carpenter made us a "medicine ball." This, when thrown backwards and forwards over a rope stretched six feet above the deck provides as much exercise as a reasonable man requires, and the battles waged between Wyn Harris and Longland, for instance, would not have been considered altogether dull in a Roman amphitheatre.

Opportunities of stretching the legs ashore were not neglected. The old Rock at Gibraltar offered a climbing problem or two. I had gone down with influenza, but the others were hospitably entertained at Government House and encouraged to explore. Then a midnight visit to the Tanks at Aden under a full moon led to some remarkable scrambling on the smooth, steep volcanic rock. The party was indeed active enough, yet I think that our friendly and interested fellow-voyagers regarded us with some misgivings. They expected of aspirants to Mount Everest a physique approximating perhaps to that of Signor Carnera, or at least to that of the old Greek athletes. As a whole, we were too lightly-built to stand the buffetings of wild Nature or climb a great mountain. They said so in the nicest possible way, and we agreed with them and deplored our lack of symmetry.

Our quieter moments were spent in the discussion of the

climbing plans, of stores and equipment. I remember that on January 25th, off the east coast of Spain, Crawford, Shipton, Longland and I had a long debate, and a detailed plan was drafted which remained our guide till events on the mountain brought us back much nearer to Norton's advice. At this time we assumed that the first part of the assault could be carried through with eight of the fittest climbers and twenty porters, based on the North Col. This would leave reserves for the second part, if necessary. The plan was as follows :

I. Preliminary. As soon as possible after the establishment of Camp IV close to the North Col, a party, G H with 10 porters, makes Camp V at between 25,500 and 25,750 feet, putting up 3 tents. All return to IV the same day.

II. The Assault. When a period of not less than 5 days has been spent in acclimatising at IV :

Day 1. A B, with 6 porters, go up to V and sleep there.

Day 2. A B, with 6 porters, establish VI (2 tents) somewhere between 27,200 and 27,700 feet. The porters are at once sent down to IV, and A B sleep at VI.

C D, with 4 porters, come up to V and sleep there.

Day 3. A B reconnoitre the north-east arête and attempt the second step, continuing to the summit if they can. If they fail to climb the second step, they look out for a site for a Camp VII near it, and then descend to V or IV.

C D, with 4 porters, come up to VI and at once send back 2 porters to IV, remaining themselves at VI with 2 porters for the night.

Day 4. C D, with 2 porters, establish Camp VII (1 tent) somewhere about 28,000 feet, near the second step. They send the 2 porters down to V or IV, and themselves sleep at VII.

E F, with 2 porters, come up to V.

- Day 5.* C D try for the summit, and descend to V or IV.
 E F, with 2 porters, come up to VI, sending porters back to IV.
 G H, with 2 porters, sleep at V.
- Day 6.* E F come up to VII, sleeping there.
 G H come up to VI, sending their 2 porters back to IV. A B sleep at V.
- Day 7.* E F try for the summit and descend to VI, V or IV.
 G H sleep at VII.
 A B sleep at VI.
- Day 8.* G H try for the summit, A B acting in support as necessary.

It will be seen that this plan permitted of four attempts on the summit in a period of eight days which did not need to be consecutive : in calculating the loads, allowance had been made for delays due to bad weather. I do not think that even the most optimistic expected a smooth realisation of the project, but some excess of confidence may be forgiven men who had not yet themselves experienced the difficulty of storming the last defences of Everest.

Some hours a day were devoted to the study of Nepali, the language in which we hoped to address our porters. Crawford was instructor, having served during the War in a Gurkha regiment. There never was a less formal pedagogue, but he has the gift of tongues and can convey them to others.

At Bombay every assistance was rendered by the authorities and by Mr. C. E. Boreham, manager of the Army and Navy Stores ; so there was no delay over the disposal of baggage, and we were able to leave the same evening. I had developed a theory that men who were about to face great and prolonged strain might be helped by a spiritual as well as physical introduction to the East. I took some of the party via Agra and showed them the glories of the Taj Mahal, the Fort, and Fatehpur Sikri, places where I had often during my service found inspiration and a great encouragement. I venture to

think that the little pilgrimage was not without a certain value.

At Calcutta we received much kind hospitality, and Wyn Harris and I had the privilege of meeting the Governor of Bengal, Sir John Anderson, who throughout showed the greatest interest in our doings. The expedition's equipment and stores had been sent round by sea. Mr. K. A. Hamilton of the Army and Navy Stores, to whom our thanks are due for work quickly and efficiently done, cleared them through the Customs (the Government of India generously allowed entry free of duty) and forwarded them by rail and ropeway to Kalimpong. The Darjeeling-Himalayan Railway most kindly granted concession rates and travelling passes.

The expedition owes a debt of gratitude to Dr. C. W. B. Normand, Director-General of Observatories, who made special and most efficient arrangements for the observation of weather, with special reference to our needs. Dr. Normand's headquarters are at Poona, but after hearing from him Wager and I called upon Dr. S. N. Sen, the Meteorologist at the Alipore Observatory, who kindly undertook to send us through the wireless a regular series of weather reports, and asked us to do the same for him from the Base Camp. Dr. Sen, with some diffidence, volunteered the prophecy that we should encounter western disturbances and an early monsoon. His forecast proved to be only too accurate.

Then everyone except me hurried up to Darjeeling. I turned aside at Jalpaiguri to meet my old friends, the 1/3rd Queen Alexandra's Own Gurkha Rifles, who were desperately keen to supply us with three N.C.O.s for the guarding of treasure and the management of camps. Lieutenant-Colonel A. G. Stone, their Commanding Officer, had already selected three of his very best men, and for some time past they had been in full training at the Gurkha Depot in Darjeeling.

I travelled on to Siliguri to meet Shebbeare and was taken out for the night to the forest bungalow at Sukna, at the very foot of the hills. Here, in primeval forest which seemed utterly remote from our quest, the expedition's transport was ex-



P. Wyn Harris

E. C. Thompson

F. S. Smythe

W. McLean

E. E. Shipton

Capt. A. A. Russell

T. A. Brocklebank

G. Wood-Johnson

C. R. Greene

W. R. Smith-
Windham

H. Boustead

C. G. Crawford

E. O. Shebbeare

L. R. Wager

E. St. J. Birnie

H. Rutledge

J. L. Longland

PLATE 8.—Members of the Expedition with Captain Russell,
British Trade Agent, at Phari.

haustively discussed. It was essential that we two should speedily make terms with the mule contractors; so next morning we skirted the hills on which Darjeeling stands, and were driven up the long ascent to Kalimpong and the lovely house of Mr. and Mrs. Odling, whose hospitality and very practical help we can never forget. Mr. Odling controls the ropeway by which goods are brought up from rail-head. He arranged for the reception and temporary storage of our equipment, helped in our conferences with Pangda Tsang, the Tibetan Government Trader, and forwarded our interests in every conceivable way, though we must have been a grievous disturbance to his own work. Meanwhile Mrs. Odling arranged for a bungalow in which the expedition could stay during the last days of preparation for the march, and took endless trouble to furnish and staff it. Yet we seemed to spend much of our time overflowing into her own house. Crawford and Longland, thinking I was lost or dead, came over from Darjeeling and dragged me away for the urgent business of recruitment. That and other matters settled, we should return to Kalimpong and make our real start from there.

Darjeeling, where Smythe joined us on February 27th and Greene and Birnie on March 1st, extended the heartiest of welcomes. Everybody was out to help, and we plunged without delay into the selection of porters, on which so much must depend. It was fortunate that word had already been sent out, for men are not easily collected so early in the year. Nima Dorje and Sanam Topgye, my Sherpa companions in the Kumaun Himalaya in 1932, had gone through the winter snows to Sola Khombu, the great Sherpa settlement at the head of the Dudh Kosi valley in Nepal. This lies at a height of about 13,000 feet, almost on the southern slopes of Mount Everest. The Sherpas, though Nepalese subjects, are of Tibetan origin and speak among themselves a Tibetan dialect. From their earliest years they are accustomed to carry heavy loads over the 19,000-foot Nangpa La, the pass at the head of their valley to the Tibetan plateau. They have thus secured an extraordinary degree of acclimatisation to high altitudes, and a

carrying power which has to be seen to be believed. Many of them come into Darjeeling, ten days' march, seeking work in tea plantations, or as porters or rickshaw coolies. They are fine, free movers on a hillside, and have the bold, open manner of the true hillman.

There must be some affinity of temperament between the Mongolian and the English races, for they seem to understand each other at once. For instance, British and Gurkha soldiers invariably fraternise, though unable to speak one word of each other's language. We lost no time in establishing an entente with the Sherpas. Nor was communication very difficult, for the Sherpa, now a resident of Nepal, has usually learnt the language of that country *pari passu* with Tibetan. He has picked up some Urdu at Darjeeling, sometimes even a few words of English. He likes languages and, if he has been with the Bavarians to Kangchenjunga, will often reply "ja-ja," regardless of the context. Shebbeare and Crawford knew Nepali; the rest of us had made some little progress on board ship or elsewhere and were not too self-conscious to "try it on the dog," so to speak. In addition, Shebbeare, Crawford, Birnie and I, having served in India, were quite at home in Urdu, of which the members of the Kamet party of 1931 had also acquired some knowledge. So at it we went. As the men poured in to enlist, filling up the level space in front of the Planters' Club to the embarrassment of its long-suffering but amused members, the crowd would often split up into little nebulae, the nucleus of each a hopeful Englishman or two, surrounded by concentric rings of grinning faces. Speech there was, and plenty of it; but what a mixture of Urdu, Nepali, English and indescribable "noises off"!

Yet you can size up a man pretty well, however imperfect your means of communication. Previous experience has shown that the big, muscular man who is capable of great feats of strength, usually of short duration, at moderate altitudes, is apt to fail on the high mountains. He has to carry too much top-hammer in the shape of his own burly person, and an additional load is his undoing. We went out for the wiry, active, clean-

bred type, reasonably intelligent and with the indefinable stamp of "quality," as a horse-dealer would say. Instinct is not a bad guide in these matters, and we did not make many mistakes. General Bruce, in a hasty visit to Darjeeling, had paved the way; the men knew and trusted him and were in a good frame of mind. Not only Sherpas were taken. A good class of men called Bhutias, Tibetan subjects from the Chumbi valley, enlisted readily. They are splendid load carriers, hardy and amenable to discipline.

It was a great pleasure to find that Lhakpa Chedi, the best of the "tigers" of 1924, was prepared to come again. He had been for some years a very efficient head waiter in a Darjeeling restaurant, and now proposed to join up as sardar and mess-man. But that humdrum though useful rôle would never content him once the Base Camp was reached. He intended to climb as high as possible, and we realised what an immense asset his prestige and influence would be in regard to the young entry.

As porter sardar we appointed Lewa, veteran of many a hard climb, who carried for me in 1927. Unhappily he lost his toes from frost-bite on Kamet in 1931, but his spirit was as high as ever, and the men liked his hard but humorous personality.

Another sardar was Nursang, a very tough person, with a fine eye to the main chance, but highly efficient. A third was Sanam Topgye, Geoffrey Bruce's old servant, who sent me during the winter a gaudy picture postcard, asking for the date of arrival and cheerfully stating that he would have all arrangements ready for the expedition.

A few more old hands were also enlisted, among them the steady, faithful Nima Tendrup, who has been on every major expedition in the Himalaya since 1921. I thought regretfully of Chettan, an old "Everester" and my companion in 1926 and 1927. A "hard case," if ever there was one, but a tremendous worker and a real mountaineer. He was killed by the great avalanche on Kangchenjunga in 1930.

Many of our applicants served in the International and the

Bavarian attacks on Kangchenjunga, so knew what they were about, and we could ascertain from their character rolls their several abilities. They would provide a valuable stiffening. The real "old soldier" must be avoided like the plague. Though we did not altogether escape this contagion, the long march across Tibet afforded many opportunities for dealing with it. Another type to be avoided, though often willing enough to do his best, is the man whom some mountaineering accident has caused to lose his nerve. He may seem cured at Darjeeling, but he cannot be trusted, for his trouble may return, and it is infectious.

Our young entry was very promising, and did not belie its promise. A close eye was kept on these newcomers; they were encouraged to bring their troubles to us, for the hillman, though independent in character and much easier led than driven, develops a pathetic reliance on the sahib once he realises that his interest in him is friendly and sympathetic, not merely inquisitive or, worse still, patronising.

Cooks were an important consideration. Most of the porters can do something in this line at a pinch, but we had five men who were really experienced, including two comparative artists in old Tencheddar and the quiet anxious-looking little Chun-Chun, whose whim it was to wear pink pyjamas in and out of season.

For the important post of interpreter, the expedition again secured the services of Karma Paul, who accompanied the expeditions of 1922 and 1924. Karma Paul is a Tibetan by birth, but has lived most of his life in Darjeeling, where he runs a motor business. He speaks almost perfect English, writes it very well indeed, and is equally at home in the Tibetan, Nepali, Urdu, Bengali, Sikkimese and Lepcha languages. Much importance is attached in Tibet to social and diplomatic etiquette. Karma Paul is thoroughly conversant with the technique of this, and was of the greatest value to the leader and the chief transport officer during the long discussions with Tibetan Dzongpens (district magistrates) regarding transport provision and rates. He revels in work, willingly accepts

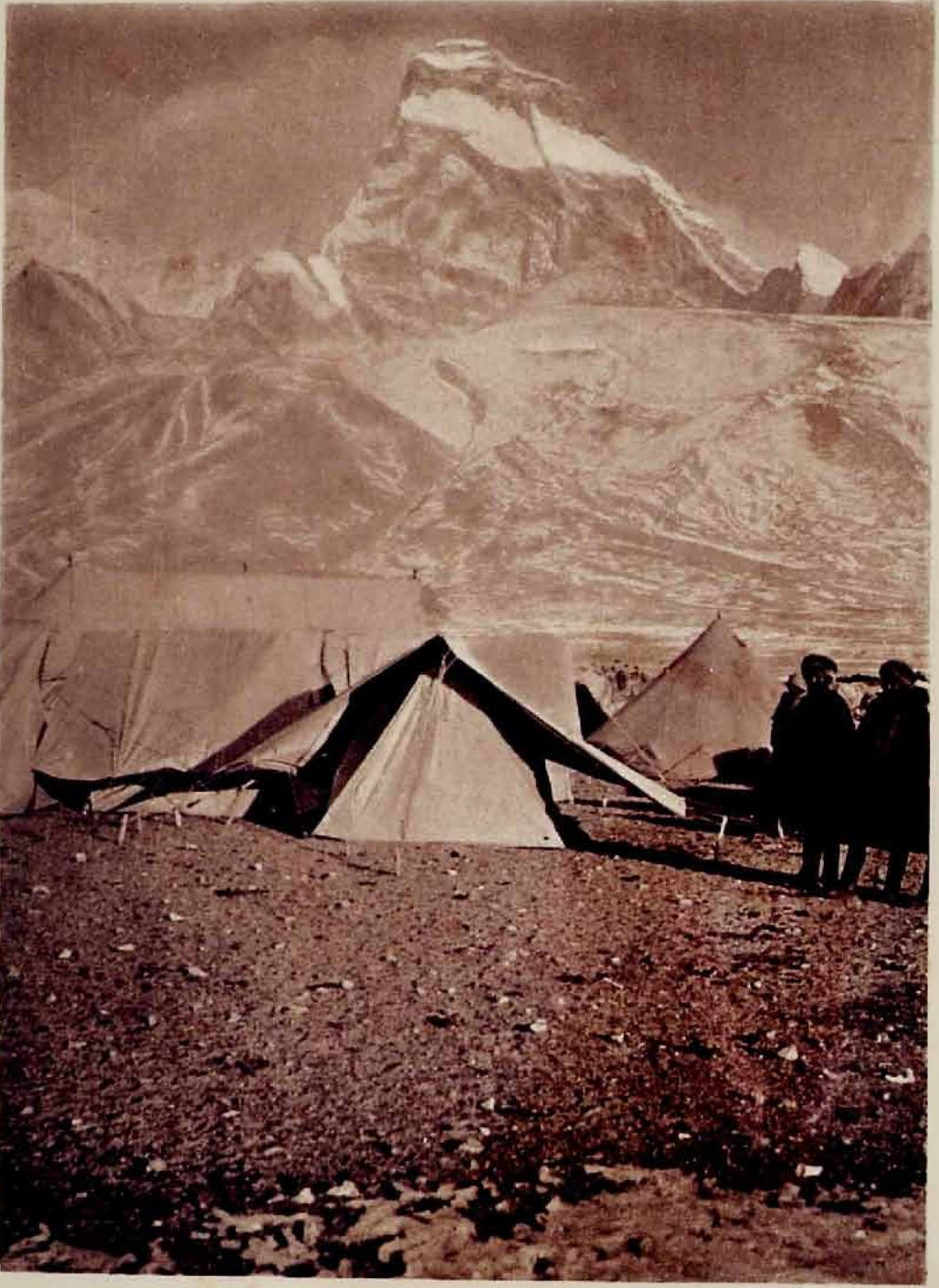


PLATE 9.—Camp at Shabra Shubra; the sacred peak
Chomolhari in background.

responsibility, and has a saving common sense allied to an acute sense of humour.

It was necessary to organise a system of postal communications, through which our despatches, telegrams and photographs could be sent rapidly to the *Statesman* of Calcutta, to be forwarded to the *Daily Telegraph* in London. This work would be put in the hands of a postal agent who knew Tibet and Sikkim ; he must be competent and reliable, with discretion to select the right type of postal runner, or rather rider. Any inefficiency here would result in loss of letters and in leakage of news. Lobsang Tsering, a Tibetan resident in Sikkim, was chosen on the recommendation of Mr. F. Williamson, I.C.S., Political Agent in Sikkim, and of Mr. L. G. Pinnell, I.C.S., Deputy Commissioner of Darjeeling ; and there could not have been a happier choice. He organised his postal service well, and kept his accounts with great accuracy. We never had any trouble.

Before the expedition started, it was necessary to have all the porters medically examined. By the kindness of Major S. A. McSwiney, I.M.S., Civil Surgeon of Darjeeling, the men were sent in successive batches into hospital, examined by our own M.O.s and by Dr. Yen Singh, and relieved of harmful organisms. The wisdom of this course was shown by the fact that 34 per cent. were found to be harbouring internal parasites. Only one was rejected for heart trouble. It is a remarkable fact that many Tibetan muleteers and the people of the Naga hills farther east are subject to this ; yet the Sherpas, who do so much load carrying at high altitudes, are remarkably free from it. We used to visit the men in hospital, where there was much merriment over our attempts to re-identify recruits last seen in their grubby working clothes. Each man had had a bath and was clothed, for the first time in his life, in beautiful blue-and-white striped pyjamas. It was a wonderful transformation, and they were delighted by the admiration of their friends.

One important and very necessary ceremony was kindly arranged for us by Dzaza Sardar Bahadur S.W. Laden La,

the friend of many mountaineers. This was the ceremonial blessing of the expedition personnel by the Lamas of the Ghoom Monastery. Sherpas and Bhutias are Buddhists, and set great store by the goodwill of their Lamas. The English members were equally willing to participate; for, as a Pope of Rome once observed to a Protestant Englishman who hesitated to kneel before him, "an old man's blessing never did anyone harm." Accordingly, on March 2nd, the space in front of the Planters' Club saw the unusual spectacle of a group of Lamas arriving in full canonicals—saffron robes and yellow head-pieces strongly reminiscent of the helmets worn by Alexander's Greek soldiery—and carrying their dorjes (thunderbolts), bells and incense-sprinklers. The ceremony was conducted with a quiet dignity which no one who was privileged to be present is likely ever to forget. The deep-voiced chanting, the individual blessing of the men and of ourselves, the serious and devout demeanour of those normally light-hearted young porters, the ceremonial of a bygone age, were infinitely moving. At the moment of the invocation of the mountain spirits, the great cloud-rack to the north parted and the gleaming summit of Kangchenjunga came quietly through. I stole a glance at the long, silent lines. It seemed that the men had had their answer, and were content.

And so to work. The porters were behaving remarkably well; for, although at this time occurred the Tibetan New Year when licence is usually abroad, there were no cases of drunkenness among them. There can be little doubt that these porters, like ourselves, felt a high sense of privilege in being selected to go to Mount Everest. In the Sherpa cosmos this is the blue riband of achievement. Almost to a man, they arranged for advances of pay and allowances to their nearest relatives, and quietly settled their affairs. The pay of an ordinary porter was to be twelve annas a day, with food allowance of eight annas a day during the march across Tibet. After reaching the Base Camp, every man would receive standard rations. Sardars and under-sardars were paid at higher rates, as were also our four principal cooks.

Birnie, as a cavalryman, was obviously cut out for the post of Master of the Horse. It had been decided that each European should have a pony, as the acclimatisation scheme provided for easy progress on the way to Everest. Cooks and sardars also were to be mounted. Our recruiting ground now became a horse-fair, wherein Birnie and the old coper Laspati wrangled amicably about prices and performance. Laspati proffered some remarkable ponies, all of which had been raced and had mouths of iron. But they were of Tibetan breed. Nothing else could stand the climate, the poor food, or the very amateurish handling of the porter grooms. Prospective purchasers galloped precariously about, while the porters laughed, and no doubt prayed for a spill or two. The saddlery was awful, but might with luck last six months. Stable gear and a supply of horse-shoes completed our equipment.

The military authorities at Delhi were most anxious to help in every possible way. We owe it to the kindness of the Commander-in-Chief in India that, in all, three British officers and two British and three Gurkha non-commissioned officers were seconded for duty in connection with the expedition and the wireless communications.

Mr. Richards brought out a very complete wireless equipment from England and proceeded to Delhi, where he explained his needs to one of our best friends at headquarters, Major-General W. L. O. Twiss, Military Secretary, Army Headquarters, and also Honorary Secretary of the Himalayan Club. It was arranged that two British Signals officers should accompany the expedition to the Base Camp, while two British Signals N.C.O.s helped Mr. Richards with his station at Darjeeling. Sincere acknowledgments are due to Mr. L. W. Ford, an amateur wireless enthusiast of great experience, who freely placed the resources of his own equipment at our disposal.

The generous offer of twenty-four Army mules and twelve Indian Army drivers was gratefully declined by me, as it was advisable to have homogeneous transport.

There was very little time in which to make these prepara-

tions, for our transport materialised sooner than was expected, and I was anxious to take advantage of it. The contingent from the Royal Corps of Signals, from Jubbulpore, arrived at Darjeeling on March 6th. It consisted of E. C. Thompson and W. R. Smijth-Windham, and Sergeant N. Watt and Corporal W. J. Frawley. They set to work at once with Mr. Richards to overhaul the wireless equipment, but the machinery needed for the Base Camp had to be loaded up without previous examination. By a great effort, their clothing, boots and stores for the campaign were made ready in time.

Meanwhile I interviewed Colonel Stone's Gurkha N.C.O.s, Havildar-Major Gaggan Singh Pun, Havildar Lachman Singh Sahi and Naik Bahadur Gurung. They had been spending strenuous days on the Darjeeling hillsides, and looked hard and fit. All three are well-educated men, with good records in the regiment. Gaggan Singh is very reserved and difficult to gauge at first sight, but he does his duty and improves greatly with acquaintance. Lachman Singh is distantly related to the old royal family of Askot, in the Almora district. He has perfect manners, and great ability and character. He was liked and trusted by the porters as well as by ourselves. Bahadur Gurung is a typical Gurkha, reliable, plucky and enduring. These men rendered yeoman service throughout the march and the operations on the mountain.

The greatest assistance was received from Mr. W. J. Kydd, a resident of Darjeeling, who most kindly volunteered to act as the expedition's agent during our absence in Tibet. He undertook to pay out family allotments, settle all bills and, in fact, relieve us of all the unpleasant humdrum work of an office. Indeed, the expedition had many good friends. Mr. and Mrs. Wrangham-Hardy, in addition to looking after our comfort at the Planters' Club, of which we had kindly been made honorary members, made a most rapid and judicious selection of stores for the wireless officers.

Most Europeans suffer from slight chills and internal troubles on first arrival at a hill-station, and we were no exception to the rule. Darjeeling can be very cold in February,

especially after sunset. Again, hill-water seems to contain particles of mica which for a time upset the interior economy of the new-comer. But the party soon recovered its form, and was all the better for a few days spent at an altitude of over 7,000 feet. Our equipment included a water-filter, to which we attribute, to some extent at least, our immunity from dysentery and other such troubles during the march.

At this time our intention was to proceed to Kampa Dzong in Tibet, where fresh transport would have to be engaged, via Gangtok and the Lachen valley and over the Sebu La, thereby avoiding the Phari route on which transport difficulties occurred both in 1922 and 1924. The former route is undoubtedly the most direct and, in normal circumstances, the easiest way to Kampa Dzong. Unfortunately news came in that the Sebu La was temporarily closed by a heavy fall of snow, and the plan had to be altered. To Gangtok we must go, in order to meet Williamson, the Political Officer in Sikkim, and obtain from him our passport and information about the state of affairs in Tibet. From Gangtok we should have to turn eastwards over the Natu La to the Chumbi valley and Phari.

The dak-bungalows or stage rest-houses of Sikkim have somewhat limited accommodation. We decided, therefore, to march in two parties, the first to consist mainly of those who had not been to the Himalaya before. They would travel on without delay to Gautsa, which lies at a height of about 12,000 feet in the Chumbi valley, and wait for the rest. A few days there would give them some preliminary acclimatisation. From Gautsa we should move on together for the remainder of the march. At Kalimpong, however, we found that Pangda Tsang, the Tibetan Government Trader, whose mules were to carry the heavy baggage to Kampa Dzong, wished to go by the regular trade-route to the Chumbi valley via Sedongchen and the Jelap La. A third party was hastily made up, consisting of Thompson, Smijth-Windham and Karma Paul, who were to accompany the heavy baggage and join the second party at Yatung.

This division into parties necessitated some resorting of our stores at Kalimpong ; so Longland and Shipton went over in advance and laboured strenuously. They were soon followed by the others of the first party, Crawford, Wyn Harris, Wager, Brocklebank and McLean. Shebbeare and Birnie, though they were of the second party, lent a hand. It was here that they bought Phil and Flo, the splendid mules which carried the mess tent. The porters, too, were sent on ahead to Kalimpong.

At last everything that could be done at Darjeeling was complete. Wyn Harris had put in an enormous amount of preliminary work on accounts and porters' rolls. Mr. Kydd had all the necessary data of advances to their dependants and next of kin, and our finances were in the safe keeping of the Imperial Bank of India. On the morning of March 8th many kind friends gave us a parting cheer as the little procession of cars, led by Mr. Laden La, moved off to the eighth milestone whence we would begin, on foot, the long descent to the Tista.

CHAPTER IV

THE MARCH

Darjeeling is separated from Kalimpong by the great valley of the Tista river. From a height of over 7,000 feet the road drops in endless zigzags to only 600 feet above sea-level, and then climbs nearly 4,000 feet to Kalimpong. That first march across the Tista valley is a wonderful experience. One passes through so many zones from the pines of Darjeeling to the tropical forests beneath. At Pashok we descended through Mr. Lister's tea estate, where it is the custom to record on his verandah wall the heights of expedition members. Greene's many inches now hold the record. Down, endlessly down the deep descent, to the detriment of one's toes, till at last the Tista bridge came in sight, and the motor-cars waiting to take us up to Kalimpong.

As it happened, the first and second parties left Kalimpong on successive Sundays, and each had the privilege of attending Divine Service at the Kalimpong Homes where Dr. Graham has laboured so long and so successfully. The first party left on March 5th, and made a sensational exit; their ponies took charge and galloped for some distance in the wrong direction.

The second party, consisting of Shebbeare, Greene, Smythe, Birnie and myself, left on March 12th in more sedate fashion, after a pleasant gathering at Dr. Graham's house. The children of the Kalimpong Homes lined the road and gave us a great send-off, and everybody pressed round to wish us success. We have very happy and grateful recollections of Kalimpong.

There is a singular sense of freedom during the march to Pedong. One is really off at last, motor-roads and towns are left behind. None but Mongolian faces are seen among the

travellers coming and going. Life will be nomadic for the next five or six months. As if to mark the change, after seven miles of steady ascent past alders and bamboo clumps and white dhatura hedges, we found a market-day in full swing at Algarra. A country market, definitely. Open booths, not the stereotyped shops of a town civilisation. Then we descended the five miles of execrable pavé mule track to Pedong dak-bungalow with its magnificent views over the Rangli-Chu. Here Wood-Johnson and Boustead joined us, the former from his tea garden, the latter post-haste from the distant Sudan. Wood-Johnson was like a schoolboy on holiday, and no wonder. For six long years he had prepared for this day.

Pedong is on the frontier between Sikkim and British India ; soon after the start of the next day's march, our passes were closely scrutinised by a stern-looking little Gurkha policeman, and we were off down the steep 3,000 foot descent to the Rangpo river. The mountain ridges of this part of the country run roughly east and west ; so the road to Gangtok is a series of enormous switchbacks, most trying for the untrained. Our thirsty troop was glad to find good oranges at the next halting-place, Pakhyong. From here, on the morning of the 14th, we had a wonderful view of Kangchenjunga, amazingly clear through miles of rain-washed air. One more valley had to be crossed, through a long avenue of rubber trees, and then we climbed up to Gangtok, the capital of Sikkim.

There was plenty to do here. Lobsang Tsering received full instructions for his postal service. His headquarters would be at Gangtok, but he had first to satisfy himself about the road through the Lachen valley and over the Sebu La ; he would then join the expedition at Kampa Dzong and accompany it to the Base Camp, thus familiarising himself with the whole route, and making arrangements with the Tibetan Dzongpens for the accommodation and support of his mail riders. From Gangtok our postal despatches and telegrams would be forwarded to Calcutta. In this the expedition received valuable help from the Post and Telegraph masters.

Williamson is the soul of hospitality, and we spent many



PLATE 10.—Nuns at Tatsang.

happy hours with him at the Residency, admiring everything : his collection of Tibetan religious banners, arms and brass-work ; his lovely garden ; and the Sikkimese uniforms of his official and domestic staff. Our passport was ready with the official seal of the Tibetan Government.

A translation of it may interest readers :

Be it known to the Dzongpens and headmen of Phari, Kampa, Teng-kye, Shekar and Kharta districts.

In accordance with the request contained in a recent written communication received from F. Williamson Esq., I.C.S., the excellent Political Officer in Sikkim, we have, in view of the excellent friendly relations existing between the British and Tibetan Governments, permitted

Mr. H. Ruttledge,
 Mr. F. S. Smythe,
 Major Hugh Boustead,
 Captain E. St. J. Birnie,
 Mr. C. G. Crawford,
 Mr. P. Wyn Harris,
 Mr. J. L. Longland,
 Mr. T. A. Brocklebank,
 Mr. E. O. Shebbeare,
 Mr. E. E. Shipton,
 Dr. C. R. Greene,
 Dr. W. McLean,
 Mr. G. Wood-Johnson, and
 Mr. L. R. Wager,

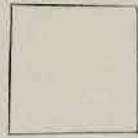
a total of 14 British Officers, with about 90 servants, to ascend the snowy mountain of Chamalung, which is in Tibetan territory, in the first month of the Water-Bird year. The expedition requires about 300 baggage animals. Please supply these immediately on demand without any let or hindrance, taking hire without sustaining any loss. You should also render them such help as is possible in the country.

On their part, the Sahibs and their servants must not roam about in regions not indicated in the passport at their will. They must not shoot birds or other wild animals at the various sacred places, an act which has the effect of offending Tibetan susceptibilities. They must not beat the people or subject them to any trouble. We have addressed a written communication to this effect to the Political Officer in Sikkim. You are required

to give unflinching and unswerving effect to the foregoing. Therefore all of you should take responsibility and act unerringly in the matter.

Despatched on the 27th day of the 12th month of the Water-Monkey year (21st February, 1933).

Seal of the Ministers of Tibet.



We also had the pleasure of meeting His Highness the Maharaja of Sikkim, who has shown consistent friendliness to many expeditions, and of visiting his new gompa (temple) with its elaborate frescoes and paintings.

There was a good deal of lameness among our porters at this stage. They had been served out with their new English boots at Kalimpong, after a startling process which is Sheb-bear's own patent. The boots were first thrown into a bath of water and then anointed with a terrible mixture of yellow soap and castor oil. This made them beautifully supple. The only difficulty was that they were of a generous size to permit of wearing several pairs of socks above the snow-line. They were therefore too loose at present on the men's feet, and galled them.

With the prospect of long abstinence, or at least shortage, in view, the porters naturally caroused a little in the Gangtok bazar; but there was no rioting, and they turned up for work on the 16th. Our principle was to give them only very light loads on the march to the Base Camp so as to have them fit and untired for the coming strain. They carried our cameras and light kit—enough to give them some sense of responsibility, and keep them out of mischief. It was important to get to know each man individually, and to study his character; by this means only should we be able to pick out the best for the higher camps. So we spent much time trying to distinguish one flat face from another flat face. It is humiliating to find oneself more than once addressing a man by his wrong name; and even when one got it right, there was the difficulty that Pasang, for instance, shared his name with at least five other Pasangs. But they were gently tolerant; besides, they were

having far greater difficulty with our own names. They solved this characteristically by observing some individual trait of appearance or disposition and applying what they considered the appropriate label. All had been given numbered identity discs at Darjeeling. Crawford, in addition, suggested numbered linen squares such as adorn the backs of Rugby football players. This worked well enough, besides amusing the porters, until dirt rendered the number and its background indistinguishable. By that time, however, we were more expert at identification, even of the non-committal Mongolian face.

From Gangtok, the pleasures of which were somewhat too much for our muleteers, we turned eastwards for the march to Karponang, ten miles away at a height of 9,500 feet. Not for many months should we live at so low a level. On this march, for the first time, we saw little patches of still unmelted snow. Primulas and magnolias were beginning to bloom, and a ring-ousel was seen.

At Karponang we took the precaution to open all our kerosene and petrol tins. If this is not done at intervals, leakage occurs owing to variations in atmospheric pressure. In the evening, over a roaring wood fire, the climbing plans were brought out and further discussed. Shebbeare remembered that in 1924 the porters had been seriously affected by the long carry from Camp IV, at nearly 23,000 feet, to Camp V, at 25,200 feet. We thought that this might be remedied by an improved acclimatisation, and that it was important to try to make a more comfortable Camp V. Above, owing to the need for a rapid advance while the weather was favourable, the climbers would inevitably get ahead of their acclimatisation. Norton's experience seemed to indicate that we must try to get to the top in three days from Camp IV.

The character of the country was now changing fast, forest giving way to slopes of grass and stone, of a generally Highland appearance. At Tsomgo, 12,500 feet, the lake was still frozen over, and there was snow around the bungalow. Great banks of dark cloud away to the west made it imperative to lose no time in crossing the Natu La, 14,300 feet, next day, lest the

pass should become closed to traffic. We found a letter from Crawford, saying that the advance party had left only two days before. The sight of the magnificent rock peak of Chomunko, 17,500 feet, had been too much for the thrusters, and four of them successfully tackled it. This climb had a certain value, for it brought a renewed confidence to some, while to others it brought home the advantages of unhurried training.

Greene was rapidly becoming an expert dentist. He had already relieved an officer of the Telegraph Department of a molar at Pakyong ; he now did the same for Pasang Dorje, Shebbeare's servant. Dorje was sublimely indifferent to the absence of an anæsthetic. A sup of whisky, a quick wrench, and he went happily off with his piece of damaged ivory in his hand.

All were up early on the morning of the 18th for the crossing of the Natu La into Tibet. We hoped for a view of distant Chomo Lhari, 23,997 feet, before the clouds came up. As snow lay on the hills, goggles had been served out to the porters the previous evening. It was interesting to observe the first effects on the party of an altitude of over 14,000 feet. Those who had recently been in the Himalaya were practically unaffected, while others admitted to slight headaches.

We gathered round the fluttering prayer-flags on the top of the pass, the old hands almost envying the newcomers their first look over into Tibet ; a vision of snow-streaked brown and purple hillsides, of sharp-cut outlines in the thin, clear air, of Chomo Lhari, fifty miles away yet looking quite close. A new world of limitless horizons after the confined landscape of the foot-hills.

There was a good deal of ice on the northern slopes of the pass, making the descent by no means easy for the mules. But Chumbitang bungalow, five miles on, was reached without accident. Though the sun was powerful enough overhead, a cold breeze blew up from the south, and a good fire was welcome that evening. Birnie, anxious for the welfare of our ponies, paid a surprise visit to their lines after dark, to find that their porter grooms had purloined the horse-rugs for their

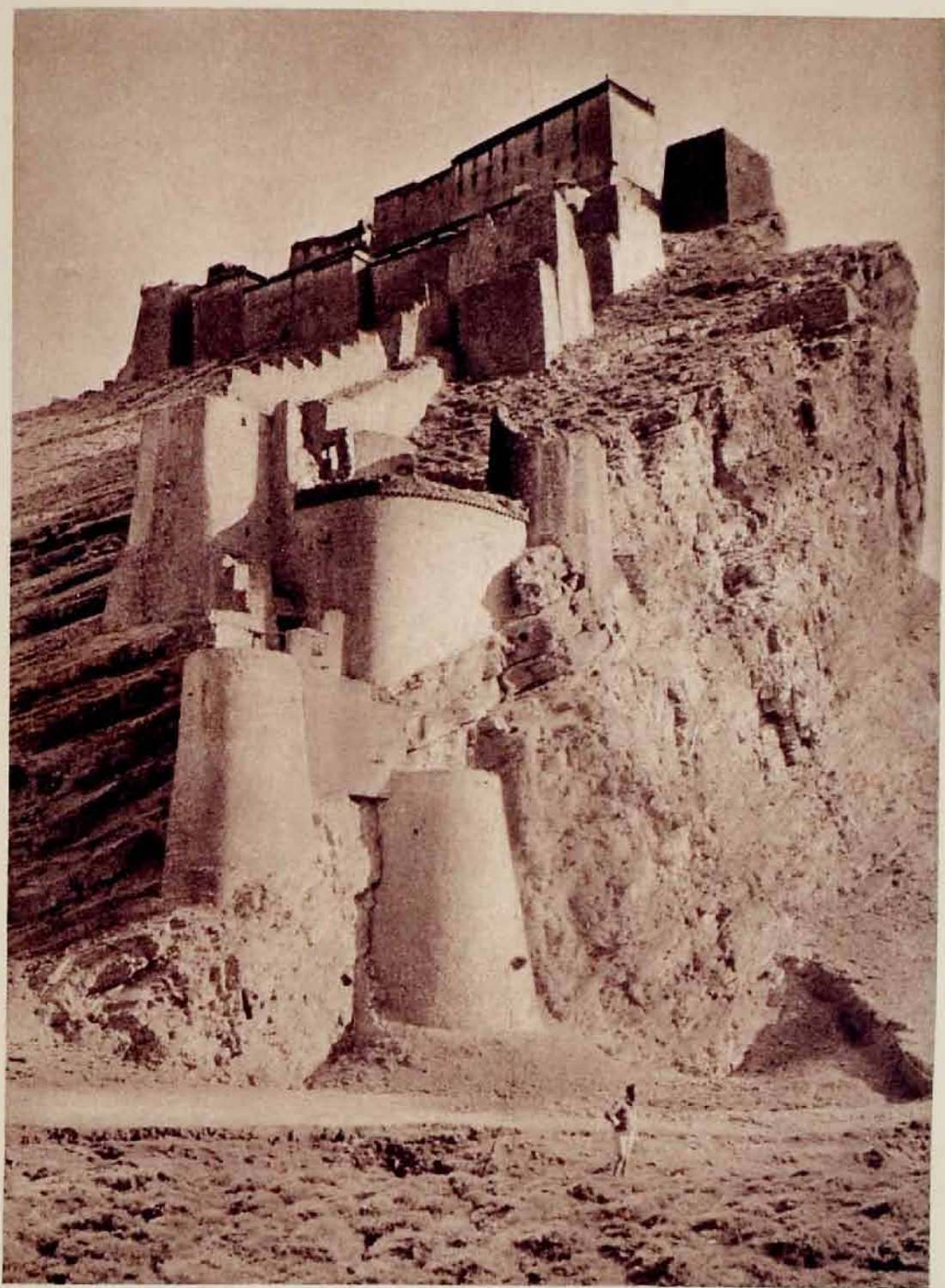


PLATE II.—Kampa Dzong.

own use. After severely reprimanding them, he repeated the visit later on. The rugs again adorned the wrong bodies. This kind of thing had to be stopped, so next morning the culprits were brought to justice in the presence of the whole porter corps. The two principal grooms were summarily dismissed and sent back to Darjeeling, while sounds of strife outside indicated that Shebbeare was dealing faithfully with his own man—the rascally old Pasang Dorje, of the tooth episode. This early and drastic action had a good effect, for the men realised that we meant business.

It was a lovely march down to Yatung in the Chumbi valley, through Scotch firs, rose trees, and scanty juniper. The Chumbi valley must be one of the richest in Tibet, for through it passes the trade between Lhasa and India. The men conduct the carrying business while their families cultivate the fertile, sun-bathed soil. We saw innumerable fields under rice.

Half-way down a great mountain spur, the road passes the red-hat Khajuk monastery, in a magnificent position. The head Lama is himself a good artist, and has painted some remarkable frescoes depicting phases of human life. Among the many images was one of a white-faced, white-clad female figure, which we were assured represented Mount Everest. This was good enough for the porters, who smothered the image in votive scarves. The monks were very friendly and inquisitive. As usual, they wanted to know why we took all this trouble to visit Everest. Evidently no one, not even General Bruce, has yet been able to offer an explanation which conveys any meaning to the Tibetan mind.

At Pipitang, Shebbeare and I were stopped by a bland person—fortunately Karma Paul had joined us—who said that the Dipon (Tibetan Trade Agent) would be glad if we would call. The gateway of the house was adorned with various instruments of punishment, whips, thorny canes, and cords, no doubt by way of discouraging potential malefactors. The Dipon, clad in the usual Chinese dress of silk, with a turquoise pendent from his left ear, greeted us smilingly. He had a somewhat nervous, anxious demeanour, but polished manners.

We noticed that, although tea was served to us, in beautiful china cups but from a Japanese tin tea-pot, he took none himself. He was very concerned to know how many names were on our passport. It was necessary to admit that there were only fourteen, but a telegram to Williamson soon regularised the presence of Thompson and Smijth-Windham with the expedition. Reassured on this subject, the Dipon became more human and less official. He desired to know the exact relationship of myself to General Bruce and, of course, our purpose in going to Mount Everest. Mountaineering as a sport is incomprehensible to a Tibetan administrator. Possibly he thinks that we seek gold. Shebbeare, Karma Paul and I did our imaginative best, though our explanation was received with a courteous but obviously puzzled incredulity, and we retired from the presence thinking that we must improve upon our story.

On our way through the village we came upon a man lying on rugs in a courtyard. He asked for medical treatment, and the bystanders, who included many women, explained with amusement that he was a murderer who had just received 150 lashes by way of inducing him to confess. He made no attempt to deny this statement. The Tibetans are a tough people, in every sense of the word.

Beyond the village we met Captain A. A. Russell, the British Trade Agent, who was on his way to lunch with his "opposite number." He most kindly invited Shebbeare and me to stay at the Residency in Yatung, and showed the greatest hospitality to us all. Thompson and Smijth-Windham had meanwhile arrived from Kalimpong over the Jelap La.

At Yatung there is a garrison of Indian infantry to protect the trade-route which, since the Lhasa expedition of 1904, we have held as far as Gyantse ; and the sepoy's play football and hockey on a small, comparatively level space of ground. A few rocks break the surface here and there, adding a sporting element of chance to the games. On this ground the irrepressible Wood-Johnson proposed a game of polo, three-a-side, on the expedition's ponies. He could contribute two polo-sticks

and a ball. For the rest, hockey-sticks borrowed from the Jemadar of the 103rd Mahratta Infantry would serve. It was a strange game, but an undoubted success from the point of view of the local inhabitants, who turned up in force. Some skill was required to keep our ponies from galloping away up or down the mountain-side, and to hit, occasionally, a rapidly disintegrating polo-ball (the rocks were very hard) with the short hockey-sticks. Luckily the second-hand reins and saddlery held together pretty well. The only accident was due to a horrible foul by Wood-Johnson which involved Boustead in a toss, to the delight of the crowd. It is only right to add that Birnie, our one expert, appeared to have no difficulty in competing with the conditions.

Here we again opened our fuel tins, finding that there was already some slight leakage. The new porters' bell tents were pitched and found to be of excellent quality, though lacking ventilation. This was easily remedied by slitting holes in the tops. Meanwhile part of our equipment, on Pangda Tsang's fast mules, passed through Yatung without stopping. Birnie made a forced march that night in order to stop it at Gautsa, twelve miles on.

We followed along the stony track next morning, the 21st. Our way led through thick bush under a fierce sun, past the prosperous-looking village of Galinka to Lingmatang plain, where the ponies seemed to enjoy a gallop as much as we did. Then the hills closed in upon us again. A cold wind now sprang up, a few flakes of snow fell, and by the time we reached Gautsa, 12,500 feet, and the riotous welcome of the first party, it was evident that the milder conditions of our early marches had been left behind for good.

Gautsa lies in a deep defile among wonderful mountain scenery. Previous expeditions had noted its advantages as a place in which to acclimatise before entering upon the rigours of the Phari plain. But there was a look of snow in the sky, and it would not do to get caught here by a heavy fall. On the plateau beyond, the west wind prevents the formation of heavy drifts. We of the second party were for the most part tolerably

well acclimatised ; those of the first had spent several days here, and a few had pitched and occupied a camp up a side valley, considerably higher. Accordingly we decided to push on.

At Gautsa all the members of the expedition assembled for the first time. Most Englishmen are afflicted by shyness when meeting strangers, but this wore off as the march proceeded, and we were a happy company in which everyone had something fresh, of experience or outlook, to contribute. Crawford began the breaking of the ice with a most interesting disquisition upon Russia, which he had visited in the previous year. Wyn Harris and Shipton could discourse on Kenya and its many problems ; Boustead on the Sudan ; Shebbeare on the Indian forests ; while in Greene we discovered a raconteur of unrivalled capacity. In a party drawn from so many professions everyone could offer something to the general stock, and we never had a dull evening. At Gautsa I appointed Shebbeare second-in-command.

The expedition split up once more into two parties for the march to Phari. Heavy snow fell during the night of the 22nd March, and early next morning it was so cold that some of us put on our windproof smocks. But the sun quickly put an end to that.

The Gautsa defile is thickly wooded ; this was the last forest growth we were to see for many a day. Signs of change were all around us. Yaks with their slow, swinging stride and musical bells were coming down the road, shying at the Europeans. Trees soon gave place to grass-clad slopes, and steep-sided gorges to rounded hills and U-shaped valleys. Then after a long, slow climb we emerged with startling suddenness among the rolling downs of the real Tibet, and were struggling against the blast of the west wind. Quite close now, Chomo Lhari towered upwards. A short halt at a solitary tea-house, a mile or two round the flank of a hill, and Phari appeared in the distance. Mule-trains, with their wild-eyed drivers, passed on their way southwards bearing wool for the Indian markets. The flat plain was scarred by the burrows of the little mouse-



PLATE 12.—Yaks fording the Yaru River.

hares, so that careful riding was advisable. Phari looked about two miles off; it was really five.

Here, for the first time, we pitched our Whympers tents, one for each member. From now on to the Base Camp, one's home was a canvas-covered space seven feet by seven. A very good home it was too. There was plenty of room for the "Trojan" camp-bed and for one's suitcases and kit-bags. It was far more comfortable than the crowded rest-houses. Crawford, however, had some reason to disagree, for that night his servant Pemba Dorje, who had become a great deal too fond of chang, the barley beer of the country, disobeyed orders about his candle-lantern and contrived to burn a large hole in the end of his tent, besides ruining a suitcase. Fortunately the conflagration was discovered early and put out. Otherwise, with the wind that was blowing, the whole camp might have gone up in flames.

Russell was passing through on his way back to Gyantse. This was an opportunity to return in some small measure his hospitality. The mess tent was pitched in the courtyard of the rest-house, the three-ply tables rigged out, and the bandalasta ware arranged in all its orange glory. Tencheddar, our principal chef, was closeted in anxious conclave, hours in advance, with Shipton the mess secretary. Our small supply of Johnnie Walker was ruthlessly tapped. The resulting banquet, however primitive in reality, had some semblance of the genuine article, and the evening passed in merriment.

Phari (Hog Hill) has often been described, and it has not changed. Here the expeditions of 1922 and 1924 had many transport difficulties, for the place is on the main trade-route to Lhasa, pack animals are in constant demand, and prices are mercurial. We blessed ourselves for having arranged with Pangda Tsang to see us right through to Kampa Dzong; for, as Tibetan Government Trader, he had first call on transport, and the responsibility was his. Yaks and mules appeared from a distant and apparently blank horizon. Both Dzongpens were away; their Gyembos (assistants), men with a highly developed sense of business, seeing no way to profit by this arrangement,

tried to give trouble. They failed, and the expedition moved out with no delay, on March 25th.

At this period of the year, perhaps at all periods, the traveller from Phari to Kampa Dzong must expect a rough passage, for he must cross the high ground formed by the northern spurs of that great mountain Pauhunri. We received news of heavy snow on the usual route, and our transport drivers insisted on a diversion towards the north, via the easy Tang La, 15,200 feet. After this we would turn sharply to the west. We camped beyond the pass that day, at the very foot of Chomo Lhari. The wind was blowing strongly at our camping-place, Shabra Shubra, but all thought of discomfort was banished by the view of that magnificent peak. Longing glances were cast on the tremendous arête of rock and ice which rises in one unbroken sickle-like sweep almost to the summit. As darkness came on, it seemed that the cold up there must be as that of interstellar space, and we thought of General Bruce's remark that Camp IV on Mount Everest is nearly as high.

That night was a presage of the future. The wind never stopped, and thirty-six degrees of frost Fahrenheit must have tried the baggage animals and riding ponies severely. Still, the morning was fine and there was a temporary lull which enabled us to breakfast in the open, while Phil and Flo, the mess tent mules, went off westwards across the snow-sprinkled plain. We started in our turn, leaving the long line of telegraph poles which runs remorselessly on northwards to Lhasa to link the modern world with the changeless solitudes which saw the cavalry of Genghis Khan.

The lull was short-lived. The wind came screaming across from the west, right in our faces; the snow, ripped in clouds from the flat plain, made direction-keeping difficult. Partly riding, partly walking to keep warm, we ascended very gradually towards a cleft in the distant hills among which, twelve miles away, was Lunge Bur. The wind in the cleft was tremendous, and we had difficulty on a snow-covered bank, where a cornice had formed and the ponies, led by their bridles, floundered helplessly down. The porters had a hard struggle

to reach camp, and we pitched most of the tents ourselves. Shebbeare, usually indifferent to discomfort, considered this the hardest march he had ever done. Already we were at a height of about 16,000 feet and puffed a good deal when hauling on guy ropes, carrying heavy stones, or hammering in tent pegs. That evening the wind dropped, and we enjoyed a wonderful view of Pauhunri. Wager and I even summoned up energy for a scramble on the great gravel banks behind the camp.

After this rough introduction to plateau travel, the next day's march to Limbu was looked forward to with some trepidation, for it involved the crossing of the Dongka La and Chago La, both over 17,000 feet high. But the luck turned and we had a most enjoyable march, feeling the altitude but little. The great Sikkimese peaks, Pauhunri, Kangchenjau and Chomiomo, climbed years ago by Dr. A. M. Kellas, gleamed blindingly against a sky of deepest blue.

The party had come along very well on this day, but acclimatisation has its setbacks. Next morning several members complained of lack of sleep, and of feeling the cold (31 degrees of frost). However, it was an easy ten miles to Tatsang, in perfect weather. There can hardly be anything more delightful than marching across the Tibetan levels in such circumstances, before the wind gets up. On the way we found some cliffs which positively invited a halt for a sun-bath on the warm rock. Longland interpreted the invitation differently. To him anything steep is a direct challenge. Selecting a moment when I was at peace with the world, he departed stealthily round a corner, and was well on the way up a vertical pitch before I could develop my parrot-cry of "safety first on the way to Mount Everest." However, Longland shares with lizards the faculty of adhering to perfectly smooth walls.

Tatsang boasts a nunnery maintained by the offerings of yak drivers. The ladies showed much interest in us, positively liked being photographed, and encouraged a visit to their gompa. Theirs must be a hard life, for their supporters are few and poor themselves, and the surrounding soil does not look

as if it made much of a return to labour. The wind here blew suffocating clouds of dust and sand through the camp. Already that distressing complaint of the Tibetan plateau, sore throat, was making its appearance. Many of us had, long ago, given up smoking; and we strove with nasal douches and throat gargles to keep the enemy at bay. Some escaped altogether, but the majority carried their sore throats with them to Mount Everest, and suffered a good deal.

Kampa Dzong was reached on the 29th, after a memorable march. The way led for nine miles up a gently ascending valley to a pass of about 17,000 feet. A herd of gazelle and a single kyang (wild ass) kept on our flank, like the scouts of an army. Longland, after some complicated manœuvres, drove them across our front at very close range. They moved with that easy, effortless stride which conceals speed. Arrived on the pass, Shipton, Smythe, Wyn Harris and I thought we might test our acclimatisation, and our theory of slow but continuous and rhythmical upward movement, by ascending a hill on our left about 1,000 feet higher. Brocklebank, Wood-Johnson, Longland and Wager followed. All found themselves going well, provided they did not hurry. Our reward was one of the grandest views imaginable, and our first sight of Mount Everest, nearly a hundred miles away. At our feet lay the plain of the Yaru river. Beyond it, the glittering northern wall of the Himalaya. The eye ranged over Pauhunri, Kangchenjau and Chomiomo on the east; then Siniolchu, Kangchenjunga (with the Bavarians' ridge in full view), Jonsong peak and innumerable unnamed summits; and, far away in the west, Makalu and a great snowy triangle which could only be Mount Everest. The snow had that yellow look which distance alone can give.

It was a glorious morning. The wind was still asleep, and we basked for an hour in the sun, one or other rising at intervals to use camera or telescope. There was little conversation, for a scene like this is best gazed upon in silence. Each, perhaps, was thinking of what his part might be in the battle for that distant summit. Reluctantly we turned to descend the easy

scree slopes to the pass, on which poor Kellas died in 1921. Eight miles down, the steep-sided valley ended in a gorge which Gustave Doré would have loved to depict ; and suddenly, round an abrupt corner, rose the soaring battlements of Kampa Dzong.

Most travellers to Mount Everest have happy memories of Kampa Dzong. Here they descend to 14,000 feet from the cold uplands of the Dongka La. The place is a perfect little sun-trap, and besides has architectural beauty of the highest order. Those old Tibetan builders had an eye for line and for proportion. The rounded towers, one above the other and connected by steeply mounting walls, lead up to the square-cut citadel with its sloping sides. The whole edifice, springing from precipitous rock, is a setting for a fairy story.

The Dzongpen of this place was away at Lhasa, being invested with the high title of Dzaza (General). His representative, the Nyapala, received us with great friendliness and procured our fresh transport without much delay. These Tibetan officials always turn out in beautiful costumes of Chinese silk, of purple, blue or claret, usually surmounted by a fur-edged hat with the official button on the top. The leader of a Mount Everest expedition has, of course, no official status. Not for him the cocked hat and gold-laced uniform of the political officer. Yet he must conduct negotiations clad in such a way as to "eat no shame," as they say in the East. The usual mufti of the West seems dull and unimpressive in contrast with the gorgeous silks of China. Accordingly we took thought, of which the outcome was, to say the least of it, singular. The expedition's ambassador received his visitor in the mess tent, arrayed in a Tibetan gown of watered silk lined with sheepskin with a red girdle, the whole surmounted by an opera-hat. The effect was all that could be desired. Here obviously was a man of standing in his own country. Deep called unto deep in the most friendly manner, with mutual respect ; and our negotiations were completely successful. It should be added that the opera-hat had been brought along in no spirit of vanity. Its destination was

intended to be the head of that porter who should do best on the mountain. The men gazed upon it with admiration, and were fascinated by its mechanism.

At Kampa Dzong we found our advance stores, all neatly stacked and guarded by the sirdar Nursang. To assist him, he had acquired a Tibetan mastiff, to whom he gave the astounding name of Police-ie. One-eyed and suspicious, Police-ie began by soundly biting Wood-Johnson, who approached the store-dump on his lawful occasions but without the formality of an introduction. The sacrifice was sufficient. Police-ie was reassured, and thereafter bit none but her own countrymen, of whom she spared neither sex nor age.

Though our friend the Nyapala was doing his best, the new transport did not turn up for four days ; but there was plenty to do. Lobsang Tsering arrived direct from Gangtok with the post, reporting that the Sebu La was now open to traffic ; despatches had to be written, stores overhauled. Longland, our quartermaster, worked overtime, assisted by relays of volunteers. The wireless officers assembled their equipment, hoping that we should be able to listen in on April 1st, and hear the result of the Boat Race. They were unsuccessful.

We explored the Dzong (fort) by invitation of the Nyapala. The way lies up a zigzag path under the southern precipice, past an enormous chorten (tomb), and one enters the fort up very steep steps through a wooden door with carved side-posts and lintel. On one side are prayer-wheels some three feet high, easily turned by a movement of the hand. The lower storey is occupied by a small carpet or rug manufactory, and access to the next is obtained by means of insecure-looking, slippery wooden ladders. It is just as well to let one's host go first, as the whole place is ill-lit and on each floor there is a savage mastiff which is hastily grabbed by the attendants, often only just in time. After stumbling over many things and bumping one's head in odd corners, one emerges thankfully into brilliant sunshine on the roof, whence there is a magnificent view of the surrounding country. The sheer walls, mounting from the very edge of the precipice, give a tremendous impression of

depth below. We are told that condemned criminals used to be hurled from this place.

Kellas's grave was next visited. The covering stone had been thrown down. We hauled a great slab into place, and carved on it a fresh inscription, with the assistance of some monks from the gompa on the hillside above, who, we hoped, might take some interest in its preservation. When all was done, Shebbeare, the oldest of us, read the 121st Psalm. Kellas's grave looks out over the plain to the great mountains which he climbed, and is in sight of Mount Everest.

The only drawback to Kampa Dzong was the dust, which added to the growing tale of sore throats. There was no escape once the wind had got up, at about eleven o'clock every morning. The dust penetrated everywhere, making our food and drink gritty and our throats dry. Several people had recourse to the Matthews respirator, and some heroic spirits even contrived to sleep with it on ; but the effort of inspiration through the copper gauze, slight though it was, produced a feeling of claustrophobia which was too much for others.

On April 2nd the new and very lively yak transport was loaded up, and we did the eighteen-mile march to Lingga, past Mende and its willow trees, and over the Yaru river. It was a day of terrible wind and dust. Lingga is surrounded by ponds and marshes, where the bar-headed goose and Brahminy duck hold high revel.

Thence to Tengkye Dzong, halfway from Darjeeling to Everest, where transport had again to be changed. This was a life of contrasts. Yesterday we had marched bent forward against the wind, muffled up to the ears and cursing the dust. To-day the wind tarried and the sun shone brightly. Larks sprang into the sky before us in full song, or ran cheerfully about among the little dunes. Lizards basked in the warmth, and we followed their example whenever the sandy margin of a pool or some alluring outcrop of rocks suggested a halt. There was no need for hurry, as the distance was short and the mess tent awaited our convenience, a tiny green speck against the red hills in the distance.

Tengkye Dzong is a delightful spot at the mouth of a wide valley, with hamlets and gompas on the hillsides. The Dzong overlooks a little lake—a perfect setting. The resident Dzongpen is an amusing character; a native of Lhasa who would be perfectly at home in Paris, for he is a born boulevardier. Our arrival was a perfect god-send to this exile. He called at once, sampled some sloe gin with emphatic approval, asked innumerable questions, and promised every assistance, including the use of his own mules. He administers, according to his own admission, an unruly and rapacious district; and he advised us to avoid the old route via Gyangkar Nangpa and go by a parallel route to the north, over the Bahman Dopté pass. Then he asked Shebbeare, Greene, Wood-Johnson and me to tea for next day, and tactfully left us to our work, waiving the formality of a return official visit.

In the evening several of us walked over to a charming willow grove about half a mile away, and found it full of birds—magpies, linnets, finches, a hoopoe, and many others. It is a never-ending joy to find the birds of Tibet so tame; the place is a paradise for the ornithologist.

That acclimatisation was improving was shown pretty clearly here. Tengkye boasts level ground, and the porters started some energetic football, of which a few, including Lhakpa Chedi, knew the rudiments. This attracted every Tibetan man, woman and child from miles round, and our camp became an animated and most amusing scene. Rules, of course, were thrown overboard; numbers were immaterial. The great thing was to go for the ball, and propel it in any direction by feet, hand, or face. The Tibetans, to whom an altitude of 15,000 feet was as sea-level to us, were indefatigable. The seething mass, madly striving after an invisible ball, surged across the ground, and we watched, helpless with laughter, though tents might fall and guy ropes suffer.

Then Boustead gave a lesson in boxing, which was an instant draw. In no time our six sets of gloves adorned as many grimy pairs of hands, the owners of which busily en-



PLATE 13.—Tengkye Dzong.

deavoured to exterminate anybody within reach, while the crowd roared in ecstasy. Two Tibetan children, perhaps six years old, fought a spirited and interminable round which fairly brought the house down, and were rewarded with many sweets.

A great afternoon's sport ended with an exhibition of pole-jumping by Longland, using a long bamboo. This took on at once, and as neither Sherpa nor Tibetan is content with the rôle of passive spectator, some very remarkable jumping, or rather falling, was observed. But these men are unkillable. Altogether a good day.

The tea-party in the Dzong was a great success, both socially and from the point of view of business. It was soon clear that the word tea was merely a "façon de parler," and that we were in for something much more strenuous. The friendly Dzongpen introduced us to his wife, a lady of much character, with a large black patch on her nose. The patch disappeared later, presumably because our hostess was reassured on the subject of the evil eye. A present of bandalasta ware and a needle-case, and Wood-Johnson's insinuating ways, secured her approval, and things went with a swing. Course succeeded course, rice, macaroni, mutton, wheaten biscuits. Tea was soon discarded in favour of chang. The moment you had taken a sip, your cup was filled again to the brim, and no excuses were accepted. Karma Paul was in his element, while Lewa and other sardars in their best bib and tucker sat in a solemn row, attended to by the domestic staff. Then two ladies were introduced, whose duty it is to dance and sing before distinguished strangers. Their voices were quite melodious, their dancing a rather stiff sort of shuffle and stamp. The dignity of the proceedings was only slightly disturbed by Shebbeare's judgment of Paris.

Our host was becoming mellow and benevolent. English travellers did not pass every day. He felt that he was appreciated. He remembered, as a boy, seeing Sir Francis Young-husband at Gyantse, where his father was Dzongpen. He would see that his guests were fairly treated. The headman of Gyangkar Nangpa was sent for and was obviously astonished to

receive a stern and uncompromising order to supply transport, along a route at some distance from his village, at reasonable rates. When at last we were permitted to go, lighted through the darkness by torches, we felt that we had in the Dzongpen of Tengkye a sure ally. In the courtyard of his house he showed us his magnificent mules, with their ear-ringed, long-haired, savage-looking drivers.

Perhaps we spoiled the Tengkye people with too much bread and games; for when work was needed, to get off on the morning of April 5th, a marked lassitude was apparent. But the Dzongpen came down himself and worked like a Trojan, allotting loads, even lifting them with his own hands, and cuffing recalcitrants. We said good-bye to him with sincere regret, as the long train of animals and men wound away up the valley for the eighteen-mile march to Khengu over the high Bahman Dopte pass. The dust at Khengu was appalling, and we were glad to move on to the meadows of Dochen, where the new Gyangkar-Nangpa transport was to meet us. From here we could see the peak of Shankar-ri, 20,000 feet high, on which an attempt was made in 1922. It was taboo this time.

News came in, after our arrival, that Karma Paul's and Lobsang Tsering's ponies had both fallen. Karma Paul broke his little finger and Lobsang Tsering his collar-bone. The one was soon dealt with, but the other nearly ended in tragedy. Greene and McLean went back and brought Lobsang Tsering in. It was decided to give him an anæsthetic and set the bone at once. Greene is an expert anæsthetist, and no difficulty was expected. But anæsthetics, it seems, can play queer tricks at over 14,000 feet. Lobsang went to sleep, and his collar-bone was quickly set by McLean; but then he did not come to, and the doctors had to work hard with coramine and artificial respiration until the heart's beat was resumed, and a very green and shaky Lobsang returned to consciousness. Arrangements were made for him to stay several days with a local Tibetan family, after which he was to follow us to the Base Camp. He was very plucky over the whole business.

The Gyangkar Nangpa men, perhaps really impressed by the lecture given to their headman, brought the animals in good time—yaks and donkeys. But loading up the transport on the morning of the 7th was endlessly prolonged, and the donkeys seemed to be getting more than their fair share. It is amazing that these little creatures, with their pipe-stem legs, can carry 160 lbs., the same as a yak. If given more than that they simply lie down, and the transport officer has to re-allot loads, with the active non-co-operation of the drivers.

The ford at the crossing of the Chiblung-Chu caused both amusement and profanity ; for the water was fairly high and everybody wanted to know if his own particular bedding was getting soaked, a question mainly of the size of his baggage animal. If there is a sand-bank in the middle of a river, yaks love to assemble on it and defy the execrations of their drivers on the near bank. They will stay there in placid obstinacy until dislodged by some accurate stone-throwing.

We crossed the river again, to camp at Jikyop, by means of an extraordinary sort of stone pier, and spent some unpleasant hours among wind-driven sand. About this time various members again took to slow training walks up any convenient hill behind camp, going up perhaps two thousand feet or so, but always keeping a speed well within their powers. Having ridden a considerable portion of the day's march, they were fresh for a moderate climb in the afternoon. Memory lingers over these occasions when parties of two or three, informally arranged, would select each their own ridge and move off without haste, content to go so far as inclination or condition prompted and sure of some unforgettable picture of plain and hill and distant ice-clad peak. The level rays of the setting sun would pick out beauties unseen under the glare of midday, while harsh outline and lack of atmosphere were forgotten in contemplation of the ever newly revealed loveliness of colour. Then would come the effortless descent towards those little green tents far below which represented home ; a few minutes perhaps with the porters collected round their cooking-pots and obviously enjoying themselves ; and a return to the cheerful

story and argument of the mess tent. Happy days, when everyone was strong and unstrained, and hope ran high.

The next two marches, to Trangso-Chumbab and Kyishong were long and trying. The west wind seemed to be gathering strength, and to blow all day and most of the night, and the dust was everywhere. The transport officers had a particularly hard time getting into Kyishong through a full gale, which of course took a great deal out of the baggage animals. We searched in vain for a good camping site, for the village was aggressively pungent. But shelter from the wind could only be found behind a wall there. We just had to make the best of it and pray for the morn.

It was a relief when we started on the last stage to Shekar Dzong, which turned out to be actually shorter than the map indicated. Usually it had seemed to be the other way. The country about here was not inaptly compared by Shebbeare to the mountains of the moon. In every direction were isolated stony hills, of conical shape and very dry. Mounting a low pass, a mile or two beyond Kyishong, we looked across a wonderful landscape of plain and hill to the single pyramidal rock on which Shekar Dzong stands. Had the ancient Western geographers known of this place, it would certainly have been included among the wonders of the world. The name, which means "white glass," is sufficiently descriptive. The town of white houses is at the foot of the rock; halfway up, perched on steep ledges and built with cunning artistry, are the gleaming walls of two great monasteries; above them the Dzong, and on the highest pinnacle, about a thousand feet above the plain, a sort of look-out post. Even more than Kampa, it is a setting for a fairy story, a place of enchantment.

To Greene's just indignation, we camped close to the town, on exposed ground swept by the evil dust-laden wind. A much better site should have been chosen, a mile away.

Our pleasure in seeing Shekar Dzong was spoilt by two things, the presence of a smallpox epidemic and the discovery that some of our equipment and stores had been looted on the

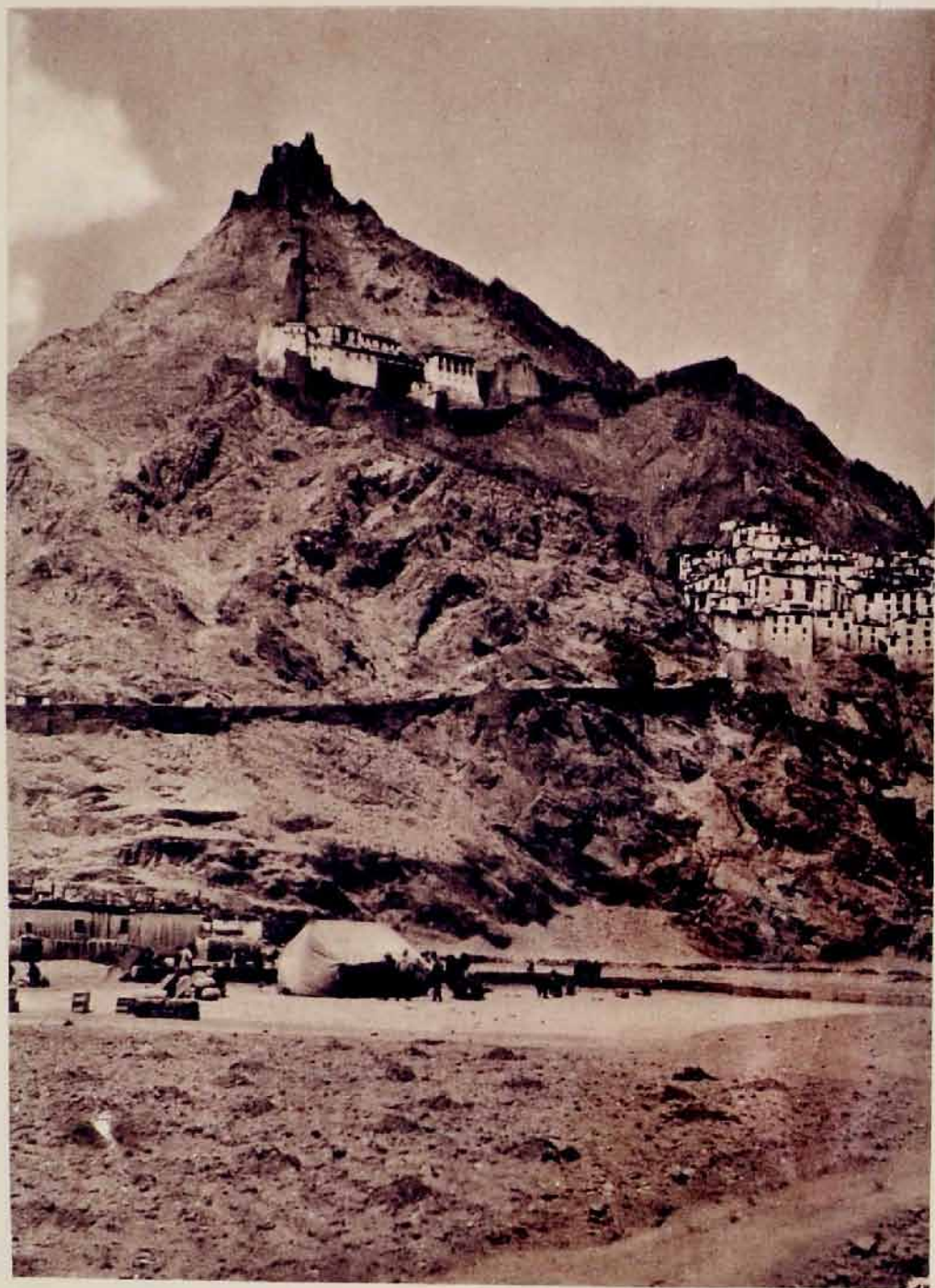


PLATE 14.—Shekar Dzong.

way. The former was not really serious, since the porters as well as ourselves had been vaccinated before starting. The latter was a calamity. All hands had to be turned on to make a full inventory, the Dzungpen informed, and a guard set—rather a case of locking the stable door after the horse had been stolen, though we had still five marches to go. The inventory disclosed the alarming fact that several pairs of porters' high-altitude boots, a Meade tent, and sundry wind-proof smocks and pairs of warm socks were missing, and that many ration boxes had been opened and their contents rifled with a skill which indicated that the thief knew exactly what he wanted. The Dzungpen called soon after this work had begun. He was friendly and anxious to do his best to help us, and began by arresting a number of our transport drivers, who were under strong suspicion. According to Tibetan (and our own mediæval) custom, he flogged them next day to make them confess, but without result. The stolen things were never traced, nor the culprits discovered. Shebbeare had proposed that he and Crawford should go on ahead to Rongbuk and begin making the route up the glacier. This programme fell through owing to the need for better supervision of the transport personnel and prevention of further losses.

Smallpox was at this time exacting a heavy toll from the neighbourhood. Apparently a knowledge of the benefits to be derived from vaccination had penetrated to this part of Tibet, and the Dzungpen wanted lymph. There was none in our medical stores, so I gave him a message for the British Trade Agent at Gyantse, asking for a supply.

The Shekar district is large and important, and includes the Rongbuk valley and Mount Everest. It was particularly advisable to secure the goodwill of this Dzungpen, in order to recruit Tibetan porters for work at the glacier camps, and organise supplies of fuel. Negotiations were opened at the first interview, with most satisfactory results. The Dzungpen placed at our disposal his Chonzay (steward), who had worked for other expeditions, and gave us excellent transport at fair rates. He was a nervous-looking, bent-backed little man, by

no means impressive at first sight. But he was an honourable gentleman, and a good friend to us.

A pleasant interlude between the hours of stock-taking and inquisition was the pitching of the new arctic tents. They were pronounced to be a success, a sound provision against the blizzards of the East Rongbuk glacier. Then it occurred to someone that a general hair-cutting might improve our appearance. Wyn Harris proved our most efficient barber, but very ill-advisedly submitted himself to Crawford's hands when his turn came. The resultant coiffure nearly caused a riot.

We visited the great monasteries, where the art of selling curios has, for some reason unknown, reached a high state of development. There are no trippers in Tibet. The Lamas had set out a regular little shop in a room, and pushed their wares—banners, cups, spoons, carvings, charm-boxes—with the skill of professional pedlars. They were very good-tempered, and thoroughly enjoyed argument with both climbers and porters. The architecture of their monasteries is a delight to the eye; austere and perfect in line. At every point one saw unexpected beauties—possibly to some extent fortuitous and due to the accident of rock-formation, but with evidence of a definite artistic perception. We were admitted to one of the services, and then taken to see, in a very dim religious light, a gigantic image of the Buddha and some highly realistic busts of departed abbots, including the last incumbent who so impressed the 1921 expedition. Judged from the photograph taken at that time, the likeness was excellent.

Emerging through the highest roofs, several of us climbed steeply up through the ruined Dzong to the look-out post, which seemed as if it might come crashing down at any moment. We brought a telescope, for it was known that Mount Everest, some fifty miles away, could be seen from here. Unfortunately there was now bad weather to the south, but we caught an occasional glimpse of the north-east arête and the north ridge; a good deal more impressive than some had expected to find them.

The porters of course knew that Shekar was the last place of even moderate size that they would see before entering the

wilderness of rock and ice. They broke out a little ; especially the bootmaker, who got extremely drunk and was well hammered in the town. That did not matter, but our sleep also was interfered with in camp, and Birnie had to relieve me in successive suppressions of the now loquacious Lhakpa Chedi.

Our departure, on April 13th, was a dreadfully protracted affair. There seemed to be plenty of yaks and donkeys about, and the little Dzongpen, with all his staff, looked very busy ; but his head clerk, and the lamas, still as anxious for barter as ever, delayed matters, and the last load did not leave for Pangle till noon. We paid a last ceremonial visit to the Dzongpen, photographed him at his own request in his full regalia, and parted from him on the best of terms. He wrote to us from time to time while we were on the mountain, cordially inviting a return visit.

The last load had left Shekar, it is true ; but our difficulties were not yet at an end. The first part of this march lay through a very narrow defile, where box after box was scraped off the donkeys' backs, till we seemed to be on the track of a defeated and retreating army. We had to work pretty hard, some retrieving the donkeys, which had taken advantage of the position, others helping the profane drivers to tie the loads on again.

Crossing the Phung Chu by an unusually good bridge, we were just in time to receive the full benefit of a furious gale of sleet, which lashed us unmercifully all the way to the snow-covered camping-ground of Pangle. It mattered little ; the porters were in splendid form, now that the temptations of cities were behind them.

We were now marching due south straight for Mount Everest. In front rose the Pang La, about 17,000 feet high, from which we hoped on the morrow to have a good view. To that end the big telescope was unpacked and assembled as quickly as frozen fingers would permit. An early start would have to be made, for there was a good deal of new snow about.

We were toiling up the slopes to the pass by 6 a.m. next day, but never got the view, clouds hiding everything to the south ; so

we descended without delay to that charming spot, Tashidzom. The valley here may be said to be an eastern continuation of the Rongbuk gorge. Most of the water in the river flowing past had issued from the Rongbuk glacier. Tashidzom boasts a delightful grove of willow trees, carefully maintained and well watered, standing among green meadows where we camped. The "Squire" of the place has obligations towards the Rongbuk monastery, which he supplies with wood and stores. He undertook to look after our ponies, which would be sent down the moment we reached Rongbuk; here, even at this early date, a certain amount of grazing could be had, and the large Tibetan pulse. Birnie, Shebbeare and I had a look at the old gentleman's own stables, and came to the conclusion that the ponies would do very well there, better than at Chö-Dzong, which is farther up the valley.

There remained only three more marches to the Base Camp. Mount Everest could not be seen, but we felt that it was very close, and that we were entering the battle-zone. During this long period of marching a close eye had been kept upon condition and form. So far we had been lucky, for there had not as yet been a single case of serious illness—just minor ailments such as sore throat and slight stomach troubles. None of the dreaded dysentery which saps a man's strength and is so hard to throw off.

Form was a different matter. No amount of organisation or thought will make a party acclimatise at a uniform rate. Our experience conformed in many respects to that of 1924. Those who had been recently in the Himalaya—Smythe, Greene, Birnie, Shipton, Wood-Johnson and I—were sufficiently acclimatised to feel no distress on the passes. Boustead, of lean and active build, and Wyn Harris, who had been to over 17,000 feet in Kenya, were shaping well. Wager, toughened by two seasons in Greenland, showed no particular signs of wear and tear. Crawford, though he had kept himself in training, both in the Alps and in the Canadian Rockies, had not been in the Himalaya since 1922, and was not, at this stage, at his best. Longland and Brocklebank also gave cause for



PLATE 15.—Dzongpen of Shekar Dzong.

anxiety ; they were clearly feeling the altitude. McLean was difficult to gauge, as he was riding most of his marches, but he seemed fit. On the other hand, Shebbeare, though tough as always, was walking too much, we thought, and carrying too heavy a rucksack, and he looked a little fine-drawn.

As for the porters, one had only to go round the camp of an evening to see that there was not much the matter with them. Away from the worries of civilisation, their pay and maintenance secure for months ahead, they were a happy, care-free crowd. To-morrow could look after itself. For all that, they were proud to be members of the expedition, and anxious to prove themselves mountaineers. The Sherpa does not come to Everest merely for what he can get out of it. He could earn as much money elsewhere. If you asked him why he came, he might prevaricate, or pass it off with an embarrassed laugh. Pride of achievement, or carrying through a dangerous job, or sheer love of the great mountains—and he now knows all about Everest's pride of place—or escape from the monotony of civilisation? He may not be able to explain, or may not wish to, but he is of nomad stock. He knows, too, that the Englishmen who have come from so far have exactly the same feeling as himself. That is why he gets on so well with them from the very start, even with those who can hardly speak one word of his language. He understands them without the need of speech. How else can you explain his readiness to risk his life in company with men whom he has never seen before, and may never see again?

The composition of parties for work on the mountain was, of design, kept open till a late hour. This involved a certain amount of strain on individuals, but it would have been, for instance, unwise to tell A and B, at Kalimpong, "You two will climb together"; or to tell C and D, "You two will establish Camp IV." But here, at Tashidzom, some estimate of individual progress was possible, and a provisional allocation of duties could be made. Smythe and Shipton were evidently in splendid form. They had climbed together on Kamet, and knew each other's capacity, speed and rhythm. They became

our "best bet" for the summit. Again, Wager and Longland had climbed much together. Wager's special qualities were steadiness, sound mountaineering methods and judgment; Longland's, a strong instinct for attack and a splendid rock-climbing technique. If Longland could acclimatise well during the next three weeks, this should make a very strong climbing party. Wyn Harris and Greene should also do well in double harness. Both were experienced mountaineers, and possessed the right temperament for the game. Others expected to go high were Wood-Johnson, Birnie and Boustead. They had Himalayan experience, but had never climbed together. Whether they took part in the final assaults or not, there was plenty of work for them: the establishment of the higher camps, for instance. At least one climber would be needed to escort the porters down if Camp VI were carried nearer to the summit than before, for on this part of the mountain it is unsafe to let them go alone. Meanwhile, Wood-Johnson could carry on as second transport officer; and Birnie made the welfare of the porters and their selection for the hardest work his special care.

A decision about Crawford and Brocklebank could wait on events. Both were thought to be slow acclimatisers. Crawford was the most experienced mountaineer of us all, spoke Nepali well, was liked by the porters, and was the only man in the party with knowledge of the North Col. Brocklebank, the youngest, should be brought along slowly, and not allowed to get ahead of his acclimatisation. His medical report had been a particularly good one, and he had given many proofs of staying power. A strong reserve was needed, in case of a breakdown or casualties among the first parties. His one idea was to be of service, and he never departed from it, now or later.

McLean's duties were expected to be primarily medical. He would be responsible for the health of the Base Camp and the glacier camps while Greene was on the mountain; but he might be called upon as a climber, should need arise.

Content with our tactical plan of assault, and with the provisional arrangement of parties, we marched up the wide

valley to Chö-Dzong on April 15th. Norton had warned me to look out on the way for a sight of the mountain up a valley to the south, but there were heavy clouds in that direction during the march, so we crossed the boulder-strewn bed of the river to our very exposed camp site without delay. That evening, several of us climbed up the hill to the north, carrying the naval telescope, and were rewarded by a magnificent view of Mount Everest now hardly more than twenty miles away as the crow flies. In spite of the recent cloudy weather, the north face carried little snow, and with the telescope we could see, in some detail, the ledges along which Norton and Somervell had traversed and the north-east arête which still held Mallory's and Irvine's secret. One thing was obvious : the second step was a formidable obstacle. Every mountaineer knows that you cannot judge rock accurately until you actually, as the late Captain Farrar used to say, "rub your nose on it." Nevertheless, the angle of the second step was certainly very severe ; the step rose more than a hundred feet above the north-east arête, overhanging slightly towards the top. Careful examination revealed signs of a fault in the rock about halfway up, which might permit of a turning movement on the right, and a steep snow slope seemed to lead up to an equivalent height on the other side. If this snow were in good condition, it might provide a means of avoiding the rock altogether and of reaching the arête again beyond, and to the west of, the second step ; after this the route to the summit would lie well above the worst part of the north face.

Norton's route, under the first and second steps and across the great couloir east of the final pyramid, looked remarkably difficult ; but we were looking at it frontally and thus could not estimate the true angle. The final pyramid, though by no means easy, seemed practicable. The problem was to reach it across the frightful slabs of the couloir walls.

Darkness began to fall as long clouds drifted across the summit. We descended to camp in a mood of qualified optimism. At least we had been able, for the first time, to see for ourselves, to form a judgment of our own, and from a

distance which allowed of a fairly true perspective. Henceforward we should be too much under the mountain to estimate our difficulties with any accuracy.

Excitement promoted early rising on the 16th. Only fourteen miles to Rongbuk monastery. Soon we were passing along the shelves of what looked like gigantic moraines but which Wager defined as river terraces. The valley narrowed as the hills closed in; and a powerful south wind drove into our faces. Grass disappeared. Boulder and scree, snow, blue ice and precipice would be our scenery for the next three months. As we turned into the Rongbuk valley proper, with its appearance of complete desolation, Tibetan men and women met us in considerable numbers. They were descending from worship or from the performance of more mundane duties at the Rongbuk monastery. The approach was dramatic. At one moment we were walking up the rough, snow-covered track, in a valley which seemed to lead to nowhere in particular. At the next, a last corner was turned and there was the monastery, with its great chorten; beyond, the wind-torn but still impenetrable mists behind which, we knew, was Mount Everest.

Rongbuk must be one of the highest permanently inhabited places in the world. It stands at well over 16,000 feet and is occupied, summer and winter, by more than 300 monks, whose maintenance must seriously tax the resources of the surrounding country. Still farther up the valley, along the steep-sided moraine shelves from which the place obtains its name, are a nunnery and some primitive cells where hermits pass a life of meditation in circumstances of hardship which baffle the imagination. It is sacred ground, and tradition has it that animals and birds have found sanctuary here for centuries past.

The head Lama of the Rongbuk monastery is a man of great influence and reputation; and his blessing is eagerly sought, not only by the Tibetans of this region, but also by the Sherpas of Sola Khombu, four marches away over the Nangpa La, in Nepal. It was important to secure this for our men.

Karma Paul, radiating Buddhistic fervour, hastened off to crave audience, while we pitched camp in a howling wind which blew straight off the snows. The expedition arrived in good health, but that wind found us out. In the afternoon the mists were driven off, and Mount Everest, sixteen miles away, stood forth in compelling majesty. Climbers and porters crowded round the big telescope, heedless of the gale. The result was a number of chills, some of which were to have more serious results, but for the moment all was animation and delight. Karma Paul returned full of cheer. He had arranged everything, and the great Lama would bless the expedition in the morning. We settled down with the feeling that all was well and the omens propitious. The ponies were taken away down to Tashidzom for their well-earned rest. The transport animals would see us right through to the Base Camp.

Our moment of arrival was fortunate. Till recently the old Lama had been in retreat, engaged in meditation and therefore unapproachable. He was now free again and, though sorrowing for the death of a beloved sister, was prepared to bless the men whom a strange madness had brought for the fourth time to Mount Everest. The porters were paraded in their best, and each man was given a rupee for an offering. Armed with a despatch-case, bandalasta ware, kincob brocade and scarves, we set off in close order for the monastery. The Lama awaited us upstairs, in a curious little shed with real glass windows. Glass is very rarely seen in Tibetan houses. He has a most attractive smile, and an air of great authority. One had only to observe the demeanour of his monks to realise that here was a man completely master in his own house. He asked if there were any members of previous expeditions, so Crawford and Shebbeare were introduced. Then he wanted to know—they always do—if I were related to General Bruce; also my age and status. He told me to be very careful and to allow no killing of animals or birds in the Rongbuk valley, and to treat his people well. Then he promised to pray for us.

After this, presents were exchanged, his consisting of various

foods, and the blessing ceremony began. Each of us advanced in turn, put his head in at a glass window and was touched with the dorje and blessed. The old gentleman asked us Europeans to recite the mystic words "Om mani padme hum" (Oh, the jewel in the lotus), and chuckled with delight when Smythe's pronunciation failed him. We fell completely under his charm. Then followed Karma Paul, the Gurkha N.C.O.s, the sardars and porters. It was an impressive little ceremony, perhaps less formal than the blessing at Darjeeling, but sincere and evidently regarded as a great privilege by men already in the shadow of danger and privation. Afterwards the Lama consented pleasantly to come out into the open and be photographed. For all his dignity, he is very human and a good friend.

The expedition now set out in high spirits for the last four miles to the Base Camp. The weather was perfect. Clambering over the debris of the old moraines, past the nunnery and the hermits' cells, we crossed the ice of a frozen lake and camped at the foot of a terminal moraine, the same place as had been selected by our predecessors. Perhaps a mile to the south was the snout of the main Rongbuk glacier; above, on the left, the shelf along which we must proceed to Camp I, in the side valley to the east. The mountain, though still twelve miles away, looked enormous, completely dwarfing the North Peak, which is 24,730 feet high.

By this time the men were well drilled in their duties. After a quick survey of the ground, they had the tents up like magic, the mess tent and Whympers for the climbers, bell tents and Meades for the rest. Tencheddar spread a great black yurt for his kitchen and stacked the firewood and yak-dung within easy reach, while the Tibetans built sangars (stone shelters). The boxes were quickly arranged in ordered rows. Then the baggage animals and drivers, with the unsolicited assistance of Police-ic, were off down the valley, leaving us to ourselves. It was Easter Monday, April 17th. The long march was over.

CHAPTER V

THE LOWER CAMPS

A certain feeling of optimism was in the air. The weather looked good, the mountain almost free from snow. The Base Camp had been established twelve days earlier than in 1924. The party seemed fit and well, apart from throat trouble. But optimism appears to have but a short life on Everest. Though all hands got to work with enthusiasm, it was soon apparent that some would have to go on the sick list. Crawford was looking wretched, in spite of his protestations. He was suffering from bronchitis, aggravated by oxygen-lack. Wyn Harris's temperature began to rise alarmingly. His illness was diagnosed as influenza, an abominable thing to get at this altitude ; and he was packed off to bed. Wager had diarrhœa, the result perhaps of that cold wind at Rongbuk ; and Thompson's heart was suspect. However, we could not expect a permanently clean bill of health, and the invalids were determined to get well without delay. It was quite impossible to persuade them to rest. Wyn Harris, for example, toiled incessantly at accounts except when he was actually on the mountain ; and one has only to read Wager's " Observations " in the second part of this book to realise the immense amount of work he put in during the expedition. In his spare time he contrived to make some experiments in the combustion of kerosene in Primus stoves at high altitudes. Greene, himself a hard worker, found these so-called invalids a pretty handful.

According to plan, the glacier camps were to be established slowly. Each must be fully stocked before a further advance, so that, should bad weather arrive, it could be held. To allow for adequate acclimatisation of both porters and climbers, at least four days would be spent at each. The porters now came on to the ration strength, receiving an ample and carefully

thought-out diet, which they appreciated. To save them as much as possible for the work higher up, arrangements had been made with the Chonzay from Shekar Dzong to employ local Tibetan labour up to Camp II; and Nima Dorje had been sent on ahead from Shekar Dzong to Sola Khumbu to collect more Sherpas. Soon men and women began to assemble from distant villages. Whatever our own acclimatisation scheme, it was important to set them to work at once, as this was the ploughing season in Tibet and they were apt to slip away to their homes without notice given. It would do the climbers no harm to prospect the way, provided they returned for the night. So the first fatigue party, Shebbeare, Longland, Shipton, Birnie, Boustead, Wood-Johnson and Brocklebank, took a large number of porters and Tibetans to Camp I, 17,700 feet, on the 19th, and were back in time for tea. They reported that the old sangars of the 1922 and 1924 expeditions were still in position, and that the site was excellent; but that even yaks could not have made the journey, as a landslide at the corner of the side valley had broken through the great shelf above the glacier.

Meanwhile Smythe and I had a great field day with stores. Greene was busy laying out sanitary lines, and both he and McLean attended to the invalids.

In the evening we perched the big telescope on the old moraine heap behind and south of the Base Camp, and examined the mountain in detail. It may be useful here to give a fairly full description of its features.

The summit of Mount Everest, 29,002 feet, looked at from the north is a triangular pyramid, resting on the western end of the structure. From this, a great arête or ridge runs down to the north-west at a considerable angle. It is perhaps not completely unclimbable, but Mallory examined it in 1921 and formed the opinion that, if an easier way existed, it would be preferable. The ridge is exposed to the west wind, and great difficulty would be experienced in getting porters and camps up it.

To the north-east descends a still longer arête, falling at a



PLATE 16.—Rongbuk Monastery. Mount Everest in background.

much easier angle for a distance of about two-thirds of a mile to a shoulder, beyond which it drops steeply to the Rapiu La on the east. On this arête, between the summit and the shoulder, are the first and second steps to which reference has so often been made. They are formed by the ends of two horizontal bands of a dark-grey limestone rock, which run westwards across the face of the mountain and constitute the chief climbing difficulty.

Just below the shoulder, a blunt ridge descends to the north, at an average angle of between 35 and 40 degrees, to the Chang La or North Col, a narrow neck of ice connecting Mount Everest with the North Peak.

Near the upper, western end of the north-east arête, at the eastern foot of the final pyramid, is a great snow couloir or gully. This is crossed high up by the two dark bands of rock above mentioned. At this point they are still continuous and precipitous; but slightly to the west, where they emerge on to the north face of the pyramid, they are a little broken, and it is here only that followers of Norton's route, after traversing a few hundred feet below the crest of the north-east arête and below the two steps, and after crossing the great couloir, may hope to storm the defences and ascend towards the summit. Mallory preferred to take to the crest of the north-east arête and pursue it westwards, whatever the difficulties of the steps. Many mountaineers prefer the crest of a ridge to the traverse of a mountain face; but circumstances alter cases, and it may well be that the second step, in particular, is utterly unclimbable. Could it be climbed or turned, the ridge beyond it, and the final pyramid, do not look too difficult. That the arête is for the most part very narrow was shown by a photograph which Air-Commodore P. F. M. Fellowes, leader of the Houston Mount Everest flight, most kindly sent me. I should like to add here that the members of that expedition co-operated with us in so generous a spirit that it was a particular pleasure to congratulate them on the brilliant success of their brave exploit.

The north face of the mountain, of which the top edge is

the north-east arête, is composed of a series of highly altered limestones, mostly of a grey colour. The strata dip northwards at an angle of, for the most part, 35 degrees, but just below the lower of the two dark bands there is a stratum of yellowish limestone, about 1,000 feet thick, which forms a very marked feature. This is a good deal steeper than anything except the dark bands, but is fortunately composed of a rougher kind of rock weathered into narrow ledges and offering better support to the feet.

The general outward, downward dip of the strata produces an effect like the tiles on a steep roof, with the result that handholds and belays are practically non-existent, and careful, balanced climbing is necessary. A slip is likely to have fatal results. The upper western wall of the great couloir will always be dangerous to negotiate, for the dip of the slabs increases here. When powder snow lies on them to any depth, they are impassable.

The eastern slopes of the North Col are formed by what is, in fact, a steeply falling glacier. This presents the first serious obstacle. The place looks, from the east, like an almost vertical wall of snow and ice, some 1,200 feet high, seamed by crevasses and broken into great ice-cliffs. As the glacier is continually on the move, these features change from year to year, and each expedition has been obliged to choose its own route of ascent. Below, the East Rongbuk glacier runs first east, then north, then west, on its way towards the main Rongbuk glacier and the Base Camp.

Such was the mountain we were now to tackle. But illness was first to cause further delay. Ondi, one of our strongest porters, went down with double-pneumonia, a disease serious enough at all times, but terribly so at the altitude of the Base Camp, 16,800 feet. He was promptly put to bed in a Meade tent, given a continuous oxygen supply, and watched all night by climbers and porters. Greene and McLean soon decided that this was not enough, and that if his life were to be saved he must be carried down to a lower altitude, in the Kharta valley, five marches away. It was a last hope, for his condition

was very serious. Poor Crawford, whose bronchitis also made a descent advisable, was detailed to take charge of a small body of Tibetan carriers. It was a bitter disappointment for him, but he rose to the occasion. Ondi was carried off one fine morning, giving a pathetic salute of the hand as he went, and McLean accompanied the party as far as Rongbuk.

The subsequent story of Ondi is worth recording, as an illustration of Sherpa spirit. When he left us, his life was despaired of. Just four weeks later, and against all orders, he turned up at the Base Camp, a heavy load on his back, and demanded work on the mountain. He is one of those rough characters, a sore trial to lovers of the quiet life, but a real thruster in time of storm and stress. Ondi is liable at any time to fall foul of the Darjeeling police. To us, he will always be the stout fellow who, scorning the ease of a convalescent camp, set an example of courage and devotion to duty. On the very day on which he collapsed he had carried a load to Camp I without complaint.

Thompson and Smijth-Windham were putting in a terrific amount of work on their wireless equipment. It was all new to them, and much of it could not be unpacked on the march. They set up two wireless masts and a wind generator, assembled with much profanity their petrol engine, and fitted up a "wireless room" in a tent, complete with receiver, transmitter, Creed machine, and all necessary tools. They were ready for action on the very day which they had promised, April 20th, but had to wait some time, in a state of incandescence, before Darjeeling picked them up. At the moment when contact was actually made, Smijth-Windham was on his way to prospect for a new site less screened by high ridges, and had to be recalled by signal.

To Havildar-Major Gaggan Singh, the senior Gurkha non-commissioned officer, fell the humdrum but responsible task of looking after the money-chests at the Base Camp. Karma Paul stayed with him, having plenty to do with the daily routine of the camp, arranging with the Chonzay for supplies of firewood, meat, eggs and potatoes, and forwarding

mails as they arrived up or down the line. Lachman Singh and Bahadur Gurung were employed in establishing and running the glacier camps, where their steadiness, capacity and tact with the porters were of untold value.

Camp I was in full occupation by April 21st, when Smythe, Shipton, Longland, Birnie, Boustead and Wood-Johnson slept there for the first time. The weather showed signs of deterioration, but we were determined not to be driven into a policy of haste. It would be illogical to vary our scheme of acclimatisation. To outrun it would simply mean reverses later on. If really bad weather set in, we must ride it out, in whichever camp we happened to be. Excessive strain at this stage could only detract from condition higher up.

Greene, Brocklebank and I got away from the Base Camp on the 23rd, leaving Shebbeare, McLean, Wager and Wyn Harris. Wager was still worried by his complaint, but said it did not affect his going. Wyn Harris was making a remarkable recovery, though still weak.

Camp I is at a delightful spot about half a mile up the eastern valley, and four hundred yards from the snout of the East Rongbuk glacier. It is sunny, and not greatly exposed to wind; and both we and the porters always liked it, almost wishing we could stay instead of pushing on to the stark wastes beyond. The approach to it is very fine. From the corner where the valley meets the main Rongbuk glacier, one sees across miles of blue seracs the great cirque west of Mount Everest, from which Pumori stands up alone, ivory-coloured, like a tooth of some gigantic tiger. Everest itself is hidden from view by a shoulder of the mountain group which culminates in the North Peak. Eastward lies the rounded, boulder-strewn tongue of the East Rongbuk glacier, grim foreground to the fluted loveliness of the peak beyond; and the northern wall of the valley is a series of red, perpendicular spires, reminiscent of the Dolomites.

The contemplation of such scenery tends to ease the first strain of life at these altitudes. Some relief is needed, for the adaptation of body and mind to changes of this sort is not

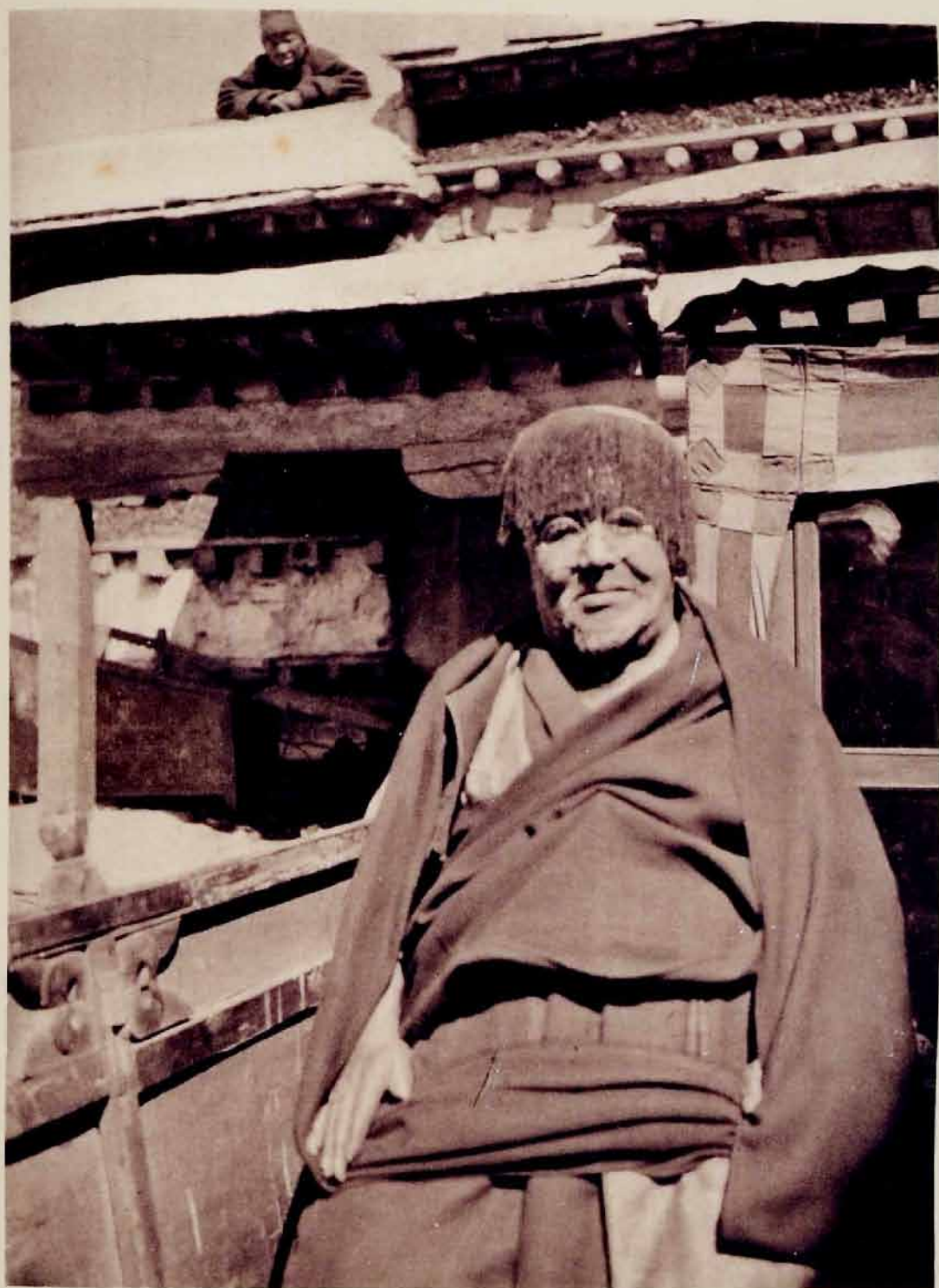


PLATE 17.—The Head Lama, Rongbuk Monastery.

achieved easily, however slow the process. Fatigue and oxygen-lack produce inevitable reactions—a critical spirit, assertion in place of discussion, an impatience of compromise ; and little differences of outlook assume an exaggerated importance. For the adjustment of all this, there was nothing like an off morning in the sun at Camp I ; perhaps the rarity of such an occasion made it the more welcome and beneficial.

The sangars of the 1922 and 1924 expeditions required but little repair. Covered with the outer flies of the Whymper tents, they gave admirable shelter to the Tibetans, who were, however, perfectly content to sit out all night, at over 17,000 feet, behind a large stone. For our part, we had arctics as well as Whympers here.

I do not think that we should have gained much from an earlier arrival, for progress beyond Camp I is difficult enough even in the last week of April. A way has to be found along and between the tumbled moraines of the East Rongbuk glacier, where snowdrifts are a hindrance to laden porters. The hot sun was now doing its best, but Smythe, Wood-Johnson and Boustead, who went up to prospect on the 23rd, reported heavy going. Moraines are anything but a pleasant promenade when deep snow lies between the boulders. However, a trail was gradually being stamped out. It was improved by a second reconnaissance on the 25th, when the old site of Camp II was found and cairns were put up along the tangled moraines, to mark the best way. In perfect weather, Smythe, Shipton, Wood-Johnson and Boustead established Camp II on the 26th, and were followed by Greene, Birnie, Longland, Brocklebank and me on the 27th. Bahadur Gurung was left behind to run Camp I, and accepted his charge in the best spirit. The way up provides something rather special in the way of boulder-hopping. This, and the increasing altitude, told rather heavily on one or two of the party, but it was refreshing to arrive among the lowest of the great seracs or ice pinnacles which are such a feature of this glacier, and then to turn a corner and see Everest again with its long cloud-banner streaming away to the south-east. Close to camp we met some of the Tibetans

descending. They were in the highest good humour, quite unfatigued and delighted to share a few biscuits and sweets with us. Sardines they shied at, but fought for the tins and secreted them about their persons, regardless of the oil.

Camp II lies at a height of about 19,800 feet on the western edge of the East Rongbuk glacier. During the day it is a pleasant place, for it receives plenty of sun and is protected from wind by high ridges of ice descending from a glacier on the west, and by the great seracs of the East Rongbuk. But there is a tremendous fall of temperature when the sun sinks behind the North Peak, and "early to bed" is a good motto. Fifty degrees of frost were our portion on the first night in the camp.

This is an important nerve-centre in the lines of communication, and the best headquarters for the chief transport officer, once the Base Camp has been fully organised. Here the regular porter corps finally takes over from the local labour for the more difficult carries to Camp III and above. Accommodation is needed for at least forty men. Stores have to be very carefully sorted, and placed in charge of a picked man, who will forward them as occasion arises. Lachman Singh, our second N.C.O., did this work to perfection.

From now on, the character of the going changes completely. The seracs of the East Rongbuk glacier extend well below Camp II, but there they are flanked by great moraines which offer a rough but sufficiently obvious highway. The last of these moraines is followed to reach the camp. Above that is a tumbled sea of ice, the tops of the waves being represented by seracs varying in height from fifty to a hundred feet. Farther advance would present great difficulties but for the remarkable phenomenon of two troughs which descend from the upper reaches of the glacier. Once these troughs are reached, they provide an easy and incredibly beautiful path for a distance of over a mile, rising steadily to the level of the upper glacier. The problem is to find a safe way across to them, among seracs and crevasses, and to descend their steep-cut, icy sides. This is best solved by scrambling some distance

up the mountain-side behind Camp II, which is composed of abominably loose rock. From here the glacier appears laid out like a chess-board, and the best route can be selected.

Fine weather does not seem to last long in this region. A disturbance approaching from the west covered the glacier in fresh snow, masking the crevasses and rendering progress slow and toilsome. Wading knee-deep in snow at this altitude is not a form of exercise to be recommended.

Perched nearly 2,000 feet up the hillside, Shipton and I, on the 28th, watched Smythe, Boustead and Wood-Johnson set out. They had already reconnoitred from above. The sky was overcast, a bitter wind was blowing snow off the peaks; but we could see the upper glacier and the Rapiu La to the south, and the great cloud-banner flying from Everest. Far below, the three little figures appeared to move incredibly slowly. Passing out of sight behind some enormous ice-pinnacles, they reappeared in the first trough, walked up this for a few hundred yards, found a way through more pinnacles, and emerged on to the open face of the glacier. Here they had to cross at right angles, due east, to reach the medial trough. They were obviously bothered by the masked crevasses, easy enough to see from our point of vantage but not so obvious to the man on the spot. However, Smythe took a very good line and we saw the party descend into the medial trough. A beginning had been made. Red flags were planted in the snow to mark dangerous crevasses, and eventually an ingenious contrivance of packing-case boards, made by Shebbeare, bridged the widest of them. Once the surface-covering of snow was melted and the trail well stamped, porters could easily negotiate this route unescorted and even unroped. They were supplied with crampons to enable them to walk in comfort on the hard ice.

The sole disadvantage of these glacier troughs is the presence of stagnant air which induces an extraordinary and devitalising lassitude, by no means unknown in the Alps. You may be going well on the open glacier and congratulating yourself on your fitness. Five minutes later, in the trough, you can hardly

place one foot in front of the other, and discover a marvellous appreciation of the ice scenery, which is of course best observed from a seat on some convenient stone. On comparing notes we think that there was, perhaps, less trouble from this source among us than on previous expeditions ; possibly acclimatisation helped, or there was more wind to disperse the stagnant air. But the phenomenon existed. Better going could be found on the open glacier, along the edge of the medial trough, when snow had fallen, melted and re-frozen on the hard, slippery ice, and a good trail could be made. Lachman Singh had a genius for working out routes on his own account.

Photography can give no true picture of the ice scenery of the East Rongbuk glacier. It can but show the outlines and mass of the pinnacles, not their gradations of blue, green and grey, and their transparent loveliness. Would that some great painter could accompany us to Everest. The least imaginative of mountaineers must feel, as he watches his companions winding in and out among the great ice-towers, that he is in an enchanted land where things undreamt of in his philosophy may occur at any moment. All is silence, save for the murmur of some little glacier stream wandering over the gleaming ice, and the occasional creak of a serac.

The transport problem was giving anxiety. No one had turned up from Sola Khombu ; indeed, a message from Nima Dorje stated that a heavy fall of snow had closed the passes and that he had not even been able to get over into Nepal. Our local Tibetans gradually dwindled as the ploughing season of the country demanded their presence at home. Our own porters responded nobly to the call. So far they had been very lightly laden, and brought up the glacier as slowly as the climbers. There is not much amusement to be had in Everest camps except the sport of gambling, and they seemed positively to welcome an invitation to work. Parties were formed, and each party carried loads two days running and rested on the third, subject, of course, to the vagaries of the weather. Our ambition was to stock Camp III so completely that we should be practically independent of the Base Camp and able to victual



PLATE 18.—The Base Camp in April.

the higher camps as required with a minimum of delay. In furtherance of this plan, the route from the Base Camp to Camp II became a scene of intense activity.

Meanwhile the climbers were prospecting the way to Camp III, much hindered by afternoon storms. The mornings were usually fine, and a party would make excellent progress up to the head of the trough. They would then emerge on to the open upper glacier, to be instantly pounced upon by wind and snow. Three such reconnaissances were turned back, and it was not till May 2nd that Smythe, Shipton, Birnie, Longland, Boustead and Wood-Johnson, with a strong body of porters, were able to force their way up the glacier and definitely establish Camp III on the old site under the eastern shoulder of the North Peak, at a little over 21,000 feet. They pitched an arctic tent, a bell tent and some Meades, retained a few porters to help to run the camp, and sent the rest down at once. It had been a rough afternoon, and I noticed that the men seemed tired on their return. They could be rested now, for Camp III had four days' supplies in hand.

Meanwhile Wyn Harris and Wager came up to Camp II, after duly spending four days at Camp I according to their bond. The former seemed to have forgotten that such a thing as influenza existed, and the latter evidently considered any reference to his complaint as slightly indelicate. Shebbeare joined us on the 3rd, almost speechless with pharyngitis and, as usual, carrying too heavy a rucksack; and McLean arrived on the 4th with news that Ondi was out of danger and that Crawford had come up to Camp I from the Kharta valley, much better but unlikely to go high. There was still no more news from Nima Dorje.

Heavy snow had fallen on the glacier. The most one could do was to ask Greene, Wager and Brocklebank to remake the trail between the two troughs, a heavy, exhausting job.

On the evening of the 4th Wood-Johnson tramped in cheerfully from Camp III, accompanied by the stolid old Nima Tendrup. For much of the distance they had been up to their knees in snow, but they were in high spirits. At this period

Wood-Johnson was going extraordinarily well, and was working like a Trojan in his capacity as second transport officer. Everything pointed to his going high when the time came. He brought news of various requirements to make Camp III a home from home, and reported that Smythe, Shipton and Boustead had already been about one third of the way up the North Col slopes. A letter from Smythe described these slopes in some detail. They had evidently changed very much since 1924, and Smythe thought we were in for a pretty difficult bit of mountaineering, of somewhere near the standard of the Col de la Brenva.

It was now time to make Camp III justify its existence as an advanced base. A cold wind was blowing on the morning of May 5th, but Greene, Wood-Johnson, Brocklebank and I started with forty-five porters now well rested and full of zeal. Among the loads were two more arctic tents. Wyn Harris and Wager had yet another day's acclimatisation to put in at Camp II, according to my calculations if not to theirs. The trail across the glacier was a great help, but there was much new snow in the medial trough, and Greene and Wood-Johnson had a heavy task breaking out at the head on to the open glacier. Here the wind and flying snow were, to say the least of it, disconcerting. The porters, a little tired from ploughing through the drifts of the trough, hesitated. It was a moment when the "old soldier" may try to sound the retreat. One or two did so. Fortunately Brocklebank noticed this; a few words indicative of pained surprise, a call to the younger men that this was all in the day's work, and they leapt into the lead. The moment of hesitation was over. Greene, Wood-Johnson and Brocklebank went on to keep the leading porters in action, while I whipped in (only metaphorically speaking) the "old soldiers" and the few new hands who were beginning to feel the altitude. Brocklebank dropped back to help as the blunt corner of the North Peak was reached, and the men rallied for a spurt into camp. Tired as they were, at 21,000 feet, they burst into breathless snatches of song as the shining wall of the North Col and the long slopes of the north arête rose into view.

All thought of retreat had vanished. They had won through, and were proud to be there.

New scenery and new conditions are observed at Camp III. Hitherto the North Peak has masked all but the upper reaches of Mount Everest, throwing out a long buttress which keeps the secret of the remainder till almost the last moment of approach up the seemingly endless though easy slopes of the glacier. The transition is perhaps more abrupt than would be expected from the map, probably because most men come up those last slopes with heads down and senses dulled by altitude. Then, suddenly, they find themselves looking steeply up at the huge north-east shoulder, 6,000 feet of striated slab and avalanche-swept couloir, beyond which, on the right, is a white rock-strewn cone flying a long pennant of cloud and snow far across Nepal. It is the summit. The foot of that shoulder is only a mile away. At long last, Mount Everest is tangible, no longer the fabric of dreams and visions.

Men only a short distance away look incredibly small on the broad expanse of the glacier. The Lhakpa La, over which Mallory and his companions came to discovery in 1921, looks down from the left. In front a long, fluted, narrow arête falls from the north-east shoulder to the Rapiu La, beyond which are Makalu and Chomo Lönzo. To the right the north ridge, hiding the north face, drops to 23,000 feet at the North Col, from which another ridge springs steeply to the North Peak and sweeps grandly round to the buttress under which Camp III stands huddled among the moraine boulders; one of the bleakest places in the world, the sport of gale and blizzard, but our headquarters for nearly two months.

It takes some time to adjust one's sense of scale. The summit of Mount Everest, 8,000 feet above, looks quite near. Only careful inspection with a telescope reveals that that apparent patch of fine scree, at the foot of the final pyramid, consists in reality of boulders some fifteen feet high. But the North Col, a mile and a half away, looks substantial enough, and we know that its crest rises nearly 2,000 feet above us. It is the first serious mountain problem, matter for anxious dis-

cussion since the expedition started ; for a steep glacier ice-fall is always on the move, and the negotiable route of one year may be seamed by crevasses or barred by ice-cliffs the next. Danger is always present. In 1921 the snow on a traverse near the Col peeled off the ice after Mallory's party had crossed it. In 1922, on the fatal day of June 7th, an avalanche carried away both climbers and porters and killed seven men. In 1924, safety was only secured by a sensational détour to the right, or north, involving the ascent of an almost vertical ice-chimney.

Clearly we must work out a route for ourselves, as a comparison of the photographs taken by previous expeditions with what we now see shows that the slopes have changed considerably. In place of the 1924 route there is a shining slope of ice, at the foot of which are the tumbled debris of many an avalanche. It would take weeks to cut steps up this slope, and climbers would be in constant danger from the overhanging masses above. To the south, a whole series of ice-cliffs rise one above the other—clean-cut precipices or great bulges which no human being could surmount. The only way seems to lie in the general direction of the 1922 ascent ; the details have altered, but the risk of avalanche remains and must simply be faced. About one third of the way up, a great crevasse splits the face horizontally. This will at least protect parties working on the lower section, by engulfing avalanches falling from above. Unless it is well bridged by snow it will be difficult to cross ; and the approach to it is obviously steep. Beyond, the slopes ease off a little but soon steepen again, by way of a winter avalanche cone, towards an ice-cliff which must be taken by frontal assault, for there is no way round it. Fortunately the cone touches this wall at its lowest point, but the very existence of the cone shows that there is a shallow funnel for avalanches from above. The wall itself is at least forty feet high and appears vertical. Can any mountaineer cut steps up it, at an altitude of 22,500 feet ? Above, slopes at a considerable angle lead up to what looks like a little shelf under an ice-cliff, some 200 feet below the crest and 200 yards

to the north of the Col itself. Can this be the shelf used by the 1922 and 1924 expeditions for Camp IV, now carried down 200 feet by slow glacier movement? Other shelf there is none.

One thing is clear : we have no alternative. A way must be forced up this route, and a certain amount of risk is all in the game. We have plenty of ice-craft in the party, sufficient to overcome the physical difficulties of ascent. For the rest, we must rely upon our combined experience to judge where and when the snow is safe. Ascent is generally more dangerous than descent. A party descending can, like the Bavarians on Kangchenjunga, send on ahead a man or two, securely held on the rope from above, to stamp about and deliberately cause bad snow to avalanche, and then follow, cutting steps downwards in the avalanche track. This will be less easy on the wide face of the North Col than on the narrow Kangchenjunga arêtes, for more weight will be required to start an avalanche. But it can be done.

The general angle of the slopes is sufficiently steep to require step-cutting nearly all the way ; and to secure the safety of laden porters it will be necessary to fix ropes from a point about 200 feet above the level glacier up to the great crevasse, and again from the foot of the avalanche cone right up to the crest. On the ice-wall itself, one of the three rope ladders presented to the expedition by the Yorkshire Ramblers' Club will be used.

If we fail to make this ascent, much time will be lost. We shall be obliged to evacuate Camps II and IV and go back to Camp I, ascend the main Rongbuk glacier to its head and attempt to reach the North Col from the west. Mallory's refusal of this route in 1921 is a sufficient indication of its difficulty. It is considerably longer and steeper than the eastern side, and is much exposed to wind and to stone-fall.

The work of establishing Camp IV would obviously take a lighter toll of the party if it could be shared. We now had plenty of man-power, for Wyn Harris and Wager, after an impatient rest at Camp II, fought their way through a gale

to Camp III on the 6th, making our number up to eleven. Working parties were therefore organised on the principle that each member should lead and cut steps for about twenty minutes at a stretch, while his companions drove in stakes and fixed ropes. To save time and energy, an arctic tent and some Meades were to be pushed up to the foot of the North Col, just out of reach of possible avalanches, to form Camp IIIa. The parties would occupy this camp till Camp IV was fully established. The sardar Nursang, though by no means in his first youth, was perfectly prepared to stay there as long as was necessary, to look after tents and equipment, and do all the cooking. He stuck it out, in bad conditions, from May 8th till June 4th.

There was a look of wind in the sky on the morning of May 7th. But the sun shone brightly as Smythe, Shipton, Birnie, Boustead, Longland and I set forth from Camp III to prospect a site for Camp IIIa and to examine the slopes above. The first part of the way lay over moraine boulders and presented no difficulty. The last half mile or so was over the ice at the head of the glacier, not very steep but terribly hard and glassy where the wind had stripped it of snow. Here I had reason to congratulate myself for having brought my crampons, which enabled me to walk with ease on a surface which exacted much careful, though not always successful, balancing from others. Shipton, in a pair of brand-new climbing boots, the nails of which bit well into the ice, was the least affected. But then I believe he could retain his balance on almost any surface, in any foot-gear.

We crossed a few narrow crevasses where soft snow had collected but made a very insecure bridge, and then the wind swept down upon us, apparently from all directions at once. You would at least expect protection from the great wall on the west, but the wind makes little of this. It rushes over the North Col and descends, accompanied by all the loose snow in the neighbourhood, vertically upon your head. Meanwhile other currents, sweeping up the East Rongbuk glacier and coasting along the flanks of the North Peak, drive fresh snow

horizontally across the ice, so that sometimes you see "men as trees walking," their legs completely hidden.

On a morning such as this very little could be done. The flying snow reduced visibility to a few yards, and the cold was intense. We marked a site for the camp and dumped there a load of rope and pitons brought up by Nima Tendrup, who remarked in the most casual manner that he might get frost-bite if we stayed much longer.

Up to now our portion had been fine weather in the early mornings, followed invariably by gales which lasted well into the night. From now on we frequently had bad weather in the mornings also; and throughout this part of the operations on the mountain my diary does not record one single day which remained fine throughout. It was just a question of degree. So long as the wind and snow were at all tolerable, and the condition of the slopes reasonably safe, the work was pushed on. One must expect a good deal of this sort of thing on any high mountain, and both climbers and porters accepted the conditions in a fine spirit; but I venture to think that they had more than a fair share of hardship.

The work was undertaken by Smythe, Shipton, Greene, Longland, Wyn Harris, Wager and Boustead. Some idea of the difficulties may be conveyed by the statement that the making of the route, up less than 1,000 feet of snow and ice to the ledge, took from May 8th till May 15th. Parties would set out in the early morning—fortunately the slopes face east and catch the rising sun—and cut steps and fix ropes for some hours. They would then be chased down by a rising gale and spend the rest of the day in the arctic tent, while the snow filled every step they had made. True, a good kick with a boot would remake these steps next morning, but it was all so much extra labour, and economy of effort was desirable at those altitudes. Moreover, the utmost attention had to be paid, each several day, to the condition of the snow. Wind-slab might form, or a current of warmer air from the south make the slopes alive with avalanches. Himalayan experience was valuable, for Alpine analogy does not always hold good. There is ever something

new to be learnt about snow. Perhaps winter Alpine conditions afford the nearest parallel to ours; even they are less complicated than the effects produced by our very cold nights (53 degrees of frost at Camp III), violent winds and strong sun. With the tragedy of 1922 in our minds, and working along almost the same route, we could afford to make no mistake.

Shipton, Smythe, Greene and Longland established Camp IIIa and made some progress towards the great crevasse on the 8th, but prudently turned on encountering bad snow. On the descent, Greene and Longland light-heartedly glissaded down the lower slopes. Greene's luck was out; he struck a patch of ice and strained a stomach muscle in the resultant tumble. A storm raged all through that night and continued on the 9th, preventing effective resumption of work, though Wyn Harris and Wager reached Camp IIIa. Nobody who has lived there loves the place; the conditions were too uniformly vile. Even the strong arctic tent at last failed to stand up to them, for during the particularly boisterous night of the 17th a sudden gust cracked one of the struts. Greene and Wager volunteered to effect a temporary repair which would prevent a complete collapse, and spent a hectic half-hour in the open. Two Meade tents were blown down, to the extreme discomfort of their occupants.

Though the majority of the party were keeping their form, the strain was telling. Longland was overworking himself; Brocklebank, still lacking acclimatisation, was obliged to leave Camp III for a rest at Camp II on the 8th, but he was back again on the 12th with Crawford, who had left Ondi convalescent in the Kharta valley and had defied McLean to keep him down at Camp I. Shebbeare at this time was not at all fit, and much of the transport work fell upon Wood-Johnson, who made a most gallant effort to conceal his growing illness from us. But a gastric ulcer cannot be long ignored, and Wood-Johnson's days at Camp III were already numbered.

Nothing could stop the advance party. Smythe and Shipton actually reached the ice ledge on the 12th, after Smythe had made a tremendous effort on the ice-wall, where

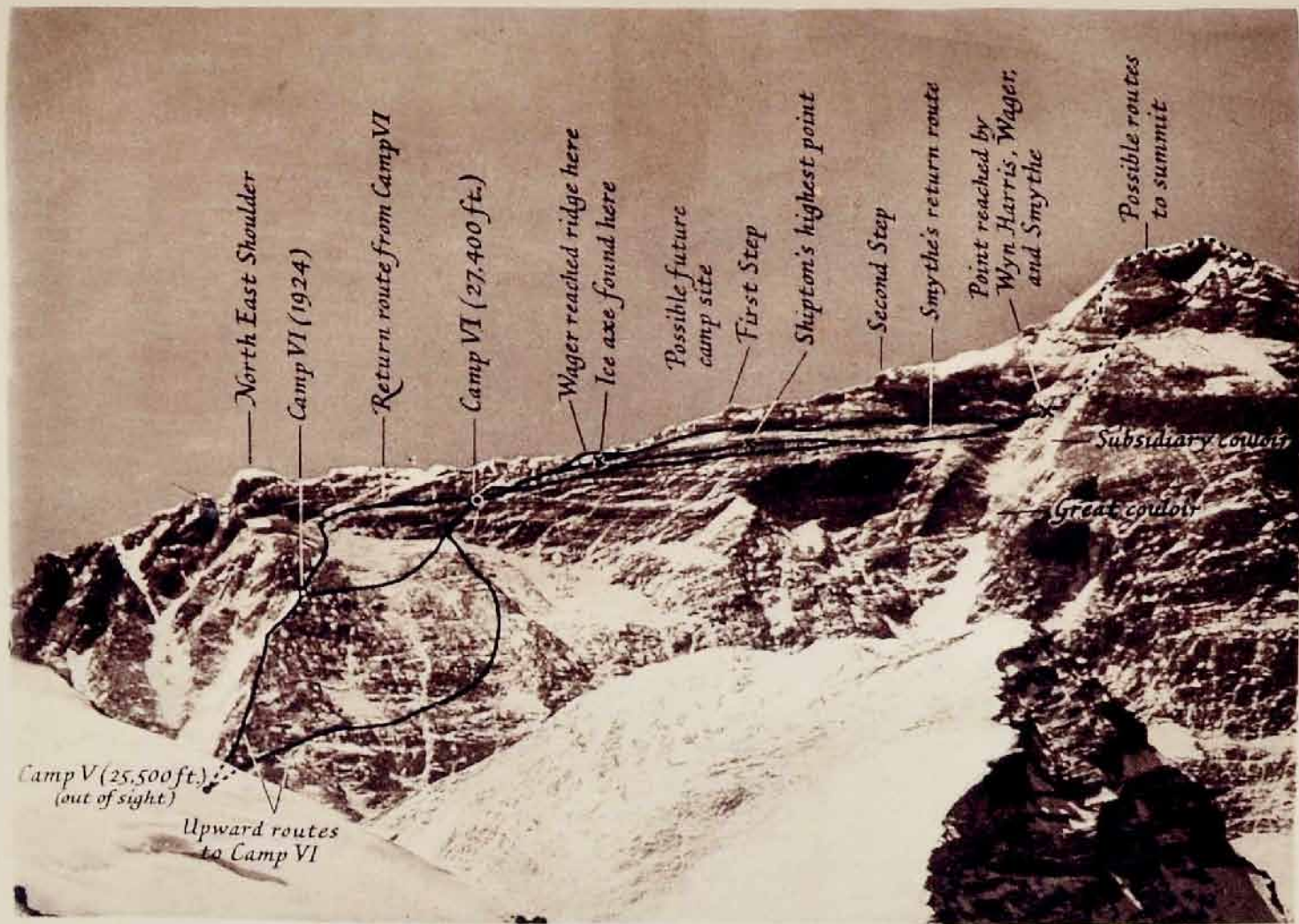


PLATE 19. —Telephoto from the Base Camp, taken by Capt. Noel in 1924; showing the North Face of Mount Everest and upper camps and routes adopted in 1933.

he put the experience gained with the Kangchenjunga expedition of 1930 to good use. The wall overhangs slightly in its lower section. Supported by Shipton with the head of an axe, he drove an ice-piton in as high up as he could reach, cut foot-and hand-holds in the hard ice, and contrived to get one foot on to the piton. It promptly slipped off, and he only just saved himself from falling backwards. Most of the cutting had to be done with the axe held in one hand while the other hand clung to a slippery hold—a form of exercise far from exhilarating at 22,500 feet. But he persevered, well backed up by Shipton, cut the remaining steps up the vertical section, and was at last able to hammer in a large steel piton at a point where the ice begins to slope back. The crucial passage was made. The rope ladder was hauled up and fixed to the piton next day by Longland and Wager. Smythe and Shipton cut steps up to the ice ledge and returned, letting themselves down the wall by a rope running round the piton. Altogether it was a fine effort of ice-craft, which evoked a sincere recognition. Bad weather alone prevented the establishment of Camp IV till the 15th, by which time Birnie had taken his little gang of fifteen specially selected porters up the glacier, ready for work.

Greene insisted upon my going down to Camp II on the 13th to see if milder temperatures would do something for my throat. There I had the immense satisfaction of seeing the much-maligned Nima Dorje come in, accompanied by forty-six splendid fellows from Sola Khombu. It was hard to realise that these were the kith and kin of our Sherpa porters, for they wore Tibetan dress, down to the thick-soled, woollen boots. They had come straight through from the Base Camp without a pause, superbly indifferent to altitude and the rough moraines. I have never seen a finer body of men. As to shelter for the night, anything would do. After a merry salute, and with no pause for rest, they fell to upon the moraine boulders, rolling them into position to make sangars. A few outer flies from Whymper tents were stretched overhead, and soon the smoke began to rise from the few sticks of firewood they had brought

up ; the tsampa was cooking in the pots ; song and laughter proceeded from every sangar, and the whack of the dice-box on its leathern pad, banged down by each successive man with a shout of optimistic import, showed that all was well and that Sola Khombu was thoroughly at home. Would they carry up to Camp III? Of course they would, and higher. Among them was Narbu Yishe, the "purana miles" (Urdu-Latin for old soldier) of 1924. He looked fit and strong, but his Falstaffian mode of life had told on even his constitution and, after a few carries, he faded away, as old soldiers should. These men solved the transport problem. We gave them what spare boots we could, though they were always ready to tackle the glacier in their anything but waterproof gear. They were a grand lot, impervious to cold and fatigue, and apparently unaffected by any superstitious dread of the mountain.

Smijth-Windham took advantage of their arrival to act upon his own account and bring up an advance wireless receiving and transmitting station at exactly the right time. Less welcome was a message he brought up from the Base Camp that the Alipore Observatory had reported signs of an approaching monsoon off the east coast of Ceylon on May 12th. We went up to Camp III together on the 16th, and found that Camp IV, at 22,800 feet, had been established by Smythe, Shipton, Wyn Harris, Birnie and Boustead the day before, leaving Greene, Wager and Longland in support at IIIa. Crawford and Brocklebank, both now recovered and acclimatising well, joined the latter.

Yet another storm put an end to all work till the 20th. This time, I thought that the arctic tent at Camp III really would go. The wind shook and tore at it, the struts creaked ominously, a guy rope pulled away from its retaining boulder. Still the tent, though sagging drunkenly to one side, stood its ground. Inside, we lay in our "flea-bags" and hoped for the best, listening to the crash of the stones wrenched by the gale from the ridges of the North Peak. A convenient trough of snow at the side of the camp prevented them from reaching us. The now empty Meades held their own, well

ballasted with stones. The porters were entirely unimpressed, and made merry in their bell tent. In the occasional lulls we could hear the roar of the Primus, and their never-ending talk. Not once did they fail to bring hot tea or soup at the right moment. There would come a yell outside, the tent opening would be hurriedly unlaced, and the faithful Tewang dragged bodily in, accompanied by about a ton of snow. Tewang was one of the Camp V men in 1924, and was keen to repeat his performance. But malaria claimed him at Yatung, and this year he never got beyond Camp IV. Efficient, completely reliable, and never idle, he performed every office from porter mess-man to nurse, in a manner beyond praise.

This sort of thing went on till the afternoon of the 19th. The great gale of the last few days was obviously due to a western disturbance, and we argued that with any luck at all we should get a few days' quiet weather before the onset of the monsoon, such as enabled the 1924 party to launch its assaults. Now came the disquieting news, passed on from the Base Camp to our wireless receiver at Camp III, that the monsoon was active in the Bay of Bengal. Still, I thought, the party at the North Col has now had nearly five days' acclimatisation there. This is just the time to establish the higher camps and go for the summit. The whole thing might be done in three days, though I would prefer a more leisurely advance. So far, there was reason for supposing that the climbers were capable of further acclimatisation, to be obtained by an unhurried establishment of Camp V, perhaps even of Camp VI. This would be infinitely preferable to rushing the mountain from the North Col.

The wind prevented a heavy deposit of snow on the North Col slopes, and what surface snow there was froze into immobility. A letter from Camp IV asked for full glacier rations, not the special high-altitude ration which, it had been supposed, was all that could be faced at 23,000 feet. As soon as the gale abated, Crawford and Brocklebank began their great series of six ascents and descents of the North Col slopes, revictualling

Camp IV and escorting porters. This hard work made the position of the higher party secure. It needed the remaking of the track and sound judgment of the condition of the snow from day to day, and the fact that it was carried through without a single accident reflects the greatest credit on both the skill and the energy of this pair.

All seemed well on the morning of the 20th. The wind had dropped during the night, and a warm sun and clear sky gave every promise that our chance had come. Everybody was on the move; Wood-Johnson and I prepared to go up to Camp IV; some active little dots near the foot of the Col were Greene, Wager, Longland, Crawford and Brocklebank already ascending; and movement could be seen on the ledge. This would be a party setting off to make Camp V. Action at last, and what a relief after the long storm-bound waiting.

At Camp III I soon observed with uneasiness that all was not well. Wood-Johnson, hitherto all fire and energy, seemed listless, even tired and unhappy. For some time past he had confessed to indigestion, but had made light of it. Now, after an hour or two's work, he proposed delaying our start till the afternoon. If he said that, there must be something seriously wrong. Neither Greene nor McLean was on the spot. It was finally decided that Smijth-Windham and I should spend the afternoon laying a telephone line to Camp IIIa, taking the third arctic tent with us; that the former should return the same evening, as he could not leave his wireless receiver for long; and that Wood-Johnson, if he felt better, should join me on the morrow for the ascent to Camp IV. Little did we think that poor Wood-Johnson's work on the mountain was finished, and that this strong, tremendously keen climber, on whom I had confidently counted to take part in the final assaults, was suffering from a gastric ulcer. He was game right through, and found his own way down the glacier to McLean and the Base Camp. Up till now he had been one of the strongest of us all, and his illness was a severe blow to the expedition.

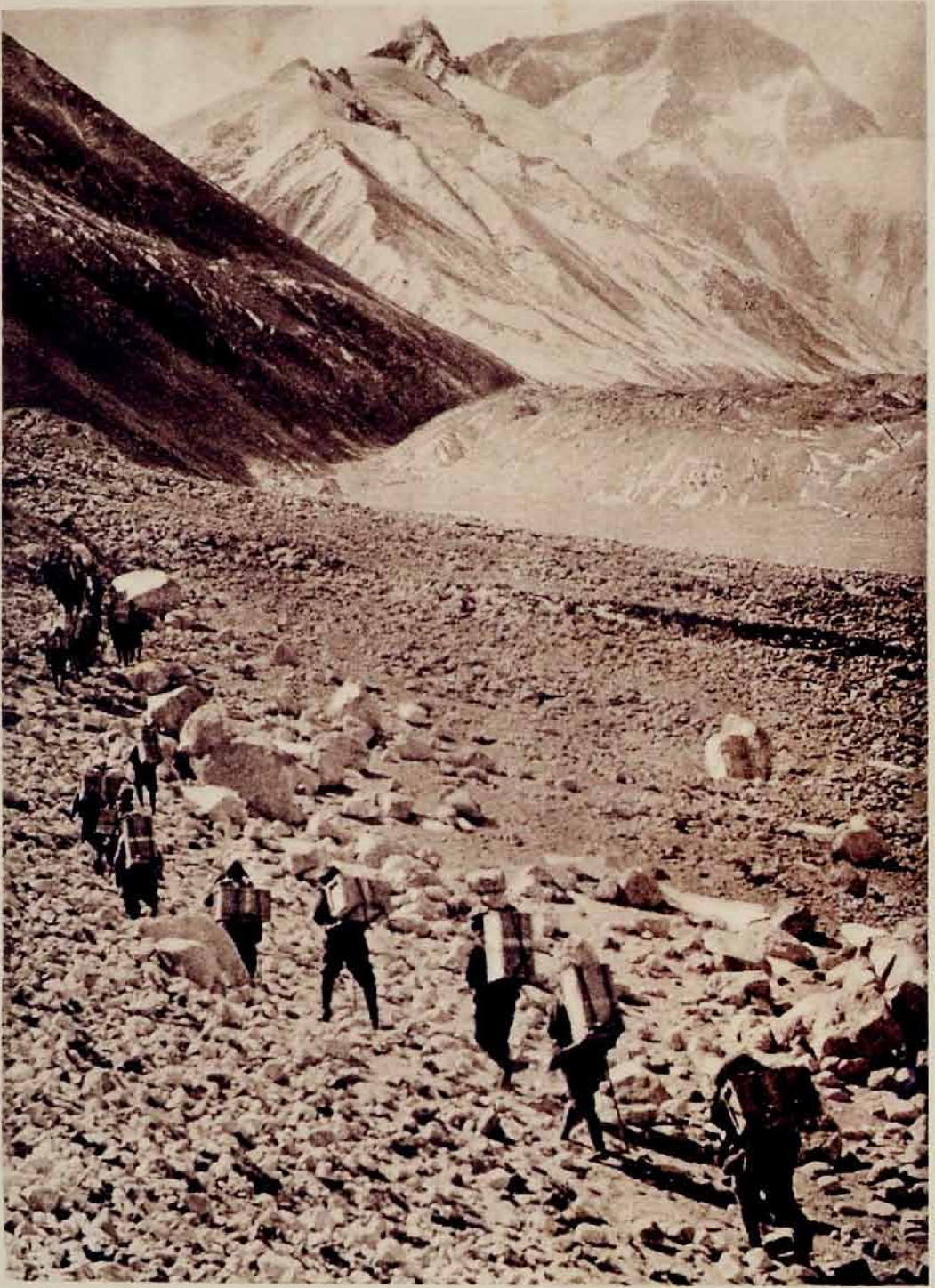


PLATE 20.—Porters leaving the Base Camp to establish
Camp I.

Smijth-Windham and I, with four porters, had a busy afternoon laying the insulated double telephone wire to Camp IIIa. As we toiled up the rough moraine, paying out the wire from the drums, it was brought home to us that the monsoon was arriving, at least a fortnight before its proper time. Light clouds came sailing up over the Rapiu La from the south-east; as they reached Mount Everest they met the still powerful western wind currents; were visibly checked, thrown upwards, and blown back to the south along a higher level. A wonderful but ominous spectacle.

For an hour or two before starting, I had watched the North Col party through the big telescope. They seemed to be going well up the edge of the long snow-slope above the Col; but on reaching the rocks at about 24,500 feet they halted, and I was puzzled to see figures traversing over to the eastern side, and wandering about there, instead of continuing farther up the ridge. They had advanced no farther when we left.

Smijth-Windham had departed after tea at Camp IIIa, and the cold shadow of the North Col had fallen across the glacier when I heard the crunch of boot-nails on the snow outside the arctic tent. It was Crawford and Brocklebank returning from Camp IV, where they had awaited news of the climb. In spite of fine weather, Camp V had not been established. There had been a misunderstanding. The climbing party, consisting of Wyn Harris, Birnie and Boustead, with ten porters, reached the top of the long snow-slope above the North Col, at a height of about 24,500 feet. They were expected to reach at least 25,500 feet, if possible a little more, and to return the same evening: a temporary shortage of porters for the high carries, due to the late arrival of the Sola Khombu contingent, made it impossible to stock Camp V fully on this first day. Wyn Harris wished to proceed accordingly, but was overruled on the ground that the rising wind would exhaust the porters if they went any higher. There was also disagreement as to the exact site for Camp V. Eventually the loads were dumped on the spot and the party descended.

After a windy night, I went up to Camp IV on the 21st,

there being clear need to straighten out the position. No time could be lost ; the sight of the monsoon clouds massing for a fresh attack from the south was a warning plain to any man. It was decided that a second effort should be made, the very next day, with the definite object of establishing Camp V at not less than 25,500 feet. The party would consist of Wyn Harris (in charge), Greene, Birnie and Boustead. If successful, and if the weather held, the same party would make Camp VI the following day, and Birnie and Boustead would then escort the porters down, remaining in support at Camp V. Twenty porters (more had now come up) carrying about twelve pounds each would go to Camp V, among them eight specially selected men for the carry to Camp VI. Lhakpa Chedi would be of this number ; he was tremendously keen to lead the Sherpas and Bhutias even higher than he had gone in 1924. Wager and Longland would accompany the party to Camp V for purposes of training, returning to the North Col the same evening. Finally, Smythe and Shipton would go up to Camp V, and on to Camp VI, one day behind the others. Thus two assaults could be made on the summit on successive days.

As the ascent to Camp V would involve a climb of at least 2,500 feet, beginning up the very steep upper slopes of the North Col, I was anxious to ascertain the spirit of the porters, and paid a visit to their bell tent. Birnie had selected these men down at Camp III, and had worked out details of loads, equipment and stores. Though the evening was not very cold, the door of the tent was well laced up. But I squeezed in somehow, to find an atmosphere inside which baffles description. On a Primus stove in the middle, in a state of violent eruption, was a large cooking-pot full of tsampa (ground and parched barley). Biscuits and meat and pemmican tins lay around. The men sat about on their sleeping-bags, most of them smoking our best cigarettes. One look at their faces was good enough. They had no doubts about the morrow. One can treat these porters as fellow-mountaineers, and I explained the whole plan to them. They responded at once. "Don't be anxious. We

mean to do our bit and carry those loads as far as we possibly can. You'll see to-morrow. Then it's up to the sahibs to climb the mountain." There was no noisy demonstration, just a quiet statement of fact, and a complete self-confidence. We spent a happy hour together, and then I left them unrolling their sleeping-bags for the night.

CHAPTER VI

THE HIGHER CAMPS

The morning of the 22nd was magnificent. There were clouds away to the south, but Mount Everest stood out clear, the great north face was free from snow, and there was little wind. Birnie was delayed for some time, making sure that the men had a really good meal ; the rest were off by 7.30, and I accompanied them as far as the North Col. The way led first round a precipitous ice corner, then across a traverse which would need some care if the snow were in soft condition, and straight up a very steep slope of snow lying on ice. Smythe and Shipton, several days before, had cut steps and fixed ropes the whole way to the crest ; even so, forty minutes of hard work were needed to reach the North Col. The crest was very narrow this year, requiring some confidence to walk upright along it when the wind was strong. A slight descent on to the North Col itself, keeping well clear of the great snow cornices on the left, and then the ascent of the north ridge begins. Here a snow-slope leads up for about 1,500 feet. It is best to keep to the rocks at its extreme western edge. They are nowhere difficult, whereas the snow is a little too hard and slippery for easy upward movement. It can be used for glissading on the descent, provided that you take good care to keep under full control, able to stop at a moment's notice ; for there are two big crevasses which must be avoided.

We were happy that morning. The sun shone brightly, and the wind, even on that most exposed place, the North Col, was gentle and not too cold. The porters scrambled up on to the crest like schoolboys out for a holiday. There was no listlessness, no doubting. The hunt was up. With only twelve to fifteen pounds on his back, the Sherpa porter moves as if on springs. I shook Lhakpa Chedi by the hand and wished him



PLATE 21.—The ledge followed on the way to Camp I.

luck. He grinned and said, "I'm not so young as I was, but I mean to reach Camp VI if I can."

The party wound off in single file up the rocks of the north arête, leaving me to solitary contemplation of one of the most magnificent views it has ever been my luck to see. I remember the long shadows cast by the rising sun as the men moved over the snow of the Col, and the still, dark savagery of the western side, which the light had not yet reached. Above towered the gigantic north face of Mount Everest, the very embodiment of silent strength. At my feet the slopes fell steeply on either side, to the tangled ice of the main and East Rongbuk glaciers. Northward rose the blunt, striated summit of the North Peak, connected with the North Col by an ice-ridge like a gleaming sword-blade. To the west were Pumori and Chö-oyu, a few ragged wisps of cloud floating around their shoulders. Away to the south-east the eye travelled across mile upon mile of lofty ridge and snowy buttress, towards distant Kangchenjunga. Man seemed very insignificant among this tremendous scenery, and very highly privileged to be there at all; yet, as I turned to go cautiously back along the narrow crest, I felt that the little company, now distant specks on that great ridge, were on the threshold of victory.

I returned to Camp IV. Its site was interesting, even sensational. It was, in fact, the lower lip of a crevasse, of which the upper lip rose forty feet in an overhanging cliff of ice and hid from view the steep slopes to the crest. Below, the slopes fell sharply towards the ice-wall and beyond to the great crevasse and the distant glacier. Movement was, of course, much restricted. The platform, if it can be so described, was hump-backed, perhaps 16 feet wide and 90 feet long. On this were placed two arctic tents, a Meade, and a porters' bell tent, leaving no room for promenade. One step to the right from the door of the arctic tent, and you were on the very edge of the crevasse. Two steps to the left would carry you on to the icy slopes. It was not a place for sleep-walkers. But it had one great advantage—complete protection from the west wind. We thought of Camp IIIa and were content. Cooking was done on

Primus stoves, over which ice had to be melted to obtain a water supply. Some altruist would issue from his tent armed with an ice-axe and a rucksack, and would hack away at the serac at one end of the ledge until the rucksack was filled with blocks of ice or until his breath gave out. Meanwhile at the door of the tent his companions would grope about in other rucksacks, to select whatever suited their fancy. At first there was not much variety to choose from. The high-altitude ration, though unexceptionable in vitamin and calory content, was sadly monotonous. Jams, sweets, oatmeal, butter, tinned fruits, cocoa, tea, Ovaltine, Bourn-vita, meat essences, pemmican, pea-flour and Maggi soups, herrings, sardines, condensed milk, biscuit, etc. Most of them excellent in their way ; but we were well acclimatised, and we craved for more solid diet. As time went on, this was to some extent supplied from below, but on another expedition we should radically change the incidence of our catering.

What a horrible business washing-up can be, in camps where hot water cannot be spared and you have to scrub plates and cups with cold snow. We could shoot all our rubbish into the crevasse, but the contemplation of the aftermath of our meals was revolting. Still, there was a recurrent pleasure in the surprises sprung upon us by Shipton and Wager, our best chefs ; and some of us managed to brew tolerable porridge and tea.

On this day, May 22nd, the marine telescope was kept very busy passing from hand to hand as we watched the party climb the north ridge. They were evidently going very well indeed, and we actually saw them reach a platform under a great buttress and pitch four Meade tents. Then drifting clouds, an unwelcome visitation from the south-east, hid them from us ; and we had to wait till after 4 p.m., when Da Tsering, followed by two other porters, came lightly down the long ladder of steps and strolled into the camp as if nothing had happened. It was delightful to see the way they took our welcome and congratulations. Their attitude was : " We said we would do the carry, and we've done it. That is all there is to be said.

There was no difficulty about it." They seemed quite untired. Others straggled in, some not quite so fresh, but all in good spirits save Aila, who had broken down with cramp of the stomach during the ascent. Longland, with his usual consideration, brought him safely home.

Just as dark was falling, Greene staggered in, to fling himself down on his sleeping-bag, exhausted. He had reached Camp V, but at a cost. One day's acclimatisation at Camp IV had not been enough, and he had strained his heart. When Longland and I had done what we could for him, he told his story. The climb had gone well ; by one o'clock Camp V had been pitched at 25,700 feet, perhaps 500 feet higher than in 1924, on an excellent platform, but of necessity on the very backbone of the ridge and therefore more exposed to the wind. On the way, about 300 feet above the end of the great snow-slope, they passed Finch's camp of 1922. His Meade tent, torn to ribbons, lay on the ground between two large boulders. The wood and brass of the tent-poles looked as if they had been made yesterday. Greene, who had added to his fatigue by encouraging one or two lagging porters, found several oxygen cylinders lying around. One had its valve still in perfect order and was full of oxygen. He sat down and tried it for half a minute. The result was remarkable : everything around seemed to brighten ; a lost sense of colour returned ; for the moment he felt stronger, and was able to resume the climb.

Greene had also found, a short distance from Finch's camp, a tin cylinder containing a roll of Kodak film. He hoped that this would be of great interest, remembering how Andrée's film was successfully developed more than thirty years after his death in the Arctic. The cylinder was therefore carefully preserved. But the sealing tape came off when it was brought down to a lower altitude, and we found that the spool had never been exposed.

Intent as ever on scientific research, Greene even obtained some samples of alveolar air at Camp V. But he was in no condition to stay there. It was decided on the spot, with my full subsequent concurrence, that Wager, who was climbing very

strongly and had been the first to reach Camp V, should now join Wyn Harris as climbing companion. The latter was full of energy ; he actually carried up an odd load from the top of the snow-slope, and seemed none the worse for it. He also carried, on this and on his subsequent climbs, his cine-camera, with which he made a remarkable record of the work above the North Col. It is difficult to appreciate the concentrated effort required to make a moving picture at such altitudes.

Greene reported that Boustead had done good work encouraging and helping the rearguard ; and that Birnie, who made a late start, had arrived safely at Camp V. If the weather held, an attempt would be made next morning to establish Camp VI on a patch of snow previously observed from the Base Camp and estimated to be at a height of 27,400 feet. If there was time, and the party was not exhausted, it might even push on to another snow-patch, near the foot of the first step, at a height of about 27,800 feet, and of course still farther westwards. A code of signals had been arranged, so that we could know what the higher party was doing ; and we turned in that night with the feeling that a long step forward had been taken.

The luck did not hold. The morning of the 23rd revealed three inches of snow on our ledge at Camp IV, and much cloud about. Here there was no wind, but a westerly gale was visibly shaking the tents up at Camp V. Our close watch with the telescope for the anticipated signal was ineffectual. Wyn Harris and Wager struggled out from their tent to signal "stand fast," but we never saw them or their signal. They told us afterwards that, although they were only out for ten minutes, it took them three hours to restore circulation, so intense was the cold. A look of clearing in the sky, deceptive as it turned out, decided us to carry on with the prearranged plan, and Smythe and Shipton made a late start up the north ridge. Fighting their way up through a powerful wind, they arrived at Camp V by 4 p.m., only to find that no move upwards had been made and that there was consequently a full house. A quick decision was necessary, for there was not

much daylight left. It would have been far better to defer Smythe and Shipton's ascent until communications had been re-established. Wyn Harris and Wager undertook to come down to Camp IV and reascend on the morrow, provided that a signal indicated that Smythe and Shipton were moving on. The rôles of the first and second parties would thus be reversed.

On this afternoon signs of activity were observed below, and Longland and I went down to the rope ladder to help porters. There we found Brocklebank, who had come up to complete the job of laying the telephone wire right up to Camp IV. He and Smijth-Windham had got it as far as the foot of the ladder the evening before. Brocklebank now carried two drums up the ladder on his back and, with the aid of a porter, went straight on to the ledge, paying out the wire as he went. The line had to be pegged down in the snow a little distance to one side of the steps, to save it from damage—a task not altogether free from danger. It was a great effort, and we were now able to converse directly with Shebbeare at Camp III. At this time Crawford and Brocklebank were putting in an immense amount of work, escorting parties up and down the North Col and keeping the long line of steps in order. I believe that the continual tramping consolidated the track, for during the bad weather that followed it was always negotiable, though we frequently observed dangerous conditions, and even small avalanche tracks, on either side. Now that Greene was temporarily out of action, it was necessary to select a climbing companion for Longland, in case another pair was needed. Crawford and Brocklebank were at Camp IV almost equally acclimatised, and I chose the latter because he was the younger.

There are certain inconveniences attached to success in acclimatising a whole party. I was obliged at this time to return a decided negative to the entreaties of Shebbeare and McLean, who were clamouring to come up from Camp III, for there was already congestion on the ledge. Smijth-Windham had ascended with Brocklebank to see about telephone arrangements, and returned the same day. His performance was

remarkable in a man who had never before been on a big mountain.

This linking up of Camps III and IV by telephone reminded me of the outside world. I hammered out a despatch, wondering the while if a typewriter had ever been used at 22,800 feet before. It was not a pleasurable occupation ; gloves had to be taken off for the purpose and fingers became very cold and stiff. But it led to an interesting test of our signals organisation. The words of the despatch were telephoned down to Smijth-Windham at Camp III. He passed them on by wireless to the Base Camp, where Thompson put them into code and repeated the process to Darjeeling. Mr. Richards and his staff relayed the message by land-line to Calcutta, whence the *Statesman* cabled it to England. I believe that the *Daily Telegraph* received it in about six hours in all from Camp IV, allowing for the difference of time between England and Tibet.

Snow fell heavily on the afternoon of the 23rd, and on the 24th the mountain was a terrible sight. A full gale was blowing from the west. There was a sound as of heavy surf beating against the North Col, and great clouds of spindrift came hissing over, powdering the tents and flying off miles to leeward. The north ridge and the face of the mountain were continually blotted from view, in racing mist and snow. A deep drumming sound in the air reminded one of the lower register of a great organ. This was no time for movement up or down. Those at Camp V must ride out the storm as best they could. They had enough food for the present, and the tents were well anchored.

We on the ledge were occupied with a danger which had been foreseen but could hardly be evaded, the danger of avalanche from above. Already, the night before, small masses of snow began to slide off the slopes above our camp. Most of them fell into the depths of the crevasse, but enough landed on or beside the tents to warn us of disaster, should a large mass descend. It is disconcerting, especially at night, to have a few hundredweight of snow fall with a thump close by,

and explode like a shell through the door, covering you with fine drift. Nothing could be done while the storm lasted, for the slopes below could not be descended, except catastrophically, and in any case we must not abandon the rôle of supporters to Camp V. On the afternoon of the 24th Wager and Crawford struggled up to examine the conditions above. They found nearly a foot of new snow on the ice slopes above the ledge. It showed no tendency to slide. Should this happen, Camp IV and its occupants would cease to exist.

On the 25th things looked a little better for the moment. Had the gale blown itself out, and were the high party in any condition to start for Camp VI? No signal could be seen. Whatever happened, we must revictual them. So Wyn Harris, Wager, Crawford, Longland and I, with ten porters, set forth. Feeling that the energy of the younger men should be conserved for the fight above, I proposed to Crawford that he and I should kick out the snow-filled steps up to the crest. Unfortunately he was delayed by cooking operations, and I led off round the ice-corner without waiting, to be duly punished for my presumption. There was an avalanche track across the traverse, but the dangerous-looking new snow held to the underlying ice, though nearly a foot deep in places. Wager had to take over the lead near the crest, for the heavy work of remaking the steps had already almost exhausted me. By the time we reached the North Col, the wind had renewed its energies, and poured over in what seemed one solid stream of cold. No one who has been up the north ridge on a windy day is likely to forget the experience. The rocks are not difficult—indeed, it is rarely necessary to use the hands. But the wind is a torture. It hurts the eyes in spite of protecting goggles. It imprisons the limbs in a grip like that of fast-running icy water, till every step upward is a battle. The fingers of the hand holding the ice-axe stiffen under the glove and have to be prised open and beaten to restore circulation. Worst of all perhaps is the searing cold of the air drawn into over-driven lungs. Movement becomes almost automatic, though there is a conscious effort to watch the feet of the next

ahead and use the same ledges. One tries to remember that there is a job to be done, that it is all in the day's work, that the porters are sticking it without complaint.

Crawford led from the North Col up the ridge to about 24,200 feet, when he considerably halted, in that paralysing wind, to wait for me. I had dropped some distance behind, having not yet fully recovered from my exertions below. About 200 feet higher, Wyn Harris and Wager, who were now leading, met Smythe descending with the news that Camp V was being evacuated. During the temporary lull of the early morning, Boustead had roused the porters and found them willing to make a start. Not for nothing was Lhakpa Chedi there. They made a hasty meal and got the loads ready. But it was frightfully cold, the wind began to rise again, and there was a look of coming storm in the sky. Smythe, Shipton and Birnie, with their Kamet experience, recognised the danger signals. Courage and indifference to hardship are not enough on those pitiless slabs above Camp V. Boustead's cheerful argument that "you can't make an omelette without breaking eggs" could not outweigh the heavy responsibility which lay upon the climbers not to expose those trustful, willing Sherpas and Bhutias to an ordeal beyond the limits of reasonable safety. Three nights of unceasing storm had already taken considerable toll of their strength, and food was running short. An unsuccessful attempt to establish Camp VI would be worse than useless. Better "*reculer pour mieux sauter*." The word was given for retreat, and the wisdom of this choice was quickly evident. The wind was increasing every minute. Down on the North Col and on the lower part of the ridge we found it bitter enough; at Camp V it was simply dangerous. The porters were as well clothed as the climbers, and had exactly the same windproof gloves. But those few minutes spent in adjusting the loads, perhaps a few moments when gloves were discarded to tie knots, and so on, played havoc with cold hands. Every man of that picked company of eight porters was more or less frost-bitten. Had they attempted to carry to Camp VI, there must have been a disaster. Only one, the great-hearted little

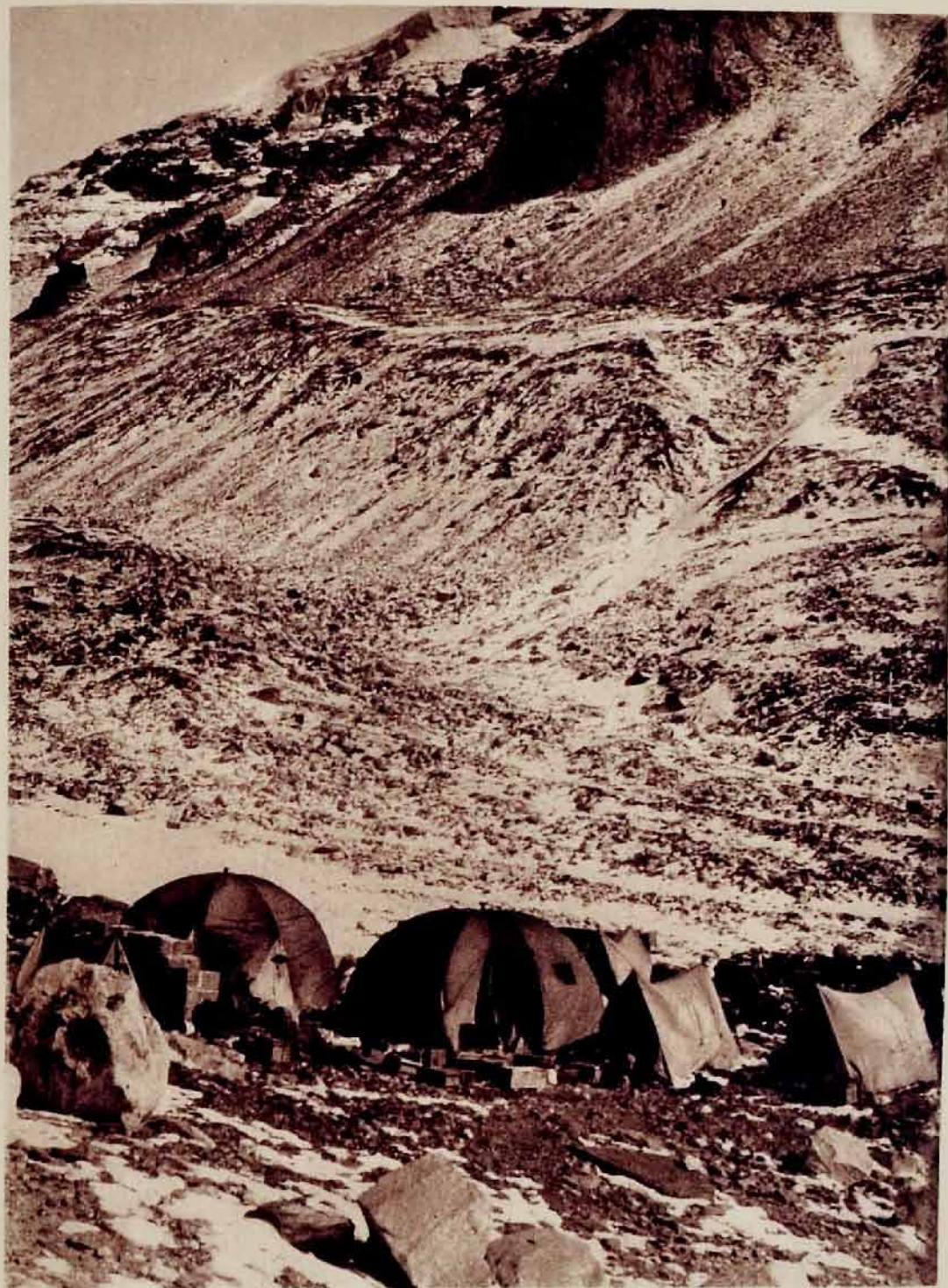


PLATE 22.—Camp I, at about 17,700 feet; showing the
“arctic” tents.

Ang Tarke, ever went high again. Poor Lhakpa Chedi lost two fingers, and Pasang one.

The ascending and descending parties met on the snow-slope. It had been intended to carry on to Camp V and restock it. But the frightful wind, and a difficulty about exchange of porters' bedding, made a return together to Camp IV essential, the more so because a complete reorganisation of the assault was necessary. Some kept to the rocks, some to the snow. Birnie, essaying a glissade, nearly came to grief. For one paralysing moment Wyn Harris saw him flying downwards, head first. Then Da Tsering took a dive at him from a rock and the pair came to rest together on a patch of soft snow. Birnie escaped with a strained leg, and Da Tsering regarded his own feat as an occasion for merry laughter, but we knew that tragedy had been very near.

Lhakpa Chedi and one or two others broke down a little on reaching Camp IV, and no wonder. They had had a terrible three days of it, and were suffering much pain. They must obviously descend further without delay. That night—the third night in succession—more little snow avalanches fell upon the ledge. The place was becoming untenable. Stores for which there was no room in the tents were already buried. At any moment a big fall might flatten out the tents, or hurl us down the great slope. But retreat was not to be thought of. The attack had begun and must be carried through. On the whole face of the North Col there was no other ledge, but on the Col itself room could just be found for two arctic tents to form a new Camp IVa. A frightfully exposed position, but safe from avalanche. First the prevailing congestion must be relieved. One arctic tent would hold the porters detailed for the next effort, the other would suffice for Smythe, Shipton, Wyn Harris, Wager, Longland and Birnie. Boustead's leave was drawing to a close, and he must descend. With him would go Crawford, Greene, Brocklebank and I, escorting the frost-bitten porters down to Camp III.

We had a busy time on May 26th, arranging all details. Much care would be required on the slopes both above and

below the ledge, for the snow lay deep and some of it had already slipped. The climbers took with them the telephone box and had to pay out several hundred more feet of insulated wire. Unfortunately this was not quite long enough, and came to an end about forty yards short of the new Camp IVa. It was secured at a point on the crest, while the box with its batteries was kept reasonably warm in one of the arctic tents. Whenever communication was needed with Camp III, a climber would issue with the box in his arms, make a somewhat difficult ascent to the crest, sit there astride with his feet dangling in space, adjust the terminals with frozen fingers, and try to make himself heard above the wind. As Smythe said, this must be about the airiest telephone booth in the world, at 23,000 feet and with space itself before and behind.

The downward party was much delayed, and did not get off till 4.30 p.m. This at least gave some time for the snow to consolidate in the increasing cold. One porter, Chin-Narbu, though an under-sardar, lost all sense of duty. Even the prospect of a descent did not appeal to him. He put a red sweet into his mouth, chewed it up, and then spat on the snow in a fatuous attempt to convince me that he had some terrible disease of the lungs. Greene and I disillusioned him. Then I had a weary hour's work to persuade Pasang Kikuli (one of our best men) and Kusang to make a move. It was the old story. When the Sherpa once gets into the dumps, he is a sorry inversion of his real self. There was Greene, a really sick man, with heart trouble, prepared to stick it out and even help others on the descent; while Pasang Kikuli, with slight frost-bite, was a mere rag-bag of self-pity. Yet this man a few short days before had been the keenest of the keen, volunteering for the hardest jobs. But I must do justice to another of the many Pasangs. Nothing depressed him. He roared with laughter over his damaged hands, and did much to cheer up his mournful colleagues.

So we started downwards at last, anchoring each step of the way, for we distrusted the slopes. Crawford and Brocklebank were a tower of strength at the top of the ladder, roping up the

invalid porters and lowering each man to one or other of us below. It was bitterly cold in the shadow of the great ice-wall, whose grim savagery seemed to be intensified by a short length of rope hanging out from the face ; a relic, probably, of the accident of 1922. Everything went well until the great crevasse had been safely crossed. Then the light-hearted Pasang, tired of a painful grip on the fixed ropes, let himself slide. He careered down to a small crevasse, which most fortunately was choked with snow. Pulling himself together, he walked in blissful ignorance, despite our yells, along the whole line of the crevasse back to the ropes. Nothing would convince him that he had been in danger. He laughed, cursed his hands, and practically told us to go to the devil.

Nursang, the sardar at Camp IIIa, now empty of climbers, revived our spirits with some excellent tea on our way through to Camp III. Alas, there was now no Police-*ie* to welcome us. She was a general favourite, for she had shown an extraordinary mountaineering enthusiasm. The danger of taking her beyond Camp II, among the crevasses of the glacier, had been realised, and she was many times packed off to the base. But she always found her way up again. She refused to be taken on a lead, and was terrified of tents. She would spend the coldest nights huddled behind a barricade of provision cases, to be found caked with ice and snow in the morning and very stiff. Meat she generally refused, preferring the *tsampa* to which she was accustomed. Her finest effort was a courageous attempt to climb to Camp IV. She reached the foot of the ice-slope below the great crevasse, at 22,000 feet, going up the long line of steps like a practised mountaineer. But of course really steep ice was too much for her, and nobody was prepared to carry her up. She was always restless and independent, and I very much fear that during a solitary ramble on the glacier she fell through a snowbridge into some crevasse. We missed her shy, almost reluctant friendliness.

The stage was now set for a renewal of the assault ; and the crucial period had arrived, for there could be no doubt that the monsoon was upon us. Nothing could be more disconcerting

than this weather. Not a day passed without an afternoon gale from the west, yet monsoon clouds were banking up steadily from the south-east, bringing snow. Greene and Boustead left for the Base Camp, the former to recuperate there, the latter homeward-bound. Crawford, Brocklebank, Shebbeare, McLean, Smijth-Windham and I were now responsible for keeping open communications with Camp IVa.

A beautiful morning on the 28th made one hope that a few days' grace would be allowed us before the monsoon set in in earnest. Movement was soon observed on the North Col. This was Wyn Harris, Wager, Birnie and Longland going up to re-establish Camp V with twelve freshly selected porters.

The position of the new Camp IVa made the carry to Camp V somewhat easier, as the men were saved the climb up on to the crest from the ledge, which took anything from forty minutes to one hour and was a steep and wearisome beginning to a day's work. The party made excellent progress on this fine morning, and all except two reached Camp V in under five hours. Birnie, who had strained a leg muscle during his glissade down the snow-slope on May 25th, now had great difficulty in ascending at all. He put up a plucky performance, arriving late in the afternoon. One porter became ill after two hours' climbing and had to be sent back, though he did his gallant best to refuse. The remaining hours of daylight were devoted to cookery, brewing hot drinks, and filling Thermos flasks ready for next morning's breakfast.

May 29th dawned very cold, though with a promise of fine weather. A steady, biting wind whistled across the ridge. Now came the real test of the porters. On a similar occasion in 1924 Norton spent himself in a four hours' argument, persuading his men to start. Nothing of the sort occurred this time. The climbers were up at 5 a.m., and found the eight " tigers " ready and willing. There can be no doubt that these Sherpas and Bhutias have now developed an improved tradition, pride of achievement, standard of possibility. It is a process of psychological evolution, for which the credit must be shared by the

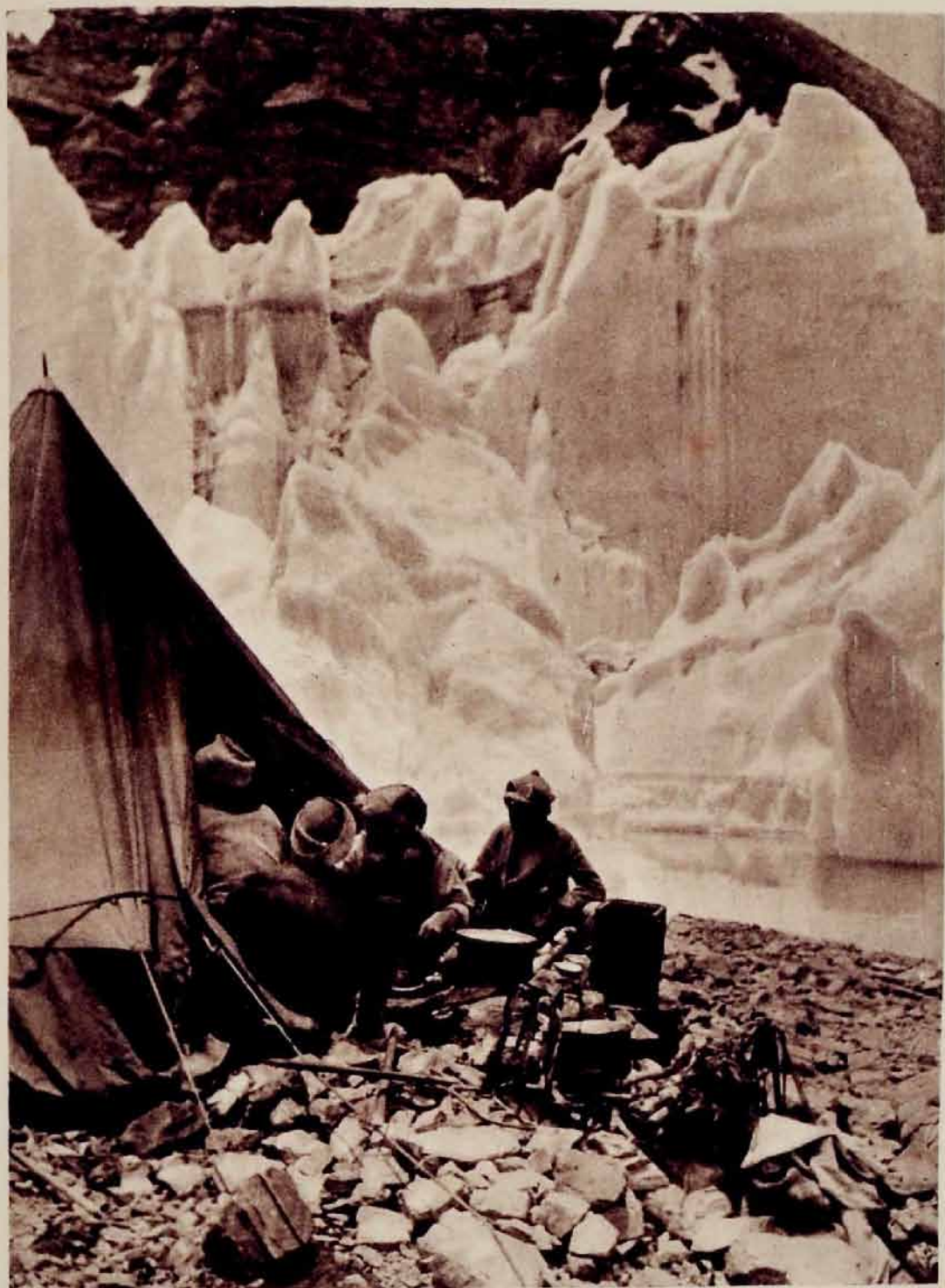


PLATE 23.—Camp II, at 19,800 feet.

men themselves and by the climbers who led them, on previous expeditions no less than on this.

The cold at this early hour was so severe that to start at once would have incurred great risk of frost-bite. No one had had a hot drink, because the flasks had not been equal to keeping their contents warm through the night. So the men were sent back to their tents to make themselves a fresh brew, and the climb did not begin till 8 a.m.

It was still bitterly cold even then. During the first two hours of the ascent most of the party were slightly frost-bitten, though the effects were not noticeable at the time. Leaving Birnie to his lonely watch, Wyn Harris, Wager and Longland proceeded up the north ridge with their eight companions, who carried about ten pounds each. No time could be lost in view of the late start, and they soon left the ridge to climb as directly as possible towards the first step. This diagonal traverse upwards soon brought them on to the kind of ground where an accident is most likely to occur : downward-sloping, smooth slabs offering no good ledges or holds, evilly smooth and treacherous, where safety depends altogether on balance and the friction of the bootnails. The rope is worse than useless, for if one man slips he will pull the others off with him. In these difficult circumstances the porters showed a steadiness and ability beyond all expectation. They were not just porters, they were mountaineers, at home alike on the slabs and on the occasional patches of hard snow and frozen scree.

Wyn Harris and Wager led the climb, and Longland brought up the rear, lending encouragement and help when necessary. At the end of every fifty minutes a ten-minute halt was called. The men hardly needed it—most of them were up and pressing on the leaders before the signal to start again. And the pace was good ; up to a height of 27,000 feet they averaged 400 feet an hour, halts included.

During one rest Longland looked away northwards across the summit of the North Peak and saw, nearly twelve miles away, the Rongbuk monastery, last seen some six weeks before. Pumori, which looks so impressive from near Camp I or even

from the North Col, was now almost insignificant, 4,000 feet below.

At about 27,000 feet the angle of ascent suddenly steepened, for the party had reached the bottom edge of that great band of yellowish limestone, a thousand feet thick, which is so conspicuous a feature of the mountain as seen from the Base Camp. The change was welcome in spite of the steeper nature of the rock, because the treacherous slabs, dipping outwards at an almost uniform angle, gave place to a series of fairly well-defined ledges which gave the appearance, if not indeed the reality, of safer going. By this time the climbers were too much under the cliffs to be able to make absolutely sure of the direction towards the first step, but Wyn Harris adopted a good zigzag route which kept up the pace, prevented straggling, and followed a line of least resistance. It was time to begin looking for a camp site ; two or three of the men were at last showing signs of exhaustion, and they must all be seen safely down to the North Col before dark.

Nothing, perhaps, gives a better idea of the general character of the north face of Mount Everest than the statement that over that great expanse of rock it is most difficult to find a single ledge affording room to pitch one little Meade tent, seven feet long by four feet wide ; and that no one has yet discovered a platform of such dimensions where the outer edge was not considerably lower than the inner. Yet a tent has to be pitched in such a manner that it will not only refrain from slipping over the edge, but resist the continual efforts of the west wind to blow it off the mountain and down on to the Rongbuk glacier. It will be understood, therefore, that the last half hour or so of the climb was fraught with anxiety for the climbers of the party. The porters, sublimely confident that they were in good hands, struggled gamely on.

At last a point was reached, about half-way up the yellow band, where a fairly pronounced ledge appears to divide the cliff horizontally. It was not a good ledge ; nowhere more than three feet wide, it sloped outwards and was clogged with snow. But nothing better could be seen. While Wyn Harris

went on some little distance alone to make sure that there was no alternative, the others set to work to scrape away snow and hard scree and even to collect small stones on the outer edge, by way of making the semblance of a level platform. On this they erected the little Burns tent, of Meade pattern, about ten pounds in weight, and anchored it as securely as possible. The floor still sloped precariously, and about a quarter of it projected unsupported over the outward edge. Four sleeping-bags, provisions for three days for four men, a couple of cooking-pots and some "Tommy cookers" completed the furnishing of this modest suite.

The site of this new Camp VI is easily identified. It is some 300 feet below two fairly prominent towers on the north-east ridge, and about 400 yards east of the first step. The height has been judged, by means of the aneroid and the study of scaled photographs, to be 27,400 feet. This is 600 feet higher than Norton's Camp VI of 1924, and about 400 yards horizontally nearer to the summit.

So high was the spirit of the men that they were even willing to try to reach the little snow patch under the first step. But this would have involved at least another two hours' climbing; it was already 1.30 p.m.; and the North Col lay 4,400 feet below. Fortunately the word was given for descent, and Wyn Harris and Wager lost no time in taking possession of the premises, for the cold of a high camp on Everest does not encourage small talk at the front door. Old Kipa Lama, his normal eccentricity much enhanced by altitude, selected this moment to demand a "chit" or certificate of good conduct. He was promised one of the best if only he would hurry, and was bundled off without ceremony.

Longland took one look at the summit which now seemed so close (perhaps 1,600 feet higher and half a mile away), wished the climbers good luck, and led off along the break in the yellow band, horizontally eastwards. Long ago, when we decided to try to place Camp VI higher than before and away along the north face, a rule had been made that porters making the carry must not be allowed to return unescorted. The rule was now doubly vindicated. Left to themselves, the men would have

charged off down the steep slopes by which they had ascended. Fatigue inevitably promotes carelessness, and undermines balance. One or more would probably have slipped and fallen to their death on the glacier thousands of feet below. The morale of the rest would have gone to pieces immediately—such is the almost certain effect of an accident—with only one result, total collapse. Longland knew the danger, and did the right thing. It was imperative to lose no time in finding the north ridge. Once on that, direction-finding would be far easier than on the great indeterminate slabs of the face. He worked his way along to a point where it seemed possible to traverse downwards across scree slopes to the ridge. The ground was steep, and delay occurred in helping the men.

The traverse was made just in time. As the last man cautiously moved over on to the ridge, a furious storm of wind and snow came roaring over from the west. A moment before all had been quiet and peaceful. In a few seconds Nature seemed to go mad. The far horizons vanished as the voice of the wind rose to a scream and the snow tore past in blinding sheets. The effect upon tired men may be imagined. Their world disappeared, their goggles iced up till they had to be discarded, whereupon their eyelashes froze together, making it very difficult to see at all. They were literally fighting for their lives.

Well for them that they had a great leader and a great mountaineer at their head. Longland never faltered though, to use his own words, “visibility suddenly narrowed to a snow-swept circle of some twenty yards, and—I was taking a party of porters down a ridge which I had never been on before, but which I knew to be ill-defined and easy to lose, particularly in such conditions.” He kept his men in close order, and they staggered downwards, leaning sideways against the wind to keep their balance and peering through the storm for a glimpse of the North Peak and the ridge, but seeing nothing beyond the rocks just ahead. Every few minutes they halted to count their numbers, lest someone should be lost or left behind. The men were responding magnificently to example, and not one fell out.

Suddenly, below a little cliff, they came upon a spot of

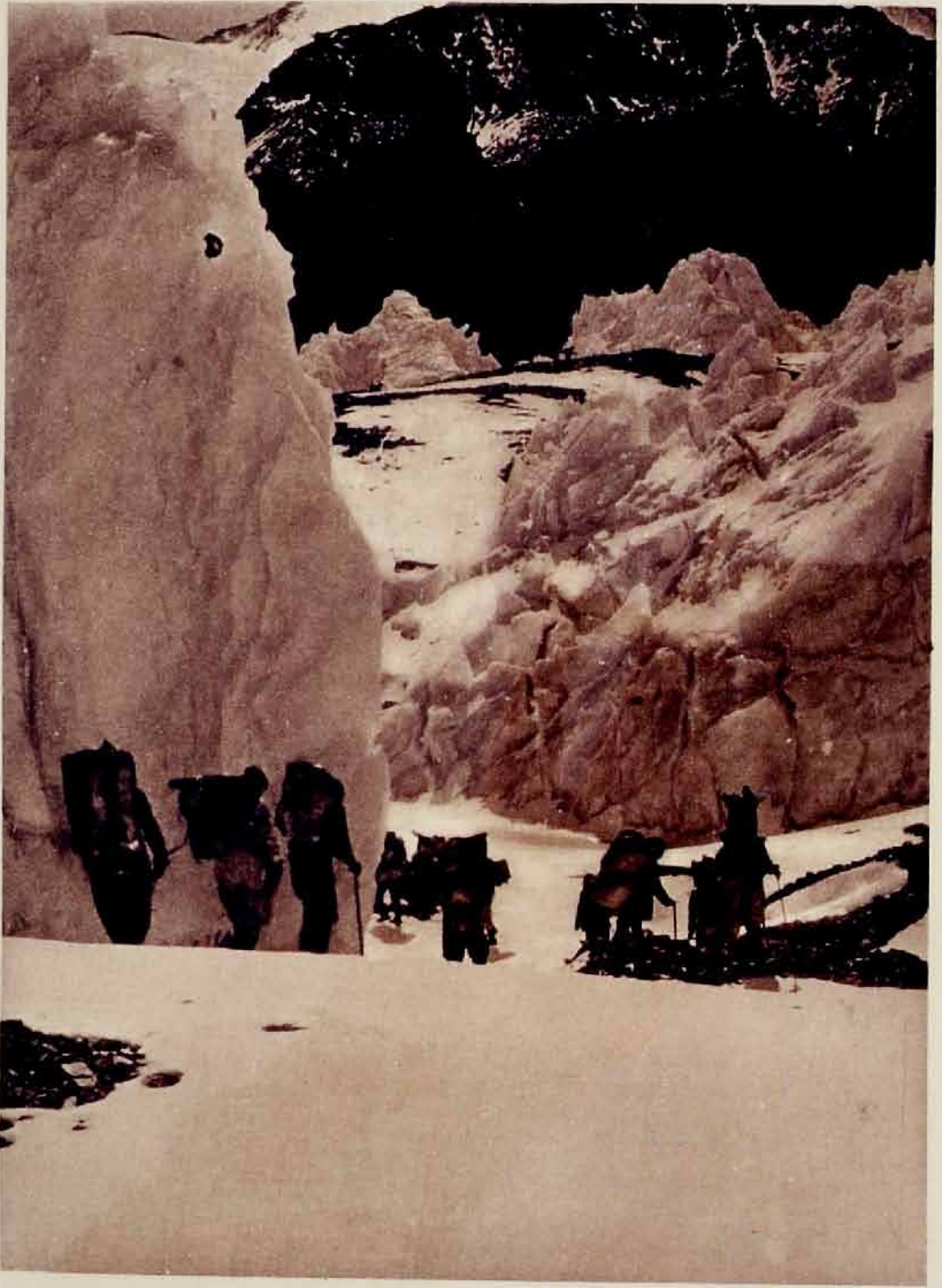


PLATE 24.—Porters entering the left trough from Camp II.

green, Norton's Camp VI of 1924, where Mallory and Irvine spent their last night of life and where Odell came in his great effort to find them. The tent was no longer usable after nine years of exposure, yet it looked surprisingly new. The men, much cheered by this discovery, rummaged about and found a folding candle-lantern and a lever-torch. The latter worked at the first touch. Then they hurried on downwards, for to remain still in these conditions meant death. The storm continued relentlessly.

About 200 feet lower down a terrible thought occurred to Longland. He remembered that, in one of the 1924 photographs of Mount Everest as seen from the Base Camp, the position of that year's Camp VI was marked by an arrow pointing, not to the main north ridge, but to a subsidiary ridge farther to the east. Could it be that he was leading his party straight for the appalling ice-slopes above the East Rongbuk glacier, instead of down the main ridge to Camps V and IV, and safety? It was a dreadful moment, and the worst of it was that he could see no landmark through the flying snow. But he kept his head and watched for the appearance of a great snow couloir, which he knew must be on the left if he were on the wrong ridge. The anxious descent continued slowly, down little snow-covered cliffs and icy screes, reassured to some extent by the invisibility of the couloir. But it was a painful passage. Some of the more exhausted porters were beginning to sit down, unable to face any longer the torture of the wind. They had to be urged to their feet and encouraged to keep on down that doubtful, perhaps fatal ridge, the problem of which the leader had to keep to himself. At last, over a little edge, and not a hundred feet below, appeared a green tent. It was Camp V. Longland had brought his party safe through a test which even Mount Everest could hardly make more severe. He had not enjoyed one care-free moment for two hours.

Birnie, Smythe and Shipton were ready with the hot drinks now so sorely needed. Two exhausted porters, including poor Kipa, were put to bed at once. The rest moved

off slowly downwards, at about 3.45 p.m. Longland followed, after endeavouring, in vain, to persuade Birnie to take a rest down at Camp IVa, and caught up the last and most tired of them just below Finch's camp of 1922. To quote his own words once more, "persuading this man downwards was sufficient task to keep one's mind off one's own condition, and it was not until the little rise leading to Camp IVa, which we reached just before dark, that I realised how near my own limit I had gone." Those simple words convey, better than anything I can write, the feelings of a man who had spent himself to the utmost for his gallant companions.

Crawford and McLean had been sent up to the North Col on the 29th with fresh supplies, kerosene, porters' socks and spare gloves, to remain there in support. They worked hard, preparing hot drinks and food, and putting the exhausted party to bed. They were so successful that next morning the porters were able to reach Camp III in good heart. The other two followed later. Not one was badly frost-bitten or permanently incapacitated. I make no apology for putting on record the names of as gallant a company as ever served an expedition :

Ang Tarke	.	.	.	.	Sherpa
Da Tsering	.	.	.	.	Sherpa
Nima Dorje	.	.	.	.	Sherpa
Ang Tsering	.	.	.	.	Sherpa
Kipa Lama	.	.	.	.	Sherpa
Pasang	.	.	.	.	Bhutia
Tsering Tarke	.	.	.	.	Bhutia
Rinzing	.	.	.	.	Bhutia

Longland, tired as he was, refused to leave his post of support on the North Col, and took a considerable share in the exhausting task of telephoning down to Camp III, from the exposed station on the crest of the Col, reports of the progress of the assaulting parties.

So, after a fortnight's struggle, an attacking position had been won in face of serious odds, and two parties were ready, with at least adequate supports, to "go over the top."

CHAPTER VII

THE FIRST ASSAULT

All now depended upon the weather. Snow had fallen on the day of the great carry to Camp VI, but the furious wind of the afternoon blew much of it off the slabs. Wyn Harris and Wager were in good form at Camp VI. Smythe and Shipton reached Camp V the same day, and Birnie was staying on there in support. Longland, Crawford and McLean held the North Col. With eight men thus in position, all camps fixed and well stocked, and reserves at Camp III, one felt that everything possible had been done to ensure success.

Camp III was a very unsatisfactory observation post, for Camps IVa, V and VI were hidden from view. The first was just over the brow of the North Col, and the last two were masked by the north ridge. All we could do was to keep the telescope trained on the final pyramid, occasionally switching over to the crest of the North Col in case a telephone operator should appear there, when a concerted rush would be made to the arctic tent and our end of the line.

I was up at 4.30 a.m. on the 30th, to see a curious hat-shaped black cloud covering the summit, while a long white pennant stretched away to the south-east. Elsewhere the sky was clear, with promise of a fine, warm morning. All was still around us. Gradually the black cloud dispersed, but the summit was intermittently veiled through the day by slowly circling mists which could do the climbers no harm. In short, the prospect was not unfavourable.

I had the telescope moved over to a slightly better viewpoint on the moraine, and spent several hours there. One never knew when some sudden squall of wind might open a little window in the mists, to disclose the climbers upon

those far-off slopes. If the route by the second step "went," we might see them at any moment after ten o'clock.

About that time seven of the "tigers," led by Da Tsering, walked quietly into camp, and told their story without a trace of bravado. They looked amazingly fresh. Only poor Kipa Lama was left behind at the North Col, with McLean trying to restore his scattered wits. He was convinced that he was dead, and a corpse obviously could not make the descent. We gave of our best to the little band and sent them off next day happy and content to the Base Camp.

About 10.30 the indefatigable Longland managed to ring us up from the North Col. From there he had, by means of the marine telescope, seen Wyn Harris and Wager making good progress at about 7 a.m. Our end of the telephone now saw fit to go on strike, and hearing became extremely difficult. Smijth-Windham, incorrectly as it turned out, understood Longland to say that the climbers appeared to have worked over on to the southern side of the north-east arête. This could only mean that they were trying to turn the second step by way of the steep snow-slope which had been observed from the Base Camp and other places. Before we could verify the impression, our telephone "packed up" altogether, and complete silence reigned till 5.45 p.m. next day. It was one of the two periods of suspense which none of the occupants of Camp III is likely ever to forget.

Base Camp suffered even more. Without a telescope Greene and Thompson could see nothing at all of what was going on, and they passed a miserable time waiting for signals from our wireless transmitter, with its maddening "no news."

Time passed wearily. Shebbeare wanted to go up to the North Col. So did I. But there was too much risk of congestion there, should Wyn Harris and Wager succeed in returning the same evening. Brocklebank, who had worked himself almost to a standstill on the slopes of the North Col, was suffering much from breathlessness and from some displacement of muscle about the lower ribs.

Meanwhile, some 7,000 feet above us, Wyn Harris and

Wager were making their great effort. The account which I am about to give is taken from notes which I recorded immediately upon their arrival down at Camp III, knowing that even the most accurate observer's memory for detail fades rapidly after a climb to high altitudes, and from narratives subsequently written by both men.

They had a somewhat disturbed night at Camp VI, after a light meal of Brand's essence of chicken, tinned loganberries, biscuit and condensed milk. Both men's appetites were poor, they were thirsty, and slept badly. Wager had the lower berth, so to speak, for the floor of the tent sloped downwards, and his companion kept slipping down upon him. Wyn Harris managed to sleep for about four hours. He was up at 4.30 on the 30th. A ten-mile-an-hour wind was blowing, and the cold was not excessive, considering the altitude. But the Thermos flask, prepared the night before, had not been able to keep its contents warm, and they were obliged to spend an hour heating water (obtained, of course, from snow) over a "Tommy cooker." After a very poor meal, during which they thawed out their frozen boots over another "Tommy cooker," they put on their windproofs, and emerged slowly and stiffly from their tent at 5.40 a.m. All movement is terribly slowed down when your oxygen supply from the air has been reduced to one third of normal.

The sun had not yet reached them, and they suffered much from cold during the first hour while traversing diagonally upwards towards the north-east ridge. Wager noticed that excessive panting resulted in rapid loss of body heat. Both felt the beginnings of frost-bite; and the moment the sun appeared, nearly an hour after they had left Camp VI, Wager sat down to remove his boots and rub his feet. Soon after this, about 60 feet below the crest of the ridge and 250 yards east of the first step, Wyn Harris, who was leading, found the ice-axe about which there has been so much controversy. It was lying free on smooth, brown "boiler-plate" slabs, inclined at an easy angle but steepening considerably just below. It was in perfect condition, looking quite new. On the polished steel

head was stamped the name of the maker—Willisch of Täsch, in the Zermatt valley. I will state in a later part of the chapter the conclusions at which we have arrived from careful consideration of this discovery.

The climbers left the axe lying where they found it, and proceeded upwards to the foot of the first step, which is actually composed of two large towers on the ridge. It will be remembered that their first object was to reconnoitre the second step, now about two hundred yards away; to climb it if they could; and to ascend thence along the ridge itself and up the final pyramid to the summit. If the step could not be climbed, they would go by Norton's 1924 route, keeping more or less along the top of the yellow band, two or three hundred feet below the crest of the ridge, cross the great couloir, and attack the slabs on its western wall, thus effecting a lodgment on the north face of the pyramid.

It was now 7 a.m. Their first thought was to turn the first step and climb straight up on to the ridge. But they soon saw that the ridge was difficult, and that it would be easier to traverse along the top of the yellow band. They could not, from their view-point, see that the cliffs directly below the second step were impregnable to direct assault; the step itself was obviously so. They therefore moved off horizontally westwards, over snow-covered slabs, keeping roughly to the line where the yellow band adjoins the bottom of the dark-grey limestone precipice forming the continuation of the first step. The going was not very difficult here, and they were still unroped. Arrived under the second step, they at once saw that, not only was the second step itself impossible from this side, but they could not even reach the foot of it. Above them rose the dark-grey precipice, smooth and holdless. From a distance the second step had seemed to be split by an oblique gully cutting down through it in a north-easterly direction. At close quarters even this could not be traced. But about 200 yards farther along appeared a gully of fair promise. It seemed to cut through both the dark bands which form the first and second steps. If it could be climbed, the second step would be turned and the

ridge reached at a point beyond which there seemed to be a straightforward way to the summit. The traverse was accordingly continued along ground that now became more difficult, and the bottom of the gully was reached at about 10 a.m.

More than four hours had thus been spent in a detailed survey of this portion of the north face. Knowing the men as I do, I feel very certain that their adverse opinion of the second step and its approaches carries great weight. They would not turn aside from a climb within the limits of the possible.

The gully was a delusion, a mere shallow scoop in the smooth walls. Moreover it did not even continue to the ridge. The party roped up here. In general, the rock was of a uniform, treacherous smoothness; in detail, a few knobbly excrescences could be found which, with less snow about, would afford a tolerably good foothold. For the hands there was nothing. Wyn Harris made an attempt to lead up the shallow scoop, but was brought to a standstill almost at once.

Two ways had now been prospected of which high hopes had been entertained through distant reconnaissance. It seemed that Norton was right, and that the ridge route was impracticable. About 150 yards farther along, round a corner, was the great snow couloir descending from the eastern foot of the final pyramid. The roped party climbed cautiously along immediately under the precipice, and were delayed by some very difficult going over snow-covered, sloping slabs near the corner. A single slip here would have been absolutely fatal. Actually they would have done better to traverse along a better ledge, some fifty to a hundred feet below, where the angle eased off. It was decided that they should give each other mutual support over any difficulties in the neighbourhood of the couloir, and that, if easier ground was discovered beyond, Wyn Harris, who was feeling the stronger of the two, should go on alone.

In the couloir a very awkward fifty feet of powder snow had to be crossed. The snow gave no support to the feet, cascading

down at a touch, and the greatest care was necessary to prevent a slip. On the left, a few feet away, the rocks overhung. The couloir itself ran precipitously downwards to the main Rongbuk glacier, 10,000 feet below. It was a sensational crossing.

The rocks forming the western wall were even steeper than those just left behind, and they had more snow on them, being more protected on this side from the wind. It seemed just possible to find a way round the base of a flat buttress and then up between minor buttresses. The place is well shown in Smythe's photograph (p. 252). The party crept slowly and carefully along for about 150 feet beyond the couloir, traversing slightly upward still they reached a point some fifty feet above the top of the yellow band, on the edge of a small gully where the snow was particularly deep and soft. Wyn Harris attempted to cross it, though knowing full well that Wager, precariously balanced on a slab affording no belays, could not possibly hold him should the snow slip away. It showed every sign of doing so. Suddenly came realisation that the limit of reasonable climbing had been reached, if not passed. Wyn Harris retreated to the lesser evil of the slab, and the position was reviewed.

It was now 12.30 p.m. The height already reached was presumably something over 28,100 feet, for, from Norton's description, he had reached approximately the same place. There remained, therefore, about 1,000 feet to the summit. The going above did not look absolutely impossible, but in the present conditions of snow on the slabs it would be difficult and very dangerous. Even worse was the prospect of a continued traverse across the little gully and the slabs to a biggish subsidiary couloir, which runs down to meet the main couloir about 200 feet below. In good conditions, with the rocks dry and free from snow, this might well be the best way to reach the easier slabs of the final pyramid above the black bands of the first and second steps. To go on in the existing conditions was to court disaster. The most optimistic estimate could not allot much less than four hours for completion of the climb. This



PLATE 25.—The left trough. Mount Everest in background.

would overstep the time-limit of safety, for the returning climbers must reach Camp V, at least, before dark. Camp VI, where Smythe and Shipton should by now have arrived, only held two men. Wager thought he might be able to continue upwards for another hour. Except in the last necessity, a man should not be left alone, either to wait or to climb, on ground like this. Lastly, both climbers had an uncomfortable feeling that they had not been able to explore fully the possibilities of the second step. If they could only prove, beyond cavil, that that route was wholly out of the question, Smythe and Shipton could go for Norton's traverse with undivided minds, and could probably reach the couloir in three hours from Camp VI. This would give them a far better chance for the summit.

The word was given for retreat. Neither man liked the thought of repeating the terrific traverse they had made on the ascent. They found a way downwards to a series of ledges between fifty and a hundred feet lower, and had less difficulty in crossing the great couloir and the slabs on both sides of it. This involved a slight diagonal ascent towards the foot of the first step, whence they intended to climb on to the ridge and have a final look at the second step. But they were very near exhaustion point, and the climb to the ridge between the steps proved to be beyond them. They continued slowly towards Camp VI; and while Wyn Harris retrieved the axe left there in the morning (abandoning his own in its place), Wager by a last effort dragged himself up to the ridge east of the first step. He is the only climber who has looked down the stupendous, ice-clad south-east face of the mountain. The ridge here he found to be extremely narrow and indented. By analogy it would be the same between the first and second steps, and he had already seen a tower some twenty-five feet high on that portion, which would present an added difficulty. It was a fair inference that the second step was too well guarded from every side, apart from its own smooth precipice.

Camp VI was reached at 4 p.m., and the story was told to Smythe and Shipton while they prepared a little tea. They decided that, to make assurance doubly sure, they would have a

final look at the second step next day and, if that could not be climbed, they would make their assault by Norton's route the day after.

Wyn Harris and Wager, after an hour's rest, followed Longland's traverse and descended the north ridge to Camp V, where they spent the night in Birnie's company and continued down to the North Col next morning. On the way Wyn Harris, forgetting the caution which his exhausted condition demanded, attempted to glissade down a short snow-slope. It was the sort of thing he could have undertaken without a second thought in the Alps. The slope was humpbacked, with a camber towards the east; and the snow was very hard. In a moment he found himself sliding, not towards the North Col, but rapidly and with ever-increasing acceleration towards the great precipice which overlooks the east Rongbuk glacier. Fortunately years of guideless climbing had taught him every move in the game. He turned over on to his face, grasping the axe-head on either side of the haft with hands held well into the chest. Slowly he turned the pick over against the hard snow till it was making a deep groove and checking the pace. If this were done too quickly the axe would be torn from his hands and nothing could save him. He told me afterwards that, though it was really a matter of seconds, it seemed to take minutes. He remembered the feather of snow thrown up as the axe bit into the surface. Just in time the braking action brought him to a standstill, on the very edge of the precipice; and he traversed, shaken and exhausted, to where Wager could extend a helping hand. It had been a very near thing.

Members of previous expeditions have remarked how slow is the recovery from the exertions of a climb to very high altitudes. In the Alps there is usually a speedy and beneficial reaction to a descent to lower levels. Not so on Mount Everest. Both men were deplorably tired, and were obliged to sit down at frequent intervals. Even the near proximity of the North Col elicited no response, no quickening stride. The mountain had taken every atom of strength they possessed. Wager was perhaps the more exhausted of the two, but McLean speedily determined that

both men had dilated hearts and would be out of action for some time. They rested on the North Col on May 31st, during a fresh spell of bad weather, and on the morning of June 1st Wyn Harris rang me up to say they were coming down, whatever the conditions, bringing the eccentric Kipa.

Thus ended the first assault on the summit. Necessarily it was of the nature of a compromise and, like all compromises, subject to handicaps. Wyn Harris and Wager did all that mortal men could do to carry out their duty of exploring the possibilities of Mallory's ridge route. Then, although pressed for time and exhausted by prolonged reconnaissance, they made a most determined and gallant attack along Norton's route; but for adverse conditions of snow, they might have succeeded in solving the problem of that solitary break in the defences, even though the summit remained beyond their reach. As it was, they had done more than win success—they had deserved it.

Brocklebank, Shebbeare and I went up to meet them at the foot of the ice-wall, finding the North Col track better than we expected; and we were delighted to find them descending with remarkable alacrity. All except Kipa, that is to say. Poor old Kipa's bewildered mind still held doggedly to the idea that he was dead. But McLean's diagnosis showed that physically he was very much alive, in fact quite well again but for slight sickness due to a surfeit of Ovaltine. Nothing but friendly or, as Greene has called it, "purely therapeutic" propulsion from the rear would move him. It was a slow process, for Wyn Harris and Wager had to steady him with the rope down the steps. I remember catching hold of his dangling legs at the bottom of the rope ladder; conducting a vivacious argument with him (he was very voluble) as to the dividing line between life and death; and handing him over to Brocklebank, who got him down the rest of the way with notable vigour and success. Kipa, who made a sufficiently complete recovery later on, was always very grateful to the sahibs who had convinced him that he was still alive. I gave him a very special and comprehensive "chit" to himself

at Darjeeling. We could never forget that the honest, loyal old fellow had been a "tiger," had carried his load to 27,400 feet, and had suffered for it. The men made a butt of him, but gently.

It was a cold day's work on the slopes. Dry surface snow, slipping down the shallow funnel above the rope ladder, fell in showers upon us standing at the foot of the ice-wall, chilling even our gloved hands till they could scarcely hold the rope. As we descended, a violent wind drove into our faces from the Rapiu La and sent the snow flying across the glacier.

I must now revert to the question of the axe which Wyn Harris found on the slabs, one hour's climbing above Camp VI. I have already stated that the maker of it was Willisch of Täsch. Our first thought was that the owner must undoubtedly have been Mallory, for the reason that Willisch is a master craftsman to whom first-rate amateurs like Mallory, who do their climbing without guides and therefore do their own step-cutting, would be likely to go for a really good axe. I have subsequently been informed, however, that a number of Willisch axes were supplied to the expedition of 1924, so it is possible that this one was carried by Irvine. To one of these two it must have belonged, for no other climbers have gone by that route previous to this year. Norton and Somervell traversed by a lower line, on their way diagonally upwards from their Camp VI to the couloir. Some have suggested that this was the axe dropped by Somervell soon after he and Norton turned to descend. But they were much farther to the west when this happened, and Somervell's axe fell straight down the mountain-side and disappeared from view "still going strong." Others proffer the theories that either Mallory or Irvine put down the axe in order to climb unencumbered, or even that it was planted on the summit and blown by wind in the course of time to the place where it was found.

As to the first of these theories, no mountaineer climbing the north face of Mount Everest regards his axe as an

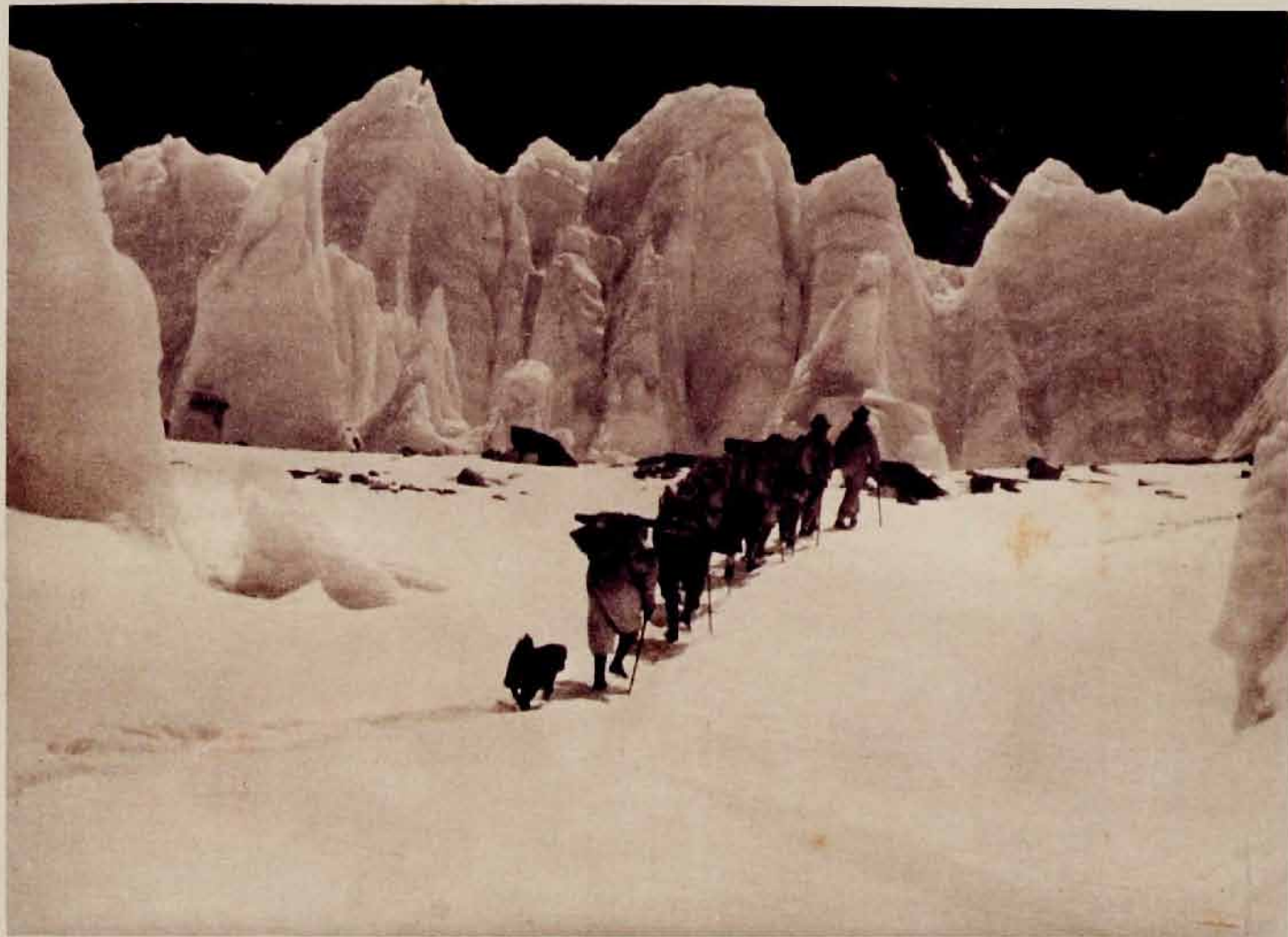


PLATE 26.—The medial trough.

encumbrance. It is his best friend and greatest safeguard. He uses it to help his balance on the outward-dipping slabs, to anchor himself when the treacherous gusts are tearing at his legs, to clear a foothold on the snow-covered rocks and, on occasion, to cut steps across hard patches of snow. The second theory is even less tenable. Supposing the axe to have been planted on the summit, for the reasons just given it would not be abandoned there. Even if it were, and supposing that the wind blew it away, it could only fall on one side or the other of the summit ridge; to north or south, to the main Rongbuk glacier, 11,000 feet below, or down the enormous southern face. By no conceivable combination of circumstances could it be carried down the eastern edge of the final pyramid, and almost horizontally eastwards for a distance of about two thirds of a mile.

We have naturally paid close attention to the problem. Firstly, it seems probable that the axe marked the scene of a fatal accident. For the reasons already given, neither climber would be likely to abandon it deliberately on the slabs, and its presence there would seem to indicate either that it was accidentally dropped when a slip occurred or that its owner put it down possibly in order to have both hands free to hold the rope. The slabs at this point are not particularly steep, but they are smooth and in places have a covering of loose pebbles which are an added danger. A slip might easily occur, and would be difficult to stop. We have no means of knowing if Mallory and Irvine climbed roped together; it is not unlikely that they did. But the rope is a poor safeguard, for the climber has no secure foothold on which to brace himself against a shock. Below, the slabs steepen considerably. A fall once begun is likely to continue. Norton has pointed out that anything dropped almost anywhere on the north face is lost for good, owing to the outward and downward dip of the strata. A flat and comparatively light object like an axe might, in this particular place, have failed to gather momentum and therefore have stayed where it was dropped or laid down; and the axe in question resisted the pull of gravity

and of the wind for nine years. But the rule rather than the exception would govern the effect of any miscalculation or loss of balance by a climber.

Secondly, the evidence is insufficient to prove whether the accident occurred during the ascent or the descent. Prima facie, a slip would be more likely to occur during the descent. It is known that Mallory preferred to try the crest of the north-east arête, and he may well have taken this line to reach it, even from the old Camp VI on the north ridge. Would he have returned the same way, whether he succeeded in climbing the second step or was forced on to Norton's traverse? If he was forced on to Norton's traverse, the more direct route back would be that adopted by Norton and Somervell, lower down; but Mallory might have preferred to regain the line which he had taken on the ascent and therefore knew to be practicable. If he climbed the second step, he would almost certainly return the same way. Odell believes that he saw Mallory and Irvine near the second step while he was ascending from Camp V in support. If he did see them, and if our theory as to the scene of the accident is correct, Mallory and Irvine fell on the descent. I quote Odell's own words in *The Fight for Everest, 1924*:

“ At about 26,000 feet I climbed a little crag which could possibly have been circumvented, but which I decided to tackle direct, more perhaps as a test of my condition than for any other reason. There was scarcely 100 feet of it, and as I reached the top there was a sudden clearing of the atmosphere above me and I saw the whole summit ridge and final peak of Everest unveiled. I noticed far away on a snow-slope leading up to what seemed to me to be the last step but one from the base of the final pyramid, a tiny object moving and approaching the rock step. A second object followed, and then the first climbed to the top of the step. As I stood intently watching this dramatic appearance, the scene became enveloped in cloud once more, and I could not actually be certain that I saw the second figure join the first. It was of course none other

than Mallory and Irvine, and I was surprised above all to see them so late as this, namely 12.50, at a point which, if the 'second rock step,' they should have reached, according to Mallory's schedule, by 8 a.m. at latest, and if the 'first rock step,' proportionately earlier. The 'second rock step' is seen prominently in photographs of the North Face from the Base Camp, where it appears a short distance from the base of the final pyramid down the snowy first part of the crest of the North-East Arête. The lower 'first rock step' is about an equivalent distance again to the left. Owing to the small portion of the summit ridge uncovered I could not be precisely certain at which of these two 'steps' they were, as in profile and from below they are very similar, but at the time I took it for the upper 'second step.' However, I am a little doubtful now whether the latter would not be hidden by the projecting nearer ground from my position below on the face. I could see that they were moving expeditiously as if endeavouring to make up for lost time. True, they were moving one at a time over what was apparently but moderately difficult ground, but one cannot definitely conclude from this that they were roped together—a not unimportant consideration in any estimate of what may have eventually befallen them."

Later on, Odell says that he saw the first of the two figures actually surmount the step *within the five minutes* of his last glimpse of them.

Now it is highly probable that Odell did see the 'second rock step' through the break in the mists. It is not masked from about his view-point. Moreover the 'first rock step' does not need to be climbed—it is easily turned on the north face. Therefore, if Odell saw figures at all, they were almost certainly approaching the 'second rock step,' and one of them may have ascended it.

I am not prepared to say that a man possessed of good sight could not have seen figures on a snow-slope separated from him by a vertical distance of 2,000 feet and a horizontal distance of some 600 yards ; it would, I suggest, be vastly more difficult

for him to see a single figure climb a dark rock-face, though he might see it arrive at the top, silhouetted against the sky.

More serious is the time question. The four men of this year's expedition who have been near the 'second rock step' are very doubtful if it can be climbed at all; they are quite sure that no man, however skilful, could climb it in five minutes.

Supposing them to be right, what then did Odell see? I suggest that the incident which occurred during Smythe and Shipton's ascent to Camp VI, described in the next chapter, offers a reasonable explanation. But Odell's firmly-held opinion is entitled to the greatest respect, and perhaps the affair will always remain a matter for conjecture. There exists, at present, no conclusive evidence as to whether Mallory and Irvine reached the summit. If Odell really saw them near the second step so late as 12.50 p.m., the questions arise whether they could possibly have completed the ascent at all, and whether Mallory would have gone on at all costs, regardless of the danger of being benighted. Norton firmly believes that Mallory had a full sense of his responsibility. If, on the other hand, Odell was mistaken, the time-factor does not apply and we know nothing further of the party's movements. We should like to think that they succeeded, for none deserved it better than Mallory, who throughout three expeditions had ever been in the forefront of the battle; or than Irvine, who in his short period of service showed a devotion to duty which could hardly be surpassed.

The weather gave us no rest, and there was a heavy fall of snow on May 31st, which would prevent Smythe and Shipton from making their proposed reconnaissance. On the morning of June 1st we could see fresh snow lying right up to the summit. It could only be left to the climbers to use their judgment. Knowing what the condition of the slabs would be, I could not be surprised if they decided to descend to the North Col. They did nothing of the kind.

A detailed narrative of the second and, as it turned out, the last assault on the summit, is better given by the man who



PLATE 27.—Camp III, at 21,000 feet. The summit of Mount Everest is on the right, above the wireless mast.

carried it out. Smythe will describe, in the next chapter, the adventures upon which he and Shipton now embarked.

Down at Camp III preparation had now to be made for taking the whole party down to the Base Camp, so soon as Smythe and Shipton and the supporting parties should return. There was no feeling of retreat about it, though the mountain was becoming steadily whiter as the monsoon advanced. If the second assault failed, we still thought we might take advantage of a break in the monsoon to try again. Wyn Harris and Wager insisted that after a period of rest they would be ready. Greene, *splendide mendax*, wirelessly up from the Base Camp that he had recovered. Crawford and Brocklebank were obviously coming on well. Longland blandly asserted his complete fitness. Birnie, I knew, was feeling the strain at Camp V, but he would not abandon his post, and there was no one available at the moment to relieve him. There would be no lack of volunteers for the next attempt. As for the porters, they were prepared for anything. A little matter like another carry to Camp VI did not bother them. "Tigers" grew on every stone. The only difficulty was to select the best.

Meanwhile Smijth-Windham coaxed even music, much interrupted by atmospherics, from the wireless; the company listened to the strains of "Blue Danube," with one ear always cocked for the tinkle of the telephone bell. In times of strain a little jollity is not amiss.

CHAPTER VIII

THE SECOND ASSAULT

By F. S. SMYTHE

Shipton and I awoke early at Camp IV on the morning of May 29th. Much depended on the weather. Anxiously we parted the twin flaps of the double-skinned arctic tent and gazed outside. The sky above was brilliantly clear, but eastwards stretched an ocean of monsoon cloud, its loftiest billows lit by the rising sun. The air about us was strangely calm, and even Everest had doffed its cap of wind-driven snow. Could this be the beginning of the long-prayed-for calm spell prior to the first burst of the monsoon, when the south-east and north-west winds cancel each other out in their struggle for supremacy?

After a leisurely breakfast we packed our rucksacks and set off for Camp V. During our first two ascents towards it we had made height at the rate of nearly 1,000 feet an hour, but we realised now how essential it was to conserve strength, and climbed at about half that speed.

The fine morning was short-lived. On the long, monotonous ridge of snow and broken rocks leading upwards from the North Col we began to experience wind, which increased steadily as we rose. We wondered whether Wyn Harris, Wager and Longland, who, according to programme, should be establishing Camp VI, had been able to leave Camp V. If not, there would be no room for us there. Our anxiety increased as we toiled past Finch's 1922 camp: mists gathered, snow whirled past in stinging clouds, and visibility was reduced to a few yards. The cold was intense, and we huddled on every stitch of spare clothing. Fortunately it was fairly easy to maintain direction, and once or twice we were cheered by seeing pieces of red bunting marking the route. But it was a relief when, after some five

hours of climbing, the storm-battered little tents of Camp V appeared through the driving clouds of snow, and we were able to escape from the blizzard into the shelter of a tent, where Birnie welcomed us with a brew of tea which he had all ready in a Thermos flask.

As the afternoon lengthened, the blizzard increased in fury. We feared for the safety of Longland and his porters who were returning from Camp VI. Now and again we glanced outside. Little was to be seen save a writhing smother of snow tearing across the slabs above the camp. Towards evening, to our relief, we heard voices. A few instants later we greeted Longland. He was unrecognisable. His face was clotted with ice; icicles hung from his nose; a chandelier of them was suspended from his beard. He brought great news. Camp VI had been established at a height of about 27,400 feet, on the limestone slabs of the yellow band, about 400 yards east of the first step and 250 feet beneath the crest of the north-east ridge. The porters had worked magnificently. Carrying loads of from 12 to 15 lbs. each, they had pitched a camp 600 feet higher than the Camp VI of 1924. Their descent had been a terrible one. For the last two hours it had not been possible to see more than a yard or two in the blizzard. Only by the exercise of supreme mountaineering skill had Longland steered his party down to safety.

After a short rest the Camp VI party was able to continue the descent to Camp IV, with the exception of two exhausted porters who elected to remain at Camp V.

Foolishly, we decided to sleep all three in a tent intended to hold only two and, as a result, passed a restless and uncomfortable night. Fortunately sleepless nights at high altitudes seem less interminable than they do at low altitudes. The mountaineer lies half comatose, only dimly aware of the slow march of the hours, caring little for the angular elbow of a companion or the inevitable stone exploring his hip or the small of his back.

The blizzard blew itself out during the night and the morning dawned fine. The clouds had retreated from many of the valleys, and for once we could appreciate our height. Over

5,000 feet beneath lay the Rongbuk glacier, shadowed and forbidding. Above it rose Pumori, a queen among lesser peaks, its snowy cone lit by the rising sun. North-westwards of Pumori stretched a wild jumble of peaks, whose dark precipices, shining avalanche-fluted ice-slopes, sickle-like blades of snow and jagged saws of rock led the eye upwards to the twin giants of Chō-oyu and Gyachung Kang. It was a relief to turn from this display of mountain savagery to the serene curve of the East Rongbuk glacier, and thence to mountains of soberer form and the distant honey-coloured uplands of Tibet.

An early start was unnecessary, and we waited until the sun had risen sufficiently high to warm us. Then, leaving Birnie to his lonely vigil at Camp V, we commenced the ascent to Camp VI. For several hundreds of feet we met with some disagreeable climbing. The slabs, snow-masked by the blizzard, demanded care; the steeply sloping patches of small scree, firmly cemented by cold and dusted with powdery snow, afforded treacherous footing. Presently we found easier going on broken rocks. Keeping as nearly as possible to the crest of the north ridge, we made steady progress. Some two and a half hours above Camp V we passed the remains of the 1924 Camp VI. The tent had long since been blown to ribbons, and its green fabric lay forlornly among its weather-bleached poles.

It was near Camp VI that Shipton suddenly stopped and pointed. "There go Wyn and Waggars on the second step," he exclaimed. Sure enough, there were two little dots on a steep snow-slope at the foot of the cliff. We stared hard at them and could have sworn they moved. Then, simultaneously, we realised that they were rocks. And, strangely enough, there are two more rocks perched on a snow-slope immediately above the step; these again looked like men and appeared to move when stared at. It was somewhere in the neighbourhood of Camp VI that Odell thought he saw Mallory and Irvine. The distance from this point to the second step is about one mile, and human figures would appear no larger than dots. Is it possible that he was similarly tricked by his eyes? His view of the north-east

ridge was between shifting mists and lasted only a minute or two. The effects of altitude, tiredness, and the strain of climbing combine to impair the efficiency of vision. It was 12.50 p.m. when they were seen. Why were they so late? No one could possibly climb the second step in the short time that he saw them; it is quite 100 feet high, vertical for the most part and even overhangs in its upper portion. It is probably unclimbable and certainly desperately difficult. Odell, however, thinks that he may have mistaken the first step for the second step. If so, it is even stranger that they should have been so late. To reach the summit from the first step and return before nightfall would have been impossible, and Mallory was too fine a mountaineer to throw his life and that of his companion away on impossibilities. On the other hand, they may have decided to go on as far as they could and return by nightfall. Another point in favour of Odell's view of them is that it is certain that they reached a point very close to the crest of the north-east ridge, if not the crest of the ridge itself.

A short distance above the remains of the 1924 Camp VI we managed to scramble down from the north ridge to a ledge on its eastern side. There we were sheltered from a slight but cold breeze, and sat for a while in delightful warmth, our legs dangling over the depths of a couloir that descends to the East Rongbuk glacier. So seldom did we feel warm on Everest that it required a real effort to force ourselves into action again.

Climbing back over the ridge we bore westwards past a prominent tower of yellow limestone. This brought us to broken easy ground of moderate angle beneath the 1,000-foot thick yellow limestone band, the crest of which forms the north-east ridge. We halted and searched the rocks for Camp VI. Suddenly we saw it, a dark-green dot perched on the slabs several hundred feet above us.

Wyn Harris, Wager and Longland with their porters had ascended the slabs directly to the camp site, but Longland had brought the porters back along a nearly horizontal shelf to the east of the camp, and thence gained the north ridge only a short distance below the north-east shoulder. Seen from below, this

latter route is by no means obvious, and we decided to follow the more direct upward route.

To reach the foot of the yellow band involved a toilsome ascent up loose scree and slabs. Our legs were tired, and none of the time-honoured artifices such as the view, an errant boot-lace or a photograph were necessary to induce frequent halts.

Our plan was to follow a couloir that ended just below the Camp. To enter it involved us in difficulties. The new snow that had fallen had collected at its foot and had been compacted by the wind into a hard icy shield. Every step had to be cut for quite 100 feet. Step cutting at 27,000 feet is something more than hard work, and we were glad at first to encounter softer snow. But it was snow of the most evil quality, loose and floury, and we sank knee-deep into it. There was no alternative save to leave the couloir in favour of the slabs to the west. It was a real struggle floundering out of it. The same loose snow covered the slabs, but there was not so much. Nevertheless, the next 300 feet of ascent provided us with the nastiest bit of climbing we had yet had. The face at this point consists of outward-shelving slabs, broken by steep little bands of rock that traverse the mountain-side more or less horizontally. Every outward-sloping ledge was laden with snow. There were no good holds and never a belay. A rope is more dangerous than useful on such rocks, and by mutual consent we climbed unroped. The loose snow had to be shovelled and swept away from every ledge with gloved hands before secure lodgment could be obtained. It was slow, cold, and fatiguing work, and it was with a grunt of joy—we had no breath left to shout—that we emerged from the slabs on to a patch of scree to see Camp VI only a few yards above us. A few minutes later we crawled into the little Burns tent and flopped thankfully down on the sleeping-bags. After a rest we collected some snow in a saucepan and set about making a hot drink. At that altitude, however, our solid methylated cookers proved so inefficient that it took them over an hour to melt snow and make two cups of lukewarm tea: not once during our stay at Camp VI was water raised to boiling-point in consequence of the diminished pressure.

The afternoon was drawing on when Wyn Harris and Wager returned. We knew that their chance of success had been nullified or at least greatly diminished by the new snow on the rocks, and it was no surprise to hear of their bad luck. They had made a great effort, and were able to advise us as to the route to be followed. From what they had gleaned during their reconnoissance, it was obvious that we must attempt to reach the summit by Norton and Somervell's route. After a warm drink they left for Camp V, following the terrace discovered by Longland, and for some time we watched them methodically traversing the shelving slabs. Then, securing the tent flaps, we struggled out of our windproof clothing and buried ourselves as snugly as possible in our sleeping-bags.

Before the sun left the tent we ate our supper, thawing out four tins of Brand's meat essence and some tinned fish, and concluding our meal with a grand brew of café au lait and condensed milk. By the time we had finished, the tent was glowing in the last gleams of the declining sun. For a few brief moments we glanced outside. Distress in breathing, the cold, and the callous grip of altitude on our senses made us unmindful of the beauties and grandeurs about us. But I retained some impressions.

The evening was peaceful, the most peaceful evening we had yet experienced above the North Col. Only occasionally did breaths of wind stray past our solitary tent, but breaths that might have emanated from the lungs of that frigid Mephistopheles whom the Tibetans believe dominates a hell of eternal and awful cold. Thousands of feet below, a cloud-sea stretched to the uttermost limits of the western and north-western horizon. Above it rose the glorious massif of Chöoyu and Gyachung Kang. Most of the lesser peaks were smothered, but some pierced the cloudy ocean, and the sharp crest of Pumori loomed through like some deadly rock set for the destruction of aerial mariners. As we watched, the golden light died from the misty billows, leaving them grey and cold. Shivering we sought the shelter of our sleeping-bags. For a few minutes longer the slabs about us were steeped in an

unearthly glare. Then, suddenly, the fires were quenched and at one stride came the dark.

It was not a comfortable night. The sharpest stones in Asia had inserted themselves cunningly beneath the tent. Time, the threat of bad weather, and tiredness had prevented the first party from constructing a proper platform, and about one third of the tent projected outwards unsupported, while the remainder sloped awkwardly downwards. Shipton occupied the lower and partially unsupported side, and I the sloping upper side. I spent the night in rolling on top of Shipton and Shipton spent the night in being rolled on by me.

Dawn came at last. We were both tired and depressed—the mental depression resulting from insufficient oxygen—and felt disinclined to do anything. Actually, there *was* nothing to be done. As daylight increased, the wind rose and snow began to fall. There was no possibility of making an attempt on the summit, and we resigned ourselves to a day in our sleeping bags.

By the afternoon a blizzard was raging. I think we both realised that our attempt was foredoomed to failure, but neither of us liked to voice this thought to the other. If the bad weather continued or the monsoon broke, descent might be prevented. We had food for two or three days, or longer at a pinch, but fuel for only two days. More serious was the question of deterioration. How many days could a man spend at 27,400 feet and still retain sufficient strength to descend safely? But in one respect altitude is merciful; the mountaineer is too much occupied with the problem of existing in the present to worry about the future. Our only grouse was the food. This had not worked according to plan. We craved for something more substantial than jellies and "slops." Shipton's constant plaint was, "Oh for a few dozen eggs!" I sighed for a tin of Frankfurter sausages and sauerkraut. Former expeditions have been able to eat little on or above the North Col and then only carbohydrates. Somervell told me that in 1924 his favourite diet was strawberry jam and condensed milk. In 1933 Rutledge's policy of slow acclimatisation proved so successful



PLATE 28.—The North Col, from near Camp III.

that tastes were different. Unfortunately the rations for high camps had naturally been based on previous experience.

The long day passed. Towards evening the clouds parted and the sun shone for a short time. The scene was wintry and desolate. The wind had lessened somewhat, but now and again a savage gust whirled a ghost-like spiral of snow across the slabs.

The night was no more comfortable than the last, and was punctuated by wind squalls which volleyed the snow against the tent.

The morning dawned clear. It was our last chance of making the attempt on the summit. We had planned to leave the camp at 5 a.m., but the wind and cold were so great at that hour that to have done so would have meant frost-bite. We cooked some sort of a breakfast. As we did so the wind dropped. At about 6.30 a.m. we began the exhausting process of pulling on our windproof clothing and insinuating our feet into boots frozen to a consistency of granite. Our appearance muffled up in all the clothing we possessed resembled the Tweedledum and Tweedledee of *Through the Looking Glass*. I wore one Shetland vest, a thick flannel shirt, a thick camel-hair sweater, six light Shetland pullovers, two long pairs of Shetland pants, flannel trousers, and over all a silk-lined "Grenfell" windproof suit; my head was protected by a light Shetland balaclava helmet and an outer helmet of Grenfell cloth; and my feet were encased in four pairs of Shetland socks and stockings. The climbing boots were of necessity broad and lightly nailed, but they gripped admirably on the sloping slabs. The ideal gloves for Mount Everest have yet to be designed, but a pair of woollen fingerless gloves and over them a pair of South African lambskin gloves kept the hands reasonably warm.

We took with us a length of light line, but by mutual consent we agreed not to use it on the slabs in the neighbourhood of Camp VI. Directly above the camp was a slanting snow-filled gully which took us easily upwards for some distance. Prior to starting, Shipton had complained of stomach

trouble, and it was obvious that he was not going as well as usual. Above the couloir we found ourselves on slabs sloping to the crest of the ridge at a uniform angle of between 30° and 35° . These slabs were not in the least difficult—not to be compared with those below Camp VI—but they demanded care owing to the fresh snow concealing the shelving ledges. It was hereabouts that disaster probably overtook Mallory and Irvine; there are no belays, and a slip would be hard to stop. We came so close to the crest of the ridge that, looking in a south-easterly direction, we could see over it. A canopy of cloud concealed Nepal and only the summits of the loftiest peaks rose above it. Far beyond, a wall of giant dun-coloured cumulus spanned the south-eastern horizon: the monsoon rains were drenching the foot-hills of the Himalaya.

Traversing below the ridge and ascending slightly, we presently gained a gently sloping terrace of scree, on which a camp might be pitched, leading to the foot of the two massive towers forming the first step. Passing beneath the step, we continued along a gradually narrowing series of ledges. Up to this point we had not gone fast, but we had gone well and steadily. It was a shock to me, therefore, when Shipton suddenly succumbed to his stomach trouble. He said that he was only holding me back and suggested that I should go on, leaving him to follow slowly if he could. Now it had been laid down as an axiom that no man was to go on till he collapsed from exhaustion; to do so might involve the whole party in disaster. Shipton wisely realised this and was able to return to Camp VI in safety. On the way across Tibet we had often discussed the possibility of one of a climbing party being unable to go on, and now that it occurred to one of us, he was not found wanting in that commonsensical outlook which is so vital in the mental equipment of the mountaineer. It was a bitter disappointment to both of us, and the chance of success, already minimised by our late start and the bad condition of the mountain, was almost eliminated. Having assured myself that he was fit enough to return to Camp VI, I continued alone.

In order to traverse the great couloir as high as possible, I decided to keep on the crest of the yellow band immediately beneath the twin bands of black rock formed by the first and second steps. As events proved, it would have been better to have traversed lower. The general angle of the slabs of the yellow band is concave, and the lower the band is traversed the easier it is. Also, owing to the shelter afforded by the steep rocks above, there was more snow lying high up on it than there was lower down. In places this snow was wind-blown and hard, but mostly it was soft and powdery. First of all came a slope of hard snow, about 30 yards broad, which necessitated step-cutting all the way across it. Beyond were narrow shelving ledges deep in powdery snow, which had to be kicked or scraped away before safe footholds could be found. Here and there, where the rocks had been blown clear, the going was easy. The angle steepened gradually, and once or twice, where ledges petered out, I had to return and seek for an alternative route. A corner formed by a projecting buttress was turned, and the buttress bounding the western wall of the couloir became visible. There was much snow lying on it, but nevertheless I experienced a thrill of hope. If it proved possible to traverse it to the ridge above, it might also be possible to force a way through an obvious breach formed by the intersection of a subsidiary couloir of the great couloir with the black rock band above, which continued from this point unbroken across the northern face of the mountain. Above the band the rocks looked easier, and once on the face of the final pyramid I might have a chance of reaching the summit.

Presently the great couloir became visible. It was filled with snow which ended beneath an impasse formed by a series of fearsome black overhangs, which put me in mind of the central gully on Lliwedd in North Wales. In general angle the couloir was exceedingly steep, and some two or three hundred feet lower it was broken by a sheer precipice. To enter it I first of all traversed along a ledge, but the ledge narrowed to such an extent that I was forced to edge along it facing inwards, my arms outstretched to grip the few rugosities in the steep rock

above like "some beast of ill repute nailed to the wall of a barn." But balance was too critical, and I felt that an extra deep breath might topple me off backwards down the couloir to the Rongbuk glacier 9,000 feet beneath. So I edged back again, but as soon as I had done so I persuaded myself that I was making a quite unnecessary fuss over an obviously climbable place and tried again—with no better success. The alternative was a wider snow-covered ledge some twenty feet lower. To descend to it I adopted a sitting position, and, trusting to friction, lowered myself down the slabs on the palms of my hands. Being partially masked with loose snow, the ledge necessitated care, but it was nowhere difficult, and soon I found myself on the edge of the couloir. To my surprise, the couloir at this point was filled with hard snow. About a dozen steps had to be cut. Hard work it was and, though I endeavoured to swing my ice-axe with the minimum expenditure of effort, I had frequently to pause for breath. It was with considerable relief that I reached the rocks of the buttress on the other side.

As previously explained, the subsidiary couloir west of the buttress makes the only breach in the otherwise impregnable black band of rock formed by the continuation of the second step across the northern face of the mountain. It is the one weakness in the most formidable of Mount Everest's defences, and in it lies the key to the ascent. My plan was to make a steep ascending traverse into the subsidiary couloir, enter it as high as possible, and thence follow it through the breach on to the face of the final pyramid. This plan, as well as any hope I had previously entertained of reaching the summit, was doomed to failure.

As far as the great couloir the climbing had been more dangerous than difficult; now it became both difficult and dangerous. The buttress was sheltered from the west wind, and the new snow fallen in the previous day's blizzard had accumulated on every place that was not too steep to hold it. And it was snow of the worst quality, soft like flour and loose like castor sugar. Owing to their steepness, the abrupt walls



PLATE 29.—Climbing the ice slope below the great crevasse on the North Col.

separating the shelving ledges were free of snow, but the ledges along which progress had to be made were covered with snow, into which I sank knee-deep and sometimes even thigh-deep. Imagine a house-roof covered with loose snow of such consistency that it cannot hold the foot and thus prevent a slip, and you will form a fair idea of the place. Sometimes I had to burrow and grope about in the snow for holds, at other times shovel the snow away altogether until roughnesses in the slabs beneath were exposed. It was work of the most arduous and exacting nature.

The western side of the great couloir was reached at 10 a.m. At 11 a.m. I had gained but fifty feet of height and had reached about the same place as did Wyn Harris and Wager. Time alone rendered the summit inaccessible under such conditions, while such exhausting work could not be kept up for hours on end, as it would have to be if the buttress were traversed. The bitterness of defeat was brought home to me, but it was a bitterness mercifully dulled by altitude. I remember glancing at the summit. How pitilessly indifferent, how utterly aloof and detached from my futile gaspings and strugglings it appeared!

It was somewhere near my highest point that a small protuberance on which I was standing came clean away. Luckily my ice-axe pick was jammed in a crack at the time and a fall was prevented. It was a near thing, but it seemed a trivial incident at the time. At 28,000 feet the brain is incapable of registering strong emotion. It was, however, with a certain feeling of thankfulness that I retraced my steps across the couloir.

Now that I was defeated and had only to return to Camp VI, I had time to take stock of my surroundings. Under the conditions prevailing in 1933, Everest is impossible by any route. Under better conditions, when the rocks are free of snow, Brigadier Norton has shown that it is possible to traverse the "tiles" with comparative ease. It would appear, however, that the best route is not to traverse the couloir high, but as low as possible. Apart from the fact that the general inclination of the yellow band is slightly concave and that the

lower it is traversed the easier it is, it is better to avoid the steep buttress, and this can be done by keeping low down and turning it at its base where the subsidiary couloir bifurcates with the great couloir. If the subsidiary couloir held good snow, it could then be climbed direct to the breach, but if it held bad snow, as is extremely likely, it should be possible to climb the rocks at the side of it, or alternatively to traverse out of it on to the snow ridge bounding it to the west. Whichever route is followed, something more than an ordinary effort will be required before easier ground on the face of the final pyramid is reached. Wyn Harris has suggested that oxygen apparatus giving off a large quantity of gas for a short time should be used for this bad section of the climb. Camp VI should be pitched on the scree ledge under the first step. Thence carrying oxygen but not using it, the climber will make a gradually descending traverse across the yellow band to the great couloir. He will then don the apparatus and climb as rapidly as possible to the breach in the black band. Once through this he will leave his apparatus and proceed without it. Any oxygen left over could be employed to help him during the descent. In addition, a long length of very light cord could be taken and fixed to pitons above and below the steep 300 feet between the great couloir and the breach: this might prove invaluable, for there is no doubt that those who climb Everest even in the best conditions are going to be "all in" after their tremendous effort. One disadvantage of pitching Camp VI under the first step is that the exhausted climber returning from the summit will be required to ascend over 100 feet to the camp; but this disadvantage will be more than compensated by the saving of time on the way to the summit and the carrying of the oxygen apparatus downhill instead of up before it is used. Both mentally and physically it is going to require a supreme effort to climb the last 1,000 feet, and anything that can stimulate the climber's flagging mental and physical energies should be employed. In all probability the summit can be reached by an acclimatised man without oxygen, but the odds against him are great. The difficulty of the mountain, the evil effects

of altitude, the possibility of being benighted, the risk of sudden storms and the dangers of exhaustion are so serious that oxygen should be taken if it can aid the climber. Prior to 1933 there were those to whom the thought of it was abhorrent. I confess to a similar prejudice. There seemed something almost unfair in climbing what was then thought to be an easy mountain by such artificial means. I doubt whether there is a member of the present expedition who now thinks thus, for Everest has been proved to rely for its defence not only on bad weather and altitude, but on its difficulties too; it allows of no latitude; it defends with every means in its power, and its weapons are terrible ones; it is as exacting on the mind as it is on the body. Those who tread its last 1,000 feet tread the physical limits of the world.

On the way back to Camp VI, I traversed low down along the yellow band and discovered easier going. The lower edge of the band breaks away in a sheer precipice, and the best route was a few feet above this. Once or twice I stopped to take photographs. Extracting the camera from the pocket, opening it, adjusting the lens aperture and shutter speed, and then trying to still the panting of the lungs for one brief instant was not easy. Furthermore, my gloves were so stiff that it was only possible to work the camera with bare hands.

Traversing low down on the yellow band meant that an ascent of over 100 feet was necessary to the foot of the first step if the line by which I had reached this point from Camp VI to this point was to be regained. I decided, therefore, to traverse directly to the camp. It was a bore having to return to Camp VI at all, for the line of descent followed by Norton and Somervell is the obvious way down the mountain, and considerably easier than the long traverse I had to make to regain the Camp. Had Shipton not expected me, I should have descended by this route to Camp V. Several times on the way back, below the second and first steps, I stopped to examine the rocks above, but there appeared to be no feasible route through the two bands. Norton has suggested the possibility of breaking through the lower

of these two bands east of the great couloir, and traversing along the slabs between it and the upper band until it is possible to break through the latter. The objection to this is that, even supposing a route be found through the lower band, the slabs that would have to be traversed are much steeper than the slabs below the two bands.

The traverse back to camp was a long and tedious business. The rocks were not difficult, but they exacted continual care. Its shelving ledges are separated by abrupt little walls, and progress was made by traversing one ledge for a short distance, then clambering down a wall to a lower ledge, then along this and down again to another ledge. The yellow limestone rocks hold the boot well, but here and there they are broken by veins of whitish rock which were treacherously slippery. To a tired man this rock forms a trap, for the foot slips from it more easily than it does from the yellow rock.

During my solitary climb two curious phenomena were experienced. It is with great diffidence that I mention them, and then only at Ruttledge's request. I prefer to draw no inferences from them and merely to describe them. The reader should realise, however, that men under physical and mental stress have experienced curious things on mountains, and instances are described in the pages of the *Alpine Journal*. Furthermore, the effects of oxygen-lack on the brain are complex and but little understood; Wyn Harris's nightmares are a case in point. The first phenomenon was one that is by no means unique, and has been experienced in the past by solitary wanderers, not only on mountains but on desert wastes and in polar regions. All the time that I was climbing alone I had a strong feeling that I was accompanied by a second person. This feeling was so strong that it completely eliminated all loneliness I might otherwise have felt. It even seemed that I was tied to my "companion" by a rope, and that if I slipped "he" would hold me. I remember constantly glancing back over my shoulder, and once, when after reaching my highest point, I stopped to try and eat some mint cake, I carefully divided it and turned round with one half in my hand. It was



PLATE 30.—The Ice Wall.

almost a shock to find no one to whom to give it. It seemed to me that this "presence" was a strong, helpful and friendly one, and it was not until Camp VI was sighted that the link connecting me, as it seemed at the time to the beyond, was snapped, and, although Shipton and the camp were but a few yards away, I suddenly felt alone.

The second phenomenon may or may not have been an optical illusion—personally I am convinced that it was not. I was still some 200 feet above Camp VI and a considerable distance horizontally from it when, chancing to glance in the direction of the north ridge, I saw two curious-looking objects floating in the sky. They strongly resembled kite-balloons in shape, but one possessed what appeared to be squat under-developed wings, and the other a protuberance suggestive of a beak. They hovered motionless but seemed slowly to pulsate, a pulsation incidentally much slower than my own heart-beats, which is of interest supposing that it was an optical illusion. The two objects were very dark in colour and were silhouetted sharply against the sky, or possibly a background of cloud. So interested was I that I stopped to observe them. My brain appeared to be working normally, and I deliberately put myself through a series of tests. First of all I glanced away. The objects did not follow my vision, but they were still there when I looked back again. Then I looked away again, and this time identified by name a number of peaks, valleys and glaciers by way of a mental test. But when I looked back again, the objects still confronted me. At this I gave them up as a bad job, but just as I was starting to move again a mist suddenly drifted across. Gradually they disappeared behind it, and when a minute or two later it had drifted clear, exposing the whole of the north ridge once more, they had vanished as mysteriously as they came. It may be of interest to state that their position was roughly midway between the position of the 1924 Camp VI and the north-east shoulder. Thus, they were at a height of about 27,200 feet, and as I was at about 27,600 feet when I saw them, a line connecting their approximate position with my position would not bring them against a background of

sky, but against lower and distant mountains. It is conceivable, therefore, that it was some strange effect of mist and mountain magnified by imagination. On the other hand, it may have been a mirage, and when I put forward this hypothesis I have in mind an extraordinary mirage of ships observed by Colonel Philip Neame and myself from the Finsteraarhorn.

Mists continued to form and drifted across, concealing familiar landmarks ; it would be no easy job finding Camp VI in a mist among that wilderness of slabs. Fortunately, two points on the north-east ridge which were directly above Camp VI showed now and then, and it was possible to estimate the general direction of the camp. My only fear was that I might be too low and might have to ascend. During the traverse I crossed the probable line of fall of Mallory and Irvine, but no further traces of them were to be seen. Suddenly I came across a shallow gully filled with snow. In the snow were footprints. It was the gully immediately above Camp VI, and there was the tent a few feet lower.

Shipton was there. He had descended without difficulty and felt much better. We discussed plans. It was decided that he should descend to Camp V, while I, who was feeling tired, should remain for another night at Camp VI and descend next day to Camp IV. It was about 1.30 p.m. when I returned to camp, and at about 2.30 p.m. Shipton set off for Camp V. The weather looked none too good when he left, and the wind was beginning to raise the new snow from the face of the mountain, but we did not anticipate anything worse for some time to come. It was about an hour later that a sudden and terrific storm broke. I was very anxious for his safety, and not without reason, for it nearly cost him his life. At one point the wind was so frightful that further progress towards Camp V seemed impossible, and he nearly decided to try and struggle back to Camp VI. To have attempted this would have meant certain death, for no one could have traversed the slabs in such a hurricane. I feared for my own safety too, and momentarily anticipated an inglorious fall, wrapped in a winding-sheet of tent, down the mountain. But, thanks to the painstaking

work of the first party in properly securing it, the stout little Burns tent weathered the fiercest blasts, though the fabric cracked like pistol shots alternating with a furious drumming as the snow-charged wind hurled itself against it. A peep between the flaps revealed a whirling smother of snow raging across the slabs. I felt thankful at having returned when I did. To have been caught in such a storm above Camp VI would have made descent impossible.

Towards sundown the wind dropped, and I ate my supper in comparative calm. It was a strange experience settling down alone for a night 27,400 feet above the world. But the loneliness of the hills is not to be feared.

It was 6 p.m. when I turned in, and it was not until 7 a.m. next morning that I awoke after the best night I had yet had above the North Col. During the night the storm must have continued and the wind-driven powdery snow penetrated a small hole that had been accidentally burnt in the side of the tent by the spirit cooker, and piled up in a drift extending nearly to the roof of the tent. The morning was the coldest that I ever remember, and it was not until the sun had struck the tent that it was possible to rescue the remainder of the provisions from the snow and prepare breakfast. After breakfast I packed my few possessions in my rucksack and set off for Camp IV. One backward glance I took at the little tent—the sole evidence of man's handiwork on that most desolate and inhospitable mountain-side. It had served us well.

The weather was calm, and there was little movement among the sea of monsoon clouds beneath. This was fortunate, for the going was disagreeable. The steep scree masking the slabs of the traverse, and in places the slabs themselves, were thinly veneered with ice. It was the first time that this condition had been found on the upper part of Mount Everest. It may have been caused by the sun of the previous day warming the rocks so that the first snow that fell melted and froze while subsequent snow was blown clear; or it may have been due to wind pressure changing the snow into ice. The first explanation would seem the more

likely one. It made extreme caution imperative, and it was galling to spend so much time with the risk of bad weather at the back of the mind.

Not far from the north-east shoulder the terrace petered out into slabs deeply covered with new snow. It was a place similar to the buttress on the western side of the great couloir, and every hold had to be searched for beneath the knee-deep floury snow. Presently, to my relief, I was able to gain more broken rocks which, owing to their steepness, held less snow than the slabs. The way now was obvious and easier, and I paused for a breather. As I did so, I was aware of a curious fuzziness approaching from the west. Before there was time to realise what it meant, a gust of wind of such strength struck me that I was nearly blown from my holds. Then came another gust and another, and in less time than it takes to write this a terrific storm was raging. Somehow or other I managed to descend the rocks to easier ground. Protected though I was by a woollen balaclava helmet and an outer windproof helmet, it was impossible to face the wind for more than a moment or two, for goggles soon iced up and the driving snow stung like whiplashes. It was fortunate that the easier ground was gained when it was, for the wind continued to increase in velocity, quickly reaching a strength that I had never before experienced on a mountain. Often I was reduced to crawling on hands and knees, and even so I was several times swept from my balance but managed to stop a fatal slide with my axe. The air was filled with driving snow, and it was seldom possible to see more than a yard or two. The whole hate and fury of Everest were concentrated on one miserable little human being.

Somehow, I do not quite know how, I managed to keep going; but the struggle could not be kept up, for if the wind was of hurricane force the cold was proportionately great. It did not merely numb the extremities, it seemed to clasp the whole of me in its grip, and for the first time in my life I felt a deadening numbness creeping up my body. And then, unexpectedly, I found myself close to the crest of the north ridge at the identical spot where Shipton and I had found shelter on the way up to Camp

VI. Crawling over it, I half climbed, half slid down to the ledge where we had sat on the lee side. Providence was kind to me that day. The ledge was completely windless and the change was magical. Even the warmth of the sun, which was dimly visible through the clouds of driving snow, could be felt. The horrid deadening feeling slowly left my body, and circulation returned painfully to my hands. Feet alone remained lifeless, and I was fortunate to escape with minor frost-bites on my toes. A few feet above me the wind roared across the crest of the ridge, striking the rocks now and again with a noise like a thunderclap, and sending the snow far out to leeward in twisting clouds. It was not until warmth and strength had returned that I decided to continue the descent. Had it been possible to stay longer on the ledge I should have done so, but the complete disappearance of the sun suggested that the wind was the forerunner of another blizzard.

To follow the crest of the ridge was out of the question and, below the 1924 Camp VI, I climbed along the western side of it. At about 26,000 feet it was only blowing an ordinary gale, and visibility was so good that there was no risk of missing Camp V. I was about 300 feet above the camp when I first saw it, and almost simultaneously two figures emerged from one of the tents and started down. I shouted and waved, but they did not see or hear me. This was a disappointment, as I was by then feeling somewhat weak and tottery about the legs. However, there was the camp and its welcome shelter, and as quickly as possible I continued on down the slabs. Keeping too far to the west involved me in some awkward climbing on some outward-sloping slabs—easy enough to a fresh man, but not to an almost exhausted one. In one place some half-dozen steps had to be cut in a slope of hard wind-blown snow, and it was all I could do to cut them.

Another disappointment awaited me at the camp, when at last I got there, for the tents had been collapsed. Birnie had considerably left a Thermos of hot tea in one of them, but it did not occur to me to look for it. I decided to continue the descent to Camp IVa. Save for my legs, which had an unpleasant habit

of giving way under me every few yards, I felt quite fit and confident of reaching it.

The wind decreased steadily as I descended, and was no longer dangerous. Below me on the ridge of snow and rocks Shipton and Birnie were visible. Presently some figures emerged from the arctic tent on the North Col and started to climb the ridge. An hour or so later I was being greeted by Longland, who, in spite of his tiredness after his great effort in establishing Camp VI, had climbed quite 1,000 feet to meet me. I was so slow that he had had to wait a long time, and he was slightly frost-bitten. He brought with him a Thermos flask of something hot and stimulating, so stimulating that I needed no help in descending to Camp IVa. In addition to Longland, McLean was in support at the camp, and neither Shipton, Birnie nor I are likely to forget the superb meals he cooked for us, or the trouble he took in overhauling our hearts and in generally seeing to our comfort. It is memories such as these that help to make Everest very much worth while.

CHAPTER IX

THE THIRD ATTEMPT

News was not so very long in coming to us at Camp III. We had been too busy ourselves on June 1st to indulge in unprofitable speculation. But the 2nd brought renewed anxiety. A lovely morning turned rapidly to a stormy noon, as a tremendous gale came up from the north-west. I could scarcely hope for a telephone message from the North Col while this lasted ; but towards evening the indomitable Longland fought his way from Camp IVa to the telephone box on the crest of the Col, to send the news that Smythe, Shipton and Birnie were safely down. Our first feeling was of relief rather than disappointment at the failure of the second assault. It had seemed that nothing could live on the north ridge through that gale ; and three men had had to descend it, one of them alone. For details we should have to wait ; it was all that Longland could do to give us the outline before running for shelter.

So, for the first time, we must return to the Base Camp. Not one man could possibly be fit for an immediate renewal of the assault. But from what I had seen of the condition and spirit of the party I had reason to hope that, if this were what we call in India the "chhoti barsat" (literally "small monsoon"), and if it were followed, as often happens, by a break of several days, an early return and fresh attempt were not out of the question.

Early on the morning of the 3rd signs of movement were seen along the crest of the North Col. Through the telescope I could distinguish Shipton in the lead, followed by McLean. The latter seemed to have broken down, and considerable difficulty was being experienced in getting him along the narrow crest and down the fixed ropes. The others, climbers and porters,

were coming along with no sign of fatigue. Shebbeare went up to the crest to meet them from Camp IIIa. About two hours later Shipton walked into Camp III by himself. I had gone out some little distance to meet him, and saw that something was wrong. He hardly seemed to know me, or to realise what he was doing. I soon got him to bed, where he suffered much from headache throughout the afternoon and ensuing night. How far his condition was the result of hardship on the mountain or of slight sunstroke was never fully established. Smythe strolled in, looking completely unruffled and untired. Longland was obviously fine-drawn, but still very much on the spot. Birnie, limping from his strained leg and frost-bitten feet, looked a mere shadow of his old self. He had spent a total of eight nights at Camp V, losing much weight and strength in the process. Just as darkness was coming on, McLean staggered in, half-carried by two porters. He was fairly "down and out." Tewang and I got him into a Meade tent, with hot drinks and a supply of oxygen. His feet and hands were rubbed, and he presently dozed off. The North Col is not a health resort for everybody. Meanwhile Smijth-Windham and Brocklebank had considerately vacated the single arctic tent, to make room for the climbers; the former setting off for the Base Camp and the latter occupying a Meade.

All except McLean crowded into the arctic tent that evening; and what an evening it was. Would that a Conrad had been there. The wind roared outside, and snow lashed the tent. We listened to tale after tale of bitter, gale-swept ridges; of frozen camps; of desperate ventures along smooth, downward-shelving ledges, where life sometimes depended upon the friction of a single bootnail on the rock; of treacherous snow; of slips corrected only just in time; of upward toil when every nerve in the tired body called for a halt; all so quietly told that conscious effort was required to realise that these men had forced themselves to the very limit.

It was sad to reflect how near those two climbing parties had gone to success. Neither had had that little bit of luck with the weather which might have made all the difference. Wyn Harris

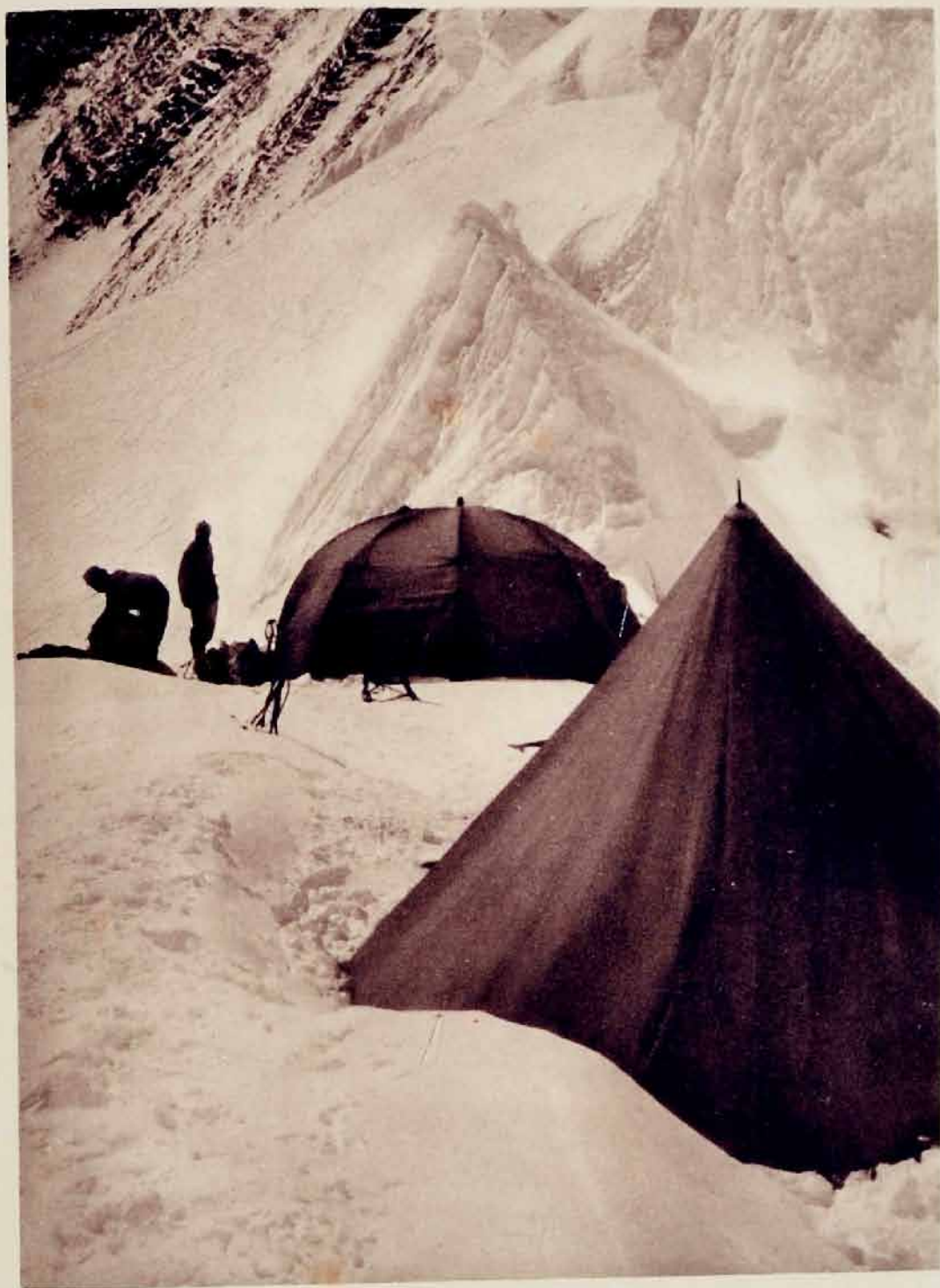


PLATE 31.—Camp IV, at 22,800 feet.

and Wager, in spite of their dual objective, could have made far more rapid progress on dry rock. Smythe had made a wonderful single-handed effort in conditions which never gave him a chance; and Shipton had been robbed, by that unlucky seizure, of the full share in the attack to which his skill and strength entitled him. Yet with the sadness was mingled profound relief that we had them all safely down with us again. Both Wyn Harris and Smythe had come very near to catastrophe, as already described. Shipton, weakened by illness and by his battle with the wind, was nearly lost in the course of his descent from Camp VI, when a patch of snow on to which he lowered himself by his hands from a ledge slipped away, and he only just had strength to pull himself back.

Truly the spirit of man is unconquerable. Here were the climbers, just down from a devastating struggle with Nature in her worst moods. Yet, their story told, they eagerly discussed plans for a fresh assault, asserting that they only needed a few days' rest and would then be ready again. It was not a question of a single act of hot-blooded courage, but of slow, dour, long-continued advance against the tremendous defences of the mountain. I felt very proud of my companions.

There was some difference of opinion as to where the much-needed rest should be taken. The Kharta valley, five marches from the Base Camp, was suggested; but it was pointed out that this would take us too far from the mountain, and that we should miss our chance if a break in the monsoon occurred. In view of their splendid keenness, I agreed that at least some of the men should be allowed to try again, but stipulated that Greene's opinion should be taken at the Base Camp, after a thorough medical overhaul.

There was a pathetic humour about the departure next morning, when assertion and hard facts came into collision. Smythe went off down the glacier with his usual long, easy stride. Some staggered rather than walked. Birnie could hardly move, though he indignantly refused a porter's arm. Shebbeare and I decided to stay on one more day, to help McLean down on the morrow, and to give Shipton more time

to recover from his headache. The weather, having seen us off the mountain, was now bright and warm, but Everest was white up to the summit. Little did we think that not one man would reach the North Col again.

McLean needed much help on the way down, but Shipton was rapidly recovering his form. He and I travelled down to Camp II together. We stopped to give an occasional hand to McLean among the crevasses, and Shebbeare saw him safely into camp. We found the trough, which we had not seen for weeks, much changed. The seracs, affected by the sun and the monsoon air-currents, were slowly settling down on their bases. One or two had fallen. The trough had much water in it, and Havildar Lachman Singh, with good mountaineering instinct, had worked out an excellent route along its left bank and across the glacier.

At Camp II we found Birnie suffering from his frost-bitten feet and obliged to yield to the logic of facts. The expedition stretcher had long ago ceased to function; necessity became the mother of invention. A porter's tubular steel frame carrier, used for the transport of provision boxes, was produced and a seat constructed from interlaced "nawar" tape. This was padded with a pillow; even stirrups were made from the tape. Next morning, amidst much chaff, the stalwart Jingmi shouldered the contraption, and Birnie was hoisted on to the most remarkable saddle of his experience. He sat facing the same way as Jingmi, with his arms round that sportsman's anything but sylph-like neck; and the procession started. The way along the moraines below Camp II is rough in the extreme. Shipton and I walked in front, giving support at awkward places and dislodging loose boulders. Jingmi took it in turns with three other porters, and gave a wonderful exhibition of strength and balance. Shebbeare, Shipton and Birnie went straight down to the Base Camp. McLean meanwhile made even slower progress, supported by another man, and completed the journey to the Base Camp next day, much of it in tow of my ice-axe. The evening before, at Camp I, we had a most amusing welcome from little Bahadur Gurung,

the Gurkha corporal. For weeks he had eaten his heart out at Camp I, of which he was in charge. Though doing his duty to perfection, he longed for adventure, for a climb on the mountain. I promised to try to take him at least as far as Camp III next time, and he cheered up. Together we made a wonderful causeway across the now swollen glacier stream, to enable McLean to cross. We splashed each other and the porters, and generally behaved like schoolboys.

The Base Camp on June 7th was very different from the dreary waste we had left in April, or the still drearier waste above. McLean and I took five hours to reach it from Camp I, but that made its welcome perhaps all the pleasanter. The sun shone brightly. Little cushion flowers appeared everywhere, and the blue gentian. There was even grass. The ice, where the porters used to toboggan about all day on a sledge intended for invalids, had given way to a sheet of blue water in which the white summit of Everest was marvellously reflected. Here were Karma Paul, our interpreter, and Jemadar Gaggan Singh (recently promoted in his regiment), Treasury Officer, and the smiling "tigers," now thoroughly rested and ripe for mischief. Wild blue rock-pigeons strolled about between our feet; choughs and linnets were everywhere; the great lammergeier, with his seven-foot span of wing, hovered overhead. Burhel, the blue sheep of the Himalaya, usually so timid, grazed on the moraine a few yards away. Life is sacred in the Rongbuk valley, and the presence of man inspires no fear.

Old Tencheddar, our senior cook, lost no time in mere welcomes. He was out to celebrate the occasion. He had more or less fresh mutton, brought from miles away, potatoes and eggs from Sola Khombu, wild nettles, carrots, even a few onions. In a leaky black Tibetan tent he was hard at work, beaming with satisfaction. He produced a banquet which lingers in the memory, and invaded the mess tent to see that it was appreciated, hopping in ecstasy from one foot to the other in the tiny ante-room.

Greene asserted that he was now quite well again. He had doctored all the porters as they came down off the mountain,

and disciplined them when their native exuberance got them into mischief. He had employed his spare time in the construction of a wonderful swimming-bath, a thing of beauty. But when I say that the climate of the Base Camp was now balmy, I must exclude the temperature of the water. We all did bathe, after the many weeks of abstention higher up, but in our respective tents. So far as I remember, only Greene (who must necessarily put to use the work of his hands), Longland and Thompson plunged, like the enthusiasts of the Serpentine, into the pool ; and even they came out of it as corks out of a bottle.

We never quite realised how thin we had become on the mountain until bathing marked the renewal of comparatively civilised existence. One member remarked, "The first time I saw my knees again I had quite a shock ; they looked so knobbly." There can be no doubt that a great deal of wasting occurs as a result of prolonged residence at high altitudes.

This "rest" at Base Camp was a figure of speech, for there was plenty to do. A mail came in. Letters had to be written, despatches sent off. A strong south wind was blowing, and Everest grew daily whiter ; but we argued that a break must occur before long, and busily prepared for fresh endeavour. The argument was once more raised that we ought to go down to the Kharta valley for a more thorough rest at lower altitudes, and come up again in July or August, whenever the monsoon should show a sign of weakening. I never quite liked the idea. One could have no certainty of a weakening in the monsoon, and there was the psychological factor to consider. The spirit of attack was still strong in the party, but would it remain so during a long period of inaction ? Moreover in the Kharta valley we should be too far from the mountain to take instant advantage of a fine spell. I felt that we were recuperating well at the Base Camp, and had better stay there for the time being.

The wireless section piled Pelion on Ossa. Not content with wireless telegraphy, in itself a sufficient miracle in this

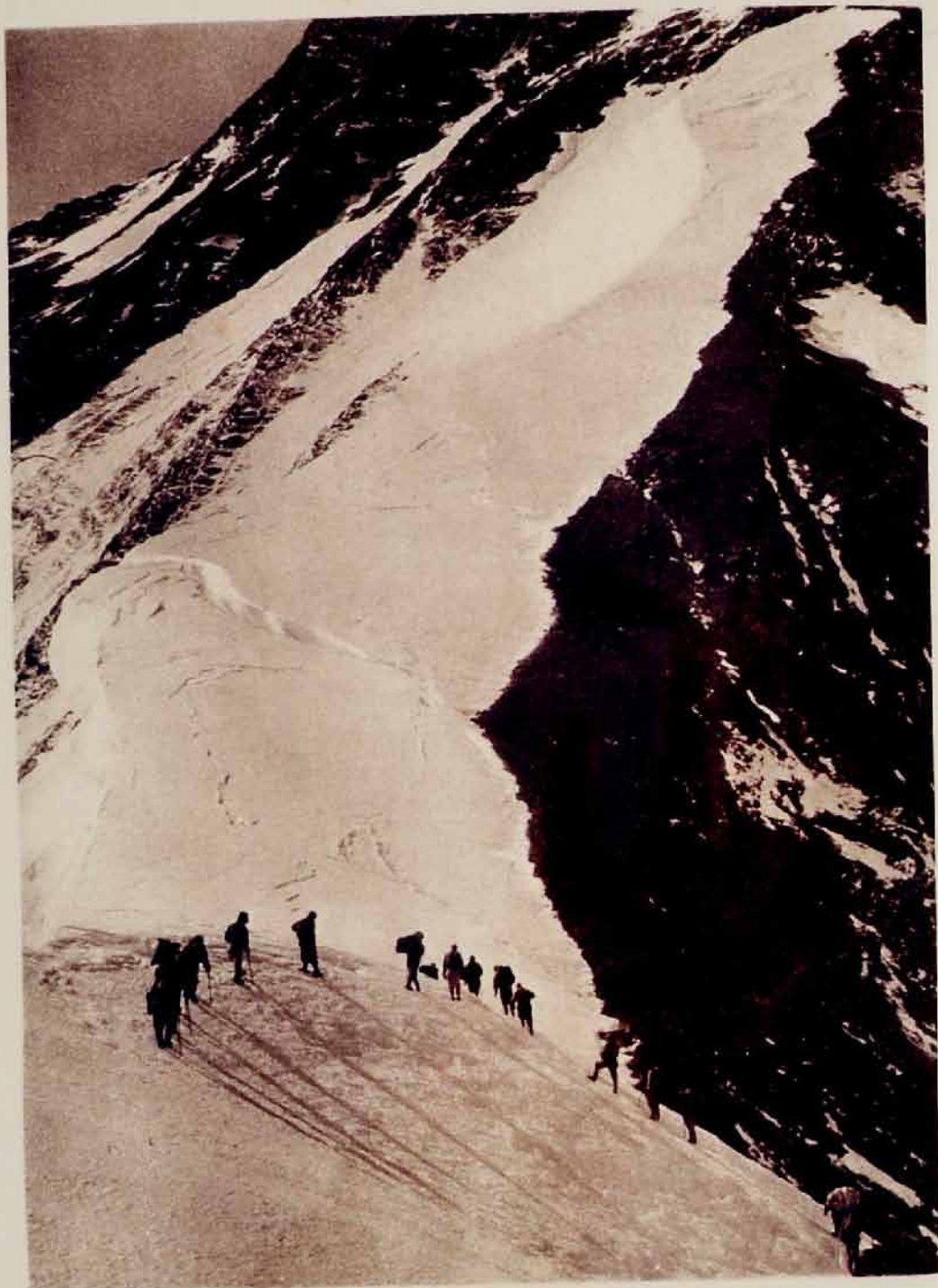


PLATE 32.—The North Col. Party leaving to establish
Camp V on May 22.

stormy wilderness, they went on to wireless telephony, and conversations passed between the Base Camp and Darjeeling, much interfered with at times by atmospheric, but usually intelligible. It is impossible to speak too highly of the work done throughout the expedition by Thompson and Smijth-Windham. They laboured early and late, sometimes all night; they were supremely competent and ever alert for improvement or improvisation. Working in circumstances of the greatest difficulty and hardship, they never failed to deliver the goods. In addition they were the very best of good companions, considerate and unselfish. None played better for the side than these two.

Greene now constituted himself a Medical Board, and passed our hopeful candidates under review. Smythe was passed with credit. Except for some loss of weight, he appeared to be as fit as ever, his heart quite unaffected by high ascents. Shipton was still practically speechless from laryngitis, but otherwise quite strong. Wyn Harris's heart had regained normal proportions and, so far as could be seen, he could go high again. Longland put up a great performance in the viva voce, and scraped through. Crawford and Brocklebank, once acclimatised, had never looked back, and were now full of energy. I was passed sound, but strictly enjoined to consider my age. The Medical Board made a pretence of sitting in judgment upon itself, but the result was a foregone conclusion. A medical officer would be required above, and no more need be said. Wager, whose heart required a longer rest, would have to remain for the present at the Base Camp with Shebbeare and Smijth-Windham. Thompson, who had not yet had a chance of going up the glacier, would work the wireless at Camp III.

Birnie at Camp II had courageously discussed the possibilities of renewed attack, but he had really shot his bolt and would not recover till lower altitudes were reached. He must now go down with Wood-Johnson and McLean to Tashidzom, three marches away. Wood-Johnson's gastric ulcer called for careful nursing and an early return to Darjeeling; McLean

had developed a patch of bronchial pneumonia. It was hoped that a few days' rest at Tashidzom would sufficiently fortify these three to continue the march home. With them would go the frost-bitten porters and others who were no longer fit for hard work. We had called our ponies up for inspection. Their condition was very poor, but under Birnie's expert care they would recover. We saw the invalids off on the morning of the 12th. Poor Wood-Johnson, very much down in the dumps, remarked to Shipton, "I mind leaving Base Camp the less because you will never climb the mountain now, it's the weather"; only to receive the shattering reply, in a husky whisper, "I never thought of that!"

During all this time snow continued to fall heavily on Mount Everest, reaching the Base Camp on some days. We decided to make Camp III our base of operations for the rest of the month, and so be in a position to take advantage of the first opportunity. Crawford and Brocklebank pushed off on the 11th with the first relay of porters. Their purpose was to examine the North Col slopes and, if possible, re-stock Camp IV. Shipton, Longland, Greene and I followed on the 13th with nineteen men; Smythe and Wyn Harris left on the 14th. Longland was now suffering from diarrhoea, and Greene's heart had obviously not completely recovered, but neither would give in. Havildar Lachman Singh and Naik Bahadur Gurung, full of enthusiasm, came up with us to Camp II, the appearance of which was rapidly changing. It now boasted a quite considerable lake, formed by the melting of ice. It was much warmer than during the bleak days of April.

The main trough had long stretches of water in it, due to the same cause. We found that Crawford and Brocklebank had worked out an effective route through the seracs which brought us out on to the left lateral moraine, and thence back through more seracs to the open glacier beyond the trough. The snow here was in very fair condition to walk on, but the wind was driving it up into our faces, and Everest was almost invisible as we approached Camp III.

Smythe and Wyn Harris came up very fast to Camp III

on the 16th, accompanied by the two Gurkhas. We had just settled down when Crawford and Brocklebank returned from their tour of inspection. Their report was not encouraging. They had ascended nearly to the big crevasse, finding the ropes buried eighteen inches under snow. A lot had come down from above. Only half of the rope-ladder on the ice-wall could be seen. Further advance would be, of course, dangerous if not impossible for a considerable time. Even if the North Col could be reached, the whole north face was still draped in snow, which would mean hopeless conditions on the slabs. We still hoped that wind or sun, or both, might come to our rescue.

Meanwhile Camp III could be held for at least a fortnight, provided that a close watch was kept upon our kerosene supply, which was now running short. More had been ordered from Darjeeling. Once he gets a Primus stove going, the Sherpa cook never dreams of economy.

Argument seems to be the chief by-product of sojourn in high camps. It raged from shining morn till snowy eve. Shipton is a Kenya settler, Wyn Harris a Kenya Government officer. What more could you want? Breakfast over, they settled down happily to mutual vituperation. A careful analysis of official conservatism, lack of sympathy, and general incompetence was met by a formidable catalogue of crime and of indifference to native interests. Lunch merely added fuel to the flame. Lofty invective gave way to the grossest personalities. On the slightest sign of flagging, Crawford or Longland would contribute some provocative and unfounded assertion which provided a fresh stimulus, what time a distracted leader was endeavouring to write a despatch and compose telegrams of serious import to the Political Officer in Sikkim or to the Meteorologist at Alipore. Needless to say, neither side was ever convinced, or ever will be. But the spell-bound audience could not complain of lack of entertainment.

Then the Rapiu La had to be visited, less than an hour's walk southwards across the glacier. Crawford, Shipton and Brocklebank went there on the perfect morning of the 18th, and returned

with such glowing accounts of the view that they persuaded Smythe and me to return with them next day. We were up soon after 4 a.m., and left Camp at five. Weather conditions looked doubtful, but fortunately we persevered, to be rewarded by the greatest mountain landscape of my experience. To the right was the enormous south-east face of Mount Everest, ice-clad from base to summit, and contained by the marvellously beautiful though terrific southern and north-eastern ridges, with their delicate ice-flutings. Before us rose the great mountains, Makalu and Chomo Lönzo, seemingly quite close. Far away to the south-east, among long-drawn clouds gold-coloured under the rising sun, was Kangchenjunga. We looked up at a snowy peak on our left, and thought that our view from its summit might be even better. It is 22,340 feet high, and unnamed. The snow was evidently deep and soft, and we agreed that each member of the party should lead for twenty minutes at a time, ploughing up the long slopes. It was treadmill work, but worth while. As we had only one short length of rope with us, the leading couple of the moment roped up, in case there should be any trouble on the crevasses ahead. But they were well bridged. I remember one marvellous view, about halfway up. In the foreground was a large crevasse, its icy depths filled with delicate blue and green mist. The line of fissure ran straight away from us to the edge of the slope, and beyond was the great mass of Makalu, ridge upon ridge of shining ice or dark rock, alternately hidden and revealed as the clouds passed by on their way to Everest.

In two hours and forty minutes we were on the summit. I paid Smythe out on the rope as he crawled carefully to the eastern edge, probing with an axe for cornices. Then we all sat down to take in the proportions of that colossal panorama. Mount Everest was now seen in better perspective, though the north-east shoulder partly hid the arête and the summit, and clouds were constantly gathering against the south-east face. Lhötse, the south peak, made a splendid buttress for the central mass. Avalanches were thundering down the face. The North Peak was almost unrecognisable, for the blunt head which we



PLATE 33.—Pumori from North Col.

knew so well from the North Col ridge now showed a delicate, pointed summit, not unlike the Weisshorn.

We were rather a silent little party, for the sight of five of the world's highest summits does not promote garrulity. Then a rush of cold snow-laden cloud warned us to be off ; we almost ran down the slopes, reaching the Rapiu La in half an hour.

Our only regret was that the others could not share our wonderful experience. Longland, Wyn Harris and Thompson had meant to come, but the two former clearly had not recovered from their exertions in May. Their appetite was poor and they slept badly. Greene, too, was far from well. The week's rest, effective as it seemed at Base Camp, was insufficient. Even had the mountain suddenly and miraculously got into condition, it would have been difficult to organise an efficient attack. Of porters there was a sufficiency, keen and strong. I had held a little parade at Camp II to satisfy myself on this point. When I called for volunteers to go above the North Col, fourteen men stepped forward, including three of the old " tigers " and two enterprising Sola Khombu men. So far so good. Among the climbers, Smythe and Shipton could be relied upon to go pretty high, though there is no denying that they were not so fresh as they had been. Crawford and Brocklebank had improved out of all knowledge, and could probably go at least to Camp V ; while I might hope to give support at the North Col. This gave us no margin of safety whatever, and no reserves. Still, given a chance, we should have tried.

But the weather, as always, had the last word. On the evening of our return from the Rapiu La heavy snow began to fall, and continued through the night. Next morning there were six inches of snow on the glacier. At 1 a.m. I had heard the first of a series of heavy avalanches falling from the north-east arête below the shoulder. Even before this we had observed that there was a daily fall of snow on the higher ridges, and that the sun of the morning seemed to have no power to remove it. Now the mountain could not in any circumstances recover condition for some weeks, and it was clear that we were wasting our time at Camp III. Also, a steadily growing theory

had now become a practical certainty, that snow does not melt much, if at all, above 25,000 feet, and that the only agents of its removal are evaporation and the powerful western wind of Tibet, which is mostly in abeyance on the north face of Everest during the period of the monsoon and does not reassert itself before the end of September. The southern wind can, and does, attack the lower slopes, and this is one of the dangers of the North Col ; but it cannot reach the north face, and no man can tackle those slabs while they are under snow.

Between the 21st and 23rd Camp III was evacuated. The last attempt had failed. We collapsed the tents and left most of the stores in position, just in case opportunity should occur again. If it did not, Shebbeare could come up and remove them. As we descended the extraordinary weather conditions of this year were once more apparent. An immense black mass of cloud to the north indicated trouble from that direction. Then, without the slightest warning, the wind changed and a bitter gale off the mountain chased us downwards. This time we used the upper part of the trough again, for the water had drained away. Longland, Wyn Harris and Thompson came down last, having contrived, after all, to visit the Rapiu La.

For some time past I had been in correspondence with Dr. S. N. Sen, the Meteorologist at Alipore, on the subject of the weather ; and I had also consulted local opinion, in the shape of the old squire of Tashidzom, and a friendly hermit-Lama, temporarily back in the world of affairs. All agreed that Mount Everest was extremely unlikely to improve its condition before the autumn. Dr. Sen, in an admirably clear and concise telegram, gave scientific reasons for his opinion. The Tibetans, of course, relied on previous experience. They stated emphatically that the snow never disappeared till the approach of winter and the return of the west wind. The old head Lama, now busy organising a monastery away in the north, sent me a letter to the same effect, adding that, although he could not recommend to the Tibetan Government that we should be given permission to return another year, he would place no obstacles in our way. As these opinions tallied with our own

theory, there seemed to be no alternative but to retreat. I telegraphed to the Mount Everest Committee, suggesting that the main body should come home, leaving Shipton, Wager and Smijth-Windham, at their own request, to study weather conditions till at least the end of August. Then came a wire from Williamson, the Political Officer in Sikkim. He pointed out, reasonably enough, that, as great difficulty had been experienced in obtaining permission from the Tibetan Government for this year's expedition, it would not be wise to count on a renewal of it for another year, though he would do his best for us when visiting Lhasa in August. It might be as well, therefore, to stay on and try our luck once more. I communicated this also to the Committee, adding that Smythe, Shipton, Crawford, Brocklebank, Greene and I were fit for another attempt. Naturally it was difficult, within the limits of a cablegram, to review the whole situation, but the Committee included among its members three who had previous experience of Mount Everest; it was therefore able to form a pretty shrewd estimate of future possibilities. Funds were short, the expedition had now only the barest minimum of climbers available, the season was apparently an abnormal one and unlikely to improve, and lastly, the existing friendly relations with Tibet made a renewal of permission at least reasonably possible. After a full consideration of the position, a cablegram was despatched to me, recalling the expedition. Of the wisdom of the order I have never felt the slightest doubt, for the weather never improved during our return march. If anything, it deteriorated. Great masses of dark cloud continued to gather in the west, and I felt sure that Mount Everest would remain, at least till the end of September, the snow-clad peak to which we bade farewell on July 2nd.

The inevitable disappointment was greatly mitigated by many messages from home, including a most gracious telegram of sympathy and encouragement from His Majesty the King. We could still look to the future.

Shebbeare and Wager, with porters, had already gone up to Camp III and were standing by for orders. If another

effort was to be made they would re-allot stores in accordance with requirements. If not, they would evacuate all camps below the North Col, making caches for such as could be of no value below and bringing down the remainder. During this period of waiting they visited the Rapiu La and the lower slopes of the North Col, and made an interesting ascent to the Lhakpa La. The North Col slopes were found to be still deep in snow, but Wager considered that the lower part could be ascended in moderate safety. Still the fixed ropes were deeply buried, and the ladder on the ice-wall was probably out of commission. A warm current of air from the south would wreak havoc. It was out of the question to retrieve anything from Camp IVa or the camps above it. I sent a couple of men up from the Base Camp with the news of recall, and the work of evacuation began.

All now prepared for the return march. Transport animals were asked for from Shekar, and supplied with commendable rapidity by the friendly Dzongpen. Stores and equipment had to be carefully sorted ; some for the march, some for storage at the Rongbuk monastery. Anything of which the value would not justify the cost of transport was to be sold, bartered, or given away. I am bound to say that our auctions, though intensely amusing, were on the whole unproductive. Tibet is a poor country, and its people care little for luxuries. Moreover they could afford to wait, while we could not. In the end a good many stores had to be given away. Men, women and children came up out of the blue, like vultures to a feast ; and pandemonium raged when a few odd tins were thrown to the multitude. We used to line up the competitors on the moraine side, while the tins were piled on a store box below. At a given signal, a human spate descended furiously—the devil take the hindmost. But they were a good-tempered lot, who seemed to enjoy the scimmages as much as the spectators did.

We kept the astronomical telescope mounted on its tripod till the last moment, so as to keep a watch on the mountain. For some time we could see the little Burns tent still standing up bravely at Camp VI. Smythe had been unable, single-

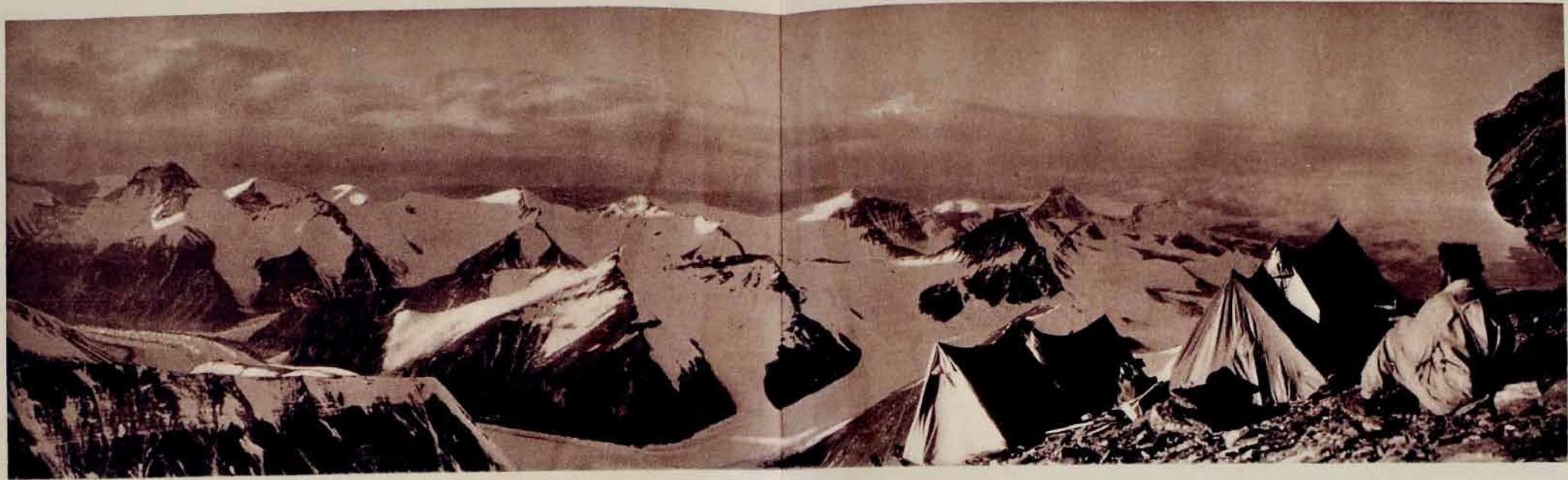


PLATE 34.—Camp V, at 25,700 feet, looking N.E.

handed, to collapse it. The weather on Mount Everest was now appalling—even at the Base Camp we had some heavy rain and sleet ; and one morning the tent could no longer be seen. Snow had either entirely covered it or, more likely, carried it down in an avalanche.

Lest there should be any moping, Longland contrived to have a birthday on the 26th, and all hands set to work to celebrate it. Tencheddar and I, in secret conference, evolved a birthday cake, with as many candles as it could accommodate. Our small stock of champagne was brought to the surface. It had been intended for another kind of celebration, now, alas ! impossible. Tencheddar's banquet was a masterpiece, a work of art. Shipton, finding himself able to speak after many weeks of enforced whispering, was in his very best form, which means much. Stirrings without, and a good deal of giggling, indicated that the porter-corps was in attendance. A cipher wireless telegram from Williamson was handed in. Regardless of flying missiles, the "Bijliwalas," otherwise the Royal Corps of Signals, decoded it without a qualm. The health of the absent Shebbeare and Wager was drunk from what should have been their share, with the specious argument that one small bottle was not enough for them. Champagne, by the way, is very difficult to manage at a height of 16,800 feet. Atmospheric pressure being so low, a large proportion of the wine follows the cork up to the ceiling. Supplies soon came to an end, but it had been a jolly evening.

By July 1st long strings of pack animals began to appear from the direction of Rongbuk—yaks, ponies, mules and donkeys. The Base Camp became a populous village for the moment, but the grazing was insufficient to allow of a long stay. On July 2nd began the usual, and seemingly interminable, wrangles which mark the first stage of a march in Tibet. The Shekar Dzungpen had sent some of his staff to keep order. This they signally failed to do. Our expedition boxes were ready, laid out in orderly lines. Equipment, carefully packed, was easily accessible. The sardars Lewa and Nursang allotted everything in suitable loads. It was no good. The Tibetan

drivers must have their fun first. They collected in little knots, arguing furiously about nothing at all. They lifted loads and put them down again, generally in the wrong place. The Dzongpen's senior representative, armed with pen-case and paper, went from group to group writing feverishly, but with no result. Our porters kept off the many prowling buccaneers.

In any case, we could only reach Rongbuk, four miles away, that evening, for Chö-Dzong, the next stage, is another fifteen miles on. But the long and inevitable delay was annoying. We helped to take down the wireless equipment, leaving Karma Paul, with his unrivalled energy, to produce order out of chaos. He has a wonderful way with his countrymen. It was all a question of making a start. A favourite excuse was that more animals were still expected. They were invariably to be found grazing peacefully round some corner, while their owners enjoyed themselves. Once half a dozen were loaded up and despatched, the rest gradually followed, protesting to the last.

By slow degrees, the Base Camp, so long our headquarters, was emptying. With the fall of the mess tent, our most prominent landmark, we felt that the end had indeed come. Soon the hermit on the moraine above would be left in peace. The birds and the burhel would disperse. Silence would again fall upon this desolate region, save for the rumble of the glacier river and the whistle of the wind. Clouds were gathering round Mount Everest, seeming to say "the curtain falls." Should we ever raise it again?

I do not think that we felt any vain regrets. We had done our best. Human endeavour alone is not enough. Some measure of good fortune must attend the climber who would set foot upon that distant summit.

Shebbeare and Wager were not yet down from Camp III, but we could not wait. Transport charges were mounting up, and the baggage animals would get no adequate grazing before Chödzung. Greene, Crawford and I were among the last to go. As we turned the corner of the moraine we had one more look at Mount Everest. Then the clouds came down for good. We had done with it all.

CHAPTER X
THE RETURN

Rongbuk had been uncomfortable enough on April 16th. It was very little better on July 2nd, in monsoon conditions. A furious south wind raged through the camp, and for some reason Ondi and his associates had pitched the mess tent exactly in the best direction for receiving it. Even Tencheddar could do nothing with his fire, and tea seemed a long time in coming. Try as we might, it was difficult to keep a cheerful countenance that evening. I suppose it was the change from attack to retreat which affected us. We could not even argue with the old spirit ; there was not much left to argue about.

Next morning some of us paid a farewell visit to the monastery. Our old friend the head Lama was away, at work on his new charge. His representative was polite but uninteresting. Mount Everest was invisible. We arranged for the storage of a few things which might be useful on a future occasion, and left. Rain fell heavily at times during the march ; there could be no doubt about the strength of the monsoon. Life was stirring everywhere, even in this bleak valley. Grass pushed its way up among the stones. Cushion flowers, blue gentians, and the beautiful little *Incarvillea Younghusbandi*, with its trumpet-shaped, red flower not two inches from the ground, appeared in all directions. Birds and insects were on the wing. The sun came out at intervals, and things did not seem so bad after all. The sight of real fields of grass at Chödzung was a wonderful pleasure. Smythe must have suffered a good deal during this march, as the nails of his frost-bitten toes were beginning to come off ; but he complained not at all, and unfolded all sorts of plans for climbing the mountain next time. He had a theory that the north face of Mount Everest and the great couloir might be traversed at about the

level of Camp V, and that a direct ascent might then be made up the rocks towards the final pyramid ; thereby avoiding the worst part of the slabs on Norton's route.

The rain redoubled its energies during the evening and Chödzung, for all its pleasant meadows, was more than a little damp. Smythe had volunteered for the duties of mess secretary. With pencil and list he inspected the loads as they came in, only to find many things missing. It was impossible to keep an eye on everything among the crowds at the Base Camp. Pilfering may have taken place, or possibly the missing articles were dumped by mistake at the Rongbuk monastery. We had to make the best of it, and anyhow we never went short.

Here I received news from Birnie that he had not been able to make a start from Tashidzom owing to the condition of the invalids. McLean had intimated that another five days must elapse before he and Wood-Johnson would be fit to travel. This would seriously affect the transport problem. Our party had promised itself a pleasant few days in the Kharta valley, where transport must be changed. "Father William," the old Tibetan friend of previous expeditions, made lavish promises of facilities. We intended to leave out Shekar Dzong on the return march, and to proceed direct from the Kharta valley to Tengkye Dzong. Now it was evident that Greene and I must go to Tashidzom while the rest branched off from Chödzung, over the Doya La, to the Kharta. This splitting up of parties during a march always involves a good deal of work, and it was not till 11 a.m. next day that Greene and I were able to start, leaving a letter requesting that Shebbeare and Wager should follow us. The others, after securing fresh transport in the Kharta valley, would follow it up northwards, and we with Birnie and the invalids would meet them at Lungme.

The drawbacks to travel in Tibet during the months of March and April are cold, wind and dust. In July it is the rivers that impede progress. The Tibetan bridges are few and far between. Where in April there had been a shallow, easily-crossed stream, there was now a strongly-running river,

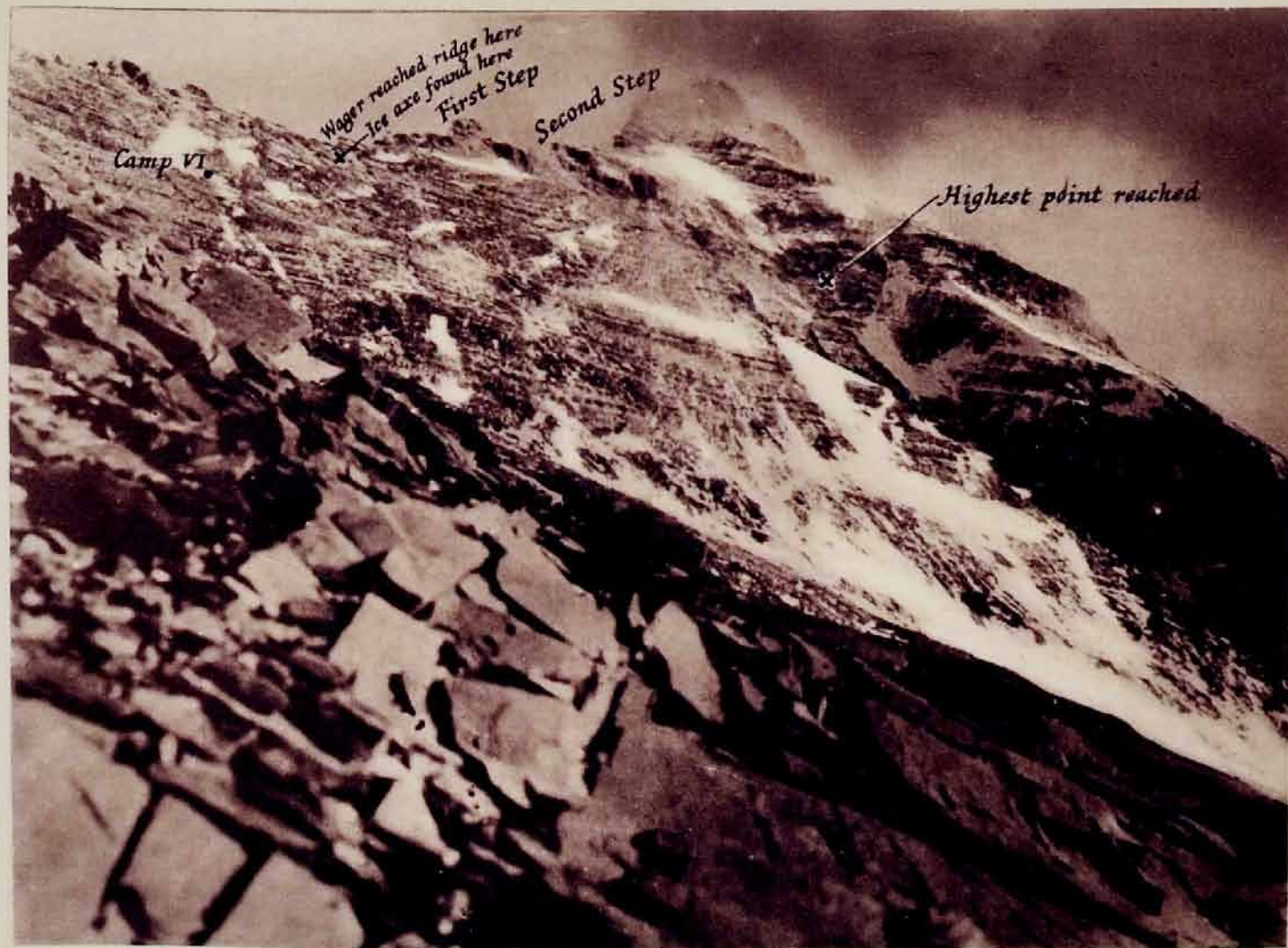


PLATE 35.—The North Face of Mount Everest, from above Camp V.

swollen by the melting ice of the Rongbuk glacier. Muddy and turbulent it rushed along, turning over the boulders in its bed with a sinister rumble. The transport drivers led us three miles down-stream to a point where a little island divided the waters. Opposite was a tiny village, the men of which were ready to help. With linked arms they staggered across, waist-deep, and then our ponies, two men holding each bridle, were led cunningly through the ice-cold torrent. How they kept their feet among the moving boulders I do not know.

On the other side the rain came down in blinding mist, from which suddenly emerged the familiar form of the old squire of Tashidzom. The friendly old gentleman had already paid us a visit at the Base Camp; he now saved us much time by piloting us across flat country intersected by full water-courses.

Half a mile from Tashidzom we met Birnie, looking very much better for his rest—if rest it could be called, for since June 12th he had looked after his two sick companions and the frost-bitten porters, besides getting the ponies back into condition.

Tashidzom was a sight for sore eyes: the grass now ankle-deep, plashing little streams, and real willow trees. Lhakpa Chedi, Pasang Kikuli, the Pasang of the North Col crevasse, and Ang Tarke met us with beaming smiles at the entrance to the camp; and there was Chun-Chun, the quiet little cook who had worked so long and so well at Camp II. Wood-Johnson and McLean were pretty weak but ready to make the best of things. Greene overhauled them thoroughly and announced, to my intense relief, that we could make a start for Lungme, three marches away, the very next morning. Both Wood-Johnson and McLean would have to ride.

The old squire was most moderate in his charges for the keep of the expedition ponies during nearly three months. We bade him good-bye with sincere wishes on both sides for an early reunion, and he provided us with a guide for our journey, as the river would have to be crossed again. Sheb-

beare turned up just before we left, having come on ahead of the transport. He would follow us and rejoin at Lungme.

Instead of branching off northwards to the Pang La and Shekar Dzong, we now followed the river down to its junction with the Kharta River near Lungme. This beautiful valley was comparatively unknown ground, so the marches were of uncertain length, the map being vague and our guide still vaguer. We crossed the river again, with local help, to the grievous discomfiture of McLean, whose pony fell with him in a nice muddy pool. Wood-Johnson was suffering a good deal of pain, but kept going with commendable spirit. Every few miles there would be a charming little willow grove, with a Tibetan country-house and some rough cultivation. Great river terraces stretched far down the valley. Here, at only 13,000 feet, the climate was perfect. Gone were the days of windproof clothing, of triple sweaters, goggles, helmets, puttees and climbing boots. Even the rain seemed warm, and we revelled in the frequent bursts of sunshine. It was another world.

At Lungme camp was pitched in open meadows, among boggy streams where more than one pony got mired. News arrived that poor old "Father William" had proved a broken reed. He was most anxious to assist, but transport is a perquisite of Tibetan Dzongpens and he was not allowed to work for us. Fortunately the Dzongpen in the Kharta was a man of character and humour, with whom Crawford and his party established a happy entente. He supplied a perfectly adequate transport and accompanied it to meet us at Lungme. His first question to Crawford had been, "Do you shoot?" Crawford, of course, expressed virtuous indignation at such an idea, for it had always been impressed upon us that shooting was not allowed. The Dzongpen approved of this sentiment, but immediately added that his ambition in life was to possess two Mauser pistols. Could we secure them for him? On his part he would devote all his energies towards getting us permission to enter Tibet again, and would be our friend for life. He was an efficient man, keeping his people well under control.

He could only take us as far as Gatong, where a rope bridge spans the river ; on the other side was another jurisdiction. He warned us against the other side. "They are the greatest thieves in Tibet," he said. Nursang was sent ahead to Kharkum to arrange for fresh transport, which he did with the greatest success, being thoroughly au fait with scoundrelism in all its branches.

A gale lasting two days at Lungme nearly flattened out our tents, but the Kharta valley party found us still standing on the morning of the 9th, and we all reached the rope bridge at Gatong on the 10th, and set about getting the loads across with such energy that about half of them were stacked by dark on the other side, under a strong guard to discourage the attentions of "the greatest thieves in Tibet." Meanwhile we camped on the near side. A slight diplomatic complication occurred when our porters found that a Tibetan had stolen an ice-axe. They neatly cut his head open for him, and Greene as neatly closed the wound. The Dzungpen's men demanded the punishment of the offenders. I replied, "Which offenders?" and asked for the return of the ice-axe. The matter was amicably settled.

The bridge consisted of two old tree trunks precariously set up among boulders on either side of the river, with four strands of yak-hair rope stretched between. On these ran a triangular cradle of wood. The passenger, or package, was attached by leather thongs to the cradle, and pulled across by a spare rope for a distance of about 30 yards. A number of Tibetans were in attendance to work the affair. Their own method of crossing was to cock one leg over the rope and pull themselves across by sheer strength of arm.

I had to take a risk with the expedition's ponies, and decided to swim them across the river. Otherwise they would have had to go a long way round, and this would have delayed the march.

The river ran strongly, swollen by the recent rain. Above the bridge was a series of rapids, but just below a stretch of comparatively smooth water, rather deep, offered a suitable

place where the ponies could be swum across. This would have to be done carefully, for lower down there were more rapids. Smijth-Windham suggested the radial rope method, which was adopted with complete success. Men held a rope on the other side, close to the bridge. The end was brought across and tied round the neck of each pony or mule in succession and the animal was driven into the water. The rope prevented it from being swept too far down-stream. It was amusing to watch how each animal adopted its own method of crossing. Some swam strongly, some were just dragged. One or two disappeared like submarines, to the distress of their owners. But in the end all crossed safely.

The packages seemed to be innumerable. The work went on all next morning, till after 1 p.m. The ever-fertile mind of Smijth-Windham evolved the horrible amusement of hurling large boulders into the river as each man was hauled across, helpless to defend himself from the splashing. Crawford escaped much by opening the umbrella, though it was not easy to keep this up and hold on to the cradle at the same time. Then came Smijth-Windham's turn, and nemesis. As he approached the bank the haulers were persuaded to cease from toil, and the victim remained in a state of suspended animation, at the complete mercy of his tormentors. Needless to say, the idea took on with the porters. They dealt faithfully by their comrades, and greatly delayed the proceedings. For the honour of the expedition, Wyn Harris and Longland crossed by the Tibetan method, amid the plaudits of the multitude.

There were still sixteen miles to cover before Khojak was reached, late in the evening. A powerful southerly wind helped all the way, as we followed upwards the left bank of the Phung-chu. In the distance could be seen the gaunt red and brown ridges overlooking the valley by which we had marched to Shekar Dzong. The long delay at the bridge made things difficult for our cooks, but they rose to the occasion, as they always did.

Nothing could be more remarkable than the variety of scenery through which the expedition was now marching ;

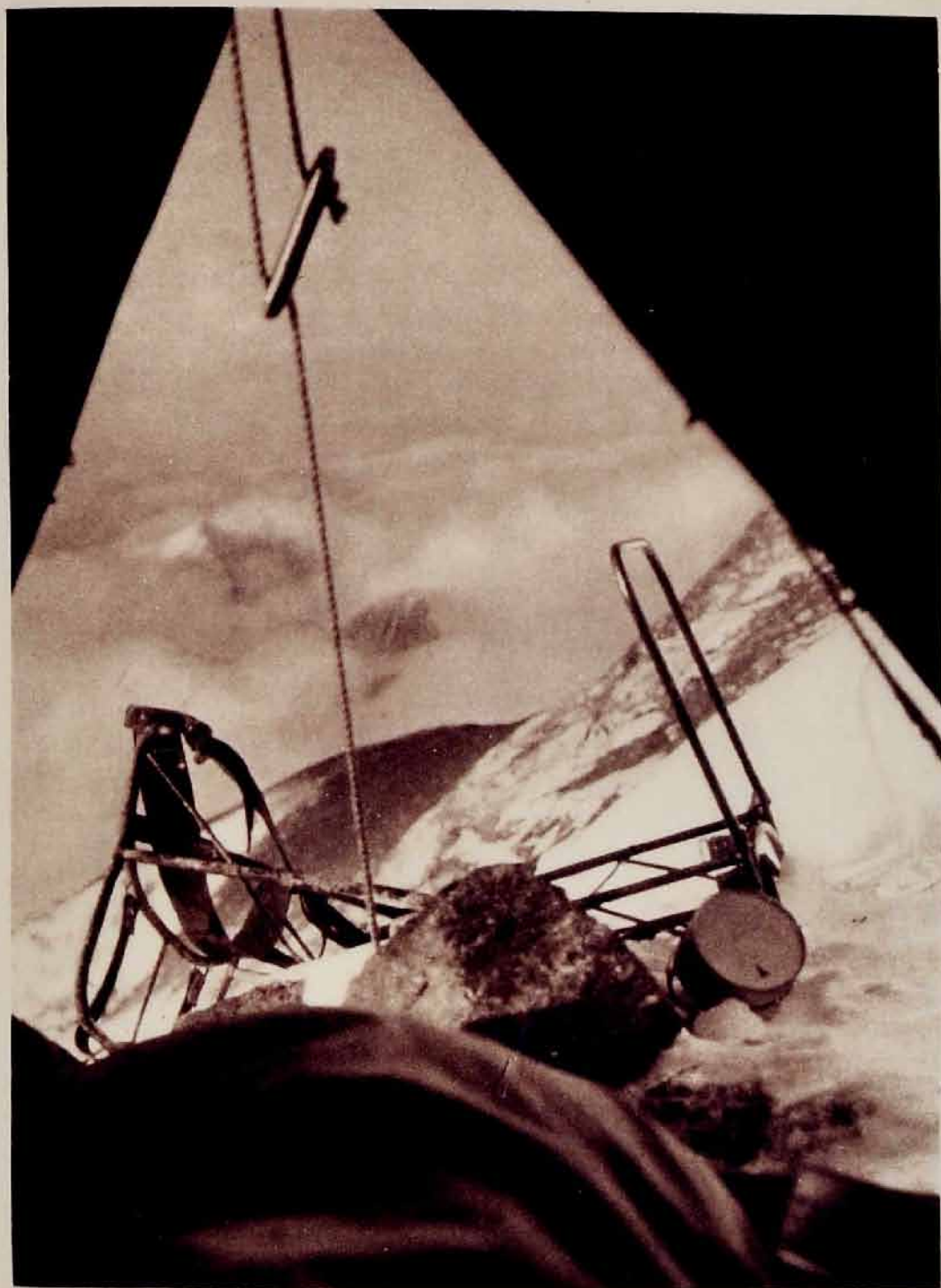


PLATE 36.—View eastward from the tent at Camp VI, at 27,400 feet. In the foreground is a porter's steel carrying frame.

perhaps the last thing one would expect on the Tibetan plateau. On this day we were in a river valley, traversing the broad flanks of a range of hills. On the next, there would be a plain with almost infinite horizons, seamed by slowly-flowing rivers. All different and all beautiful. Travellers have often remarked that there is no effect of distance in Tibet. In that clear air, far-off ranges look as near as their foreground. That is very true of conditions in the spring. But now, as the monsoon winds brought up cloud and mist, there came atmosphere. It needed an artist to depict those wonderful gradations of reds and browns, and the lovely misty blue of distant hills. The mere photographer, knowing the limitations of monochrome, could but marvel and stay his hand. Colour is everything during a Tibetan July.

Rungkung seemed a haven of peace after the roar of the river at Gatong. The wind had dropped, and at our feet flowed a broad and placid stream. Here Shipton and Wager left us, to find their way through unexplored country into Western Lhonak, and thence to the Lachen valley. They climbed a peak of about 20,000 feet in the Nijö Nori range, and made what we believe to be the first crossing of the Lhonak La, climbing the Lhonak peak en route. Later on Wager made some remarkable geological researches in the north of Sikkim.

The rest of us crossed the plain between Rungkung and Chushar, having to ford five branches of the river on the way. We passed virtuously by some "Danaos et dona ferentes," in the shape of women from the notorious village of Gyangkar Nangpa, bearing pots of chang. Shankar-ri, now totally devoid of snow, towered up on the right. Farther to the south were the magnificent peaks of the Arma Drimi range, so imposing that we were almost persuaded, for the moment, that one of them was Makalu. Crawford and Brocklebank performed some remarkable cavalry manœuvres in chase of a hare; the porters upset each other into the water at the fords; and the sun shone upon the just and the unjust, while the midges displayed a similar impartiality.

Chushar is separated from Tengkye Dzong by a range which has to be crossed by a pass nearly 17,000 feet high. A sudden storm plastered the hills with snow, but this had all melted by the time we approached. There was some little difficulty about the water supply at Chushar, as Greene discovered that the spring used by the inhabitants lay at the bottom of a hollow shared by the drainage of the hamlet. He also discovered, near a more distant but better spring, some interesting fresh-water fauna. In the course of the evening Wood-Johnson gave us a bad fright, when his temperature went up rapidly to 104°. Greene at once decided that he must stay over the next day with the patient, and Birnie volunteered to keep him company. The rest of us pushed on without delay over the pass to Tengkye Dzong, on the morning of July 14th, in order to pay off the Kharkum transport and negotiate for a fresh supply. Wood-Johnson was determined not to give in; he actually rode over the pass on the 15th. I had sent up porters with a stretcher to meet him. I regret to say that the attractions of Tengkye proved too strong for them and they were too late to be of service. It was one of the few occasions on which they neglected their duty.

Tengkye Dzong had changed much since we were there last. Always beautiful, it now had an added charm of green fields and running water. The lake was larger, but for some reason its usual tenants, the bar-headed goose and the Brahminy duck, were conspicuously few. Our sociable old friend the Dzongpen sent us a message full of sadness. Duty had called him away to investigate a murder case. Too bad, for he had promised himself, and us, a merry reunion. His wife could not in the circumstances entertain us, but she came to call and did her best to see that we were comfortable. I have usually found in Tibet that when an official is away his wife is more than equal to carrying on his work, especially when it involves some business transaction. On this occasion the matter of transport was dealt with by the Dzongpen's Nyapala; a big, rather surly-looking, cross-eyed individual. I do not think that he was in the least hostile, but he

was a little obstructive, mainly because he was not sure of his own position and wished to assert himself. In consequence negotiations were protracted, and Shebbeare and I, with Karma Paul, had to do a good deal of arguing. The position was complicated by the fact that the party was now splitting up. Crawford and Brocklebank wanted to branch off directly southwards, to cross the Chöten Nyima La and rejoin the main body at Lachen; Longland and Thompson had to push on ahead via Kampa Dzong, having engagements in India; lastly, we could not know until the last moment when Greene and Birnie would be able to bring Wood-Johnson over from Chushar, or if Wood-Johnson would be fit to resume the march.

However, in Tibet as elsewhere things sort themselves out if you have patience, and they did so on this occasion. A reasonable transport rate was agreed upon, and baggage animals appeared as usual from nowhere. But the main body, as well as Longland and Thompson, would have to go via Kampa Dzong, though we were not following the route of the outward march via Phari, but making for the Lachen valley to the south-east. The Tengkye Dzong authorities could only supply transport along the regular trade or postal route to Kampa. Evidently each administrative area in Tibet is a close preserve, as is natural enough where Government officials receive no pay but, as in India before the British took over, "farm" their districts, taking a percentage of revenue collections and organising all transport as a private business. Crawford and Brocklebank had to rely chiefly on our own porters. With great difficulty they secured some local help to take them over the first stage or two of their march.

These halts at district headquarters are pleasant enough in their way. At intervals between diplomatic transactions one has time to write despatches, catch up with a neglected correspondence, and generally put one's affairs in order. At Tengkye Dzong some of us even bethought ourselves of a return to the observances of civilisation. Men would retire stealthily to their respective tents with an air of purpose. An hour later they would emerge very self-conscious, to greet each other

with the remark, "I think we last met in Darjeeling." Their beards had gone, and they seemed strangers to one another. I am bound to say that most of us appeared very much the worse for the change. The shaven cheeks looked pallid and unnatural until a few days' exposure to the sun set things right.

I fancy that the local population expected a renewal of the fun and games which had been so attractive on the way out. But we were hardly equal to that. Baulked of this pleasure, some of them took to pilfering. Karma Paul lost his watch; articles of clothing disappeared from tents. A guard had to be set. One must suppose that an expedition like this presents an almost irresistible temptation to the wilder spirits. When not engaged in getting something for nothing, they endeavoured to sell us their trinkets—rough charm-boxes, rings, spoons, and so forth, some of which were of considerable artistic merit. In the end we understood each other pretty well and parted on good terms. The Dzongpen's wife came down in all her finery to bid us farewell. On her head she wore a magnificent semi-circular hoop, into which her hair was braided, and she was covered with miscellaneous jewellery. She read us quite a little lecture about taking care of ourselves, advised us to give up the foolish sport of mountaineering, and then expressed in the most cordial terms her hope that we should meet again. I hope we shall, for she is a lady of merit. Besides, I do not know what her husband will do if another expedition does not go and cheer him up in his lonely district.

The plain between Tengkye Dzong and Lingga was now a series of marshes, through which it was by no means easy to find a way. Greene and I, convoying Wood-Johnson, got too much to the left, and spent a hectic morning while our ponies floundered among the bogs and fell into water-holes. It was enough to kill Wood-Johnson, but the worse things got the more he laughed. Two porters, one of them a Tibetan with some local knowledge, came to our rescue, and we reached Lingga in time for a late lunch, covered with black mud and nearly as tired as our ponies.

The place was alive with birds, and the people were friendly,



PLATE 37.—The “ tigers ” (except Kipa) who established Camp VI.

but an entire case, in which Greene had packed more than four hundred specimens of Tibetan insects and other fauna, was removed during the night. I hope the thief drank the raw alcohol in the bottles. Karma Paul organised an elaborate witch-hunt, without success. He employed every threat which occurred to his fertile imagination, from aeroplanes to visitations of smallpox. The village headmen, and especially the women, were visibly shaken, but the property was never recovered.

Greene spent a busy afternoon digging out a molar which McLean disapproved of and did not wish to keep. We basked in the sun, and watched the storms circling round to the south, where our path lay over the Sebu La. There was promise of a stormy crossing.

For the eighteen-mile march to Kampa Dzong we had a perfect day. The Dzongpen was still at Lhasa, but his wife had returned and, true to type, was thoroughly prepared for business. She had already imposed upon Longland and Thompson a charge of three rupees per transport animal per stage. They could not afford to stop and argue. We could, and did. Shebbeare and I, with Karma Paul, paid our official call in the evening. The formalities were soon over, but business was another matter. I think that both sides quite enjoyed themselves. It is axiomatic in Tibet that negotiations must be carried on with resolute politeness. The most outrageous demands are met with a smiling regret. One must not get excited. The lady sat with her back to one of the few glass windows I have seen in Tibet. Opposite her were the Nyapala, who had treated us very fairly on the outward march but was now very much in the background, and the lady's secretary, a cheerful rogue. Shebbeare and I sat on rugs, with our backs against a wall. In the middle of the room was Karma Paul, alert and in his element. Tea and chang were passed round, and we drank each other's healths. We spoke of the absent Dzongpen, of the season, of Mount Everest, of cabbages and kings. By graceful transitions, the talk veered round to yaks and the difficulty of travel. The lady was deso-

late ; she was alone and unversed in business. Her yaks were out at grass, and in poor condition. She had heard that on the far side of the Sebu La there was much aconite among the grass. Transport animals would eat it and die. Was it possible that we thought of going that way? It would be difficult, very difficult, perhaps even expensive. We extolled the merits of the route by comparison with the arid, wind-swept uplands on the way to Phari. Shebbeare, who had been there before, waxed lyrical about the meadows of Sikkim, its gentle climate and gentler people ; about the flowers, the perfect grazing, the complete absence of aconite. More chang was pressed upon him, and a price suggested with an air of benevolence. Three rupees per animal per stage.

Karma Paul's look of horror could not have been bettered. His pleadings would have melted a stone. Here were we, representatives of a friendly nation, under the protection of the Dalai Lama himself, strangers, exhausted in body (and in purse) by meritorious pilgrimage to holy places, anxious to report favourably at headquarters upon our treatment in Tibet. Surely he had heard incorrectly. An honourable Dzongpen's wife could not contemplate charging us three times the normal rate. He paused for a cup of chang. The lady smiled, and intimated that his perfect knowledge of the Tibetan language ruled out the possibility of misunderstanding.

We took up the tale. Argument with so charming a lady was painful to our sensitive minds. Time was no object, Kampa Dzong was a pleasant, sunny place in which to restore jaded energies. The sick needed rest. Our many friends in Sikkim, made anxious by our prolonged absence, would doubtless send over their splendid and innumerable yaks to find us. We should then be obliged reluctantly to tear ourselves away. Of course we would rather bring big business to Tibet, at a rate of one rupee eight annas. Even this was too much ; more we could not even contemplate.

Karma Paul, greatly daring, took the lady by the hand. His face at this moment would have secured him an instant and prolonged contract at Hollywood. It registered emotion,

admiration, suspense, and all kinds of devilment. Much affected, Mrs. Dzongpen looked at us. I don't know what my face registered, but Shebbeare's was stolidly wooden. Suddenly, the end came. With the pleasantest of smiles our hostess gave way. Transport, as much as we wanted, should be provided next morning at our rates. Would we have some more chang? We would.

By this time we were pretty well accustomed to delays at the commencement of a stage. But Kampa Dzong, on the morning of July 18th, surpassed itself. The yaks were there—we could see them on the open plain, and their drivers could not avail themselves of the usual device of hiding them round a corner. By slow degrees they were herded up and tied by the nose to the long ropes pegged along the ground. Our equipment was all ready, the tents packed, the boxes in their right numbers for loading up. It was important to get away before the porters finished the entire liquor supplies of Kampa. The Nyapala himself could not get a move on. He brought me a little rug from the lady. I presented him with yet another hat. No good. The drivers wrangled and loafed. Hours elapsed before persistent pressure had its effect.

We paid a last visit to Kellas's grave. The monks had chiselled out the letters traced on the new slab, and we hope that now the grave will be left in peace. Then we descended the hill-side on to the plain, just in time to find the yaks giving a spirited imitation of a Wild West show. Boxes lay everywhere, in all stages of disruption. One had contained eggs; they were no longer eggs. Another contained our bandalasta plates and cups; it rattled ominously. One or two porters watched, in stolid detachment. The yaks, having got clear of everything by a series of tremendous bucks, resumed their occupation of the past three months, a leisurely grazing. Their drivers, fetching a wide circle, approached "with cat-like tread." The situation was not without its humour, but the hour was late and we wanted to get on to Giru, eight miles away. In our inexperience we thought to round up the herd. Greene and Smijth-Windham "prick'd madly o'er the plain." Shebbeare, on foot, made a

creditable matador. But the yak laughs at rodeos or the tactics of the bull-ring. For all his apparent unwieldiness, he can turn on a sixpence. Completely foiled, we gave it up and left the fermenting drivers to their own devices. They turned up all right in the evening.

Giru, Shebbeare told us, was quite new since 1924, when he and Odell passed this way. It has no apparent *raison d'être*, and is much exposed to wind. As a view-point, however, it has merit. The great Sikkim peaks, Chomiomo, Kangchenjau, Pauhunri, tower up only a few miles away, and the vast cloud-formations of the monsoon, in alternate advance and retreat, were a marvellous sight. The Valkyrie would have felt quite at home.

On our last morning in Tibet we slowly breasted the six-mile slope up to the Sebu La, at a height of about 17,000 feet. One felt reluctant to be leaving the country which had afforded an unforgettable experience, a country, moreover, which we might never see again ; for entry to Tibet is not easily arranged. Sikkim in all its beauty lay before us, yet our footsteps lagged. Forgotten, for the moment, even the long marches in the teeth of gales, the dust, the bitter struggle on Mount Everest, the failure of our hopes. We remembered only the feeling of a great endeavour, shared alike by Sherpa, Bhutia, and Englishman, the friendly people, the companionship of months, the ever-changing loveliness of ridge and plain, of rock and ice and snow. What had civilisation to offer instead? I saw more than one porter turn in his tracks, to take a last look across the roof of the world. He, like ourselves, would gladly return.

Clouds were massing in the south, and we had still ten miles to go. The great shoulders of Chomiomo and Kangchenjau closed in upon us, an apparently impassable barrier. A mile farther on, after a scarcely perceptible dip and rise, came the Kongra La, the frontier between Tibet and Sikkim. We hurried down the slope on the farther side, to find the valley twisting its way between the mountains, to our last camp in the open. There was wind here too, but not the dry, searing wind of Tibet. The softness of the south was in it.

Tangu, which boasts the highest dak-bungalow in Sikkim, almost reconciles the most confirmed nomad. It is beautifully placed on an open hill-side, and the march to it is something to remember. We walked through meadows bright with cow-slips, primula and blue poppies, through birches, rhododendron, and even small pine trees. The river rushed southwards over a splendid waterfall. A turn in the path, and the snows vanished from sight. All was green, save for the bright flowers and the distant welcoming red roof of the bungalow.

The luxuries of civilisation were not long in making their appearance. A most welcome present awaited us at Tangu in the shape of a basket of fresh vegetables, very kindly sent up from Lachen by Miss Kronquist, the lady missionary. Karma Paul produced a wonderful arak, made from millet by the local people. Chang is milk and water compared with it. The Pipen or headman of Lachen, a robust and most courteous individual, came to call with the glad news that he had plenty of mule transport ready which could take us right through to Gangtok. We were the less reluctant to part with our Tibetan yak drivers because they had been caught on this day making a determined effort to steal a number of our boxes. Their simple method was to drive their animals off the path at a spot where they were concealed from view, hoping to get back over the pass before the loss was discovered. Happily Shebbeare and Smythe were in the rearguard and observed this little ruse. There was a brisk scene at Tangu, especially as Karma Paul and Lhakpa Chedi had lost their bedding. Each selected a likely driver and set to work on him, while the Tibetan Gyembo, who had done his best for us, applauded loudly and promised the offenders a special beating on his own account when they returned to Kampa Dzong. Everything was recovered.

We were now nearing the region of larches, hemlock pines, Sikkim firs, and dog-roses, and the march to Lachen was a sheer delight. We crossed the fine new suspension bridge where the Zemu River makes its inconspicuous exit from the great valley of the Zemu glacier, by which the Bavarians

returned from Kangchenjunga. Here were two porters who told us that Crawford and Brocklebank were just ahead. They had encountered a good deal of bad weather in their crossing of the ranges. At Lachen we delved in our suitcases for those almost forgotten things, collars and ties, for Miss Kronquist had asked us to tea. She has laboured for many years in this remote valley, helping the poor and encouraging cottage industries. Rugs and a very strong kind of tweed are the principal manufactures.

In these last marches there were certain disadvantages to counterbalance the beauties of Nature. Below Lachen the temperature was becoming steadily higher, the track was a jumble of slippery, water-worn boulders, landslips here and there made things difficult for the mules and, worst of all, the leeches were not to be robbed of their prey. The Sikkim leech is voracious and persistent. Among the forests, wet from a tropical rainfall and seamed with countless watercourses, he awaits you on every leaf and every stone. He is very insinuating in his ways. He will enter through the lace-hole of a boot, or crawl up your sleeve. He is so small that his manœuvres are not easily seen ; moreover his bite is not felt. You do not realise that you have given him free board and lodging until someone calls your attention to a broad smear of blood on wrist or bare knee. The leech has quickly gorged himself and dropped off, contented. Bare-footed men and animals suffer most ; and there is one kind of leech that gets up the noses of cattle, sheep, horses and dogs, residing there for long periods and growing to a length of four inches or more. Salt is one of the few things he dislikes. We got into the habit of watching our boots during a march and flicking off the intruders before they had got a proper hold.

The boulders in the lower valley were a sore trial to the ponies on the steep descents. Some began to go lame. Wood-Johnson, who had put up a gallant show, found himself unable to ride on these gradients. Miss Kronquist came to the rescue with a wicker armchair to which carrying poles were tied. Four men could then carry it ; but the Sherpa porter is not

used to this kind of work, and on the stage of only eleven miles from Lachen, in spite of relays of carriers, Greene and I spent eight and a half hours getting the men along. After that we secured local talent for the work, and Wood-Johnson was brought in at a great rate.

A special effort had to be made to reach Gangtok, by means of a double march of twenty-four miles, to avoid spending a night in that very malarious place Dikchu. I remember the march for two reasons. Firstly, Shebbeare, Brocklebank and I, while walking along the path above the river, came upon a little patch of wet sand on which fifteen butterflies rested, apparently engaged in full conclave. They had the most lovely blue and purple wings, which they held stiffly upwards and then, as it seemed at a given signal, vibrated rapidly. The séance closed before we were able to form any opinion as to its cause. Secondly, the hill up from Dikchu is the longest and most continuously steep, rough, and leech-infested that I have ever encountered. But the last three miles into Gangtok, in spite of the rain, were enjoyable. We had risen above the steamy valley again, and the road was in very fair condition.

At Gangtok the Maharaja of Sikkim, the friend of many expeditions, showed us the kindest hospitality, and we had the privilege of meeting the Maharani at dinner. Williamson, unfortunately for us, was away en route for Lhasa. We spent a busy two days arranging for fresh transport, and making up the accounts of our postal agent, Lobsang Tsering, who had been most business-like and efficient.

Marching was now a thing of the past, for there is a motor road southwards from Gangtok, and cars can be procured from Kalimpong. The Maharaja, in addition, most kindly put his own at our disposal. We went our several ways. Longland had already left for Indore. Crawford had to pay a call at Shillong. Wyn Harris, Smythe and I, after lunch with our good friends Mr. and Mrs. Odling at Kalimpong, went straight through to Darjeeling in those wonderful, specially-g geared Baby Austin cars which make light of the tremendous gradients

of the Tista valley, and have revolutionised life for the tea-planters.

We arrived after dark, to find that a crowd of several hundred people had waited for hours to welcome us back. Alas, we were a bitter disappointment to one of them, an old "Everester." He peered through the darkness at the occupants of the first car, and then sped up the bazar shouting in Nepali, with the very ring of tears in his voice, "they've no beards!"

No time could be lost, for the porter corps had to be paid off, character certificates written, accounts settled with Mr. Kydd, and a thousand and one matters arranged. Fortunately Wyn Harris had kept the expedition accounts with such devoted care and accuracy that the settlement was comparatively easy. Moreover Indian rupees are now accepted everywhere along our line of march, so there was no need for complicated conversions to and from the Tibetan tanka. Only one mistake was made: during a crowded session, one porter managed to get away with a double payment, and no amount of detective work by Karma Paul succeeded in tracing him.

The Sherpa and Bhutia sardars, who had done very well in Tibet and in the Lachen valley, rather failed us on the last two stages from Gangtok. The return to civilisation was too much for them, and the flowing bowl too attractive. But the Gurkha N.C.O.s did their duty. I shall always remember Havildar Lachman Singh's arrival at Darjeeling, nearly dead-beat but justly proud that he had got the last load safely in.

Darjeeling was kindness itself. The difficulty was to get any work done amid so much hospitality. The chief event was a dinner given at the Planters' Club, at which every single member of the expedition present went through the ordeal of having to speak. In spite of this, it was a merry evening, ending with a dance at the Gymkhana Club which proved that our sense of balance was still unimpaired.

At last, on August 1st, came the farewells to our generous hosts, and to our close friends for five months, Karma Paul, the Gurkha N.C.O.s and the porters. It was very hard to say



PLATE 38.—The first assault party : (right to left) Wyn Harris and Wager.

good-bye or to thank them adequately. But the link forged by those months of shared privation and endeavour will not be broken. If the call comes again, most of them will appear on the "quarter-deck" of the Planters' Club, ready as ever for adventure. They want to see Mount Everest climbed as much as we do.

CHAPTER XI

RETROSPECT AND PROSPECT

It is not easy to be wise even after the event of an Everest expedition, for any attempt to lay down a rule, or set of rules, to govern future effort is sure to be shipwrecked on the quicksands of phenomena over which there can be no human control. The circumstances of one year are not exactly repeated in another ; and so intricate and indeterminate are the forces brought into play against the advance that dogmatism is a waste of time. Nevertheless, each expedition undergoes experiences which go some way towards the placing of facts and theories in their proper relationship. We cannot afford to emulate the French philosopher who, when informed that the facts did not accord with his theories, replied "tant pis pour les faits." As a gesture, that is delightful ; as a basis of action, disastrous. I propose in this chapter to attempt an analysis, critical, explanatory and comparative, of the past ; and to offer a few suggestions for the future, in the hope that they may be of service.

I. WEATHER

As this must necessarily be a prime factor in the fortunes of any expedition to Mount Everest, it is dealt with first. If the weather of 1924 was abnormal, that of 1933 may be said to have been even more so. The scientific aspect will be discussed by Wager and by Messrs. Sen and Chatterjee elsewhere in this book ; here it will suffice to analyse in more general language the conditions which we experienced and their effect upon our plans.

It will be recalled that Dr. Sen, the Meteorologist at Alipore, warned me in February that we must expect a series

of western disturbances and an early monsoon. During the greater part of the march across Tibet nothing exceptional was observed. The west wind blew with considerable force at times ; that was seasonal, and caused no anxiety. But from Shekar Dzong, on April 10th, we observed heavy clouds over the Everest region ; no view was obtained from the Pang La on the 13th ; and on the 16th, the date of our arrival at Rongbuk, a westerly storm was evidently at work on the mountain.

From now on till the establishment of Camp III, on May 2nd, the weather was fairly good for the work in hand ; snow-squalls of short duration were not infrequent in the evenings, but a strong west wind on the upper part of the mountain kept the north face clear from snow and the long cloud-banner flying from the summit.

Then disturbance after disturbance came over from the west, delaying the establishment of Camp IV until May 15th. I was duly warned from Alipore of their approach. They were accompanied by very high winds and low temperatures. Work on the North Col slopes was only possible on six days of this period, and on two of those days very little could be done, owing to wind and to the dangerous condition of the snow which had blown over from the other side of the Col. To make things worse, Dr. Sen reported monsoon conditions off the east coast of Ceylon as early as May 12th.

No sooner was Camp IV established, on May 15th, than another storm completely cut it off from below till the evening of May 19th. Simultaneously a depression was advancing from the Arabian Sea and the monsoon was active in the Bay of Bengal. Balloon observations in Bengal indicated a wind speed from the west of sixty-five miles an hour at 29,000 feet on May 19th, and of eighty-three miles an hour on the 21st.

On the afternoon of the 20th there were clear signs of the advance of the monsoon air-currents from the south-east. They were beaten back again and again by the westerly winds, but from now on they were always to be reckoned with in

judging the state of the snow on the North Col. Their arrival, however, and their battle with the west wind, may explain the three comparatively good days, May 20th–22nd, of which advantage was taken to establish Camp V. These were immediately followed by a very heavy gale from the west, which lasted till the 25th and coincided with the formation of a cyclonic storm in the Bay of Bengal. Camp V had to be evacuated, and the snowfall on the North Col subjected Camp IV to danger of avalanche.

Camp V could not be reoccupied till the 28th, by which time the monsoon was in full strength from the Bombay coast to Burma. The wind was now very uncertain in the Everest region. It was frequently gentle in the mornings, but a marked feature of the period from May 29th to June 1st, during which Camp VI was established and the two assaults on the summit were made, was the recurrence in the afternoons of sudden westerly storms of great violence which were naturally a source of considerable danger to the parties on the mountain. They seemed, on occasion, to occupy a horizontal stratum of no great vertical thickness. Thus the storm which caught Longland and the porters while descending from Camp VI on May 29th was not severely felt at Camp VI itself. Their approach was invariably sudden and most disconcerting. They occurred on every day of the period except May 30th, and brought snow as well as wind.

Perhaps the most remarkable phenomenon of all was the *simultaneous* activity in the Everest region of westerly storms and monsoon. This really made things impossible for us. We never enjoyed the truce between the elements which the experience of other expeditions had led us to expect before the monsoon developed in full.

A number of photographs taken by Beetham from the Base Camp in 1924 afford evidence that the north face was often more free from snow in that year than it ever was in 1933. The snowfall of May 29th and May 31st set the final seal on our hopes, for it rendered the slabs near the summit unclimbable. From now on the north face of Mount Everest

became whiter and whiter, in spite of the fact that violent north-west winds were forecasted, and experienced, as late as June 6th. Then, as the monsoon gathered strength, the higher reaches of the mountain became unapproachable. Crawford and Brocklebank found dangerous snow conditions on the slopes of the North Col on June 14th. Wager, who made another inspection some twelve days later, came to the conclusion that the slopes might then be ascended in moderate safety before eight o'clock in the morning. Anyhow, the state of the upper slabs of the north face after June 3rd would have made an ascent to the North Col unprofitable.

There was to be no respite, not even the few days of clear weather which commonly occur during the early part of the rainy season. The effort to renew the attack, begun on June 11th, was really of the nature of a forlorn hope. The mountain was "closed for the season."

To sum up : constructive work was only possible on thirteen days during May, and sometimes only for a few hours on those days. Both attacks on the summit, especially that of June 1st, were made in conditions which were unfavourable to success. After that, snow never left the mountain.

Compare this state of things with that which prevailed in 1924 : then storms exhausted the party in its attempts to establish Camp IV ; but a fine spell began on May 26th and lasted nearly three weeks. Not perfect, of course—three consecutive perfectly good days are rarely come by on Mount Everest—but favourable for work. The monsoon set in about the middle of June.

In 1922 conditions were better during the early stages, though the monsoon arrived about June 3rd. In 1921 it was actually delayed till July 7th. In neither of these years were western disturbances so persistent as in 1924 and 1933.

It is unfortunate that the science of meteorology has not yet reached a stage which enables seasonal forecasts to be made well in advance. Dr. Sen, who has devoted his life to the study of this subject, and whose forecast for 1933 was remarkably accurate, informed me that he could not, in any given year,

venture a prophecy earlier than February of the conditions likely to develop in May and June. A message which he sent me on June 18th was of particular interest in regard to the possibility of work once the rainy season had started. He said that breaks in the monsoon ordinarily mean periods of little rain over the heart of India. During such breaks pressure distribution over Northern India is often most favourable for heavy precipitation over the Eastern Himalaya. Such breaks should occur so long as a well-defined monsoon depression is situated over the head of the Bay of Bengal. It is impossible to forecast far ahead the likelihood of fine spells in the Everest region during July and August. All that can be done is to indicate from day to day the progress of the monsoon, with the outlook for two or three days. The monsoon period in the Eastern Himalaya extends usually from mid-June to mid-October. As statistics of breaks in the monsoon over the Everest region are not available, it can only be said that the chances of prolonged spells of fine weather there are greater in September and October than in July and August; and no correlation has been established between the onset and the cessation of the monsoon.

We have strong reason to believe that the north face of Mount Everest remains snow-clad from the onset of the monsoon till late in the autumn. The west wind probably resumes its activity then, and possibly blows the snow off the north face. By that time, however, the days are getting short and the cold is excessive. On September 26th, 1921, Mallory and his companions were unable to face the wind for more than a minute or two on the North Col.

I think that the following conclusions are justifiable :

1. The proper season for the attempt is during May and the early part of June.
2. A normal monsoon may be expected to reach the Eastern Himalaya during the first half of June.
3. An abnormally early monsoon, such as we experienced in 1933, will be almost certainly fatal to success, especially if western disturbances are active.

II. OPERATIONS

This subject is, of course, closely linked with the climatic and physiological conditions. The question is sometimes asked, "Should you not have started earlier?" The same question was put to General Bruce in 1922. My answer is that we started as soon as we could. From the time that the news of the Tibetan Government's permission came through till the day when the main body sailed was only four and a half months, a small enough allowance for the organisation of a big enterprise. We had to work at very high pressure throughout.

Again, it is by no means easy to procure animals for the transport of some thirty tons of equipment and stores across the Tibetan plateau in the early spring. The Tibetan Government Trader himself told me that it was only by a lucky chance that his mules were available in sufficient quantity in March. Moreover the yaks and donkeys which have to be requisitioned for the greater number of the stages are in poor condition early in the year, especially if the winter has been hard.

Thirdly, the passes over into Tibet are often blocked by snow in the early spring, and on the plateau itself the climate is of such severity at that season as may put an unreasonable strain on the personnel of an expedition. As it was, we started nearly a fortnight earlier than our predecessors; were prevented by snow from crossing the Sebu La; and were threatened with a heavy fall on the Natu La. The first few days after leaving the Chumbi valley provided a sufficient test, both of men and of animals.

Once on the plateau, we advanced steadily, covering between twelve and eighteen miles a day except for halts at district headquarters, where transport had to be changed and delay was inevitable. I would add that these halts were beneficial to the party and should be made in any case. The experience of seven seasons in the Himalaya has convinced me that men *must* be given time in which to adjust themselves to the changed conditions of life. Even at Darjeeling, Europeans coming up for the first time are liable to stomachic and other

disorders, due perhaps partly to the water of the hills, but also to altitude, variations of temperature, different food, and so on. How much greater, then, must be the strain upon the newcomer to Tibet. If it were at all practicable, I would strongly recommend that the next party selected to attempt Mount Everest should first spend a winter at Gyantse.

If we are forced by circumstances of time and finance to cover the 350 miles from Darjeeling to Mount Everest in about five weeks, it is impossible to guarantee arrival at the Base Camp with the party anything like equally acclimatised, and this applies to the porters almost as much as to the climbers. In organising the establishment of the camps up the East Rongbuk glacier the fact was not lost sight of. I held—and still hold—the view that it paid us to advance methodically, however tempting the weather. Norton himself has said, “For some, three weeks’ acclimatisation at each advance in altitude would be desirable—were it possible.” He is absolutely right. Unfortunately it is not possible, and we have to make the best compromise we can.

Had the weather remained uniformly good, we should have been in Camp III by April 29th, twelve days after our arrival at the Base Camp. Actually we established it on May 2nd. In 1924 the operation took only six days. But there is this further difference: we were never driven out, though the ensuing weather in both years was about equally severe; and by May 7th we had no less than eleven members of the expedition in full residence, most of them very fit and ready to take a share in making the North Col. And porters were working steadily up and down the glacier between Camps II and III. Our improved tents certainly contributed, but I firmly believe that the slow advance was the chief factor.

Now take the next stage, the making of the North Col or, more exactly, Camp IV. During this operation the weather was about as bad as it could be, but everything possible was done to spread the work over a reasonable period, to take it in shifts, and to eliminate fatigue; for instance, by pitching a temporary Camp IIIa near the foot of the slopes. In good

conditions, Camp IV would probably have been in occupation by May 7th. In very bad conditions it was ready by May 15th, when five members slept there. So we were a week behind on our time-table, but still ahead of the 1924 party, who did not reach the North Col until May 20th, or seriously occupy it till May 31st. Apart from the gales which raged over the mountain at this time, the very low temperatures indicated that conditions higher up would have been too severe for an assault.

The next period was for us the critical, and the decisive, part of the campaign. It had never been contemplated that the advance above 23,000 feet should be at the same phlegmatic speed as heretofore, and by May 15th we had few illusions about the danger of deterioration, though we knew that Odell, a slow acclimatiser, had been all the better for ten days spent on the North Col. I well remember how Shipton pressed for a maximum of five days before launching the assault; and on the fifth day an attempt *was* made to establish Camp V, though the four days' gale which began on the night of May 15th had made it impossible to get sufficient porters up from below to stock the camp fully, even had the attempt succeeded. One of the two alternative plans for this part of the work allowed for a "dump carry" on the fifth day, if it should be found that more acclimatisation was needed; this meant that loads would be carried half or three-quarters of the way to the proposed site and dumped there, the party returning at once to Camp IV. The plan was abandoned when it was realised that at least four members—probably five—were ready to advance. Smythe and Shipton, on the 19th and 21st, made tentative reconnaissances up the north arête, finding themselves able to climb fast, but prevented from going far by the wind.

There are so many "ifs" which appear in the retrospect. If Camp V could have been properly established on the fifth day (May 20th), and if the party, with porters, could have made Camp VI on May 21st, and gone for the summit on the 22nd, success might have been theirs; for these three days were

as good as any we had throughout the operations and the mountain was in excellent condition.

But (there are just as many "buts") our strongest attacking force was not yet complete. The great gale of May 16th-19th prevented Wager, Greene and Longland and several porters from reaching Camp IV till the 20th. The planned assault could not take place at the most favourable moment. We must not forget, too, that any party which had attempted the summit on May 22nd might have been destroyed by the terrific weather which blew up on that same night, unless it had had the strength to come down to Camp IV.

The upshot was that Camp V was made on the 22nd ; that it had to be evacuated after three terrible nights which told heavily upon its occupants ; that, as a consequence, it could not be regained till the 28th. This was the second blow to our hopes. Could the strong party of the 22nd have continued up the mountain on the 23rd and 24th, with Smythe and Shipton one day behind them, the summit might have been reached.

This second blow was far more serious than the first. The frightful exposure suffered by the leading parties, no less than the time spent above the North Col and the repeated ascents and descents of the ridge, was beginning to tell ; and when Camp V was gained for the second time, on May 28th, several of the climbers had not been at a lower altitude than Camp IV for thirteen days. There had been no opportunity for them to descend for a rest, and the North Col slopes were in a dangerous state.

The attacks which began on the 28th and were continued till June 1st constitute the last phase of the expedition's work on the mountain. They were pushed to the very limit, and they failed mainly because of the snowfalls on the 29th and 31st. All was over on June 1st, the date on which the first climbing party of 1924 began its ascent of the north ridge. We never had another chance.

I think that, given a season which, for lack of a better name, may be called normal (remembering that normality in the

Everest region cannot yet be fully defined), the expedition of 1933 might have reached the summit. A spell of reasonably good weather, lasting ten days from May 15th, should have been amply sufficient ; and such a spell may, I suggest, be expected at about this time in any but a wholly abnormal year.

The conclusion, therefore, appears to be this : bring your parties, climbers and porters, slowly up to Camp IV, conserving energy the while ; aim at reaching that point with your best acclimatised men somewhere about the middle of May ; allow a short period for acclimatisation there ; and then go for the high camps and the summit as rapidly as possible, keeping the slower acclimatisers in reserve at Camp III. The rest is on the knees of the gods.

III. LEADER AND CHIEF TRANSPORT OFFICER

Something should be said here about the work of the leader and of the chief transport officer. It is not, I think, essential that the leader should take part in the higher climbs ; it may even be better that he should not, for events are sure to occur which he can deal with only from some central position. Opinions differ as to where that position should be. Experience on the spot has convinced me that it should be on the North Col. There only can operations be controlled. The leader should reach the North Col as soon as he possibly can, and should endeavour to stay there during the work on the mountain. If he cannot do this, he is not fit to be leader. He must, of course, be an experienced mountaineer, capable of judging the conditions of weather and snow and the abilities of his men. I strongly deprecate the principle of appointing a second-in-command to control the climbing operations. The responsibility is very great, and should not be placed on the shoulders of any other member of the party. The leader must bear it himself. He should, however, before leaving Darjeeling, select someone to take over the command in the event of his own breakdown. That is quite a different thing.

The chief transport officer should, I consider, be a specialist.

His concern should be with transport and victualling, and with these only. Climbing and other pleasures are not for him : his duties will occupy the whole of his time if efficiency is to result. During the establishment of the glacier camps his headquarters should be at the Base Camp ; after that they should be at Camp II, though occasional short visits to Camp III may be necessary. He should be in telephonic communication with all camps as far as the North Col. I know well that his task is exacting in the extreme and by no means spectacular ; but it is hardly an exaggeration to say that he can make or mar an expedition.

IV. THE PHYSIOLOGICAL ASPECT

Raymond Greene deals with this scientifically elsewhere in the book. Here I am concerned to discuss it from the point of view of the layman responsible for the conduct of the expedition.

It is a truism to say that men react differently to altitude. No expedition has yet had the time to make anything but empirical attempts to neutralise these differences of reaction. I have already mentioned my belief that if you could winter an Everest party on the Tibetan plateau at a height, say, of 14,000 feet, they would start for the mountain with a far better chance of success. They would, of course, have to be properly housed, clothed and fed, and be given plenty of occupation for both body and mind. Those with previous acclimatisation would not, I believe, deteriorate at all. Those without it would obviously benefit. I have discussed this question with officers who are quartered at Gyantse on the road to Lhasa. They were unanimous that their general health and working power were enormously improved by a six-months' residence there. Among other things they had got rid of the trouble of sore throats which causes so much loss of condition among both climbers and porters during an expedition. If further proof is needed, you have the definite fact that local Tibetans exhibit greater energy on the Rongbuk glacier than the still comparatively unacclimatised Sherpa porters.

In 1933 we did all that was possible to level up the party.

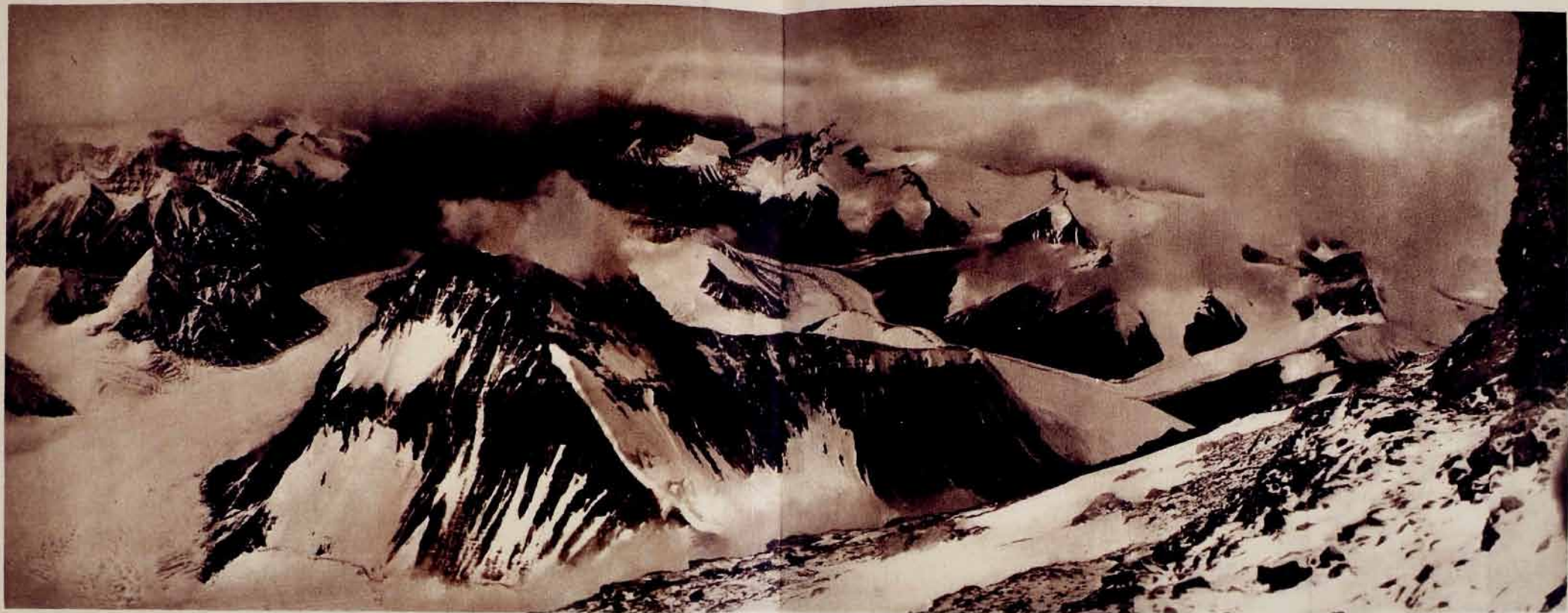


PLATE 39.—View from the first step, looking N.E. Main Rongbuk glacier on left; North Peak, left centre; East Rongbuk glacier, right centre; first step, on extreme right.

The advance guard on the march was made up chiefly from those who had never been high before, or not recently. Riding was encouraged, and serious climbing discouraged. Even so, we reached the Base Camp with fairly marked differences of condition still in evidence ; and the illnesses which occurred there still further complicated the problem. Nevertheless, that the general level was pretty high is shown by the number of men who were fit for hard work on the North Col by May 7th, and by the comparative absence of lassitude, distress, sleeplessness and loss of appetite at any except the highest camps. I attribute this almost entirely to the slow advance.

Again, anyone who has read *The Assault* and *The Fight for Everest* is familiar with the descriptions of distress, amounting to exhaustion, felt by the climbers of 1922 and 1924 when they first tackled the slopes of the North Col. Almost nothing of the sort was experienced in 1933, and thirteen climbers and a wireless officer reached Camp IV. Breathlessness there was, but not exhaustion. The inferences are that if you will only take your time up the East Rongbuk glacier and not try to rush it, you can arrive on the North Col with plenty of reserve in hand, and not get ahead of your acclimatisation, at least up to 23,000 feet.

After that, the case is probably different but, even so, events proved how great was the reserve strength of the party. Smythe, Shipton, Wyn Harris and Birnie were continuously at Camp IV and above from May 15th to June 2nd. The first two ascended twice to 24,500, twice to 25,700 feet, and once to 28,000 and over. Neither had the slightest vestige of heart trouble as a result of this terrific strain. Shipton's collapse at about 28,000 feet had nothing to do with physiological phenomena. Wyn Harris, who made exactly the same number of ascents, did get his heart dilated, but he had been down with influenza at the Base Camp on April 18th ; and Wager, who did nearly as much, with similar results, had been ill too.

On the other hand, there is no doubt that the long residence at Camp IV and above allowed deterioration to set in. It was not part of our plan, but was forced upon us by circumstances.

Every man who made more than one ascent of the north arête found that he went better the first time than the second. This is clear evidence that the limit of beneficial acclimatisation had been passed. Oxygen-lack, cold, wind, fatigue, discomfort, loss of appetite and of sleep must eventually cause deterioration. The first five were unavoidable anywhere above Camp II, the last two were not often felt below Camp V.

The comparative study of speeds is germane to the subject, though it must never be forgotten that figures of this kind can be most misleading. They depend on condition of the day, both of climbers and of weather, on the numbers and composition of the party, on the speed of its slowest member, and on the nature of the ground and direction of ascent.

In 1922, the first party ascended at the rate of 400 feet an hour to Camp V, at 330 feet an hour above that. The second party, using oxygen, climbed at 1,000 feet and 900 feet respectively.

In 1924, the best speeds recorded by parties of two or more, without oxygen, was 433 feet an hour up to Camp V, 333 up to Camp VI, and 205 above that.

In 1933, Smythe and Shipton in the course of their two early ascents to 24,500 feet, without porters, found they could ascend comfortably at nearly 1,000 feet an hour even in a heavy wind. Going up to Camp V on the 23rd in bad weather, and again on the 29th, they deliberately slowed the pace down to 500 feet an hour in order to save themselves for the next day, but they felt that they were not going so well.

The parties which established Camps V and VI climbed at 500 and 400 feet an hour respectively. They included laden porters, and the positions of these two camps were, respectively, about 500 and 600 feet higher than those of 1924. Moreover the climb to Camp VI was over unexplored and sometimes very steep ground.

In considering the speed of ascents made above the Camp VI of 1924 and that of 1933, it must be remembered that these were not made vertically upwards; they involved a great deal of almost horizontal traverse and much difficult going where the greatest care was necessary.

Wyn Harris and Wager took six hours and fifty minutes to achieve a vertical rise of only 700 feet or so. Smythe took about three and a half hours to do the same. The speeds, therefore, work out at very little more than 100 feet an hour in the first case, and 200 in the second. At first sight this compares very unfavourably with Norton's ascent of no less than 1,300 feet in six and a half hours. The figures for the first party are really valueless, for the men spent much time in trying to find a way up or round the second step. Whether they had to contend with more snow on the slabs than Norton found on his day is not very clear, but the storm of May 29th had certainly made the going difficult. Smythe probably had worse conditions, due to heavy snowfall on the 31st.

On the whole, the evidence shows that our assault parties retained their form well. Shipton spent two nights at 27,400 feet, and Smythe three, with no untoward results. No one suffered really severely except Birnie, who was not in the best of health and spent a total of eight nights at Camp V, insistent on staying there.

We can offer no exact parallel to Odell's example of very slow acclimatisation followed by amazing performance. Our slowest acclimatisers did undoubtedly much improve with time, but opportunity never occurred to test them fully.

Two more points may be noted : firstly, it is very doubtful if any of the men who went really high could have repeated their performance, though this may be ascribed, at least in part, to the long period they were forced to spend on and above the North Col. Even Smythe and Shipton were subject to the general loss of condition and weight. Secondly, the rapid recovery of most members of the expedition during the return march was very noticeable.

I trust that the foregoing paragraphs will not convey the impression that we claim any epoch-making discovery for the 1933 expedition, or that comparisons have been made at the expense of our predecessors. Nothing could be farther from the truth. The more our record is examined, the more it will be seen how we fell into line with Norton's own recommend-

ations. The need for gradual acclimatisation, for speed above the North Col, for not more than two high camps, the position and height of those camps—all these and many other things we owe, in large measure, to him.

V. OXYGEN

Readers may well have been forcibly impressed by the speeds attributed to the oxygen party of 1922. The fact that they could climb at 1,000 feet an hour to Camp V, and at 900 feet an hour above that, would appear to afford a very strong argument in favour of the use of oxygen. Unfortunately the experiences of one party do not provide an adequate basis on which to build a general theory of action.

The following points may be noted :

1. Finch appears to have used oxygen continuously from Camp III upwards.

2. An accident to the oxygen apparatus carried by Geoffrey Bruce occurred at about 27,300 feet and nearly produced a disaster.

3. Odell used oxygen in the course of his ascent in support of Mallory and Irvine in 1924. Its effect on him was so very slight as to make it doubtful whether it was worth while carrying the apparatus.

4. Greene, in the course of his climb to Camp V after only one day's acclimatisation at Camp IV, made a trial of one of Finch's cylinders on the north ridge, and obtained considerable relief from it.

5. Smythe, on the other hand, having descended from his high climb, used an apparatus experimentally at the North Col, only to find that it gave him a sore throat. It did not appear to improve his condition in any way.

We may perhaps justifiably conclude that a climber will receive little or no benefit from the use of oxygen at an altitude to which he has acclimatised himself in the natural way.

On the other hand, if the tactics proposed in foregoing paragraphs are adopted, the climbers will always be, to some

extent, ahead of their acclimatisation when at work above the North Col, though we know that a camp can be established and occupied for a considerable time above 27,000 feet without danger of collapse. Apart from the difficulty of transporting oxygen in any quantity to high camps, I think it is advisable for the assault parties to attain such acclimatisation as is possible at least as far as 27,000 feet. But we should do well to consider the advantages of the use of oxygen above that, especially if an even more efficient apparatus can be devised. The dangers from deterioration and from bad weather are so great that speed is essential. Wyn Harris's suggestion that an apparatus might be used to help men over the difficult part in the neighbourhood of the great couloir is worth examination. I would go farther. A party might begin using it when leaving Camp VI and might have a better chance of reaching the summit. They would probably suffer less from cold, and would be able to make more rapid progress. Having reached Camp VI without this aid, they should incur little risk of collapse if the apparatus failed.

I know that there are many who would still prefer to attempt to climb the mountain without oxygen ; but the odds against success in any conditions are so heavy that I am inclined to recommend the use of every available means.

VI. THE CLIMBING PROBLEM

The experiences of 1933 confirmed an opinion which first took shape in 1924, that Mount Everest is, in a technical mountaineering sense, a difficult mountain. Norton, whose favourite climbing ground in Switzerland is not dissimilar in formation to the upper slopes of Mount Everest, with the added disadvantage of loose rock, was the very last man to exaggerate the obstacles. He considered that the climbing for perhaps 400 feet on either side of the couloir, and in the couloir itself, was difficult and, in a greater degree, dangerous ; and that both difficulty and danger were greatly increased by the presence of powder snow on the slabs. The point is that,

although the work is not of the kind found on "severe" routes in the British mountain districts or the Chamonix Aiguilles, it nevertheless requires delicate and accurate balance. Overhangs, or places requiring strong arm-pulls, would not be negotiable at all at such an altitude; but smooth, small outward-sloping ledges, which have to be traversed by climbers whose co-ordination of mind and muscle has necessarily been impaired by altitude, constitute a difficulty of a high order when masked by snow.

The reconnaissance made by Wyn Harris and Wager afforded evidence, which to my mind is conclusive, regarding the comparative merits of the routes favoured by Mallory and Norton respectively. The conditions on May 30th were sufficiently good to permit accurate judgment of the practicability of the second step. One cannot go so far as to say that a rock-climbing expert might not climb, or turn, this step in good conditions at Alpine levels; but I am satisfied that if Wyn Harris and Wager, both of them first-rate mountaineers, turned away from it, future parties will be well advised to leave it out of their calculations. If, after arrival at Camp VI, they should find the slabs rendered temporarily impassable by a sudden fall of snow, they might make a further examination of the second step. But this should not, I think, be included in the plan of assault.

I would strongly recommend single-minded adherence to Norton's route, which offers a practical certainty of success in good conditions. Provided that you can synchronise the arrival of two parties at the top of their form with the absence of snow and three, or preferably four, days of consecutive fine weather, I believe that the summit will be reached by Norton's route.

Before leaving this subject I should say something about a theory which Smythe has developed. This is, that the north face can be traversed at a level of about 25,500 feet, the couloir crossed at this height, and a lodgment effected upon the western part of the north face directly below the final pyramid. The face will then have to be climbed more or less directly, up

what is undoubtedly steep ground ; but there will be this advantage, that the possibly more dangerous traverse of the upper slabs and the upper couloir will be avoided, and direct access afforded to the western subsidiary couloir leading to the easier slopes of the final pyramid. The difficulty is that, while we know the advantages of Norton's route and the possibility of placing a high camp either where it was placed in 1933 or, better still perhaps, on a snow-slope just below the first step, we cannot know without previous reconnaissance that Smythe's proposed route will "go," or that suitable sites will be found for at least two camps which would be needed on the face ; and a great deal of time would be expended in this reconnaissance. For my own part, I would prefer to follow Norton and go for what we know to be possible.

VII. CLIMBER PERSONNEL

There is no test known to men of science, to philosophers, or to mountaineers (who should be either or both) which will ensure the formation of the perfect party to attempt Mount Everest. Our medical examiners conscientiously probed our qualities, physical and psychological, but the expedition was the real test, and Everest the final judge. Perhaps it will always be so. How can a man's reactions to prolonged strain at great altitudes be foreseen? Defects and weaknesses, imperceptible or perhaps barely existing at sea-level, may assume strange proportions above the Himalayan snow-line. Chance must, therefore, inevitably play its part in the formation of a party.

It is well to consider men who have been high before, and men who appear to be temperamentally stable as well as physically active. They should be for choice between the ages of 25 and 35. They must be as much at home on snow and ice as on rocks, and have had long experience of guideless climbing, for there are no guides on Everest.

The selection must, I firmly believe, be made by the leader. If he is wise, he will seek advice and consider opinions among

the party as it takes shape, for homogeneity is of great importance. But he must use his own judgment and shoulder his own responsibility.

VIII. PORTERS

No praise can be too high for the services rendered by the porter corps of 1933. There can no longer be any doubt whatever that, physically and morally, they are capable of bringing the summit within reach of the climbing parties. The final climb can probably be done from the height and position of the Camp VI of 1933, but a still better chance would be afforded if this camp could be placed just below the first step at a height of about 27,800 feet. The form shown by the porters allows of the belief that they are capable of carrying as far as this, even from the site of our Camp V. The position of the latter cannot, we think, be improved upon; but the camp itself might well be more solidly constructed.

In calling upon the porters to carry to 27,400, or perhaps to 27,800 feet, we must see to it that they are under escort both up and down; for the dangers of climbing above Camp V demand it. This requires an act of self-sacrifice on the part of at least one among the climbers. I am confident that a volunteer will never be called for in vain. It is essential that every climber should be capable of independent action on the mountain; morale is a plant of tender growth, and the porters must have confidence in the ability of the man to whose care they are entrusted.

Norton has always, and rightly, laid stress upon the importance of getting to know the porters individually and of learning their language. The party of 1933 did its utmost in this respect, though linguistic ability was not universal. It was found that, if only the porters liked and trusted a climber, they would follow him anywhere even though his powers of communication were limited. Personal influence is by no means in direct proportion to capacity for speech. The latter, however, is obviously a valuable asset, and will always increase the standard of performance and improve the safety factor at a crisis.



PLATE 40.—Wyn Harris and Wager leaving Camp VI on the descent.

In the matter of climbing Mount Everest the Sherpa and Bhutia communities have now developed an esprit de corps which ensures that any future expedition will have no difficulty in obtaining a fine body of men.

VIII. WIRELESS COMMUNICATIONS

I have already stated in Chapter II that Mr. D. S. Richards financed, equipped and controlled, independently of the expedition, the wireless system which kept us in close touch with the outside world. Our thanks are due to him, to the military authorities in India, to the Director of Wireless and to the Director-General of Posts and Telegraphs for the organisation which made this possible for the first time in the history of Himalayan expeditions; also to Messrs. McMichael, who presented us with a receiving set which was in constant and effective use at Camp III. It is regretted that a detailed technical description of the system cannot be included in this book.

Put very briefly, the arrangements were as follows: a wireless transmitting and receiving station was set up at Darjeeling, equipped with apparatus made by Standard Telephone and Cables, Limited. In addition, a Post Office line was specially erected to put this station in communication with the Darjeeling exchange. This line could be plugged through direct to Calcutta.

The Darjeeling wireless station exchanged messages, over a distance of about 110 miles, with a station erected at the Base Camp and equipped with apparatus by the same company. The transmitter at the Base Camp was operated on a wavelength of 41 metres; power being supplied by two parallel banks of accumulators, each consisting of three Young 4-volt 80 A.H. batteries charged by a 1 H.P. Stuart-Turner charging unit.

The Base Camp station also exchanged messages with a station at Camp III, where the transmitter was worked from Siemens "Full-O'-Power" 50-volt batteries of a special (inert)

type designed to maintain its performance in great cold. The wave-length employed here was of about 51 metres. The McMichael receiver has already been mentioned. It was a 4-valve battery-driven super-heterodyne Colonial model.

The chief advantage to us of this elaborate organisation was the receipt of timely information about the progress of the monsoon and general weather forecasts. So efficient were the arrangements that on several occasions I received weather reports at Camp IV within an hour or two of their despatch from Alipore.

Secondly, despatches to the Press and private communications could be sent quickly : 450 such messages were dealt with in three months, including one of 695 words in cipher. On one occasion I sent a report to the Mount Everest Committee in London, and received the reply within twenty-four hours. On another, Smythe received a telegram from New York while he was at Camp IV, and was able to return the compliment on descending to Camp III.

Thirdly, Empire Broadcast programmes were frequently received at the Base Camp. They could easily have been relayed to Camp III, but the late hour of their reception, and the cold, would have prevented anyone from turning out of his flea-bag to listen to them. Gramophone relays from the Base Camp were, however, well received at Camp III, and were even, on one occasion, retransmitted by means of the telephone to the North Col.

Transport difficulties in Tibet, and the damage to which delicate apparatus is liable in transit, make a lighter and less complicated equipment desirable for future expeditions. It is not absolutely essential to take a long-distance transmitter as well as a receiver to the Base Camp ; reception is the main thing. But light transmitting and receiving sets for radio telephony between camps as far up as Camp V might be of great value ; the field telephone wire, which we used in 1933 between Camps III and IV or IVa, could never be carried above the North Col. Now that the possibility of exchanging messages across the Himalaya has been proved, engineers will

doubtless make a close study of the problem. Wireless equipment and staff should, I think, form an integral part of the next expedition.

IX. THE FUTURE

I assume without hesitation that the attempt to climb Mount Everest will be continued. We cannot leave the work unfinished. So much is now known that we may reduce the odds of fifty to one against, which Mallory thought represented the chances of a given party in a given year. The all-important psychological factor has, I think, changed. An ascent to at least 28,000 feet is almost regarded as a matter of course. Success may not come at the next attempt or till after many more attempts, but the end is certain. As soon as the Tibetan Government gives permission the struggle will be renewed, and our successors will use our experience and avoid our mistakes. Surely it is worth while to pursue one of the last great adventures which the surface of the earth has to offer.

II
OBSERVATIONS

I. EXTRACTS FROM AN EVEREST DIARY

Thursday, March 30th. Resting at Kampa Dzong.—This is another stage of the journey finished. Taking it all in all, we are as fresh as daisies, overfed and, if anything, under-exercised. I wish there was a weighing-machine, because I believe I'm actually putting on weight at 15,000 feet.

A still and sunny morning. We had breakfast at the slothful hour of 8.0 and spent the morning washing ourselves and our belongings.

I'm writing in the sun, overlooking the plain with Kangchenjunga in the distance. This really is a good life.

Sunday, April 2nd. Kampa to Lingga.—Left at 8.0 in fine calm weather, and rode nearly all the way with Ferdie Crawford. After a few miles we passed through the pleasant little village of Mende, where we were astonished to find a little clump of willow trees—the first trees we've seen for a fortnight. We forded a river and had great fun watching porters and yaks crossing. One yak threw off its load, and four boxes of high-altitude rations got a wetting, but luckily all the contents are tinned.

Ferdie and I then went over a rise rather like Shap, with light-coloured dead grass everywhere. The wind was very strong in our faces and there was intermittent snow. Going down the other side was rather unpleasant, and finally we had some miles to go over a flat plain with dust almost suffocating us. We reached Lingga at 2 p.m. and were glad of the shelter of the mess tent. There's a lake just outside on which Ferdie and I spotted about seventy bar-headed geese—they were very tame and allowed us within about twenty yards of them. Brahmini duck are also very common now.

The poisoned finger and sore face are getting on well. I expect the lower heights are helping matters.

Saturday, April 8th. Jikyop to Trangso-Chumbab.—A very windy night ; at one moment I was afraid my tent was going. We started at the usual time and shortly came to some hot springs, where I think the previous expeditions camped and bathed. We went on dirty, however, and soon had to ford a widish river. Raymond Greene's pony got a bit to one side and nearly perished in a quicksand, but about ten minutes of pulling and shouting by some Tibetan muleteers got him out none the worse.

A few miles later we came to the River Phung Chu, which we now follow up to Shekar. This is the river which gets through the main Himalayan range into Nepal, being called lower down the Arun, same as the one that flows through Amberley and Arundel, "and the places we know," as Belloc would say. Raymond and I actually found some grass on its bank, and lay down and slept for two hours, in lovely sunshine and with another very good view of Shankar Ri, now a tilted sharp needle like the Rothorn. Then we walked on down the gorge, two rather strong silent men addressing each other perhaps once per mile (we both felt very sleepy for some reason), till the last mile or two, when we had a race into camp on our ponies.

Sunday, April 9th. Trangso-Chumbab to Kyishong.—A long march along the plain by the Phung Chu. Wind got up early and was very tiresome. When we got into Kyishong, we found that they had pitched camp right in the village, with all sorts of filth blowing about. The mess porters declared that anywhere else near by would be too dusty, but, as Eric Shipton solemnly observed, "two mouthfuls of dust are better than one mouthful of dung."

Monday, April 10th. Kyishong to Shekar Dzong.—On arrival at Shekar it was discovered that the stores had been looted wholesale. The rest of the day was spent in sorting out and stocktaking. All the process was undertaken in fearful dust-storms. I'm still covered with muck and itching all over. The first discovery of the losses was quite humorous. Lewa found that a box of porters' boots had been emptied and filled with

yak dung. Screaming with rage, he flung the yak dung at the driver whose animals had been carrying these boxes, at the same time administering his own boot on the driver with a magnificent disregard for the parts of his anatomy he was mutilating.

After supper, when the tumult and the shouting had died, not to mention (thank God) the wind, we could appreciate the real beauty of Shekar rather better. The rock looks immense in the moonlight, and the clusters of ghostly white buildings seem to stand upon nothing at all. And the surrounding hills look more friendly. In the sun's glare they were brown and uninteresting.

* * * * *

Saturday, April 22nd. At Base Camp.—My tent blew down in the night and I had a jolly time getting it up in the gale. It took hours to get warm again in bed. When I awoke this morning it had begun to snow, and has been going on ever since, so we can't go to Camp I to-day either, which is a curse. My servant Nima Dorje and I have been putting our heads together, putting tapes on my Shetland pants, to keep them from falling down to my ankles. The result looks queer, but works. I was the creative genius and he the seamstress, and I don't know which was worse.

Sunday, April 23rd. Base Camp to Camp I.—Left Base Camp for good—that is to say, I hope not to see Base Camp again till some poor fools have climbed the mountain! Started 10.20, arrived 1.20 with a twenty minutes' halt, with Hugh Rutledge and Raymond.

We had a lunch on arrival fit for heroes, having opened some of our few stores from Fortnum's. Grilled ham and Stilton can't really be improved on, except that a mug of beer would have slipped down well.

We're still living in great comfort; we mess in the arctic dome tent and two sleep in it, while the rest of us each has a little Meade tent, which for one is quite commodious.

Monday, April 24th.—The night was very cold, but I was

heaps warm enough with the blanket over the sleeping-bag. This morning the clouds had rolled away and we had breakfast outside in sun and flat calm. Since then I have been lying out in the sun, writing this up to date and reading.

After lunch I wandered up the glacier for an hour towards Camp II, with Jack Longland and Bill Birnie, turning at about 19,000 feet.

Tuesday, April 25th. To Camp II and back to Camp I.—To-day some of us prospected the route to Camp II. Raymond, Frank Smythe and George Wood-Johnson went ahead, and Eric and I went behind, Eric as usual setting a very slow and suitable pace. He's got the art of walking uphill to perfection, better than anyone I know. However, the most perfect pace in the world wouldn't have made the last part of the ascent comfortable, and in the last hour or so we got our first taste of "glacier lassitude." We were walking on moraine-litter in the middle of the glacier, rather enclosed and airless. But at 2 o'clock we found the first party perched on some moraine eating their lunch, which we very gladly did too. I still found I could do justice to food, although my lunch was partly spoilt by having continuously sucked sugar-candy on the way up—much the best stuff for these occasions, and well worth the spoiling of one's lunch. Afterwards we went farther along this medial moraine, in search of Camp II's site.

The ice-pinnacles on the glacier near II are the product of madness and insanity. Seen from above they look absurdly like an army marching purposefully down in column of fours.

As soon as we started down for Camp I, I for one became aware that I was extremely tired. I hadn't noticed it before, because of the interest of the ice-pinnacles and of the search for Camp II. But now that it was a case of a humdrum walk down irritating moraine, one became only too conscious of uncontrollable limbs and a complete lack of balance. Everyone was tired and stumbled frequently on the loose stones which slithered away from the black ice underneath.

Thursday, April 27th. Camp I to II.—Five of us moved up to II to-day, to wit : Hugh, Raymond, Bill, Jack and self. We went, I thought, very slowly, but improved on Eric's and my time two days ago.

Camp II is a pleasant spot, surrounded by ice-cliffs and pinnacles, but very cold when the sun goes down. Ten minutes after sunset there were 18 degrees of frost.

Friday, April 28th.—Had my first really bad night so far. I couldn't get warm, added to which the frozen snow under my bedding made itself into most unaccommodating lumps. I'm lying in camp all day, feeling slightly battered. Nothing much happens ; a party has gone to prospect a way to III, and others are vaguely looking at Everest through the telescope. It's a bit cloudy and windy to-day.

There were 50 degrees of frost in the night.

Sunday, April 30th. At Camp II.—Slept like a log—partly the effect of Raymond's pills, and partly because I had some excavations with an ice-axe under my tent yesterday, and removed most of the worst lumps of frozen snow.

I've been very grand and had breakfast brought to me in my bed. Everyone does this on off days when not working on the glacier. Even Hugh succumbed to it to-day, and he's been very spartan so far. It's pleasant to lie abed in the morning, but not so the other end of the day ; the sun leaves us about 4 o'clock as there's a mountain in its way ; so we have our last meal just after then and crawl into our sleeping-bags for the night. Thus one has at least twelve hours in bed, and sometimes considerably more.

* * * * *

Sunday, May 14th. At Camp III.—Ferdie arrived from II with the news that at last forty-six Sola Khombu men have arrived. Apparently they put up a very good show yesterday, going the whole way from the Rongbuk Monastery to Camp II carrying loads. So they are resting to-day. This alters the whole picture. It will now be possible to stock the North

Col much quicker and also put forward the date of the first attempt.

This afternoon I walked up alone to IIIa with all the news. Most of them were working on the North Col and I had a cold wait for them. Eventually they came down, with fifteen porters; the latter very pleased with themselves, and apparently having enjoyed their carry to the North Col purely as a piece of mountaineering.

After a brief talk with Bill about porters and loads for the next few days between III and VI, in the light of new developments, I ran down to Camp III again. In the middle of supper a porter came in with a hand dripping with blood, having almost cut off a finger with a tin opener. I dressed it as well as I could, but the significant part is that it led to a wash of the hands afterwards, the first for nearly three weeks.

Wednesday, May 17th. At Camp IIIa.—This is the windiest camp on this very flatulent mountain. It snowed all day, and I crept into the arctic tent for company. We spent the day reading and talking and having a sort of general knowledge paper out of *Whitaker's Almanack*. The dark came and we settled down in the arctic to what we foolishly thought was to be a night's rest.

Thursday, May 18th. At Camp IIIa.—The wind gradually increased to something like a hurricane, and suddenly CRASH! and I woke from a doze at about 2 a.m. to find the windward side of the arctic tent had caved in. After a hurried consultation, Wager and Raymond Greene put on some clothes and went out to try and do some repairs. Ferdie and I sat inside grimly trying to hold the tent down as it showed signs of wanting to bowl away down the glacier. It reminded me rather of the final scene of *Journey's End*. They kept shouting outside for "string, more string," and we fed them with the string from the tops of rucksacks, which was all we could find. But it worked, and they managed to fix things safely for the rest of the night. After that I slept like a top through the gale until it was light.

The gale continued right through the morning, and it was quite impossible to do any work on the Col. So we again had to spend the day in our sleeping-bags.

A very pleasant change in the evening was the arrival of some mail from III. It's very good in the present surroundings to hear news of an English spring.

Friday, May 19th.—Still blowing hard all night, but mercifully the tent was all right, and this morning the sun was shining when I woke up. The wind was blowing hard, so we couldn't make an early start. It was an enjoyable day for me, being the first time I'd visited the North Col. The first part is easy enough snow-ploughing, but then the route becomes steep ice with an ice-cliff overhanging below, so care is needed; but it's now patent safety as it's got fixed ropes. Above this one crosses a huge horizontal crevasse, a friendly crevasse which is shallow but wide and would catch anyone who tumbles off the bit above! We took it in turn to kick or cut steps, about 200 feet each. One had to pull out a fixed rope which was embedded under the slab. A curious form of mountaineering, and about the most exhausting I have met so far.

And so to the crux, a wall of hard blue ice, the first part overhanging. This part must have been the devil for Frank Smythe the first day. We arranged that Jack Longland and Wager should go on ahead to get the porters down who are now staying on the Col. I stayed behind and dumped the loads of the porters whom we had brought up with us, tying them on to the bottom of the ladder to stop them rolling all the way down, a rather cold affair with ice chips falling down my neck from Jack's axe above the ice-wall. Then I sent our porters down to IIIa, and when the ten porters from the North Col arrived at the top of the wall they hauled the loads up and carried them the short distance to the North Col Camp (Camp IV). So they're stocked with necessaries for a long time now, which is a load off our minds.

Sunday, May 21st.—The ladder to-day was quite a severe "lead," as it was iced. I brought four porters up, who are

to stay at IV, and finally climbed down the ladder to tie on loads and send them up. Apart from being the coldest $1\frac{1}{2}$ hours imaginable—with ice and snow fragments falling down one's neck and in the shade all the time—I was a bit unhappy having heavy rucksacks swinging above me; there was too much strain on the string at the neck of the sacks, and I had visions of being "bumped off" by showers of 1-lb. tins of raspberry jam and pemmican. But all was well, and eventually I was able to run down the track to IIIa, glissading the last 400 feet or so, and got in just after sunset. I got straight into my sack and had a tot of rum, and lay talking to Ferdie as warm as toast. There are only we two at IIIa now.

Monday, May 22nd.—A cloudless and windless morning after rather a rough night. Smijth-Windham turned up from III, according to plan, and after some sorting-out we started laying the wire to the North Col. Eventually the wire unfortunately ran out altogether just under the ladder, so I shall have to finish it myself to-morrow—it's only a short bit into Camp IV.

Smijth-Windham implored me to take him up the ladder to IV, and as he'd got so far I hadn't the heart to refuse him. So up to Camp IV we went. Coming down to IIIa, we had to rope down a dozen porters, not to mention Smijth-Windham, which was cold work and meant standing in the same ice steps for an hour. Once down the ladder, it was just the usual twenty minutes' run to Camp IIIa.

Tuesday, May 23rd. IIIa.—Very much annoyed to find that snow fell in the night. Also things are distinctly monsoony—big clouds coming over from Nepal, snow inclined to melt and not evaporate, air temperature high. It's not pleasant. Shortly I shall have to start again for the North Col (I'm writing after breakfast).

Same day—later. North Col.—New snow had obliterated all the tracks. I went ahead and kicked steps from IIIa to the ladder, with two porters behind carrying the extra wire. As far as I could see and judge, the snow was just about justifiable, and Ferdie bore me out afterwards; he followed with the

other porters. At the ladder, Jack and Hugh came down to meet me ; and after I'd joined the wire up where it ran out yesterday, I took both coils on my back to save time and trouble, and shinned up the ladder. At the top I got a porter from IV to take one of them the last 200 feet to the camp. Then I connected it all up in the arctic tent at IV, and—it worked !

Wednesday, May 24th. At Camp IV, North Col.—I stayed in my tent most of the day, regarding the prospect which hourly becomes more displeasing and discouraging. No one could go up to-day, as it was snowing and blowing like fury ; a gap in the clouds showed that at V, too, they were stuck. The route down from here to IIIa must be an absolute death-trap with all this new snow and higher temperatures. We are therefore quite cut off from below, and chances of the mountain being climbed now get smaller and smaller ; also at any moment new snow may slide down on us from above.

That's the full chronicle of our ills, I think, but even so it's not as bad as all that, and we find each other quite good company still.

Altogether this is too much a war and too little mountaineering. Members of previous expeditions may throw several fits when they hear we've been on the North Col route within three days of new snow. If we hadn't, though, we should never have reached the North Col at all.

Thursday, May 25th. At Camp IV.—To-day I was left with Raymond in camp, suffering still from a chill and altitude.

Jack, Wyn and Wager set off, as arranged, as support party and Hugh and Ferdie accompanied them a short way for a walk. At about midday the whole caravan, plus the four now at V, came down owing to the appalling conditions up there. No one slept a wink last night at V, owing to wind and snow.

For thorough exhausting-making-mess I recommend collecting some lunch for eleven sahibs at 23,000 feet. I had to do this to-day, on one "Primus," collecting snow to melt, and searching for food outside in drifted snow. All the tempting food seems to have disappeared, too. We cook for ourselves

up here in our arctic tents and in infinite squalor. No one can bother about clearing up, and one's very apt to find a half-empty tin of condensed milk mixed up in one's sleeping-sack.

Friday, May 26th. Camp IV to Camp III.—About six or eight inches of snow fell in the night. After a long conference it was decided (a) that a party should lay siege to the mountain, (b) the other five of us, Hugh, Hugo Boustead, Ferdie, Raymond and self, to go down to III. This is to economise in food as the state of the North Col route may preclude any further carries-up. (c) This site is clearly exposed to avalanches from above, so most of the day was spent in evacuating it and moving half an hour up to another site, more exposed to wind, but not at all to avalanches.

Finally, at about 5 o'clock the five of us went down; by that time the sun had been off the snow an hour and it seemed fairly safe. Ferdie and I went last and had a cold and long job letting down the frost-bitten porters on a rope over the ladder. We were there for well over an hour in the same steps, with feet and hands like ice. Pasang Kikuli did amazingly well, unable to use his hands and balancing down like a born mountaineer. The other Pasang slipped half-way, and it was all I could do to hold him with my cold hands, even with the rope belayed in a piton. At last the last porter was down, and I got down myself and caught up the others. We got in (to Camp III), Ferdie and I ahead, at 7.30 p.m., just as it got dark.

I swallowed some lovely hot pea-soup and a spoonful of rum and crept into my sack.

Saturday, May 27th. At Camp III.—Sat in sun all the morning. A glorious change. Thank God there's a lull in the monsoon. Three days of this and they should do the trick up above.

Tuesday, May 30th.—A bad night as my back gave me hell whenever I coughed.

In the morning, we were greatly cheered by the arrival of the "tigers," who yesterday established Camp VI at 27,400

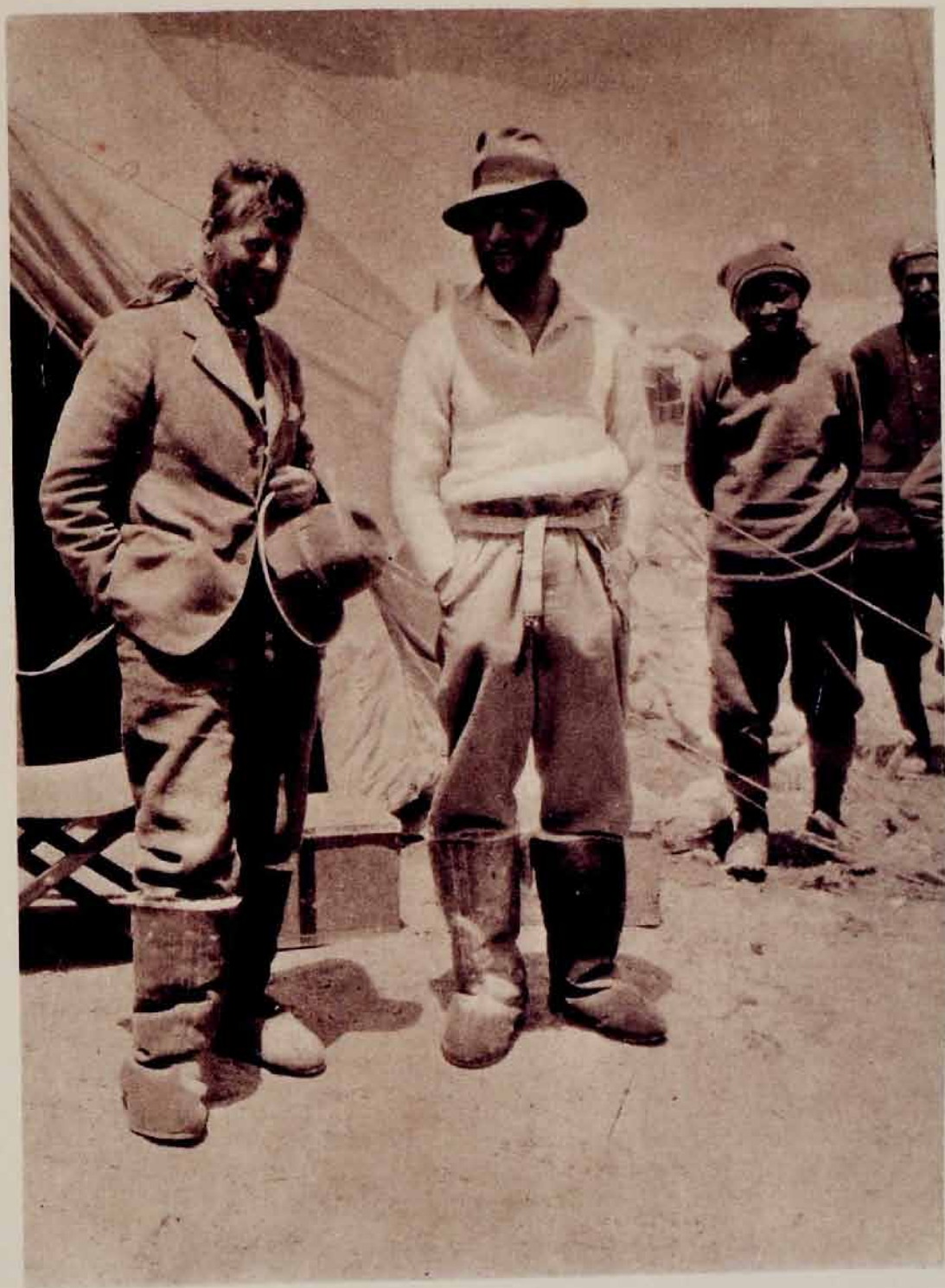


PLATE 41.—The second assault party: (left to right)
Smythe and Shipton.

feet—a magnificent achievement and easily the highest point to which loads have ever been carried. Most of them were looking as untouched as if they were hanging around Darjeeling bazaar. Apparently Jack took over the shepherding of porters to VI, although himself a very tired man, and put up a very wonderful show indeed.

Wyn and Wagers are making their attempt to-day. We've waited and waited, but no news has come through. The telescope's no good as the summit's in slight cloud, though luckily there seems very little wind.

May 31st, 1933.—Mostly cloudy, and very heavy snow in p.m. Passed the time reading and playing chess. No news from above and Hugh getting very anxious. At last, about 5.45 p.m., the telephone rang from the North Col and we got the news of Wyn and Wagers's fine effort yesterday. . . .

Thursday, June 1st. *To ladder on North Col and back to III.*—I sat in the sun writing early in the morning. Made a late start for the North Col with Hugh and Shebby.

We got to the ladder and there found Wyn and Wagers descending with a sick "tiger," one Kipa. This changed our plans. We dumped the loads and I took over the sick Kipa and came down behind with him on a short rope. Kipa slid down most of the way on his bottom, utterly wrecking the track and with most of his weight on me, in spite of my entreaties that he should stand up. I found it a distinctly hard job, even with the fixed rope, and where there was none the joke was really quite hard to see, as if I'd slipped, old Kipa and I would have gone for six all right. Also the poor old boy was affected in mind—he kept stopping and staring about him in a dazed sort of way. Where there was no fixed rope, he seemed unable to see the track and kept wandering all over the slopes, which frightened me as the snow seemed ready to slide on the slightest provocation. Eventually the sight of tents brought him safely down to Camp IIIa.

After a welcome cup of tea, I went on down with Wagers in a severe snowstorm, Wyn following behind. At III there were no spare beds and I put Wagers into mine and dossed

myself down on some synthetic bedding of bits of blankets and sheepskins.

Waggers has a fairly badly dilated heart, Wyn less so. No news, by the way, of Frank and Eric, who are still on the mountain up in the clouds.

Friday, June 2nd.—Started earlier with Shebbeare, meaning to take five porters up to Camp IV. At IIIa we saw Ferdie coming down the slopes with a couple of porters, and we waited for him in case he started an avalanche on our heads. When he arrived, he strongly advised us not to go up as the snow was getting worse every minute. So we abandoned it.

We were all very anxious all day about Frank and Eric, and finally Jack telephoned from the North Col in the evening that they made their attempt yesterday and failed. . . .

Saturday, June 3rd.—Stayed in Camp III to-day, waiting for the rest of the party to come down from the Col. They were very late; the first to come was an ill and almost incoherent Eric. I moved into my Meade to let the war-scarred veterans have some warmth in the arctic. To-morrow, it's decided, the whole party begins a retreat to Base Camp to recover.

Sunday, June 4th. *Camp III down to I.*—Ferdie and I moved right through from Camp III to Camp I to-day. It looks rather like the fittest going down first, but the idea is that the blind and halt and maimed only go to II to-day, and there aren't tents enough for all of us there. Ferdie and I started off early, before the rest, and the first part was delightful walking on crisp snow; it was so warm that I went in my shirt sleeves, taking off my two Shetland pullovers for the first time for weeks.

The lower we went, the warmer it became, and the better I felt. The boulders and rubble of the moraine were sunny and friendly, and the air generally seemed more capable of supporting life.

When we reached Camp I, we found little tufts of grass all round the camp. The change is really wonderful; six weeks ago Jack and I were hacking through a young glacier with ice-axes to get water here.

Ferdie and I played chess with the tent flaps open, till 7.30 p.m. without getting cold. I slept in a Whympers all to myself, and it felt like bedding down in the nave of St. Paul's.

Monday, June 5th.—Camp I was such a glorious sun-trap this morning that Ferdie and I couldn't bear to leave it, and sat reading and writing for some time after breakfast. (This is written up to date here.) It really is heavenly to lie on a sun-warmed boulder, with no struggle for existence and nothing to worry about, with the sound of the glacier stream just below, and the knowledge that in an hour or two one will be at Base Camp enjoying one's first bath and change of clothes for seven weeks. In fact, writing this is too like hard work. I shall stop and go to sleep for a bit. . . .

Later—Base Camp.—Although I felt rather slack and pulled-out, the walk down from I to Base Camp was one of the pleasantest things I remember. As we turned the corner into the main Rongbuk valley, the brown Tibetan hills to the north came into sight, shimmering in heat. For the first time one could believe it was summer, without looking at a calendar to see the date.

We took a short-cut down the moraine, and reached Base Camp in one hour fifty minutes. Then we had a perfectly gargantuan lunch—cold ham with vegetables, potatoes, onions both cooked and raw, and young ones, beetroot and carrots; and fresh bread and digestive biscuits and . . . well, it went on for hours. And then, a bath and clean clothes. My body was a horrible sight when first uncovered—all the ribs sticking out, and hardly anything on my arms or legs at all, and my skin all white with spots on it.

I finished my bathing in time for an enormous tea, and at 7.30 (it's good to be up till a reasonable hour, instead of creeping into one's bag at sundown) a huge supper of all manner of good things, and so to bed in a Whympers, in my camp bed and silk pyjamas. The latter were sheer bravado, and I had to put on more after an hour or so. I didn't sleep for a bit. It was so pleasant to lie and realise one was off the

mountain, in comfort lower down, and able to turn over in bed without panting oneself silly.

* * * * *

Friday, June 9th. At Base Camp.—Raymond “vetted” the whole party and on the whole was agreeably surprised. The result is that Ferdie and I, the old-established “comic turn” combination, are to start up the day after to-morrow in advance.

Sunday, June 11th. Base Camp to Camp I.—Hugh did a great deal of photographing of us, in various groups; what with this and packing, Ferdie and I waited till after lunch before setting off for Camp I. We took Thompson with us, to work wireless at III. We reached Camp I in two hours twenty minutes, with one brief halt, and felt very fit and pleased with ourselves. Towards the end it was snowing, which now seems continuous high up.

Wednesday, June 14th. Camp III.—It snowed all night and continued all day; nothing was visible anywhere, and we couldn't have done anything on the Col. So we stayed in our sleeping-bags all day, feeling considerably discouraged. It was sad, as I was feeling very fit to-day.

Thursday, June 15th. Camp III to IIIa.—Theoretically Ferdie and I started early for Camp IIIa to avoid “glacier lassitude,” but it turned out that we didn't leave III till 9.30, as we waited for Tommy to get us a weather report on the wireless, which turned out to be a bad one anyway. The walk up the glacier was rather hot, but we went very slowly and, when we got to IIIa, we got the Whymper pitched and slept for a bit. It was a grand day, one of the very few with no snowfall since the monsoon really broke. But things are woe-fully changed up here; round the bottom of the North Col wall the glacier is covered with avalanche debris, and there are fresh ones falling all through the day. The actual route to the Col is freer than most parts of the ice-wall, except the ladder,

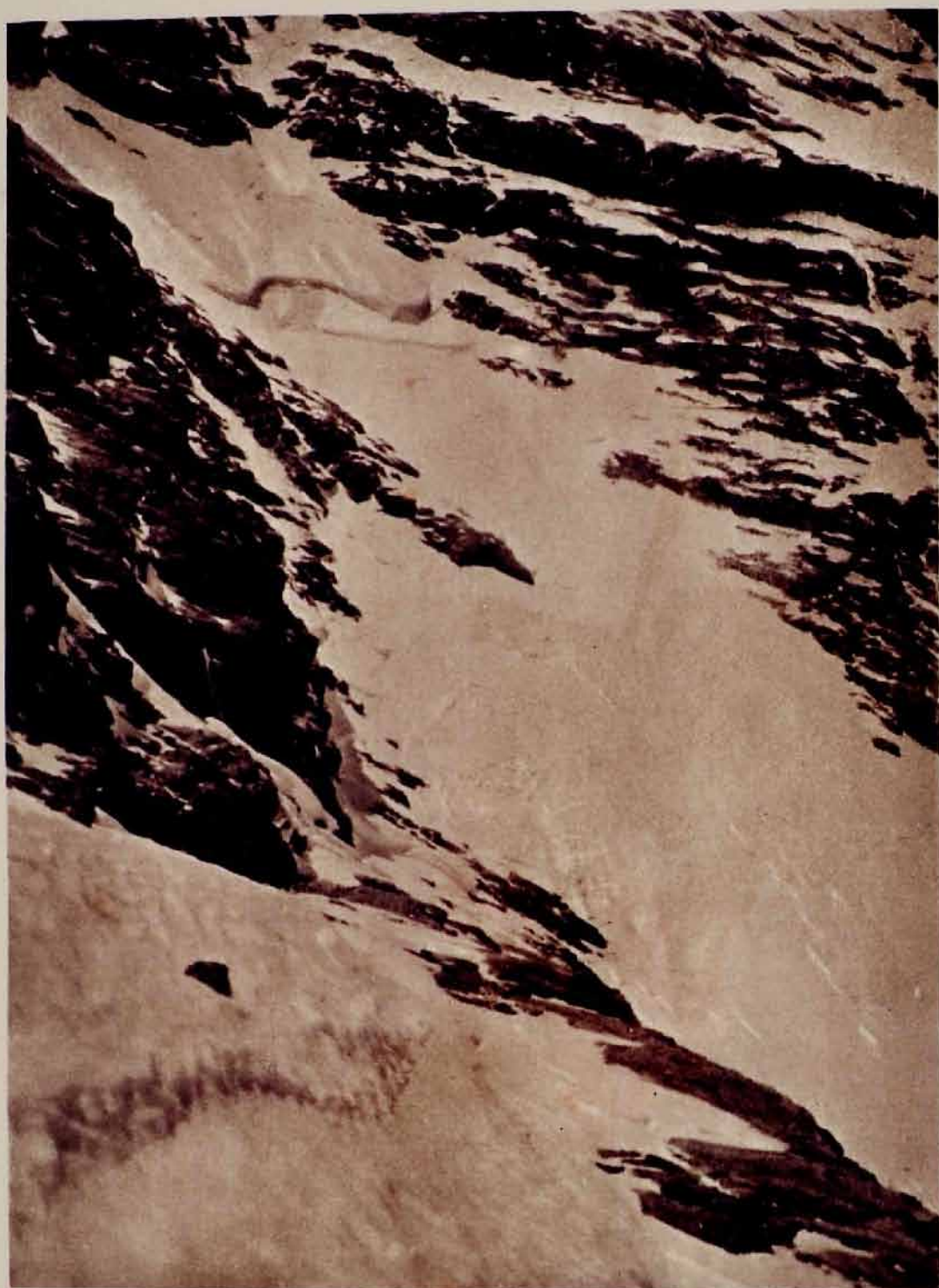


PLATE 42.—The great couloir at about 28,000 feet.

which is almost buried under fallen snow. No ropes are visible anywhere on the route.

After seeing these discouraging signs, it was with some trepidation that we set out to begin reopening the route. We set off at 4.20 p.m., after the sun was off the slopes and the snow had had some chance of consolidating. But it was very soon obvious that there wasn't much consolidation going on—one's axe went right up to the head in soft snow, and goodness knows how much deeper the stuff went. Of this about a foot was new-fallen snow, and the rest was apparently old snow gone soft and rotten. Hugh and Frank have both noticed the same thing in Kumaun after the monsoon's broken; it's a phenomenon you don't quite get in Alpine conditions. However, it seemed to hold, and we went on up kicking steps in the beastly stuff. At first I led, but very soon changed round.

In a minute or two I luckily spotted a fixed rope in one of Ferdie's steps, about a foot deep. This was quite encouraging, and we pulled it out gingerly as we went up. And still the snow held. Finally, a little below the big crevasse, or about half-way to the Col, we came to the place where one traverses diagonally; to do this we felt would be tempting Providence too far, so Ferdie decided to turn back. I'm sure he was right. We'd already come about 800 feet up slopes that no self-respecting mountaineer would look at in the Alps, in conditions which Ferdie says were very much the same as when he was "avalanched" in 1922, when seven porters were scuppered.

We went down the slopes and got in to Camp IIIa just as it was getting dark, heartily relieved at being off those slopes.

Friday, June 16th.—Ferdie and I had thought of getting up at dawn and doing more work on the Col before the sun melted it, but more snow had fallen in the night and the temperature had been rather high, so it hardly seemed justifiable. Things aren't too good; it's going to take time, even with good weather, before the Col's fit for traffic, especially laden porters. I forgot to mention also that we found that several of the hollow wood pitons, to which the fixed ropes are attached, had worked loose, and no amount of banging into this filthy snow

would make them safe again. Until this can be done, no porters can go up; at present nothing short of driving in a hop-pole would do, and there aren't many hop-gardens snooping around on this hill.

All things considered, a conference down at Camp III seemed indicated, Hugh and others being there now. So we got up early and had a very pleasant walk in the early sun down to III, where we found the others finishing their breakfast, and had some more ourselves. We told our tale of conditions on the snow-slopes, and Hugh and all of them were very good and completely approved of our action in not pursuing things too far. While we were talking it began to snow, and this more or less decided that nothing more can be done at present.

So Ferdie and I sent porters up for our kit and the Whymper, and now we shall stay down here at III, as there's no point in isolating ourselves at IIIa, which is a bleak spot still.

Monday, June 19th.—The weather's gone very queer this evening, the monsoon seems to have got done down by one of the old "western disturbances," but the net result is the same: SNOW.

Tuesday, June 20th.—An enormous snowfall in the night has made any idea of a further attempt on the mountain farcical. We've stuck out nearly a month of monsoon, and it's pretty clear now that any fair breaks that happen during the monsoon are insufficient to put the mountain in condition for climbing.

Wednesday, June 21st. Camp III to Base Camp.—Eric Shipton and I went the whole way from III to Base Camp to-day. It was a fine day, not too warm on the glacier, and we fairly raced down. The lake in the "trough" had burst, so we could go straight down the old way. The odd thing was that we took exactly one hour and twenty-five minutes between each camp: we only had one halt, about a quarter of an hour at Camp I for a drink of water and a biscuit. I've always liked Camp I; all the big mountains, including Everest, are invisible, but it's

such a warm and sunny spot, and there's a pleasant glacier stream just below.

Although we were almost running most of the way, we took a look back at Everest sometimes. One had a feeling one might not be going up the glacier again.

Soon after 1 p.m. we got into Base Camp, slightly tired as one might be, however fit, after a descent of over 5,000 feet and fifteen miles at that pace. Ten again came up to scratch with a grand lunch.

* * * * *

Sunday, July 2nd. Left Base Camp.—All very busy packing. The animals didn't turn up till one o'clock and the drivers were very fractious at first.

Two relieving features of a rather trying day were, first, that the weather was glorious, which is more than one has a right to expect at this time of the year; and secondly, that my Nima Dorje came down again from the glacier. In his absence, poor old Kipa insisted on ministering to me, and I hadn't the heart to stop him, although he's still very dotty and messed up my things properly.

Eventually all was ready and we walked down to Rongbuk for the night. Rongbuk is much warmer than Base Camp. It's good to think that cold has become a thing of the past, but rather queer that life won't revolve round Everest any more.

II. SOME MEDICAL ASPECTS

BY RAYMOND GREENE

The medical problems of a great Himalayan expedition may be divided into many groups, of which the most important are the choice of personnel, European and Asiatic; the provision of medical equipment; the care of members of the party on the march and on the mountain, not only when afflicted by ordinary ills, but in the fight with the disorders associated with life in an environment to which their physiology

is strange ; and the observation of their reaction to this environment.

Every Himalayan expedition has taught a little more about the type of man required in an Everest team. We have learned the futility of vague generalisations about the " Everest figure " in comparing the tall spare form of Norton with that of the short and muscular Wager. Tall men, short men, thin men and thick men have all done well and badly on Mount Everest. But two generalisations have borne the test of repeated expeditions. Every man chosen should be mentally and physically fit, for Mount Everest will accentuate his smallest imperfections of mind and body and bring into prominence his most secret failings. He must also be a good mountaineer. Mount Everest has been under-rated in the past and called an easy mountain. Were this true, a good mountaineer would still be necessary, for even on easy ground an experienced climber moves with greater speed and with greater safety to his companions than a bad one. But we know that Mount Everest is a difficult mountain, as Mallory and Longstaff always said. In *The Reconnaissance*, Mallory wrote : " Amusing to think how one's notion of the last effort has changed ; it looked like crawling half blind up easy snow, an even slope all the way from a camp on a flat snow shoulder ; but it won't be that sort of ground ; we'll want climbers and not half-dazed ones ; a tougher job than I bargained for." The ascent of any difficult mountain involves a considerable nervous strain. On mountains over 25,000 feet, at which height the effects of altitude become serious even in acclimatised parties, the strain is much greater. It becomes obvious in those of little self-control and appreciable to careful observation in the strongest characters. If to this unavoidable strain on the climber is added that of living under conditions never before experienced ; lack of confidence in his climbing ability ; fear of falling, whether conscious or subconscious, inevitable in an inexperienced mountaineer ; perhaps most important of all, the fear of endangering his companions, he can hardly fail to handicap an expedition.

Next in importance after physical and mental fitness and mountaineering skill comes the question of age, a subject which it has always been difficult to discuss without prejudice. There can be little doubt that the best ages lie between twenty-five and thirty-five years, or that in this decade the first five years are preferable. No one without recent experience above 25,000 feet whose age is without these limits should be chosen as a climber. But a man who has had an opportunity to show himself an exception within the past two or three years may well be a valuable member of an expedition, for there will remain with him a little something the new men have not got, an increased power of acclimatisation remaining from his previous experience.

The medical examination of candidates for the Mount Everest Expedition of 1933 was conducted by the Royal Air Force Central Medical Establishment in consultation with myself; and independently by Dr. Claude Wilson, whose special knowledge of the climber's heart has made his opinion invaluable. A few of those chosen evaded examination by residence in the tropics. In future all candidates should come home. This will not merely ensure adequate examination, but will give them a holiday in the temperate zone between their professional life in an unhealthy climate and their arduous work on Mount Everest. The conclusions drawn by the medical examiners on the purely physical side were very accurate. It was hardly to be expected that exact forecasts could be given of the mental reactions of candidates to the special strain of high climbing, which differs very materially from that of flying. There is unfortunately no known way of testing beforehand a man's capacity to acclimatise to a shortage of oxygen.

The examination of the eighty porters could not, of course, be as thorough as that of the climbers. It was not necessary that it should be so, for though collectively of the greatest possible importance, individually they are of less importance than the Europeans. They were, however, admitted to the Victoria Hospital at Darjeeling by the courtesy of Major S. A.

McSwiney, I.M.S., the Civil Surgeon, and were there examined by Dr. Yen Singh, Dr. McLean and myself. Very few were refused on physical grounds. Thirty-four per cent. were found to be infected with parasitic worms, some of them containing within their persons a representative collection of almost all known breeds. These men were kept in hospital until cured. All the porters were vaccinated, a valuable precaution, for on reaching Shekar Dzong we found an epidemic of smallpox raging. Having no vaccine with us, we felt distressingly helpless, but I instructed the Dzongpen's assistant and one of the lamas in the art of vaccination and the Government of India was asked to provide the lymph for their use. The great value of vaccination is already appreciated in a country which, though filled with superstition, is capable of assessing results without foolish prejudice.

The medical equipment of the expedition proved adequate except in the matter of lozenges, which were too popular when the dust of Tibet had given sore throats to a large proportion of the porters and a few of the Europeans. A list of medical and surgical supplies will be found as an appendix to this chapter. Here I will describe only three pieces of equipment which were of new or special interest—the portable Thomas splint, happily never used; the new oxygen apparatus; and the stretcher, an aged example of an out-of-date pattern which nearly caused two tragedies and succeeded, by its effect on the temper of the medical officers, in providing much of the comic element of the expedition.

The splint was designed by myself for use on the Kamet expedition as a substitute for the cumbrous but necessary Thomas splint. The Thomas splint for the treatment of broken legs consists of a padded ring which encircles the top of the thigh, and two metal rods which lie one on each side of the leg, converging downwards and joined by a horizontal piece below the instep. By attaching this cross-piece to the leg by a string under tension, any desired degree of extension of the leg can be produced. But such a contrivance is inconvenient to carry over rough country. I therefore substituted hinged strips for

the rods, so that the whole apparatus, instead of occupying a space of about five feet, could be folded into the convenient length of two feet.

The question of oxygen on Mount Everest will be discussed at a later stage. Here only the apparatus and its evolution will be described.

In the autumn of 1931 I was asked by the Section of Physiology of the British Association to join with Professor J. Barcroft and Mr. N. E. Odell in a discussion on the limits placed on physical exercise by low barometric pressures. The outcome of the meeting was the Committee on the Supply of Oxygen at Great Altitudes, the members of which were Professor Barcroft, Major J. A. Sadd, Dr. G. S. Adair and myself, with Mr. Odell as Secretary. The Committee, lacking the spur of practical urgency, did not meet until the announcement of the Mount Everest Expedition, 1933, when Mr. Odell resigned his secretaryship and I was appointed in his place. We met, and with the assistance of Wing-Commander Marshall, R.A.F., and Mr. Gorman Davis of Siebe Gorman and Company, we laid down certain general principles and dispersed. Assisted by the mechanical ingenuity of Mr. Davis and the critical faculty of Wing-Commander Marshall, I was able to produce at the second meeting of the Committee an apparatus which met with general approval except from Professor Barcroft, whose love of music caused him to press for the inclusion of a whistle in the apparatus. The Committee therefore adjourned to the nearest toy shop and, accompanied by a variety of whistles, syrens, squeaking ducks, and other childish enormities, returned to its labours. The apparatus consists of a Vibrac steel cylinder of 500 litres capacity, to which is attached by the shortest possible pipe an aluminium reducing valve. This valve can be adjusted to deliver any prearranged oxygen flow, up to three litres per minute. From this valve the oxygen passes by means of a flexible metal tube of fine bore to the lower end of a flexible corrugated tube, into which it opens immediately above an inlet valve. The corrugated tube is attached at its upper end to a face piece which covers the mouth and nose of the wearer, and which is

fitted with an outlet valve. The face piece is kept in contact with the face by a light harness which can be worn either within or without the woollen helmet. The whole apparatus fully charged weighs twelve pounds and twelve ounces.

During expiration, the outlet valve on the mask is open and the inlet valve at the foot of the corrugated tube is closed. In this period oxygen is entering the corrugated tube and slowly filling it. During inspiration, the outlet valve on the mask is closed. A current of atmospheric air rushes through the inlet valve at the foot of the corrugated tube, and enriches itself with the oxygen which has accumulated during expiration.

It is difficult to imagine that a simpler apparatus can be produced, though it is probable that it can still be lightened.

The apparatus was never used by climbers. Both for scientific and for sporting reasons an ascent without oxygen was preferred; but when the monsoon had broken and the party's strength had been reduced, time became a factor of prime importance and an assault with oxygen was planned. The apparatus lay ready at Camp IV, and there it remains. We did not succeed, owing to the dangerous condition of the North Col slopes, in reaching so high a point again. The monsoon robbed us of an opportunity to test the new apparatus in the conditions for which it had been designed. The question whether the weight, even of so light a load, may not counter-balance the good effects of breathing a necessarily restricted additional oxygen supply, remains in doubt. The practical value of an oxygen apparatus to healthy climbers is still a matter of conjecture. For the treatment of the sick oxygen is a certain necessity. Its value in pneumonia, of which we had two cases on the expedition, is well known. But it is also of great value in frost-bite, a disease in which it has seldom, if ever, been used before. Frost-bite is due to the insufficient oxygenation of the tissues. At ordinary levels this may be brought about by cold alone, for severe cold contracts the arteries supplying the extremities and superficial parts of the body. At great altitudes an additional factor is brought into play.

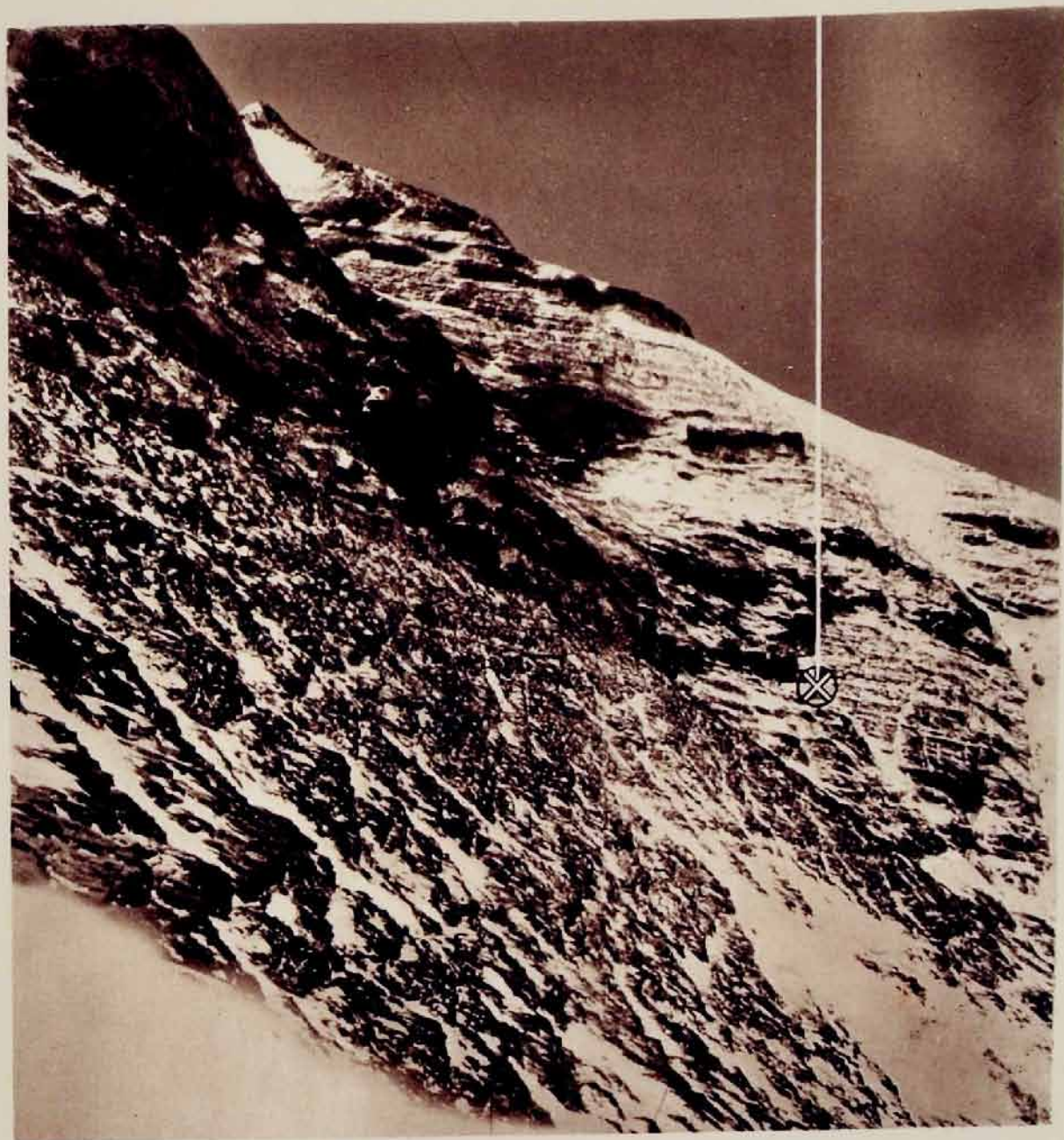


PLATE 43.—The slabs near the great couloir, which itself is out of sight behind the slope in the foreground. The highest point reached is shown by a cross. The summit appears on the left.

One of the effects of a shortage of oxygen is to reduce the amount of blood pumped out by the heart every minute. This reduction in the "minute volume" of the heart causes a slowing of the circulation of blood, which itself probably contains less than its normal oxygen freight. The danger of frost-bite is therefore greatly increased. It had occurred to me, and probably to many others, that the obvious treatment of frost-bite was the inhalation of oxygen, which would increase the "minute volume" and send to the extremities not merely an increased flow of blood, but of blood with a full freight of oxygen. After the final establishment of Camp V, three porters returned to Camp IV with frost-bitten hands. Only one of these seemed to me to require urgent treatment. In this I was wrong. To this one, Pasang Kikuli, I administered oxygen throughout the night. His hands when he arrived in camp were already swollen, dark, and cold: in the event he did not lose even his finger-nails. The other two, Pasang and the veteran Lhakpa Chedi, seemed only slightly affected and they did not receive oxygen, which was, it must be remembered, a precious commodity. Pasang lost one finger and Lhakpa Chedi two.

The stretcher was of the old-fashioned Boy Scout pattern. It was not chosen by the medical officers. It was not used on the march across Tibet and was first required to carry down to a lower level one Ondi, a porter, who was desperately ill with pneumonia and was hardly expected to stand the fatigue of the journey. After a mile one side broke and Ondi fell to the ground from the height of a man's shoulders. The side was repaired with an ice-axe and the journey continued, Ondi now delirious. A mile more was safely covered, when the other side broke and the victim once more came to earth. Another ice-axe was requisitioned and the journey again continued, Ondi now unconscious. It was due to Crawford's expert nursing rather than to the patient's comfort on the journey, that he arrived at the Base Camp three weeks later under his own steam, carrying a load of about forty pounds and demanding permission to go to

Camp VI without further interference with his personal freedom. He was disappointed. The stretcher was artfully repaired by Thompson and Smijth-Windham, and for many weeks gave considerable moral support to potential casualties. When finally it was required for the transport of Wood-Johnson, weak from long dieting and suffering considerable pain, the canvas burst asunder in the midst.

The principles which govern the choice of a well-balanced diet are becoming generally known. But where the safety of an expedition over a long period is involved, it is as well for the menus to be overhauled by an expert. The last expedition was well served by Dr. Zilva, of the Lister Institute. It was not Dr. Zilva's fault that a diet which looked well on paper tasted less well in the mouth. In fact, one of the most popular food-stuffs was the concentrated lemon juice suggested by him as an antiscorbutic. But the diet must not only contain a well-balanced mixture of fats, proteins and carbohydrates, arranged to give the necessary number of calories and containing the necessary minerals and accessory food substances. It must be palatable. Former parties, fighting their way unacclimatised and in poor health up the slopes of Mount Everest, found that from the North Col upwards their appetites deteriorated. The 1933 party, well acclimatised and in robust health, retained its appetite, but became fastidious. Unlike our forbears, we were not prepared to live on condensed milk, jam and acid drops. We wanted meat, cut off the joint, and two veg. Urgent messages were daily sent to the harassed party at Camp III, and by them passed on by wireless to the Base, demanding mutton and ham and eggs. At Camp IV men dreamed, with childlike blissful smiles on their brown and hairy faces, of steak and onions and roly-poly pudding, while the more fiery spirits emptied into the crevasse tin after tin of a peculiarly loathsome tinned-meat ration, unpalatable at any height and inedible when great altitude had made gourmets of us all. At Camp VI Shipton, almost dumb with laryngitis, was heard to whisper hoarsely, "Oh, for a few dozen eggs."

It has been said earlier that Mount Everest puts an unwarrantable strain on a man. There is no more potent source of irritation than bad food. It is probably one of the causes of that deterioration which inevitably occurs after long residence at a great altitude. Not only must all the food be of the highest quality, but the individual tastes of every member must be studied with the greatest care and without any regard for economy. In 1931, I wrote¹: "At great altitudes a man will rather underfeed than feed on what is lacking in appeal. Of Antony, Octavius Cæsar said: 'In the Alps, it is reported he did eat strange flesh which some did die to look on.' What was possible to Antony in the Alps is not necessarily possible to others in the Himalayas."

One of the commonest questions, a good second to "Was it cold up there?" is "How do you train for Everest?" The healthy man has no need of special training. The 300 miles of marching across Tibet will give him all the training he requires. One may go farther and say that more than this is harmful. The mountain will take the fat off a man very quickly and will then begin to reduce his muscle. One of my greatest regrets is my inability to develop a pendulous abdomen, with which I may satisfy the mountain's craving for human flesh. Any climbing of lesser peaks which may lie temptingly near the line of march is greatly to be deprecated. As General Bruce wrote: "The great danger lies in fatiguing and exhausting one's party before the real test comes." Mallory, confessing a temptation to train too much, wrote: "I might spare myself the trouble of such futile meditations. Experience seems only to show that, provided I habitually eat well and sleep well and take a moderate amount of exercise, I can do nothing to improve my endurance on a mountain." The climbers should keep themselves for Everest, and attempt to arrive at the Base Camp untired. Those who normally drink alcohol and smoke tobacco should continue to do so. Neither in moderation ever harmed a healthy man. In 1933 we did not take enough alcohol, and most of what we took was stolen.

¹ Greene, *Kamet Conquered* (Smythe), p. 344.

We had plenty of tobacco because many people found that smoking hurt their throats. At Camp IV public opinion forbade smoking in the tent, an extremely inconvenient and, in the opinion of one member, selfish point of view.

On the march the climbers must be protected not only against their own insane desire to climb mountains, but against a variety of ills for which they cannot be blamed. "Beachcomber" once said, apropos of a Sanitary Congress (I quote from memory): "I wonder whether the people who talk about boiling things ever thought of boiling their heads?" While admitting his general thesis, it is impossible to deny the danger to health of the filthy habits of native cooks in a country where dysentery is endemic. The Sherpa or Bhutia sees no sense in the cleaning of pots or washing of dishcloths. Himself apparently immune to any but the most virulent dysentery, he looks upon the boiling of water or milk as an insane whim of the doctor. Only unceasing vigilance and frequent visits in rubber-soled shoes will ensure his co-operation. Dirty plates can so easily be cleaned with a little saliva or the tail of the shirt. Boiled water once cooled is indistinguishable from water gently warmed. If the amount of sediment in the water is small, it is easier to put it into the lower chamber of the filter, whence it can be drawn immediately for the thirsty and impatient sahibs. Yet, whether by luck or by constant care, the attacks of internal troubles which did much to reduce the strength of previous parties were happily avoided, and no serious abdominal illness occurred on the march across Tibet.

One of the worst menaces to health on the march across Tibet is the dust. At varying times between dawn and breakfast time, there arises the famous "afternoon" wind of Tibet, which blows till midnight. It blows into mouth and ears and eyes, water, food and cooking-pots, tents and kitchens, a fine yellow dust, which would be irritating and dangerous enough if it contained only the clean sand of the desert. Coming from the soil of age-old camps in which sanitation is unknown, it is doubly dangerous. It was responsible in 1933 for an epidemic of sore throats and sore eyes amongst the porters, but the

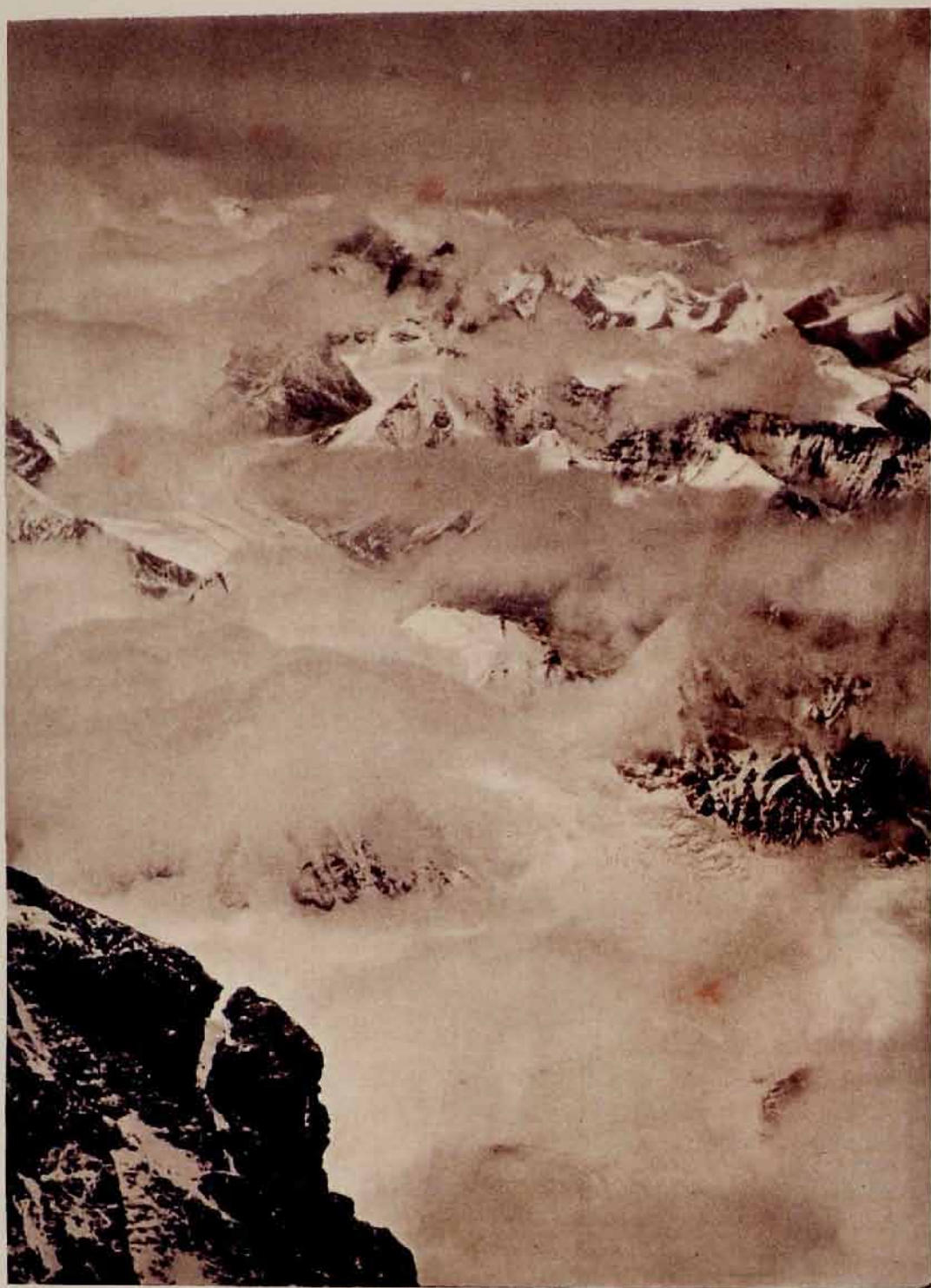


PLATE 44.—View N.W., from near the great couloir.

majority of the Europeans escaped. This may possibly have been due in part to the institution of a daily throat and nose toilet, a disgusting performance which was known to keep a whole village spellbound and to rid us of the attentions of beggars for an hour at a time.

To what extent the sore throats of Everest are a legacy of infection introduced with the dust is a question not yet settled. I hoped to prevent this serious handicap to health by the institution of the daily nose and throat toilet, and I think the incidence of the disease was perhaps reduced. The published accounts of sore throats in 1924 strongly suggest that the trouble was not due, as Hingston suggests, simply to "the rapid breathing of cold dry air," but to actual infection. "Some of the porters," he wrote, "developed severe bronchitis; one had a profusely ulcerated throat, another persistently coughed up blood." The description of Somervell's throat bears out my theory that altitude throat is probably an ordinary infective sore throat, intensified by "the rapid breathing of cold dry air." The results, however, of my attempts to cut down the incidence of infection were disappointing, and several members of the expedition who had suffered no ill-effects from the dust of the plains complained of their throats on the mountain. All cases were immensely improved by the use of the Matthews Respirator, though occasionally this means of relief was refused by the patients on what appeared to me to be psychological grounds. The respirator gave them a feeling of suffocation which had no basis in fact.

The Matthews Respirator was designed by Mr. Bryan Matthews, of Cambridge, for a very different purpose than the treatment of sore throat. He pointed out that at sea-level in dry cold air, 15 to 25 per cent. of the total heat production of the human body is dissipated through the lungs and respiratory passages, in vaporising water, setting carbon dioxide free from solution, and warming air; and that at great altitudes at least the same amount of heat will be lost, while the potential heat gain, by reason of the shortage of oxygen, is less and less. The rapid breathing necessary to obtain oxygen may result in

the loss of more heat than is gained by obtaining the oxygen. Matthews even suggested that at about 30,000 feet, not far above the summit of Mount Everest, there would not be enough oxygen obtainable, even by fast deep breathing, to maintain body temperature. His respirator, designed to combat this danger, consists of a squat cylinder containing layers of copper gauze, through which one breathes in and out. The warmth of the outward breath is used in warming the copper gauze, in the interstices of which the warm moisture of the breath is deposited. The dry cold air in inspiration is warmed and made damp by passing through the gauze. Much of the heat loss is thus recovered, and in addition it is damp warm air which passes over the mucous membrane of the throat. The great disadvantage of the respirator is that icicles tend to form at its junction with the beard. Largely for this reason it was not taken to the highest points reached. Those who climbed above Camp VI were, however, very conscious of what we called the "Matthews effect," a feeling of what one man described as a "central coldness," which came on only while exercise was increasing the breathing and with it the heat loss.

Sore throats, sore eyes, an occasional cold, two or three minor fractures, were our only troubles on the march. But when the discomforts of the road had been exchanged for the comparative comfort of the Base Camp, other troubles began to appear. Wyn Harris developed influenza, and Wager a less dignified complaint. Crawford, whose respiratory apparatus had been functioning ill for some days, retired to bed with bronchitis and was finally sent down to convalesce in the Kharta valley in the company of the apparently dying Ondi. Finding his progress in the Kharta valley slow, he returned to the mountain and climbed to Camp I, where he immediately recovered.

Happily these ailments were no hindrance to us, for a plan of careful acclimatisation had been formed which necessitated delays. We had learned from the distressing experiences of our predecessors, and were determined that no impatience, enthusiasm or brilliant weather would deflect us from our plan of

spending at least four days at every camp, in order that our bodies should accustom themselves to the progressive decrease of oxygen in the air we breathed. In 1921 Colonel Howard-Bury recorded headaches among the porters at only 18,000 feet. He himself experienced great lassitude even late in the season on his way to the 20,000-foot camp. At this camp he confessed to laziness and a lack of mental concentration. He also noticed blueness of the faces and hands of his companions, whereas on Kamet in 1931, where acclimatisation, though not as strictly enforced as on Mount Everest in 1933, was carefully considered, I failed to detect any blueness at all at any altitude.¹ Sleeplessness was a common experience in 1921. The deep breathing realised to be essential was a conscious effort. Mallory felt mountain-sick on one occasion at least, and many coolies were seriously mountain-sick at only 22,000 feet. Some of Morshead's coolies succumbed on the Tang La, at only 17,980 feet; Norton below the Jelap La, at only 13,500 feet. Mental symptoms were noted too; Mallory confused the identities of Longstaff and Morshead after the first attempt on the summit in 1922. I have sometimes wondered whether one chapter in *The Assault on Mount Everest*, in which the author describes a process of breathing through the skin quite unknown to science, was not written at a great height. Irritability in previous parties, quickly regretted and forgiven, sometimes occurred, as described in Norton's account of the ascent to the North Col in 1924. Great difficulty was often experienced in persuading porters to start in the morning. The appalling panting of unacclimatised men, the air starvation, the rapid pulse, the lassitude which made of every step a struggle, the sleeplessness, irritability, mental deterioration, grinding headaches, mountain-sickness and loss of appetite which are described so well in the accounts of former expeditions, are all the symptoms of lack of oxygen. In so far as acclimatisation is capable of removing these symptoms, we were determined to give it every chance. Our efforts were rewarded to a remarkable degree.

¹ Greene, *Journal of Physiology*, vol. lxxv.

According to modern theory, acclimatisation to great altitude takes place in three ways : an increase in the number of red blood corpuscles, whose function is oxygen carriage ; an increase in the ventilation of the lungs ; and possibly active secretion of oxygen by the lung epithelium. Of these the increased ventilation is by far the most important. There is no use in increasing the number of oxygen carriers if there is no oxygen to be carried, especially when sufficient carriers are already present, provided that loads can be given them. The increased ventilation takes place in the following way. The first deep breathing of the ascending climber is probably caused by the direct effects of oxygen-lack, which renders the respiratory centre in the brain more susceptible to changes in the acidity of the blood. The deep breathing washes carbon dioxide out of his blood and so lowers its acidity. It is the duty of the kidneys to correct this lowered acidity by secreting more alkali and thus making the blood more acid again. When the blood is more acid, the breathing is deeper and more oxygen is taken in. Acclimatisation has occurred. But the kidneys have to be taught this function slowly.

Perhaps the most obvious reward of our tactics was the absence of serious respiratory distress. Breathing was occasionally disordered in several members during their first night at a new altitude. Except in the case of one slow acclimatiser, this trouble passed off rapidly. Very little distress was felt during exercise and, of the fourteen climbers, thirteen reached the North Col without having experienced serious discomfort. So also did the Signals Officer of Camp III, Smijth-Windham, who is not a climber. The one exception was Wood-Johnson, who had not noticed up to Camp III any increase in his breathing, so quiet and unconscious had it been. He unfortunately contracted a gastric ulcer, a disease which cannot be ascribed to the effects of altitude, and, after six years devoted to preparation for Mount Everest, was forced to abandon all active participation in the work. Above the North Col, proper acclimatisation was made impossible by the weather and by the nature of the ground. Yet our respiratory distress was not great. In the



PLATE 45.—North peak, from above 27,000 feet.

ascent to Camp V (25,700 feet), though my heart was functioning poorly, I was far more comfortable than on the final slopes of Kamet (25,447 feet). Those who climbed above Camp VI needed only two or three breaths to a step, and found frequent halts unnecessary. On the porters, the effects of acclimatisation were equally remarkable. There were no cases of mountain-sickness, and there was never a shortage of volunteers for Camps V and VI. Never was there any difficulty in making them start in the morning, even under the worst conditions; yet the weather was, according to the evidence of those who were present on both occasions, far worse than in 1924. I am sure that men like those who attempted Mount Everest in 1924 would never have been forced to retreat from Camp III to the base, had they been properly acclimatised and therefore fit.

In other particulars also acclimatisation proved its value. I have already spoken of our excellent appetites. Headaches were uncommon. Most men slept well throughout, except sometimes on their first night at a new camp or where the discomforts of their position were too great. Smythe, alone at Camp VI, slept for thirteen hours. The lassitude was less than we had expected. The party was remarkably fit, cheerful and energetic, even at camps above the North Col. Mental deterioration, apart from occasional irritability, was only noticed by those who went above Camp VI, or who were at the time sick men.

But at last came deterioration. The concept of deterioration has had a chequered career in the history of Himalayan climbing. There was a time when it bulked so large in the imagination that the possibility of acclimatisation shrank into insignificance. During this period it became a bogey, and peaks of moderate altitude were "rushed" to avoid the appalling consequences of prolonged residence at a great height. Longstaff delayed the coming of the light by his astounding effort in climbing 7,000 feet in a day to the summit of Trisul (23,406 feet), at that time the highest mountain which had been climbed. But the recent series of great expeditions on Mount Everest, Kangchenjunga and Kamet all produced evidence in

favour of the opinion long held by physiologists that the greater peaks could not be climbed unaided by artificial oxygen, unless time were given for acclimatisation to occur. A reaction then set in and deterioration was forgotten. Some even denied its existence, though one school continued, assuming the majesty of Jove, shaking the spheres and threatening thunderbolts, to believe in its importance. But, however interesting and important to the scientists may be laboratory experiments on animals, like those of Dr. Argyll Campbell, the ordinary man prefers to turn to the evidence of field experiment. Accounts of all the expeditions named show evidence of deterioration to the careful reader, but especially those of the former attempts on Mount Everest. During the move to Kharta in 1921 Howard-Bury described the coolies as "stale from remaining at heights for a considerable time." "Living at great heights," he later wrote, "lowers the vitality enormously." Mallory, in the same year, wrote: "The long periods spent in high camps and the tax of many exhausting expeditions had undoubtedly reduced the physical efficiency of sahibs and coolies alike." Somervell wrote in 1922: "Some of our number (especially the older ones among us) actually seemed to deteriorate in condition while staying at a great height." In 1924 all those who went high were found by Hingston to have damaged hearts.

These observations were confirmed and extended in 1933. Probably as a result of the delays caused by bad weather at Camps IIIa and IV, signs of deterioration began to show themselves on the North Col. Several climbers reported that they moved progressively more slowly on each ascent to Camp V. But it was later, in the course of the abortive last assault, that the signs became most obvious. The party of survivors at Camp III degenerated rapidly. Crawford and Brocklebank, slow acclimatisers whose activities had been confined to the mountain below the North Col, were unaffected. But the rest of us appeared less energetic and lost appetite and weight. The effect of exercise on our pulse rates showed that our hearts were less efficient than before. The party had shot its bolt.

These observations agree with those made by Dr. Argyll Campbell on laboratory animals, and one must agree that in all probability prolonged shortage of oxygen is directly or indirectly the most important cause of deterioration. The shortage may be the direct cause. But it seems at any rate possible that acclimatisation, itself originally due to oxygen-lack, may carry deterioration with it as a noxious by-product. Crawford and Brocklebank, slow acclimatisers, were also slow deteriorators. It is unlikely, however, that deterioration is due to any one cause. Staleness in a boat's crew is due to boredom. Life on Mount Everest is an alternation of monotony with periods of great nervous strain. The food is monotonous and badly cooked. Cold and wind and snow injure the morale. All these undoubtedly play a part. An unacclimatised man is a fit man under difficulties : a deteriorated man is an unfit man with those difficulties greatly reduced. Major Hingston has brilliantly compared the interaction of acclimatisation and deterioration on a high mountain with the interaction of increasing toleration for alcohol with a concomitant undermining of the general health. The practised drunkard may pass as a sober man : he has become acclimatised by practice to his swaying environment. Yet he may at the same time be a very ill man.

The physiological problem of Mount Everest appears to lie in the difficulty of taking the middle way between rush tactics with mountain-sickness and siege tactics with deterioration. In 1933 siege tactics, owing to the weather and not to any fault of organisation, were overdone. But this admission should not be used as an argument for rush tactics, for the condition of the climbers at 28,000 feet was so good that there can be little doubt of their capacity in good conditions to climb Mount Everest without oxygen and without permanent harm. All those who suffered heart and other troubles due to altitude were soon in robust health again. They suffered no permanent danger to livers or hearts.

This difficulty in choosing the middle way has led to various attempts artificially to speed up the ascent. Of these methods the best known is the use of oxygen, by means of

which acclimatisation is made unnecessary. To suggest, as some have, that oxygen is incapable of helping the climber is, of course, absurd. The special difficulty on Mount Everest, apart from the difficulties of weather and terrain, is due to the shortage of oxygen. Any practical failure of oxygen apparatus to help the climber is due to the apparatus and not to the oxygen. It is therefore unnecessary here to recapitulate the evidence on the value of oxygen collected by previous parties.¹ The apparatus taken by past expeditions should never have been allowed to leave England. I need quote only one remark on each. In 1922 Finch wrote: "The apparatus leaked very badly, and to get them into satisfactory working order four days of hard toil with soldering-iron, hacksaw, pliers and all the other paraphernalia of a fitter's shop were necessary. . . . The masks from which the oxygen was to be breathed proved useless, but . . . a satisfactory substitute was eventually evolved. . . . Without this new work no real use could have been made of our oxygen supplies." In 1924 Mallory wrote: "Irvine has done the principal engineering work on the apparatus—what was provided was full of leaks and faults, and he has practically invented a new instrument, using up only a few of the old parts and cutting out much that was useless and likely to cause trouble." Can we marvel that oxygen was hardly popular with Himalayan mountaineers?

Other suggestions for circumventing the physiological difficulties of the ascent have from time to time been made. In 1930 Richter, the medical officer of the International Kangchenjunga Expedition, attempted to stimulate the activity of the blood-forming organs and so to raise the number of red-blood corpuscles in the circulating blood. Realising the value of exercising these organs, he repeatedly bled those members of the expedition who would submit to his experiment, but failed to produce any beneficial result. Arguing also from the benefits to be obtained by its administration in certain forms of anæmia, he added liver to the diet of his companions.

¹ Greene, *Nature*, November 28th, 1931.

I had already shown that extract of hog's stomach, which has the same effect as liver, failed to raise the red-blood count of healthy men. Richter could report no success with liver.

A more hopeful experiment was the use of ammonium chloride, first suggested by Haldane.¹ I have pointed out already that one increases the ventilation of the lungs by increasing the acidity of the blood passing through the respiratory centre in the brain. Ammonium chloride is split up in the body into ammonia, which is excreted, and hydrochloric acid. The suggestion was put into practice by myself on Kamet in 1931 and by Ruttledge on Nanda Devi in 1932. The results we obtained, though by no means conclusive, were sufficiently encouraging to warrant further experiment. I instituted a series of experiments² in the low-pressure chamber at Oxford in 1932, which showed that the administration of ammonium chloride definitely increased the capacity for work at low barometric pressures, and followed up this laboratory work by field observation on Mount Everest. Though Crawford believed himself to be better while taking the salt, the experiment on other climbers had to be abandoned owing to its irritant effect on the stomach. At Haldane's suggestion I had already planned a similar experiment, using acid ammonium phosphate instead of ammonium chloride, but had insufficient time to begin before leaving for Mount Everest. Unknown to me, other workers had already used the phosphate with results which would make it advisable to try it on the next Mount Everest expedition.

Only one matter remains still unmentioned. An expedition to Mount Everest affords a rare opportunity of observing the clinical reactions of the body to an unusual environment and of obtaining direct experimental evidence of the nature of these reactions. I have mentioned already the theory that an acclimatised climber takes in more air, and thus, of course, more oxygen, than one who is unacclimatised. This theory was tested during the Mount Everest Expedition, 1933, by

¹ Haldane, *Respiration*.

² Douglas, Greene, and Kergin, *Journal of Physiology*, 1933, vol. 78, No. 4, p. 404.

taking samples of "alveolar air," air from the farthest spaces of the lungs, at Camps III, IV and V. The full results will shortly appear in the *Journal of Physiology*. Here it is sufficient to say that the results obtained supported the theory held. Much experimental work remains to be done. A laboratory could easily be erected, were funds available, at a height of 21,000 feet. It is to be hoped that the next expedition will set out well armed to attack the problems of great altitudes in comfort.

APPENDIX

LIST OF MEDICAL SUPPLIES ORDERED BY DR. RAYMOND GREENE FOR THE MOUNT EVEREST EXPEDITION, 1933

A. FROM MESSRS. BURROUGHS WELCOME & CO.

On Loan :

- 2 No. 251 Aluminium "Tabloid" Brand medicine chests.
- 30 No. 2510 feather-weight containers.
- 20 No. 2523 feather-weight containers.

Supplied.

In No. 2510 containers :

- 2 containers "Tabloid" Aromatic Chalk Powder and Opium.
- 4 " " Aspirin gr. 5.
- 4 " " Tr. Camphor Co. min. 15.
- 2 " " Ipecacuanha and Squill.
- 4 " " Phenacetin Compound.
- 2 " " Quinine Bihydrochloride gr. 5.
- 4 " " Soda Mint.
- 4 " " Sodium Bicarbonate gr. 5.
- 2 " " Ammonium Chloride gr. 5.
- 2 " " Ammonium Bromide gr. 5.

In No. 2523 containers :

- 4 containers "Tabloid" Chloral Hydrate gr. 5.
- 4 " " Potassium Permanganate gr. 1.
- 2 " " Calomel gr. $\frac{1}{4}$.
- 4 " " Dover Powder gr. 5.
- 2 containers "Tabloid" Potassium Chlorate gr. 5. (N.B.—This quantity should be quadrupled.)
- 4 containers "Soloid" Boric Acid and Zinc Sulphate.
- 2 3-oz. Chlorodyne.

- 2 No. 318 bottles "Tabloid" Santonin gr. 2.
 4 100 "Tabloid" Quinine Bihydrochloride gr. 5.
 4 2-oz. Mandl's Paint, each in metal case.
 4 2-oz. Tincture Iodine in metal cases.
 24 regular tubes "Tabloid" Mag. Sulphate Effervescent gr. 60.
 12 uncompressed Triangular Bandages.
 2 yds. Jaconet, full width.
 2 doz. assorted Safety Pins (2 boxes of 12).
 2 25 12-inch lengths of Silkworm Gut, in spirit.
 2 tubes Catgut as in No. 363 case.
 1 yd. Gooch's Splinting 18 inches along the wood strips.
 1 sq. yd. Poroplast.
 15 large tubes "Hazeline" Cream.
 8 $\frac{1}{2}$ -pint tins Castor Oil, with screw tops.
 2 25-c.c. "Epinalin."
 2 1-oz. Ephedrine Spray Co.
 30 Nasal Irrigators (Duck Pattern), each in strong card box.
 30 No. 2574 feather-weight containers, each containing 12 "Soloid"
 Naso Pharyngeal Co.
 1 tin of "Soloid" Naso Pharyngeal Co. (1750).
 15 1-oz. tubes Vaseline.
 4 1-oz. bottles Collodion, each in metal case.
 2 1-oz. screw-capped pots Ung. Hyd. Nit. Dil.
 2 1-oz. screw-capped pots Ung. Sulphuris.
 2 1-oz. screw-capped pots Ung. Resorcin Co. with 1% Cocaine.
 2 tubes of 20 "Tabloid" Hypodermic Morph. Sulph. gr. $\frac{1}{4}$.
 12 1-oz. "Paroleine" Spray Co.
 3 2-oz. bottles Chloroform.
 8 10,000 units in 25-c.c Anti-dysentery Serum.
 2 $\frac{1}{2}$ -lb. tins Sodium Sulphate Crystals.
 2 $\frac{1}{2}$ -lb. tins Potassium Permanganate Crystals.
 2 1-oz. 8% Solution Zinc Chloride.
 12 small-size Kaylene powder.
 3 4-oz. Kaylene-Ol.
 400 tablets Acriflavine gr. 1.75.
 10 ampoules Percaine with Adrenalin (Clayton Analine Co.).
 50 capsules Nembutal in bottles of 25 ($1\frac{1}{2}$ gr.).
 15 First-Aid Boxes, each containing 4 glass tubes empty (free).
 1 box of spare gummed labels (free).
 96 1-oz. "Tabloid" Compressed Boric Lint.
 120 1-oz. "Tabloid" Compressed Absorbent Cotton.

- 48 2½ ins. by 6 yds. "Tabloid" Compressed Bandages.
 48 3 ins. by 6 yds. "Tabloid" Compressed Bandages.
 6 3 ins. by 10 yds. Zinc Oxide Plaster.
 4 2 ins. by 10 yds. Zinc Oxide Plaster.
 6 small tubes Lanoline.
 2 yds. Oiled Silk.
 2 1-lb. pkts. Gamgee Tissue.
 12 3 yds. "Tabloid" Compressed Absorbent Gauze.
 12 3 ins. by 3 yds. Crêpe Bandages.
 12 4 ins. Plaster-of-Paris Bandages, each in tin.
 12 15-c.c. Coramine. (N.B.—An unnecessarily large supply).
 20 ampoules Coramine.
 2 yds. Rubber Tubing No. 3604.
 4 Hot-water Bottles 12 ins. by 8 ins.
 2 Higginson's Syringes in card boxes.
 24 Throat Brushes, straight.
 12 ½-min. Clinical Thermometers, lens front.
 36 Iodine Pencils.
 12 Glass Eye Baths on foot.
 12 small Camel-hair Brushes No. 4003.
 6 2-c.c. Hæmoplastin.
 2 Medicine Tumblers with lips and 1-dram Measures in red cases.
 2 Rustless Steel Spatulas.
 2 Wooden Spatulas.
 2 pair Scissors.
 30 boxes Eucalyptus Pastilles. (N.B.—This quantity should be quadrupled.)
 4 tubes of 12 "Tabloid" Ophthalmic Cocaine Hydrochlor gr. $\frac{1}{20}$.

B. SURGICAL INSTRUMENTS FROM MESSRS. ALLEN & HANBURYS LTD.

- 1 Finochietto's Tourniquet, complete with rubber cord, 3890.
 1 pkt. half-circle Needles Nos. 7-12.
 1 pkt. half-circle Needles Nos. 13-18.
 1 pkt. straight Needles Nos. 13-18. (Greased.)
 2 boxes "Azoule" Minor Sutures, all Silkworm Gut.
 2 Bowle's Stethoscopes, small-size chestpieces, thick med. tubing, 6804.
 1 A. & H. Knife Handle.
 1 Double-folding Scalpel, S/S. 740.
 1 pair 5-in. Dissecting Forceps, S/S. 830.
 1 pair Michel's Dissecting Forceps, S/S. 1501.
 1 pair Splinter Forceps, S/S. 1197.

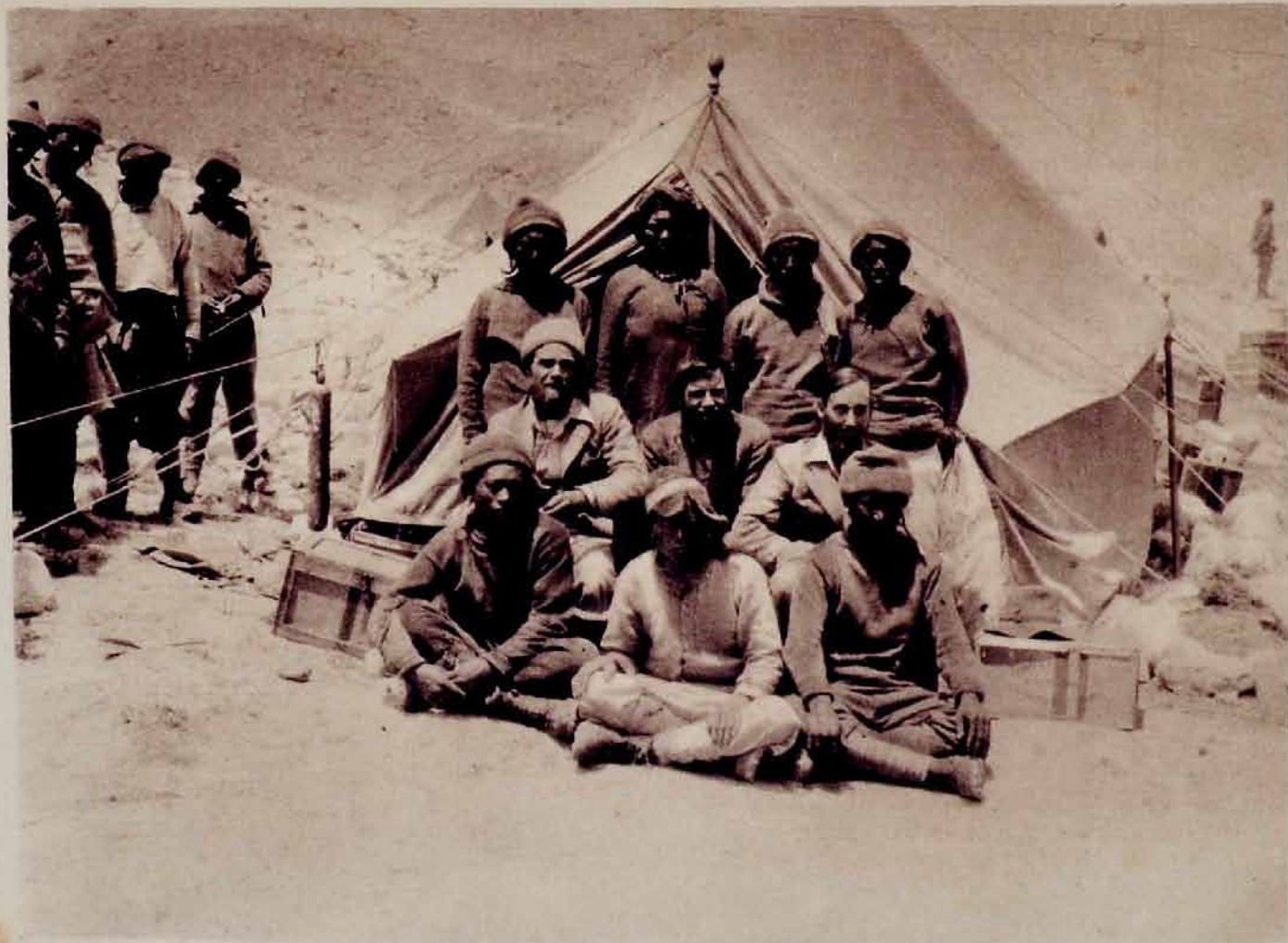


PLATE 46.—The party which established Camp VI (one porter absent;
Kipa Lama wearing a pugaree in the back row).

- 1 pair Universal Dental Forceps, S/S. 6591.
- 6 pairs Moynihan's Artery Forceps, box-joint, S/S. 784.
- 2 6-in. Silver Probes.
- 1 pkt. A. & H. Knife Blades, No. 1.
- 2 pairs 5-in. Sharp-pointed Scissors, S/S. 877.
- 1 pair 5-in. Blunt-pointed Scissors, S/S. 871.
- 1 pair 5-in. one blunt and one sharp point, Scissors, 882.
- 2 1-c.c. 20-min. Record Syringes in spirit-proof cases, 3801.
- 6 each Nos. 20 and 16 Record Needles, S/S.
- 1 No. 14 De Vilbriss Spray, 8746.
- 1 No. 15 De Vilbriss Spray.
- 1 "Kompak" Baumanometer.
- 1 Schimmelbusch's Mask, 68.
- 4 Cope's Radius Splints, aluminium.
- 1 set of 8 Aluminium Universal Splints, 7785.
- 1 each Black Gum Elastic Aboule Catheters, Nos. 6, 7, 9, and 10.

C. PRESENTED BY MESSRS. SMITH AND NEPHEW

- Elastoplast Finger Dressings, 2 boxes of 3 dozen.
- Elastoplast Gauze and Plaster Dressing Strip, 1½ ins. by 1 yd., 2 boxes of 1 dozen.
- Elastoplast Gauze and Plaster Dressing Strip, 2½ ins. by 1 yd., 2 boxes of 1 dozen.
- Elastoplast Bandages, 2½ ins. by 3 yds., 2 boxes of 1 dozen.

N.B.—1. Future expeditions will, of course, take adequate supplies of Evipan, an invaluable anæsthetic which had not been introduced when the 1933 expedition left England.

2. Supplies of Bacteriophage, an essential part of the medical equipment, can be obtained in India.

3. Supplies of medinal and veramon were kindly presented by Messrs. Schering, and of allonal by Messrs. Hofmann Laroche. Allonal and medinal have proved their value in the insomnia of altitude. Veramon is undoubtedly the best drug for altitude headache.

III. TRANSPORT

By E. O. SHEBBEARE

The transport officer of an Everest expedition should be a "jack-of-all-trades," so that, in writing of "transport," I may

stray in places from the strict path of what a soldier would call "S. & T." and wander among other branches of "Q." In this wide sense I have included the whole business of putting a party on the mountain fully equipped and provisioned for the attempt, feeding the climbers on their journeys out and back through Sikkim and Tibet, as well as feeding the porters whenever they are out of reach of local supplies.

The task therefore begins, as far as provisions are concerned, with the important work of choosing in Europe the best supplies, calculating the correct quantities of each to take, sorting and listing them in the right order, and getting them packed in the right kind of boxes and shipped to Calcutta. The choice of equipment is even more important and difficult than the choice of provisions, and means selecting or designing the most suitable clothing, bedding, tents and climbing gear, not to mention such vital details as the right kind of cooking-pots and means of heating them.

All this preliminary spade-work had been done before those of us who were already out in India had come on the scene at all, but it would be a very unimaginative transport officer who failed to realise the task that had been accomplished at Home, the amount of thought that had been given to apparently insignificant details, or how important such details could suddenly become when put to the test.

It is, perhaps, not so easy for anyone who has not provisioned and equipped a similar venture to grasp the full significance of all this. An example will make it clearer. I have written, rather loosely, of "sorting and listing them in the right order," and if I explain all the implications I had in mind when I wrote this, I hope it will enlighten readers with no personal experience of such work without boring them too much.

Sorting the provisions at once raises the controversial question "bulk boxes versus man-day rations." I will explain. Bulk boxes are simply ration boxes containing all one commodity, say sugar or flour. Man-day ration boxes, on the other hand, contain an assortment of food calculated to feed so many men for a day or, conversely of course, a man for so

many days. It is the rival merits of these two methods of packing, or rather the proportion of boxes that ought to be packed by each method (for I think everyone is agreed that there should be some of each kind) that constitutes the problem.

At first sight it might seem immaterial how the stores were packed so long as they were all there, but a moment's consideration will show that a situation might occur in which it would be inconvenient to transport a bulk box of *every* commodity required for a short halt at some spot. This is a minor drawback, for it is easy enough to fill an empty box or two with all that is required from the bulk boxes. There is, however, a far more serious drawback. Tibetan transport drivers, and even our own porters for that matter, show no inclination to "grow into plaster saints." On the contrary, unfortunately, each successive expedition has shown them to be more and more confirmed and accomplished pilferers, handy with a screw-driver and nice judges of the correct weight of stones to replace stores removed. A box once opened is never quite the same again, it always shows scars from the screw-driver: hence the importance of having as few legitimately broached packages as possible in the store dump. If it were possible to have man-day ration boxes so perfectly calculated that the mess secretary need only hand over the requisite number to the cook and leave him to feed the party, all would be well. But this is a counsel of perfection. What is required is some practical approximation to this ideal reinforced by surplus commodities in bulk.

There are many more sides to this still unsettled question. Some mistrust man-day rations as tending to monotony; their opponents maintain that the scheme propounded by Beetham, as mess secretary, in *The Fight for Everest, 1924*, would ensure plenty of variety. Others accuse man-day rations of being wasteful, because any food left over from a box must be given away; their opponents say that, unless the total quantities of each kind of food taken exactly coincide with requirements, the surplus must inevitably be wasted whether it is packed in bulk or man-day boxes, and further claim that

the man-day system automatically apprises the quartermaster of shortage or excess early enough in the proceedings for him to put matters right by sending for more or dumping. I must not weary my readers with any more pros and cons. I can assure them that, though no decision was reached, it was not for want of discussion: it was almost as popular a subject for mess-tent debate on the return journey as the merits of rival routes were on the way up.

With all the preliminary work done for us, the transport problem which faced the transport officers in India was a straightforward and comparatively easy one. It consisted in the moving of some twelve hundred packages, weighing about twenty-one and a half tons in all, from Calcutta and Bombay, firstly, to the head of the Kalimpong ropeway. This also was done for us by the Army and Navy Stores in these parts, so that we can hardly claim this as a part of our work.

The real hard work began at Kalimpong, where a great deal of opening up, issuing of kit, reshuffling and repacking had to be done. Here again the official transport officers of the expedition had their work done for them by someone else; George Wood-Johnson and I were still engaged in our normal occupations of tea-planter and forester, and our leave did not begin until the 13th and 1st of March respectively. The work of reshuffling could not wait for us, the advance baggage had to be despatched without delay; Jack Longland and Eric Shipton volunteered for what was actually the hardest and most difficult work of the whole transport business. I believe I am in a better position than anyone else to judge their work, for I had a similar, but far less difficult, task to do in Kalimpong in 1924, and I doubt if anyone else fully realises the amount of work that they got through in the course of a few days or what a splendid job they made of it. From this time onwards they were the real authorities on the whereabouts of equipment, for some drastic re-packing had been necessary, and it was a long while before George Wood-Johnson and I had mastered their intimate knowledge of the contents of packages or got our store-books fully up to date. Later on



PLATE 47.—The party which established Camp V (Boustead absent).

Jack Longland acted as quartermaster and, without his help, many hours would have been wasted in long searches for articles of equipment on the march.

The advance baggage was sent ahead of the party from Kalimpong to Kampa Dzong, a fort on the plains of Tibet, so that it was not until we reached this place that the whole baggage of the expedition was once more assembled in one spot. Nursang, a sirdar who has accompanied every expedition to Everest or Kangchenjunga since 1921, had been sent on to Kampa Dzong to take delivery of the advance baggage as it arrived, in convoys of various sizes according to the trade-route mules available. These were supplied by Pangda-Tsang, the Government transport contractor in Kalimpong.

In Tibet no convoy is complete without its watch-dog, whose duty is to bite all strangers approaching within a hundred yards of the baggage under its charge. Nursang had not failed in this respect, and had provided himself with the usual Tibetan mastiff, an attractive bitch about the size of a sheep-dog, but of more stocky build, with a thick, dark-brown coat and buff points, which he had christened "Police-ie" in allusion to the duties she was appointed to perform. The name looks clumsy in print but was quite serviceable in practice, and she certainly lived up to it, for no officer of the Criminal Investigation Department ever took his duties more seriously. C.I.D. officers, it is true, are handicapped by having to investigate, a formality that Police-ie could dispense with, for by her code all strangers were guilty until they had proved themselves innocent—a point which the victim could discuss, if he chose, while one of our medical officers was dressing the wound. She made no mistake, however, as to identity, and any man of our party of sixteen Europeans and seventy porters, once known, was never forgotten, or at any rate never bitten. How she managed to distinguish some of our men, who often wore Tibetan dress, from the local population has always been a mystery to me.

Her first meeting with the party was unfortunate. The store dump at Kampa Dzong was about two hundred yards

from the main camp, and therefore in the neutral zone as far as Police-ie was concerned. As I walked across to see Nursang, I noticed the dog in the offing and, from earlier experiences with Tibetan mastiffs, insisted on a formal introduction, but forgot to warn George Wood-Johnson, who came across a few minutes later, and Raymond Greene was soon busy with iodine and cotton-wool. The rest of the party lost no time in making the acquaintance of our guardian, and I do not think any other member of the expedition was ever attacked.

She was a friendly beast, and liked to be made a fuss of, but would never enter a tent, nor did she show the slightest interest in any sahib's food. I suppose she lived on barley meal and an occasional mutton bone, but I never saw her eating. Her bed was the bleakest and most exposed part of the camp, preferably on snow or ice; she scorned the lee of a tent even in a snow-storm, and all that was visible on such occasions was a nose sticking out of a small rounded drift. After we had reached the Base Camp I expected that she would remain there in the comparative luxury it afforded, but I had under-estimated her hardihood. Completely independent, she would follow any party up the glacier, usually at a distance of a hundred yards or so; and, though friendly to all, she owned allegiance to no one, not even Nursang. She made several trips up and down the glacier camps, coming or going at her own discretion. The highest point she reached was the foot of the rope ladder below the North Col; had it not been for this obstacle I believe she would have helped to establish Camp VI.

Poor Police-ie; no one knows what became of her or when she came to grief, but she had been seen to treat crevasses with a contempt that they did not deserve, and we fear that this was her undoing. Let us hope she broke her neck and did not suffer long.

I have digressed and must return to the transport at Kampa Dzong. Here we parted with the quick and efficient mules of the trade-route, and had to rely on whatever transport animals we could get locally. It is not possible to take one lot of transport animals through the whole journey across Tibet.

The drivers are not willing to leave their homes for more than a few stages, so that several complete changes of animals are necessary. It is at the stages at which transport animals are changed that the greatest confusion occurs, as well as the greatest danger from pilfering, for the departing drivers know that they are saying good-bye and we shall see their faces no more.

The scene on the morning of one of these changes of animals is interesting and amusing enough, no doubt, for anyone not personally concerned with the safe transit of the expedition's property across Tibet. It can be a heart-breaking enough spectacle for the transport officers, who must wait behind to see the last package loaded.

Before the arrival of the three hundred or more animals which have been ordered through the local Tibetan officials, the baggage has been made up into loads weighing approximately eighty pounds a side, carried by each animal. Theoretically each owner has as many pairs of loads pointed out to him as there are animals in his string, his name is written against them both by the Tibetan officials and the transport officers of the expedition, and he proceeds to load up and move off. In practice, unfortunately, there is more in it than that. To begin with, each driver notices certain loads which appeal to him as appearing both light and handy, and he proceeds to pick these out at random from all over the baggage ground amid loud protests from other drivers to whom some of them have already been allotted. Before long the whole baggage ground is a battle-field of little groups gesticulating and quarrelling among themselves, while a few solitary prospectors wander among the baggage, feeling the weight of the smaller packages, and trying to get away with half-loads. The transport officer is well advised at this stage to keep a wary eyelid lifted for little strings of animals moving quietly away and availing themselves of any cover provided by stone walls or houses.

After this sort of thing has gone on for an almost incredible time, the gyembos, who are supposed to be helping in the operation, are at last persuaded that something must be done, a few packages are loaded up, and animals begin to move off.

This is the time to see that half-loads do not get away, or the supply of animals will, of course, run short. One is lucky if this does not happen.

So it goes on, with more hunting round for animals that should have arrived and have failed to do so, and more disputes as to whose beasts should take which loads. The usual way in which this last question is finally settled, in Tibet, is to collect a garter from each disputant, shuffle them, and throw one over each of the loads—a decision by lot which I have never seen questioned.

Time goes on, and the loads on the ground slowly diminish in numbers in spite of everything. Just as one is beginning to congratulate oneself that all will soon be clear, a hasty count of unloaded animals and unloaded baggage makes it clear that all is not well. More hunting for animals follows, with long waits which seem all the longer for the glib assurances of the gyembos that large herds of yaks and donkeys are, even at that moment, about to round the nearest corner. But my description is becoming as wearisome as the real thing, and it is enough to say that, at one of these changes of animals, he is a lucky transport officer who leaves the camping-ground behind the last load earlier than one o'clock in the afternoon.

It may be thought that I have made too much of the inconvenience of stopping behind, but it is more than a question of mere impatience. It is all in the day's work, and just a part of one of the most interesting jobs in the world, but it has its drawbacks. The west wind in Tibet does not get up much before eight o'clock in the morning, and seldom begins really to blow before nine or even ten. Given an early start, it is possible to ride in considerable comfort, and by nine o'clock reach the next halting-place where, thanks to the mess mules having left at daybreak, the mess tent should have arrived or may even have been pitched. The late starter, on the other hand, heading westwards as he must, has to face anything from a strong wind to half a gale, carrying with it sand or fine snow as the case may be. What distressed me more than this minor discomfort was the fact that the passage of the earlier starters



PLATE 48.—The expedition (except Boustead) at the Base Camp in June.

generally dispersed some of the wild life of the plains, at least the larger animals, and the late comer was less likely to see such heartening sights as a herd of wild asses or a solitary gazelle. Even so the birds, and sometimes small mammals, were to be seen, and with these and the scenery a walk across Tibet (even under the most unfavourable conditions) can never be dull.

I must not give the impression that the solitary task of bringing up the rear always fell to my lot. I was fortunate in having the most good-natured of colleagues, and must confess that George Wood-Johnson did a great deal more than his share of the dirty work. Often we stopped behind together, and generally either "Tommy" or "Smij" (Thompson and Smijth-Wyndham of The Royal Signals), who luckily did not trust me to supervise the loading of their delicate wireless apparatus on pack animals, stayed back as well. I shall always remember a part of the long march from Kampa Dzong to Lingga with the four of us cantering along together singing ribald songs at the top of our voices.

From Kampa Dzong westwards the transport animals are mainly yaks to begin with, but the proportion of donkeys steadily increases at each changing-stage, and beyond Shekar they are in the majority. We could seldom get many mules, except when the kindly Dzongpen of Tengkye, a good friend to us, lent us fourteen of his own so that our bedding and tents could get through in good time.

After mules, yaks are probably the most efficient pack animals. Slow but sure, they move across the plain like a regiment in column of squadrons, the drivers behind urging them on with stones and wild cries. The difficulty with yaks is that, on the outward march, after the scanty grazing of the long winter, they are in poor condition and loads must be kept as light as possible, whereas, after the fat feeding of the spring and summer, they are apt to be over fresh and buck their loads off in every direction. An incident of this sort occurred just outside Kampa Dzong on the return journey, and I shall not forget the desperate scene of broken boxes and runaway yaks scattered over the plain, or how each successive animal, as it

grasped the humour of the situation, began to throw a series of bucks that would have shamed a broncho. A yak has one of the saddest faces in the animal kingdom, but I could not help feeling that, somewhere inside those great, tousled carcasses must be rumbling the yak equivalent of a hearty laugh.

The tiny, woolly Tibetan donkey is a wonderful creature, because in spite of his size (he only stands the height of a dining-table) he can carry the same load as the much larger mule and, by comparison, the gigantic yak, and apparently with equal ease. The donkey's greatest difficulty is falling down under his load. This is attributed to laziness by the callous and to tiredness by the humane. I believe that both conclusions are equally wrong. Donkeys fall down just as often at the beginning of a march as at the end, which seems to me to dispose of the tiredness theory; and as it is not always the same animal which makes a habit of falling down, laziness does not seem a likely explanation. My own opinion is that the greater comparative size of his load prevents him from recovering his balance as a yak or mule would do and, if he pecks, he is forced to let himself go and wait there until his driver picks him up, when he hurries on after his companions; for he is above everything a "matey" creature. For the rest, he is much smaller, woollier, and darker than an English donkey, often almost black, with a dun snout and points.

The other pack animals used in Tibet are zos (a cross between cattle and yaks), and a few ponies. I have omitted sheep, which are only used for carrying salt and borax, commodities that can be sewn tightly into bags and bound on their backs. They are more often used in Western Tibet, I believe, but we did not see any pack-sheep this year as far as I know. In 1924 we found a sheep that had fallen off some rocks and broken its neck. It had apparently escaped the notice of its owners, for the salt panniers were untouched, thus providing us with the mutton and the seasoning at one stroke.

It has often been suggested that something more efficient than that most ancient form of transport, the pack-saddle, could be used to convey an expedition and its baggage across

Tibet. I believe bullock-carts were tried towards the end of the Younghusband expedition of 1904, but I never heard with what success. Nowadays the talk is of motor-lorries or even aeroplanes. I believe the greatest obstacle to the use of such new-fangled contrivances in the sacred land of Tibet would be the religious objections of the rulers, backed by the hard-headed, practical opposition by those of less high degree who make a more or less modest profit out of the supply of transport animals. Those who understand such matters seem, on the whole, to think that the landing speed of a load-carrying aeroplane at 15,000 feet would put flying out of court. I do not pretend to understand flying problems, but I know something of motor-lorries—my private "car" being, in fact, a one-and-a-quarter tonner. I do not believe that, if the passes and fords were made up, motor transport to the Base Camp is outside the range of practical politics, nor that it might not even be cheaper than pack transport after allowing for the cost of road-making. There is only one real objection, but I believe it is an insuperable one—the religious sentiment of the country. Wait—I have forgotten one other objection, also based on sentiment, my own and that of many more who would be sorry to see the last of the mule and the yak for reasons which we should find it hard to put on paper. I suppose we should have to abandon our prejudices if the success of an attempt on the mountain were at stake; but, for the present, we lie safely entrenched behind the prejudices of Tibet.

To those unacquainted with the route of the expedition, it may come as a surprise that motor transport to the mountain could be even seriously suggested. Seeing that the object of the expedition was to visit the highest mountain in the world, it might be supposed that the country traversed would, for the most part, be mountainous. This idea is even stronger in the minds of the inhabitants of Darjeeling, who, seeing the tumbled mass of mountains facing them, into which expeditions disappear, find it hard to realise that the greater part of their way will be across plains and rolling country, once they have passed through the barrier of the hills. This barrier is only

about sixty miles wide where the expedition crossed it, the actual route being about a hundred miles. The subsequent journey across the tableland was something less than two hundred and fifty miles, at an average elevation of between fourteen and fifteen thousand feet above sea-level.

The ranges of hills which cross the tableland all have well-worn passes through them which offer no difficulties to the pack animals, so that the only obstacles are the rivers. These are all easily fordable in early spring, while the glaciers, which are their head-waters, are sealed with frost, so that at the time of our approach to the mountain it would have been possible for animal transport to move in almost any direction through this part of Tibet. On our return journey, in July, the rivers were swollen with the thaw, though still generally fordable, especially in the early morning before the sun brought down the full spate, if the right spots were chosen. In some places good bridges have been built with piers of stone, and wooden spans and single-span bridges over the smaller rivers are common.

At Gatong, on the return journey, the whole expedition crossed the Phung Chu River by a yak-hide ropeway. I had heard of this Gatong ropeway but never seen it. The descriptions given me by porters had led me to expect something more thrilling, and I must confess to some slight disappointment when I found that, instead of spanning a gorge, the rope was stretched just above the water. The river here was a raging torrent, and we were distinctly anxious about our ponies, who would have to swim. The stillest pool in the neighbourhood was chosen, only a few yards below the ropeway as it happened, and, by tying them, one by one, to a rope held by men on the far bank and pushing them into the water, we "swung" across the current without mishap. I think we were all greatly relieved when the last of them was safely across, but it was interesting to watch the way in which individual ponies faced the ordeal, some frankly scared, some with a sort of desperate resignation, and some as if they had been doing it all their lives. As they got out of the slack water

under the bank and into the main force of the current, the pull of the rope round their necks heeled them over and the heads of even the strongest swimmers were under water for a few minutes ; some made an almost completely submarine crossing.

Luckily we changed transport at Gatong, so that the pack-animals did not have to be crossed, and it was only necessary to sling our baggage and ourselves across the rope bridge.

It was a crude contrivance, three ropes of raw twisted yak-hide stretched across over a forked post on either bank and anchored at each end with a heavy pile of stones. On these ropes slid a wooden yoke, fashioned out of the bent branch of a birch tree, to carry the load, human or otherwise, and this was pulled backwards and forwards by strong yak-hair cords. The yoke has a horn-like handle on either side ; the passenger grasps these and is bound on to them by raw-hide thongs passing under his knees. Thus trussed up, with his knees to his chin, he is hauled across in a half-sitting, half-lying position, while his friends, if he happens to be a member of an Everest expedition, heave rocks into the water below him and drench him from head to foot. This pastime, starting among the sahibs, soon spread to the porters and helped to relieve the monotony of five weary hours spent in passing the baggage and personnel across the Gatong Aerial Ropeway.

No account of the transport of the 1933 Everest Expedition would be complete without a jibe at the system of numbering packages—the transport officer's standing complaint, ever present to provide us with a grouse when a grouse was most needed to relieve our feelings. On previous expeditions each package has been given a serial number, and this, stencilled on the box or bale, has served to link it up with an entry in the store-book. It was also the custom to paint coloured bands round some boxes as a clue to their contents. This year the coloured bands were enormously elaborated, but still all went well until, in an unlucky moment, it was decided not to give

a different serial number to every package on the expedition, as heretofore, but to start a new series of numbers for each colour. Now, there were twenty-one separate colour schemes this year, which meant twenty-one number ones, twenty-one number twos, and so on. Theoretically it should have been easy to distinguish "No 1 black and blue" from "No. 1 purple and green." Had all concerned had a good eye for colour results would have been better. Unfortunately George Wood-Johnson happens to be colour-blind, and, judging by appearances, the artist who assisted the packers seems to have suffered from the same disability. Colours, too, seem to have run rather short, for there was a red-and-black as well as a black-and-red series. Another difficulty was that the coloured bands were painted round boxes exactly where the pack-ropes go, so that the colours wore away. But, apart from these drawbacks, it is a miserable system from the point of view of the transport officer. His work consists largely in making lists of packages and, when he has to write down two colours as well as a number for each box, and a mule-load consists of four boxes, it is not to be wondered at if, fumbling with a blunt pencil in a biting west wind, he has hard things to say about this kaleidoscopic system.

I must not end up on this peevish note. Transport is the most interesting job on the expedition, at any rate on the out and back journeys, and the transport officer sees more of the people of the country than anybody else, except the leader. One meets, and has dealings with, all types of Tibetans, from the suave, Chinese-looking official or business man, with his face bleached by the paper-windowed twilight in which he lives, to the hard-bitten, picturesque muleteer of the plateau, whose tanned and leathery skin is seamed by the sand-blast of the Tibetan dust-storms. Though the former type regards one as a barbarous simpleton who must be solemnly humoured to obtain the best financial results, it is to be hoped that the latter sometimes sees in one the semblance of a fellow-man.

IV. QUARTERMASTER'S NOTES

BY J. L. LONGLAND

These notes have been compiled from a diary and from recollections arising out of about six weeks' quartermastering on the march across Tibet and the first advance up the glacier. They are not intended as any general summary of the work of handling stores during such an expedition, but are simply a series of suggestions which may be useful in one small part of the organisation which will be necessary before the next attempt.

This naturally means suggestions for alteration or improvement, but the reader should not run away with the idea that things were bad this year, simply because there is no space to mention the results of all the forethought that was devoted to the stores in England, the many admirable innovations that were introduced, and the extraordinary completeness of our equipment in view of the very short time that the leader and Mr. Scott had for preparation.

The first principle which impressed itself upon one this year was the necessity of making the whole business of stores—format of store-book, arrangement of categories, programme of issues—as automatic, or, more bluntly, as fool-proof as is possible before an expedition leaves England at all. The obvious point that transport difficulties in Tibet, and bad weather or sickness on the mountain, will probably cause a series of opportunist modifications in any previously contrived plan, is a bad reason for forming no plan at all until a crisis arrives. It is rather additional grounds for working out in advance a system which is as complete and uncomplicated as can be managed, that illness or a sudden change in the strategy of assault on the mountain may remove your transport officer or quartermaster from the key-point in the line of communications, and involve in his job at the shortest notice another member of the party who has had no previous work with the stores at all.

PRELIMINARY ARRANGEMENT OF STORES

1. If possible, the quartermaster's post should be given to a member of the party in England as soon as ever the first stores are being collected. He should be someone who can spare time to supervise personally the whole of the packing, and who has a power of veto if badly packed or badly marked stores are sent along to the clearing-house. It is not easy for anyone who has not himself wrestled with embodied chaos to realise what it means to be confronted for the first time in India with a mountain of assorted stores piled higgledy-piggledy in a small and heat-baked godown. And it would have taken a confirmed cynic to estimate in advance the number of mistakes that could be made in marking and numbering stores which were arriving at the packers' from all directions in a desultory stream for many weeks. But I doubt if the obviously high proportion of colour-blindness among packers' foremen has ever received the amount of medical attention that it deserves.

2. An Everest expedition has to cart about some curiously varied equipment, ranging from foot-muffs to football pumps, from candles to cascaras. But since transport of boxes occupies an enormously greater proportion of time than consumption of their contents, it is important to simplify the numbering and marking in the interests of the transport officers and more especially of their sardars, even if this involves some waste of time when individual boxes are needed for opening. I suggest that there should be no duplication of numbers at all, but that each box should have its own number, which does not reappear even in a box of a different colour category. Colour bands fade or disappear in the course of constant handling and bad weather much more quickly than stencilled numbers, and in the later stages of the expedition we were frequently faced with apparently indistinguishable boxes with identical numbers when the colour bands had disappeared. Serial numbering avoids this difficulty, and also checkmates any mistakes in colouring. It would be best to choose a large series, say from

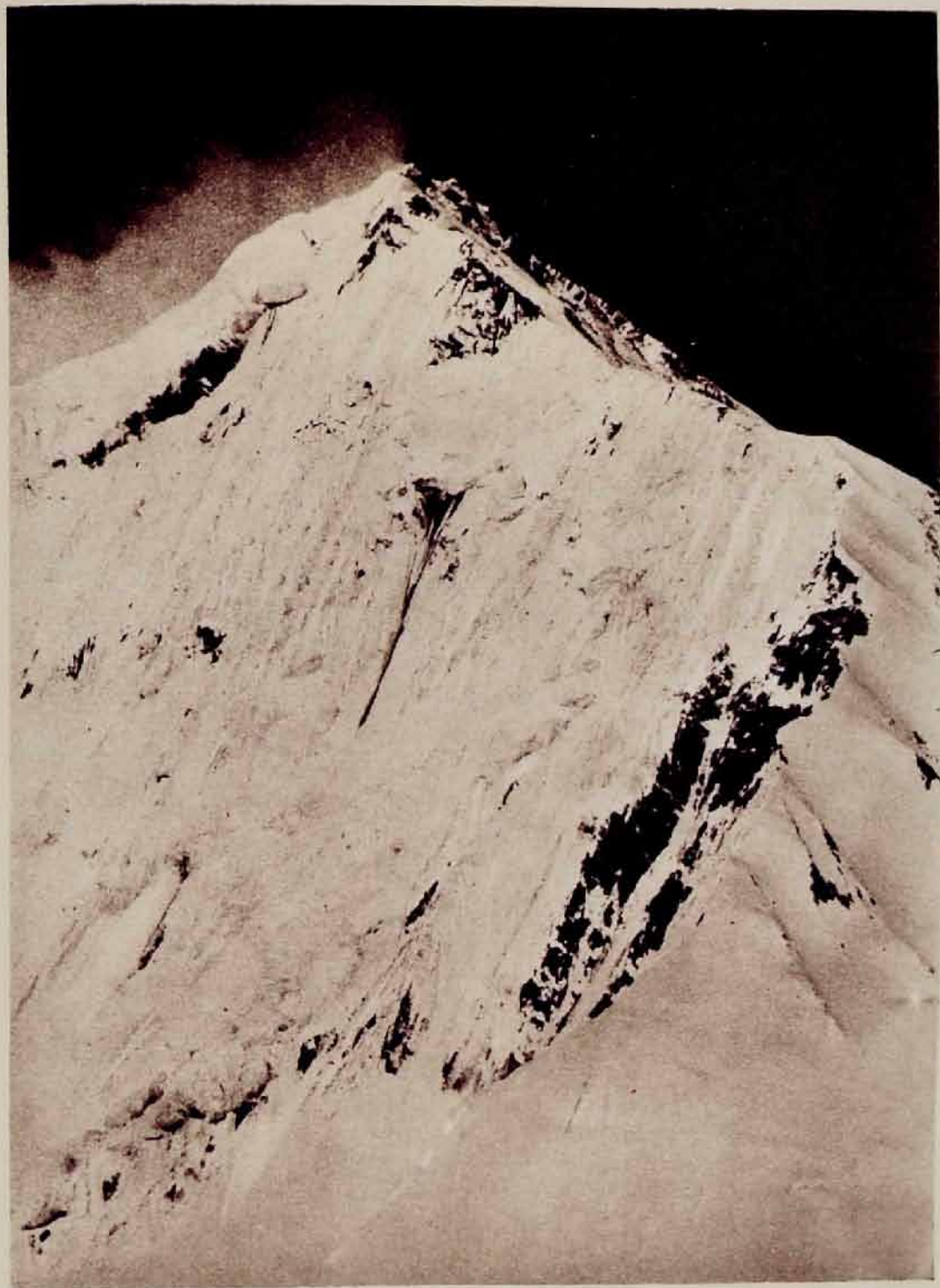


PLATE 49.—S.E. face of Mount Everest, from summit of peak above Rapiu La.

1 to 1,500, and leave gaps between the different categories, so that any stores which arrive late as last-minute gifts or unavoidable afterthoughts can be fitted into the system without dislocation. As boxes cannot always consistently be piled in the same way in godowns or in camp the numbers should be stencilled clearly, in waterproof ink, on all *six* sides of each box.

Three colour categories should be enough, dividing the stores into main groups of March, Glacier, and High Camps. Perhaps broad single bands of dark blue, red, and bright yellow respectively will be best for these divisions, as these colours are less likely to fade until they become indistinguishable as did the dark blue and black, and blue and green, in our stores this year. These bands should pass right round the boxes in two directions on the long and the short axis, for the same reason that has been suggested for stencilling the numbers on all sides of the boxes. Then even if some of those who handle stores turn out to be colour-blind, they might be taught to distinguish between these three simple colours, if necessary, by using paints with different smells! With such a clear method it will be easier to enforce the system, more difficult to accomplish with our complicated colour series this year, of making the muleteers tie up all loads in identical colours, and stack them in camp in the same way, for greater ease in checking and prevention of pilfering.

To facilitate the identification of individual boxes, the system adopted this year with part of the stores of stencilling a "short list" of the contents on the outside lid of each box should be made universal. This can be supplemented by fastening a complete list of contents on the inside of every lid.

3. To ensure that animal loads are in every case nearly identical, all boxes should conform to a 40-pound standard, so that the transport officials can see at once that a full load (two maunds = about 160 pounds = 4 boxes) is being carried. Certain heavy articles which are not bulky, such as money in rupees or Meta fuel, could be made up into 80-pound boxes. If certain boxes are only 20 or 25 pounds, though this is an admitted convenience for such things as high-altitude rations which have

to be carried on the upper parts of the glacier where the coolie load is only about one half of the normal 40 pounds, it is very hard to ensure equitable loading, both for transport animals and porters. It was a common sight this year to see a gigantic yak stalking along, with four high-altitude boxes totalling well under 100 pounds on his broad back, beside a tiny donkey staggering under the full two maunds. Also, when porters were carrying between Camps III and V, with a descending sliding scale of loads from 30 to about 18 pounds, they almost invariably broke open the ration boxes and carried their contents, to save weight, in the special light rucksacks. It does not therefore seem necessary that even the high-altitude ration boxes should be less than the 40-pound standard. There are two exceptions to this method: one, certain light but bulky articles, e.g. "Everest carriers," cannot be done up in packages of the standard weight without making the animal fully loaded with them look like an over-decorated Christmas tree, and so in practice it is easier to load him up on each side with one large and light package, and one small but heavy box; two, for convenience of shipment, stores must often be combined into bales or crates of much more than 40 pounds, but here the principle should be enforced that each component package must be separately packed sufficiently strongly to stand the journey across Tibet. The contents of some of our huge bales and crates this year had to be separately made up into packages in Kalimpong, against time and in circumstances that made efficient packing impossible, with the consequence that by Shekar Dzong many loads were disintegrating and pilfering of their contents was positively encouraged.

4. This brings us on to the very difficult question of the best methods and materials for packing the various sorts of stores. Here a compromise is necessary, since a type of packing at once proof against thieves and against the rough usage of constantly changing and variously unskilful muleteers would swallow up too large a proportion of the total weight and leave little over for the contents. The ordinary Venesta case, while

admirably light, will not stand up against either a determined thief or a series of obstreperous yaks. But unless something almost equally light and a great deal stronger can be designed, these cases will probably be retained for such store-boxes as are only opened *once*, their total contents all distributed, and the boxes discarded (e.g. day rations, or articles of equipment all issued at once to members of the party at a certain stage of the advance). Even with these boxes I suggest that the usual warehouse method should be adopted, of putting a tight steel band round each box, fixed tight with a ratchet and sealed, so that it is nearly impossible to tamper with the contents and not have the result readily detectable. When the transport officer wishes to open them on his lawful occasions, a stout pair of cutters will obviate the damage to box and contents caused if the homelier ice-axe is used.

Where a box must be constantly opened and closed, and only part of the contents extracted each time, the Venesta case is not suitable. The securing screws round the lid soon cease to hold after several openings, and the box consequently begins to break up, no longer being rigid; and it is not hard to get at the contents, once the screws along the sides have gone, even when the box is padlocked. For these stores, then, as well as for those which are taken out each day and replaced in their boxes for the next march, such as Kranzow lamps, crockery, or books, stouter cases and more complicated locks are necessary. When these boxes are opened at irregular intervals, this year's practice of having set-screws, passing right through the lid, as well as the lock, is probably best; but where they must be opened every day, I suggest they should be fitted with two locks, just like a suitcase, to hold the box rigid and prevent unauthorised peeps under the lid. Money or other particularly valuable stores might be packed in very thin sheet-steel or aluminium cases, and Messrs. Chubb have very kindly offered their advice on the question of the best kind of lock. Alcohol should be packed in stout boxes fitted with internal divisions, and only one or two keys should be provided, to be kept in charge of the quartermaster or leader: it should not be impossible to design the

different locks so as to allow a master-key to be constructed, again for use by authorised people. Similarly, I doubt if it is good policy to have a separate key with the padlock inside every box : it would be easier to control issues if keys were only supplied to the head cook, mess-man, Gurkha N.C.O.s, and selected sardars, with a small reserve supply in the quartermaster's possession.

Only stores which cannot possibly be put into boxes (e.g. big tents, bulky bedding) should be done up in gunny bales. Bales offer a very indifferent resistance to bad weather or rough handling, and, since it is often possible to feel attractively shaped objects under the outer covering, are much more provocative of looting. Valuable goods such as climbing boots, windproof suits, or high-altitude sleeping-sacks, all of which were heavily plundered on the march, should certainly be put in boxes, in spite of the greater weight and bulk involved.

Weighing bales and boxes periodically in camp proved an insufficient precaution, since a thief who was skilful enough to open a package and close it again without leaving any obvious traces was also cunning enough to replace the articles he abstracted by stones and turf sods of approximately correct weight. I can well remember our disgust at Camp I when, on opening up some luxury boxes which had been weighed and passed at Shekar, we found that all the crystallised fruits had vanished, though their lead outer cases were left as a make-weight, suitably reinforced with stones, while the two tinned Stiltons had been pierced with an ice-axe, and left in their places, the native nose not being sufficiently civilised to tolerate the delicate smell that emerged.

But with suitable supervision, and the adoption of methods similar to those I have described—metal bands for all Venesta cases, stouter boxes and better locks for frequently needed stores, and the elimination of gunny bales—it should be possible to checkmate attempts at theft on the march. On the glacier pilfering, which seems generally confined to small quantities of food and alcohol, is much harder to check. In glacier camps



PLATE 50.—Mount Everest from a peak above the Base Camp.

few people have the time to devote to effective supervision, and in fact in camps above Camp III, where it is particularly necessary to give porters all the food and luxuries they will eat, pilfering becomes so unimportant that it might almost be encouraged ! In camps up to III, the only safeguard is a very limited issue of keys ; but since climbers after a hard day or in blizzards are naturally very ready to leave the cold business of issuing stores to mess-man or cook, and will consequently hand their keys to him, no system that is completely reliable can be devised.

5. Certain special stores need particular methods of packing. Money in coin and alcohol have already been mentioned. Petrol or paraffin fuel is something of a problem. You want a container which is readily opened and yet proof against leaks, since if the tins are nearly full at Darjeeling, several openings will be necessary, to prevent bursts, in the gradual climb to reduced air pressures at the Base Camp. The ordinary petrol tin seems to serve well, but it would be a great advantage if some lock could be fitted to the cap. Porters are careless about filling Primus stoves, and once they have lighted them, tend to keep them roaring in their cook tent all day for warmth, and, since our very generous supply this year began to fail in June, months before it should have done, it is obvious that rigid control of fuel issues is required. Also Venesta cases are not very suitable for transporting the tins across Tibet ; constant opening and screwing up again weakens the boxes, and the unstable weight in the filled tins completes their demolition.

Primus stoves should each be enclosed in a tin large enough to contain all needed parts, including alternative burners, or else loss of time and spare parts seems inevitable.

Matches should be distributed among ration boxes, and not left to the hazard of a single case. A reserve supply can be kept in a *waterproof* box with a good lock.

The packing of oxygen is a matter for the particular climber in charge, but this year's experience suggests that the whole consignment should be sent to Calcutta for testing quite

separately from the rest of the stores, and in charge of the responsible member.

Specially fitted boxes seem to be needed for spare tent-pegs and guys, which, if included with individual tents, are easily lost. Boxes with specially designed compartments would be useful for crockery (something on the lines of a picnic basket, but less complicated), and for the Kranzow lamps (which all got damaged in transit), and a special box for the cook to take on with his pony in advance, equipped for the midday meal, which is usually over before the main transport comes in.

Other frequently used things needing special packing and locks are gramophone records, newspapers and magazines, maps and candles.

Lastly, if there is ample time for preparation, although there is a multiplicity of small and unrelated objects that are needed on the march, it should be possible to avoid boxes which are altogether a lucky dip. A box containing Homburg hats, "Jollyboys," Grenfell smocks, and tooth-brushes is trying to the quartermagistral temper, and such infinite variety means considerable delay on those occasions when a great many people are clamouring for a great many different things. Incidental to this, individual members of the party should be made to include all the articles of kit they are certain to need before the Base Camp in their own personal luggage at Darjeeling. Certain awkward things, like crampons, which are not likely to be wanted before the glacier, can travel with the main stores, but great waste of time and efficiency is caused by issuing personal stores in small dribbles to members who realise their needs at surprisingly different times. Such spare parts as tooth-paste, Bromo, or bootlaces will always require a haphazard method of issue, but if a list of individual march kit (camp-boots, blankets, etc.) not already in personal luggage were worked through at Darjeeling with the whole party present, much time would be saved on the march. It is also probably not a very good idea to encourage individuals to give their own personal luggage to the packers to be included in the general shipment. "Mr. C. G. Crawford: one pair of

socks, packed in a case of champagne," would cause difficulties, as the member concerned would demand the first and not be allowed the second.

ARRANGEMENTS IN INDIA AND ON THE MARCH

1. One difficulty is that the stores should obviously be dumped at the ropeway-head in Kalimpong, where the mule journey begins, whereas it has been customary to make Darjeeling the headquarters of the expedition in India. It is a great convenience if the party can all stay near the stores during the days before the march, both for ease in issuing kit to climbers and porters, and to familiarise all members of the party with the arrangements of stores before the journey begins. If this is not possible, it is at least essential that the quartermaster should be with the stores during this whole period, whatever the rest of the party is doing. If he is not present during all the loading of transport animals, especially if some of the stores are sent off in advance of the party, as they were this year, it becomes very difficult to check lists and numbers later in the journey. It seems very doubtful whether advance stores should be sent on ahead of the main body, unless the quartermaster or a transport officer accompanies them. I see in my diary of March 30th, when we had just picked up our advance stores at Kampa Dzong, the entry, "puzzle much over stores discrepancies (11 packages present and not on the list, and a large number unaccounted for)." This difficulty was caused by my having to be one day in Darjeeling and the next in Kalimpong during the time when the advance stores were moving off. The fact also that the stores wait for a week or more at one place before the party catches up makes supervision by a climber more necessary still, since this stationary period gives a dishonest servant ample opportunity to thief with discretion and to cover his tracks completely.

This year half the party was sent on a week in front of the others for acclimatisation purposes, which made a further sub-

division of stores and personal kit necessary. If this method, which has advantages for climbers who have never been in the Himalayas before, is adopted again, it is advisable that the proportions of stores needed by each party should be worked out in England, and the appropriate boxes at once segregated and marked in the godown. It is essential that the quartermaster should go with the second party, and not the first. This year the two people who had done the preliminary work on the stores happened to be with the advance party, and consequently muddles appeared quite naturally when the others started with their stores a week later. Through a mistake, some of the special high-altitude pots were issued to porters at Kalimpong, and recovered rather battered at the Base Camp, while Birnie had to do an all-night march from Yatung to stop the Whymper tents, which would be needed at Phari, from going right on to Kampa Dzong while their owners trailed hopelessly behind. So it seems clear that the quartermaster must keep close to the stores from the moment they arrive at Kalimpong.

2. An effective system of supervision of stores on the march, and more in the nightly camps, is essential, as we learnt from our losses this year. In camp the simplest method is probably that adopted by us after Shekar Dzong, of making all the stores into one dump as close to the climbers' tents as possible, and roping the dump in such a way as to make it difficult to remove a box. Unless this rule is enforced, each little knot of transport drivers will make sangars of the group of boxes in their charge to protect them from the cold, and if they get into camp late in the evening (as this year at Trangso Chumbab), or if there is not much room for party and animals on the same site (as at Jikyop), these little collections of boxes are often some distance from camp, and no one has the leisure to be constantly patrolling. One single dump in the middle of camp each night is, I think, the only answer, even if it means providing the muleteers with yak hair tents.

During the day's march the best precaution is to extend the system used to guard the money boxes on the way, that is to

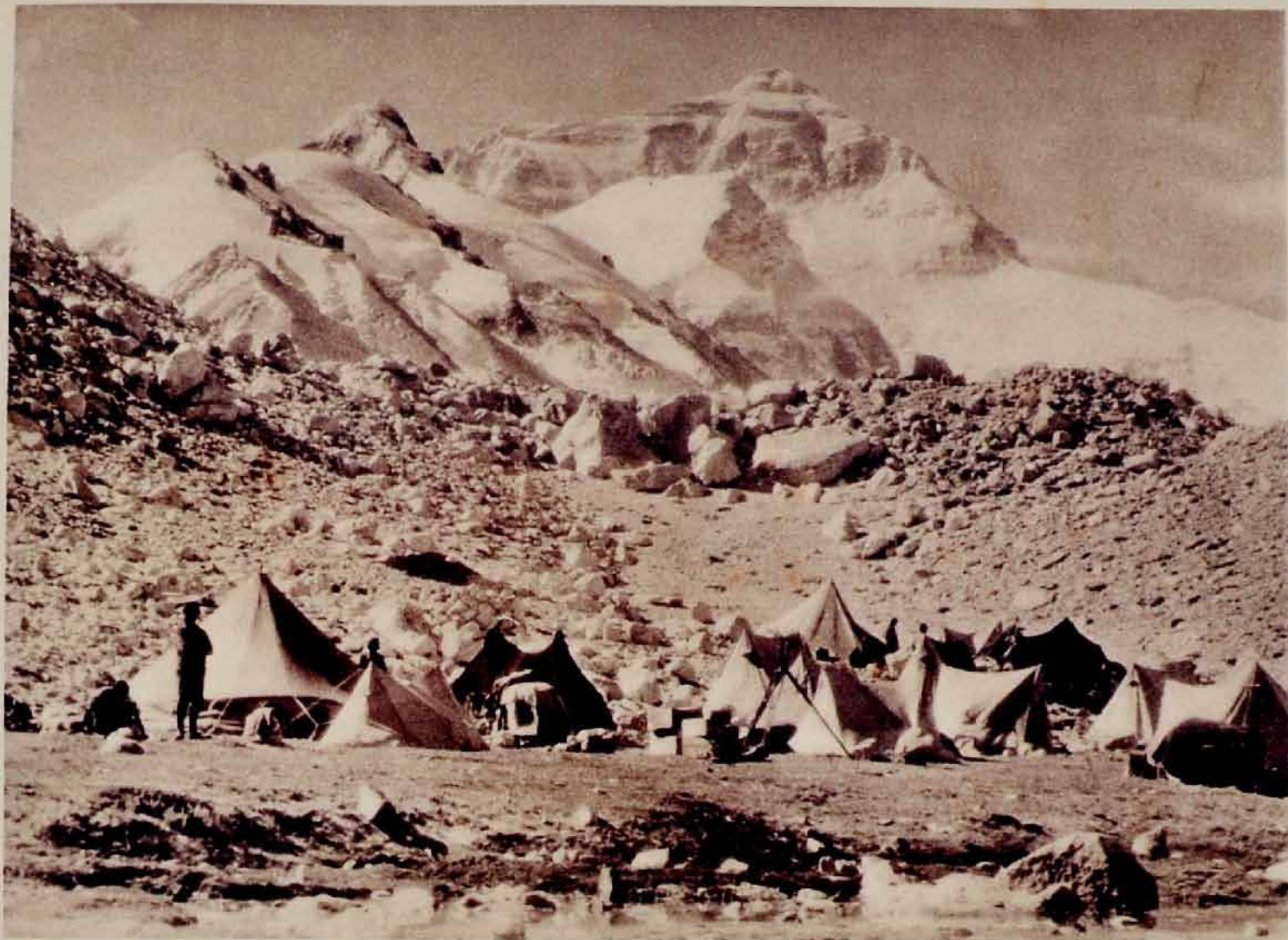


PLATE 51.—Mount Everest and the Base Camp in June.

put a responsible sardar in charge of a definite series of boxes, which he must count both when they are being loaded and unloaded, and must also accompany throughout the march. The Gurkha N.C.O.s were very efficient in this policing, and it should be possible to parcel out the whole of the stores between them and, say, six under-officers. Where there are transport drivers with very small herds in the charge of each man, as on the marches between Kampa and Tengkye, several of these must be required to travel together, to make up the full tally of boxes.

It would be advisable to attach one special sardar to the quartermaster from Darjeeling onwards, so that he can be gradually trained as an understudy, and can be a very useful stand-by when, as will probably happen, the quartermaster is needed for climbing at the higher camps, and the transport officer has to take over his job. Also a small special squad of porters might be detailed at the beginning of the march to help with the heavy work of shifting boxes in camp.

3. In the store-book should be marked the *order* in which stores are to move up the glacier, and the various camps at which they are needed. If the store-books are marked in this way in England, and if a copy of the store-book (Glacier and High Camp section at least) is kept at each camp, it will be possible to ensure the right stores reaching the right places without muddle and without an intensive system of little notes flying up and down the glacier. The transport officer will simply have to work through as many loads as he has coolies for, in accordance with an order of "first necessities," "second necessities," etc., already printed in his store-book. The receiving officer at the camp to which the loads are carried will merely have to check the boxes in by his own copy of the store-book. This seems the best method of ensuring that, even while the climbers and some special porters may be waiting at a camp for acclimatisation, a constant stream of the right stores shall be passing up the chain of camps.

4. The food which an Everest expedition has to carry will never stay discussion as well as it may stay appetite, and,

as space is small and an individual opinion only one of a dozen opinions to which a leader has to suit his selection of food, I am not going to do more than touch certain aspects of this vexed, or rather tormented, question which belong particularly to quartermastering. For the quartermaster in his official capacity is exclusively concerned with the arrangement and issue of food, and only secondarily, as a suffering human being, with its kind and quality.

But if, as seems likely, a future expedition invites offers of foodstuffs from any firms who may be interested, some central figure will be useful who can receive their wares, sample them (aided by a staff of unimpeachable palates), and decide which will be good for the expedition, and what quantities will be wanted. And since the packing of foodstuffs is the quartermaster's care, he might take this task as well from the shoulders of the over-worked leader. It will probably be most economical either to hire a warehouse floor in London and engage a private staff of packers, or to employ some export packing firm which is *not* interested in the supplying of stores. Thus a uniform packing can be ensured for food arriving from many different sources. Of course, if firms who are actually giving foodstuffs are also prepared to pack them in accordance with the 40-pound schedule and regulation strength, it would be ungracious not to accept; but the quartermaster must have absolute power of veto against unsuitable or inefficient packing, and must retain the right of marking and numbering the cases entirely in his own hands.

In arranging foodstuffs, the man-day ration system is probably best for the march across Tibet. I think, however, that it is a mistake to provide a *complete* ration in every box, since certain things, like butter, condensed milk, salt, tinned meat, or jam are consumed at surprisingly varying and totally incalculable rates (often in inverse ratio to the amount of palatable fresh food available at a village). The day-ration box should, then, contain basic and invariable necessities, and these other foods of variable consumption rates should be collected in separate chop boxes (e.g. one case of butter to thirty day-

ration boxes). This will cause some little trouble to mess-men and cooks at first, but not nearly so much as having to make these collections, usually in unsuitable boxes, while on the march, from a number of ration boxes from which all other stores have been emptied.

On the glacier appetites are so fickle and incalculable that it is doubtful if it is worth continuing the pretence of a day-ration any longer. But you might keep a drastically pruned series of boxes containing basic necessities (e.g. oatmeal, sugar, Ryvita) as the one stabilising force in a much larger number of "luxury boxes," packed with assortments of delicacies calculated to suit as many difficult appetites as possible. As someone said at Camp IV, "at this height *all* your food must be luxuries." These luxury boxes should be marked "Only for Camp III and above," since on the passage up from the Base Camp the resident cooks at each camp try to take toll of any delicacies for the benefit of any sahibs living in their camp, and what began as a load of vegetables may, as once this year, fetch up at IIIa as one Brussels sprout, part-worn! The ideal to aim at, though incapable of achievement, as opportunities for elaborate cooking decrease the higher you are from the Base Camp, is a scale of living which increases in luxury with each advance in height, so as to counteract discomforts of weather and mountain-sickness, and if possible delay the appalling loss of weight that attacks climbers living for any length of time at 23,000 feet or over. But the arranging of a constant service of fresh meat, fresh vegetables, and bread to reinforce the storm troops at the head is the transport officer's job and not the quartermaster's. The importance of such a supply is obvious, but has perhaps not been completely realised in the past, and is certainly worth a good deal of trouble and expense to arrange for any future party. The inevitable and cumulative distaste for patent foods and even for any tinned stuff, simply because it is tinned, can perhaps be postponed by keeping off tinned meat on the march across Tibet, so that when you come to eat at the high camps, in which your staple quite naturally is something from a tin, you can approach a tin with a less biased mind, and

preserve that freshness in yourself which you seek in vain among your food. This should certainly help with the normal person living in England who does not eat very much tinned food in ordinary life, though for inveterate backwoodsmen and lonely outposts of Empire, whose stomachs are already heavily tin-plated, it is probable that none of these harmless subterfuges will be effective. But a complex against tins as such is largely an effect of altitude upon a mind already jaded by an insufficient variety of tinned stuffs from which to choose attractive daily meals. An entry in my diary during the first days at Camp III still makes me swallow hard, where I apparently ate a hearty meal of two kinds of food which I couldn't be induced to face now, even under an anæsthetic. A greater variety will stave off this accumulating disgust, but for the sheer irrational "anti-tin" attitude you must blame altitude. It was noticeable, when I was travelling back through Sikkim with one of the wireless officers, that he still preserved a passionate curiosity about the contents of tins, especially those that had not impinged on his quiet life at the Base Camp, while anything coming from a tin, however surprising, had in my case to be elaborately disguised before I would show the faintest interest.

V. NATURAL HISTORY AND BOTANY

By E. O. SHEBBEARE

Although on Everest expeditions scientific research has never been allowed to interfere with the straightforward object of trying to reach the summit, a good deal of work has been accomplished on these adventures.

In 1921 Wollaston obtained specimens representing over 200 botanical species, 10 mammals, and 61 birds, besides observing and identifying 33 more birds. In 1922 the collecting of birds was discontinued in deference to Tibetan feelings, but, working on Wollaston's notes, Longstaff and Norton were able to add to the list a great number of birds

by observation, and Norton, with the help of Roomoo, the Lepcha collector, brought back botanical specimens representing over 270 species. In 1924 we took no collector into Tibet, but Hingston by his own almost unaided efforts brought back 500 specimens of plants and 10,000 specimens of animals, mainly insects. I am, unfortunately, unable to say how many species were represented in this wonderful collection. As before, no birds were collected in 1924, but we were fortunate in having with us three exceptionally keen observers of bird life—Norton with previous knowledge of Tibet, and Beetham and Hingston who, though new to the country, had had much experience elsewhere. From them, especially from Norton, I learnt to recognise most of what I saw.

This year, with the help of what I had learnt in 1924, Dresser's *Palæarctic Birds* and Ludlow's paper on the birds in the neighbourhood of Gyantse, I found that I could identify the majority of the species we met with on the expedition.

We had the misfortune to lose the whole of the zoological collection which Raymond Greene had taken much trouble to collect. It was all in one box, which was standing beside his tent when we were camped close to the village of Lingga on the return journey. In the morning it was missing, and though a thorough search of the whole village was made, we never discovered it, the thief having presumably put as many miles as he could between himself and the expedition during the night. It was poor consolation for us to picture what the rogue's disappointment must have been on examining the contents of his prize—valueless to him, so valuable to us. Among the contents was a collection of grasshoppers which would probably have been of special interest.

This year's botanical collection compares unfavourably with the work of previous expeditions, for the specimens, recently dispatched to England, number only 162 and may, allowing for duplicates, represent something like 120 to 130 species. Their condition also leaves much to be desired, for in the rush of the return journey, on which, for the sake of our invalids, we could not afford to halt, the changing of

drying-papers was neglected. This caused no trouble in the dry climate to the north of the main backbone of the Himalaya, but once in Sikkim and within the influence of the monsoon, mould began to attack the specimens, and even those which had seemed perfectly dry in Tibet soon became a horrible mass of green mildew. With neither the time nor the sunshine to dry them out, for it rained most evenings, we were forced to leave matters as they were, and the herbarium did not get its much-needed sunning until after our return to Darjeeling.

This year, with no special collector, we could not hope to add much to the extensive work of earlier expeditions. We judged it best to concentrate first on the higher elevations at which any plant life was found and then on the plains of Tibet, treating the monsoon valleys as the least important. The valleys, in the north of Sikkim at any rate, are available to any botanist who can spare a fortnight's leave, and have, moreover, been extensively worked by experts from Hooker to Cave. The plains of Tibet and Mount Everest have, on the other hand, only been visited a few times, and no one can say how often we may be in a position to visit them in future. In any lists that I have seen of the collections made by previous expeditions the flora of the valleys has been combined with that of the tableland and mountain. As might be expected, the moist climate and comparatively low elevation of the former produce a luxuriant vegetation far richer in species than that of the latter, so that in any combined list the valley species outnumber and swamp those of the tableland and mountain. We therefore kept as full notes as possible on distribution, and we have tried to show in our lists the plants most commonly found in various situations.

It might be supposed, and I believe this was expected by some botanists, that the earlier and lowlier forms of plant life, such as lichens and mosses, would ascend the mountain to higher elevations than the flowering plants. This was not so. The highest plant found this year, perhaps the highest ever found, was a straggly Crucifer with a pale pink flower, which was growing on the moraine of the East Rongbuk glacier below

Camp II at an elevation of 19,000 feet as nearly as we could judge. It was rooted in a pocket of wet glacier sand and had struggled up to the light so as to hold its flower and leaves under the shade of one of the rocks of the moraine. A similar plant was found on the Kongra La at about 16,000 feet. Whether both are of the same species remains to be seen when the specimens are identified.

It may be held that an isolated plant like this, happening to germinate at this extreme elevation, should be regarded as an exception. The highest elevation at which plants normally occur on the north face of Mount Everest is a few hundred feet above 18,000, just above Camp I. Here the species that appears to go highest is a cushion-plant with moss-green, and rather moss-like foliage and small white flowers—an *Arenaria* I believe. Just below this, at the elevation of the camp itself, about 17,700 feet according to our reckoning, some twenty species are found, including a moss and an *Ephedra*, but mostly Dicotyledons with smallish but quite showy flowers. At this elevation the family best represented is perhaps *Compositæ*, the members of which are mostly protected by white down.

The lichens seem to stop short at about Camp I, at about 17,700 feet or perhaps a little lower. Judging by colour, there appear to be about five species—a grey, a green, a yellow, a red, and a black.

The whole life of the vegetation of the mountain, of the tableland and passes of Tibet, and even of the upper parts of the monsoon valleys, is subterranean for at least three-quarters of the year. When the expedition gets above the tree-line, at, say, 13,000 feet, on its outward journey towards the end of March, it has seen very nearly the last green thing that it will see until flowers begin to come out and the hidden vegetation comes to life again at the Base Camp in early June. A few green bushes of the gorse-like *Caragana* near the stream in the sheltered valley at the back of Kampa Dzong, and a couple of acres of green in the irrigated willow-garth at Tashidzom are the only relief from the absolute desert of Tibet in winter.

It is almost impossible to believe, at this time of year, that the whole country is not as barren as the Sahara. All that shows above the surface on the plains round Tatsang are a few greyish cushion-plants, looking more like stones than vegetation, while, on the sandy plains round Shilling, Caragana bushes are up to their necks in drifted sand and look dead. In spite of its barren appearance the tableland supports gazelles and herds of wild asses, which contrive to find a living throughout the long winter, and not a scanty living either, for they are as fat as butter.

The plateau is not dead, it is only asleep for three quarters of the year, every plant sheltering underground from the bitter winds that blow out of the west. Early in June the cushion-plants turn green, the half-submerged shrubs send out new shoots, flowers spring up from unseen roots, and everything prepares to rush through the business of flowering and setting seed in the short season before winter is again upon them. The whole desert is in bloom, for there is no time to be lost and everything is in flower together. *Incarvillea Young-husbandii* is a startling flower like a gaudy pink convolvulus springing direct out of the bare earth with a hardly noticeable, flat rosette of leaves pressed against the ground. On sandy plains a beautiful mauve iris (*I. kumaunensis*) grows everywhere, and occasionally one of the blue poppies, the forget-me-not one and the most handsome. Blues and mauves are favourite colours for the flowers of the plains of Tibet, and one of the commonest of all is a leguminous plant (*Oxytropis sp.*) with feathery foliage and bluish-mauve flowers.

Along the larger rivers of the plateau there are in places small groves of *Hippophæ*, a large thorny shrub, almost a small tree, rather like sea-buckthorn. At a place called Tsering-me on the Dzakar-Chu, one march down-stream from Tashidzom, I was puzzled by an old and gnarled but still vigorous tree nearly eight feet in girth. The foliage seemed familiar, but it was some time before I recognised that it was nothing more than a giant *Hippophæ rhamnoides* which, having outgrown the necessity for self-defence, had given up



PLATE 52.—Longland crossing a Tibetan River.

producing thorns, "like the high branches of a holly tree." It had evidently acquired sanctity, judged by the number of flags tied to its branches; perhaps this had contributed to its long life. It would have been interesting to know how old it actually was.

I have mentioned the willow-garth at Tashidzom as a sort of green oasis on the outward journey; on the return it was a perfect flower-garden. How it would strike anyone fresh from an English country-side is hard to say, but after months among barren moraines it was like the freshness of Colombo after arid, dusty Aden. The flowers standing in the long grass were much like those of an English meadow, though not many were actually identical. The favourite colour here was yellow—dandelions, potentillas, buttercups, mustard, a primula and a long-tubed pedicularis particularly. The trees in these rare irrigated and walled-in gardens are mainly willows, pollarded or coppiced at various heights to supply the village with withies, but there are generally a few huge poplars also planted.

Such places are full of birds and are the only nesting-places for many species. Magpies are always common in villages where there are any willows, and the trees are full of wrens, warblers, and some of the less common small birds. At Tashidzom there were grey-backed shrikes, hoopoes, and crag-martins always somewhere about the garden, and a pair of Tibetan hares spent the night among the long grass. Outside the garden were the common birds of a Tibetan village, tree-sparrows, house-martins, rock-pigeons, ravens, and kites. The Brahminy duck and bar-headed geese, which had been so tame there on our way through in April, were now busy with their broods and keeping out of the way of mankind.

The birds of the Base Camp were above all the yellow-billed chough, the rock-pigeon, and the red-breasted accentor, which this year was commoner than the little brown accentor, the friend of the 1922 and 1924 expeditions. These birds were with us most of the day, arriving at daybreak and leaving at sundown. Most evenings a few snow-finches would spend

an hour or two in the camp, and for a week or so after our arrival a pair of rose-finches frequented the frozen pond in the early morning. I expected them to breed somewhere in the neighbourhood, but they seemed to have found a better spot, and I never saw them again. This year, as far as I know, the lammergeyer only visited the Base Camp twice, a mature bird shortly after we arrived, and a full-grown bird in immature plumage about the first week of June. The most surprising bird to meet at this elevation was a solitary Indian rufous turtle-dove, which attached himself to the rock-pigeons and appeared in the camp on two or three occasions about the middle of June. This bird has been recorded from the Kharta valley, which is not far off and is perhaps the roosting-place of the rock-pigeons.

Of the birds of the plateau the most noticeable, on our arrival, were the snow-finches, which share their burrows with the mouse-hares. They were still about on our return across the plains in July, when their glorious song, beginning before it was fully light and going on into the night, if there was an early moon, is one of the delights of Tibet. When I say that the larks were not conspicuous until they began to sing, I mean the Tibetan skylark, who is the best songster. The Calandra lark, strikingly marked and as big as a mistle-thrush, is always conspicuous, and so is Elwes's eared lark, perhaps the commonest bird of the plateau and coloured rather like a ring-plover.

I think we saw less of the mammals of Tibet than we did in 1924. The wild ass and Tibetan gazelle were fairly often sighted, and ovis ammon once, I believe, by some of the party. I did not hear of anyone seeing a marmot this year, though I once heard one, and saw a dead one that had been killed by a dog below the Kongra La. I only once saw the rock-pika, and that was in Sikkim and not Tibet. The herd of burhel, as usual, visited the Base Camp several times and a cinematograph picture was taken of them. Those interested in that elusive species, the abominable snow-man, will be sorry to hear that there were no reports of either him or his tracks this year.

VI. LIST OF PLANTS COLLECTED IN THE
RONGBUK VALLEY

WITH NOTES BY L. R. WAGER

The small collection of plants made by members of the 1933 Mount Everest Expedition comprises a fairly representative collection from the Rongbuk Valley and various haphazardly collected specimens from the other parts of Tibet visited during the return journey.

The Rongbuk Valley collection is probably typical of the flora of the high northward-running valleys of the Central Himalaya. Our specimens from here have been identified at the Royal Botanic Gardens, Kew, and for this privilege our thanks are due to the director and to those botanists who made the determinations. As Mr. Shebbeare is still in India, the task of presenting and commenting on the list has fallen to me.

Flowers first appeared at the Base Camp, 16,800 feet, in the second week of June. For some time there were only six, namely, *Sedum quadrifidum*, *Androsace Selago*, *Draba glomerata*, *Oxytropis glandulosa*, *Astragalus orotrephe*s, and *Lloydia serotina*, the last apparently a species identical with that found in the mountains of North Wales. On July 2nd and 3rd Shebbeare and I, who had been for some time at Camp III in order to evacuate the camp, passed down the Rongbuk Valley to the monastery collecting on our way all the different species of plants we could find. Although only three weeks had passed since we had found the first flower, it seemed to us that most of the plants occurring in the region were either out or were sufficiently advanced to make generic determination possible. The summer being short, all the plants apparently flower at the first opportunity, and probably our collection includes most of the plants living in the Rongbuk Valley at, or above, the Base Camp.

In the lower part of the valley from the Base Camp down to the junction with the Gyachung Chu, considerably more plants are able to grow and the flowering season is longer.

Our collection in this part of the valley is undoubtedly far from representative, and it is the more meagre because here we were hurrying in order to catch up the main body of the expedition.

During the reconnaissance expedition in 1921 Dr. A. F. R. Wollaston and others collected 220 different species of plants¹ from the regions to the north, east and west of the Mount Everest Group. It is, therefore, remarkable that of the plants collected in the Rongbuk Valley in 1933 only four had been previously recorded by Wollaston. Brigadier E. F. Norton and others collected plants during the 1922 and 1924 expeditions. The list of names of the plants collected has never been published, but presumably most, or all, of the forms here recorded were collected, as the route taken was almost the same as that followed in 1933.

Along the junction of the Himalaya and Tibet the abrupt change in climate, occurring within a few miles, causes abrupt changes in the flora. For this reason, as Shebbeare has written in the chapter on natural history and botany, it is desirable to give accurately the localities of the plants collected. Rapid changes in the climate must partly account for the great difference between Wollaston's list and the present one.

The Rongbuk Valley, which extends northwards from the glaciers of Mount Everest to the junction of the Rong Chu and Gyachung Chu, is only twelve miles long. It lies entirely north of the main range of the Himalaya and its lower end is still 15,300 feet in height. The valley is therefore a circumscribed region within which climatic conditions are fairly uniform. During the winter—roughly from October to May—drifts of snow occupy the hollows, but a continuous covering probably never lasts for long, owing to the small amount of the snowfall and the extreme dryness of the air; at this time low temperatures and violent winds are usual. During the summer months precipitation is also small and frost probably occurs on most nights. The conditions for the whole valley must differ only slightly from those for the Base Camp, described in the chapter on the weather.

¹ *Mount Everest—The Reconnaissance 1921*, pp. 346-350.



PLATE 53.—The middle part of the East Rongbuk Glacier showing the troughs. Photograph from the route to the Lhakpa La.

Nevertheless, within the valley there is some variation in the distribution of the plants, which presumably is mainly the result of small climatic differences, and for the purpose of assigning localities and describing the conditions, the valley will be divided into four regions: (a) Camp I, (b) the Base Camp, (c) Rongbuk Monastery, and (d) the lower valley.

The Camp I region, extending from a point half-way between Camp I and the Base Camp up to the snout of the East Rongbuk glacier, varies in height from 17,500 feet to 18,500 feet. Compared with the more northerly and lower parts of the valley, the summer snowfalls in this region are more frequent and slightly heavier. In a general way, the climate of Camp I has been regarded as pleasanter than that of the Base Camp, and in fact it would have been made the base in 1933 if animal transport could have been used so far. Various plants also apparently find conditions at Camp I more congenial than lower down, for the flora at Camp I is richer than that at the Base Camp. Above the Camp I region only a single plant was found, a crucifer, *Ermania himalayensis*. With increasing height there appears to be no gradual falling off in the number of species, but an abrupt cessation of all plant life, and this point is so remarkable that it will be returned to later.

The plants collected in the Camp I region were found among scree and old moraine on the south- and south-west-facing hillside along the usual route between the camps. In the drier localities the following plants, which also occurred at the Base Camp, were noticed or collected¹: *Thalictrum glareosum*, *Draba glomerata*, *D. lasiophylla*, *Viola biflora*, *Arenaria ischnophylla*, *Astragalus orotrephe*, *Oxytropis glandulosa*, *Potentilla fruticosa* (apparently the same as the English species), *Sedum quadrifidum* and *Sedum* sp. prox. *S. bhutanense*, *Artemisia* sp., *Androsace Selago*, *Rheum globulosum*, *Ephedra saxatilis* var. *sikkimensis*, *Lloydia serotina*, and various grasses.

Certain plants found rarely or not at all at the Base Camp

¹ In the complete list of the plants of the Rongbuk Valley on page 309, the locality given is that of the actual specimen identified.

and in the valley below occurred at Camp I among scree, under which water from glaciers or snowdrifts on the hillside above was running continuously during the summer. Plants found in this habitat were : *Anemone* sp., *Corydalis* sp., *Lychnis apetala*, *Petasite* sp., *Nepeta* sp., *Rheum* sp.

There were also other plants not occurring lower down the valley which, although not necessarily found near running water, were probably only able to inhabit the Camp I region because of the greater general dampness. Plants in this category were : *Paraquilegia grandiflora*, *Meconopsis horridula*, *Saussurea gnaphalodes* and *Primula Caveana*. The *Paraquilegia*, *Meconopsis* and *Saussurea* were found later on the Doya La and at other places where moisture-bearing winds penetrate from the south.

Besides the conspicuous flowering plants, a new species of moss, allied to *Barbula nigescens*, was found at Camp I, and various lichens, three of which have been identified : *Lecidea* sp., *Placodium elegans* and *Acarospora chlorophana*.

The complete list of plants collected or observed in the Camp I region between 17,500 and 18,500 feet is given below. Those marked with an asterisk were not noted elsewhere in the valley.

- * *Anemone* sp.
- Thalictrum glareosum*
- * *Paraquilegia grandiflora*
- Corydalis* sp.
- * *Meconopsis horridula*
- * *Ermania himalayensis*
- Draba glomerata*
- Draba lasiophylla*
- Viola biflora*
- * *Lychnis apetala*
- Arenaria ischnophylla*
- Astragalus Heydei*
- Astragalus orotrepes*
- Oxytropis glandulosa*
- Oxytropis microphylla*

- Astragalus tatarica
 Potentilla fruticosa
 Potentilla nivea var. uniflora
 Saxifraga sp.
 Sedum quadrifidum
 Sedum sp. prox. *S. bhutanense*
 Anaphalis xylorhiza
 Leontopodium pusillum
 Tanacetum gossipium
 Saussurea gnaphalodes
 * Petasites sp.
 Artemisia sp.
 * Primula Caveana
 Androsace Selago
 * Nepeta sp.
 Rheum globulosum
 * Rheum sp.
 Urtica hyperborea
 Ephedra saxatilis var. sikkimensis
 Llyodia serotina
 Agrophyron sp.
 Carex Montis Everestis
 Carex melanthus
 Barbula sp. nov. peraffinis *B. nigescens*
 Lecidea sp.
 Placodium elegans
 Acarospora chlorophana

The Base Camp region includes the terminal moraines among which the camp lay and the "shelf" as far as a point half-way between the Base Camp and Camp I. Most of the plants which were found at the Base Camp also occurred at Camp I, and except for *Saussurea Kuntheana* and a *Cremanthodium*, probably all the Base Camp plants would be found at Camp I by a more careful search.

The Rongbuk Monastery division of the valley, which is taken as lying between the terminal moraine at the Base

Camp and the older terminal moraine at the Monastery, is probably as dry as the Base Camp, but the wind and cold are presumably slightly less severe. Two shrubs appear here: *Myricaria davurica* and a *Hippophæ*. As we passed through this part of the valley on July 3rd the remarkable *Incarvillea Younghusbandii*, which is widespread in Southern Tibet, and *Oreosolen Wattii* were conspicuous flowers.

Between the Rongbuk Monastery and the lower end of the Rongbuk Valley our collections, as has been explained, were scanty. The Tibetan gorse, *Caragana versicolor*, occurred, and also another shrub, *Lonicera spinosa*. Among the smaller plants we collected *Primula tibetica*, *Nardostachys Jatamansi*, and *Stellera chamæjasme*.

It will appear from the foregoing that in the Rongbuk Valley there is an abrupt limit above which plants do not go. Within the Camp I region forty-two species of plants were collected or noted. Above this, as Mr. Shebbeare has stated, only one plant was found, namely, the crucifer *Ermania himalayensis*, which was growing in a pocket of soil hidden among the moraine of the East Rongbuk glacier at a height of approximately 19,000 feet.

In the field we were surprised at the abruptness of the upward limit of the plants because there seemed to be no abrupt change, so far as we could see, in the environmental conditions. Near Camp III and on the ridge leading to the Lhakpa La, at heights of 21,500 feet, there were sheltered corners where we expected to see plants. The difference in the weather between Camp I and Camp III was not apparently great, and it was difficult to understand why some of the forty-two species occurring at Camp I should not have been able to overcome the slightly more adverse conditions 2,000 feet higher up.

As there were no conspicuous flowering plants, we looked carefully for mosses and lichens, but found none. I was particularly impressed by the absence of lichens, because at 10,000 feet on Mount Forel in East Greenland, in a district lying just

north of the Arctic Circle and on the edge of the ice cap, there were a moss and at least two species of lichens. Here, even during the height of summer, frost occurs during the coldest part of the twenty-four hours, and the weathering of the rocks suggested drier general conditions than in the Mount Everest district.

Wollaston states¹ that, during the reconnaissance expedition, he found *Arenaria musciformis* up to 20,000 feet at the head of the Kharta Valley, and that a few other plants approached this height. Perhaps the level above which plants cease to exist is not so abrupt elsewhere as it would seem to be in the Rongbuk Valley. More observations of the maximum height to which plants ascend in the Himalaya are required, but such as exist lead one to wonder if low atmospheric pressures do not interfere with some fundamental process in the life of plants in a way analogous to its effects on human beings.

COMPLETE LIST OF PLANTS COLLECTED IN THE RONGBUK VALLEY IN 1933

(The locality given is that of the actual specimen determined.)

RANUNCULACEÆ

Anemone sp. (Camp I).

Thalictrum glareosum Hand.-Mazz. (Base Camp).

Paraquilegia grandiflora Drumm. et Hutch. (Camp I).

FUMARIACEÆ

Corydalis sp. (Camp I).

PAPAVERACEÆ

Meconopsis horridula Hook. f. & T. (Camp I).

CRUCIFERÆ

Ermania himalayensis O. E. Schulz (glacier above Camp I).

Draba glomerata Royle (Base Camp).

Draba lasiophylla Royle (Camp I).

Draba Winterbottomii Pohle (Rongbuk Monastery).

¹ *Mount Everest—The Reconnaissance 1921*, p. 302.

VIOLACEÆ

Viola biflora DC. (Camp I).

CARYOPHYLLACEÆ

Lychnis apetala Linn. (Camp I).

Arenaria ischnophylla F. N. Williams (Camp I).

TAMARICACEÆ

Myricaria davurica Ehreb. (Rongbuk Monastery).

LEGUMINOSÆ

Astragalus Heydei Baker (Camp I).

Astragalus orotrepes W. W. Smith (Base Camp).

Oxytropis glandulosa Turcz. (Base Camp).

Oxytropis humifusa Kar. et. Kir. (Base Camp).

Oxytropis microphylla Pall. (Camp I).

Oxytropis tatarica Camb. (Camp I).

Caragana versicolor Benth. (Lower Valley).

ROSACEÆ

Potentilla fruticosa Linn. var. *ochreatea* Lehm. (Camp I).

Potentilla nivea Linn. var. *pinnatifida* Lehm. (Rongbuk Monastery).

Potentilla nivea Linn. var. *uniflora* Th. Wolf. (Camp I).

SAXIFRAGACEÆ

Saxifraga sp. (Camp I).

Saxifraga sp. prox. *S. imbricata* Royle (Base Camp).

CRASSULACEÆ

Sedum quadrifidum Pall. (Base Camp).

Sedum sp. prox. *S. bhutanense* Praeger (Base Camp).

CAPRIFOLIACEÆ

Lonicera spinosa Jacq. ex Hook. f. (Lower Valley).

VALERIANACEÆ

Nardostachys jatamansi DC. (Lower Valley).

COMPOSITÆ

Anaphalis xylorhiza Sch.-Bip. (Lower Valley).

Leontopodium pusillum Hand.-Mazz.

Leontopodium nanum Hand.-Mazz. (Camp I).

Tanacetum gossypium Hook. f. et. T.

Saussurea gnaphalodes Ostenf.

Saussurea Kuntheana C. B. Clarke (Base Camp).

Cremanthodium sp. (Base Camp).

Petasites sp. (Camp I).

Artemisia sp. (Camp I).

PRIMULACEÆ

Primula Caveana W. W. Smith (Camp I).

Primula tibetica W. W. Smith (Lower Valley).

Androsace Selago Hook. f. et T. (Base Camp).

Androsace coronata Hand.-Mazz.

SCROPHULARACEÆ

Oreosolen Wattii Hook. f. (Rongbuk Monastery).

BIGNONIACEÆ

Incarvillea Younghusbandi Sprague (Rongbuk Monastery).

LABIATÆ

Nepeta sp. (Camp I).

POLYGONACEÆ

Rheum globulosum Gage (Base Camp).

Rheum sp. (Camp I).

THYMELEACEÆ

Stellera Chamæjasme Linn. (Lower Valley).

URTICACEÆ

Urtica hyperborea Jacq. (Camp I).

GNETACEÆ

Ephedra saxatilis Royle var. *sikkimensis* Stapf (Base Camp).

LILIACEÆ

Lloydia serotina Reichb. (Base Camp).

CYPERACEÆ

Carex psychrophila Nees (Base Camp).

Carex melananthus C. A. Mey (Camp I).

Carex Montis Everestis Kuekenh. sp. nov. (Camp I).

Kobresia schoenoides Boeck. (Base Camp).

Kobresia vidua Kuekenh. (Base Camp).

GRAMINEÆ

Elymus sibericus Linn. var. (Base Camp).

Agrophron sp. (Camp I).

MUSCI

Barbula sp. nov. *peraffinis* B. *nigescens*. Mitt. (Camp I).

LICHENES

Lecidea sp. (Camp I).

Placodium elegans DC. (Camp I).

Acarospora chlorophana Mass. (Camp I).

VII. A REVIEW OF THE GEOLOGY AND SOME NEW OBSERVATIONS

By L. R. WAGER

Few geologists have travelled in Tibet owing to the objection of the Tibetan Government; perhaps the geologist is feared because he is often the forerunner of commercial exploitation. Any introduction of Western ideas is likely to be inimical to a theocracy, and the Tibetan authorities, in attempting to exclude expeditions, and especially geological expeditions, are therefore taking up an intelligible attitude.

The first geologist to succeed in visiting Southern Tibet was the late Sir Henry Hayden of the Geological Survey of India, who was attached to Sir Francis Younghusband's expedition to Lhasa in 1904.¹ He was followed by Dr. A. M. Heron, the official geologist to the Mount Everest Reconnaissance Expedition in 1921. Heron continued Hayden's pioneer work, but as he was a member of the Geological Survey of India the Tibetan Government objected to his being attached to subsequent Mount Everest Expeditions. However, Mr. N. E. Odell, a geologist by profession who took part purely as a climber in the 1924 expedition, was able, in such spare time as he had, to make a useful contribution to the geology of the Mount Everest and Rongshar regions. In 1933 I was in the same position as Odell had been, and thanks to Ruttledge's sympathetic attitude I also was able to make various geological observations during the course of the expedition.

¹ References to published accounts of the geology are given in the section headed Data.

Building on a foundation of the work of Hayden, Heron and Odell for Tibet, and of Hooker, Mallet and Garwood for Sikkim, I propose to give a general review of the geology and geomorphology of the whole region between Darjeeling and Mount Everest. In writing this review I have endeavoured to be intelligible to those who, though not geologists, may wish to know about the rocks which compose the highest part of the Earth's crust, or may perhaps be fortunate enough to travel through the region and may wish to understand some of the features of the scenery.

Following the general account is a summary of the data on which it is based, and with this are included brief accounts of some of the new observations made this year.

THE SCENERY AND ITS DEVELOPMENT

The variety in the country through which the Mount Everest expeditions pass is due mainly to two causes—the geological structure and the climate. The Himalayan range is here at its narrowest, being only eighty miles from the plains of India to the plateau of Tibet, and nowhere in so short a space can greater differences of scenery be found. The dead flat Gangetic plain stretches for 400 miles from the Bay of Bengal to the foot-hills south of Darjeeling, and in this distance only reaches a height of 500 feet. Then the lower wooded ranges, sub-tropical in character, rise up abruptly so that at Darjeeling, only fifteen miles from the plains, the mountains are 7,000 feet high. Another thirty miles to the north the snow and glacier-covered mountains are reached, and beyond lies the dry, cold and windswept plateau of Tibet.

The mountains of the Himalaya can, in this region, be divided roughly into three types lying in zones parallel with the length of the range. This classification, which is based on the form of the mountains and their state of glaciation, is dependent more on climatic factors than on the composition of the rocks. The first zone comprises the wooded foot-hills which rise to 10,000 feet and have shapes characteristic of stream erosion. This

is succeeded by a discontinuous zone consisting of the mountains and valleys between 10,000 and 16,000 feet, which are at present without glaciers but which have forms to be ascribed to recent glaciation. For this reason the mountains and valleys of the second zone resemble the recently glaciated Scottish Highlands. To the north lie the groups of higher mountains forming the third zone, that of the main range of the Himalaya. The more southerly high peaks, rising commonly to 23,000 feet, and conveniently regarded as forming a sub-zone, are piled with snow due to the immense precipitation and their glaciers, which descend to 12,000 feet, resemble in a general way the glaciers of the Alps. The more northerly high peaks, a second sub-zone, have much less snow and abnormal glaciers descending only to 16,000 feet.

The general level of the southern part of the plateau of Tibet is about 14,000–15,000 feet, and its highest peaks are 21,000 feet. Although so high, the region is free from permanent snow except for small glaciers on the few peaks reaching over 20,000 feet. The moisture-bearing winds which come from the south give a belt of high precipitation on the southern side of the Himalayan range, but little moisture reaches the northern side. Hooker, in his *Himalayan Journals*, was the first to describe the striking rise in the snow-line which takes place in passing from the wet southern side of the Sikkim Himalaya to the arid plateau of Tibet.

The detailed pattern of the mountain ranges of the Sikkim Himalaya is a result of the rivers which, having flowed originally along the easiest course on an uplifted area of the Earth's crust, have now cut out deep valleys between which remains the higher ground.

In the zone of the foot-hills, river erosion, acting in a wooded country with a high rainfall, seems to have been solely responsible for shaping the hills. The valleys are characterised by having practically no level flood plain and the valley sides tend to curve over more steeply as the valley bottom is approached. These characteristics indicate a youthful stage in the evolution of the rivers, and are a consequence of recent uplift.

The zone of former glaciation between 10,000 and 16,000 feet is well seen in the neighbourhood of the Natu La and Jelep La. From Freshfield's and Garwood's descriptions there seems to be a similar region on the western frontier of Sikkim. Districts belonging to this type of scenery show up on the map because of numerous small lakes, and when the mapping is more thorough this feature will be still more conspicuous. The region of the Natu La and Jelep La forms a broad upland with rocky peaks having rather an irregular distribution and rising to 16,000 feet. Bare rock is exposed extensively in glaciated surfaces, but, as Hooker first noted, glacial striæ are no longer visible. The valleys have a U shape and lakes are common—two characteristics of a formerly glaciated region. The lakes are either moraine dammed, or they are basins (such as Tsomgo) scraped out of the solid rock. It is clear that the valleys have not been occupied by ice for some time, because in many of them the glacially produced U shape has been obliterated by the slow accumulation of screes coming down from the mountains on both sides, and this has produced a V-shaped valley again.

At the former lower limit of the glaciers the broad upland valleys of the Natu and Jelep La region give place to deep V-shaped, river-cut valleys, and at the same point the gradient of the valley bottom is for a short distance abruptly increased. Between the upper part of the Chumbi valley and the Kangbu Chu there is a similar recently-glaciated upland, and the side valleys, such as that at Gautsa, "hang" in the same way to the deeper Chumbi valley. This characteristic supports the view that the country of the second zone remains as a broad elevated tract, because the glaciers, which must once have practically submerged the mountains, protected the region from the inroads of rivers, which would otherwise have cut narrow, deep, V-shaped valleys farther up towards the watershed.

The most conspicuous feature of the southern flank of the high Himalayan zone is the large snowfall, which piles up with snow and ice even the steepest faces of the mountains. The beautiful fluted form of the snow and ice slopes, which is

characteristic of the mountains of this region, is probably a result of the frequent small avalanches of the accumulated snow. The glaciers resemble Alpine glaciers, but are usually more moraine-covered. In this sub-zone the moraines do not sink into the glacier and form troughs, nor do pinnacles occur.

In the more arid northern half of the high Himalayan zone and in Tibet, the relative resistance of the rocks to erosion begins to play a part in determining the shape of the mountains. An example of this will be mentioned later when the rocks of Mount Everest are described, but here it may be noted that in the foot-hills and the southern part of the main range, where there is rapid water- and ice-erosion, differences in hardness and resistance to weathering are factors of small importance in controlling the shapes of the mountains and valleys, while these differences at once became important in the arid climate of Tibet.

On the northern side of the main range the glaciers show characteristics which are probably due to the extreme aridity of the region into which they extend. Thus about half-way between the upper *névé* fields and the snouts of these glaciers narrow, sunken, moraine-covered areas are developed parallel with the length of the glacier. The 1922 Mount Everest Expedition found that one of these sunken areas made an easy route through an otherwise difficult part of the East Rongbuk glacier, and they called the feature the "trough" (Plates 24, 25 and 26). An equally well-developed trough was found this year to occur on the glacier running west from the Lhonak La, and features but little less definite can be seen on the Lhonak glacier on the Sikkim side of this col. The development of a trough seems to be controlled by the distribution of moraine, combined with peculiar climatic conditions. In every case seen this year moraine was found to be lying in the bottom of the troughs. Also the position of the troughs on the glaciers is exactly that of medial moraines (Plate 53). Although I am aware that Odell has offered another explanation of the origin of troughs, they seem to me to be the result of the dark rocks of the moraine absorbing more of the sun's heat

than the good reflecting white surface of the moraine-free glacier ; melting of the ice under the moraine thus takes place, and the moraine-strewn areas sink below the level of the moraine-free surface. Troughs are not characteristic of the glaciers of more northern countries, probably because the sun is not sufficiently powerful and they are not characteristic of the glaciers on the south side of the Sikkim Himalaya, probably because the frequent snowfall covers moraine and glacier alike and makes both an equally good reflecting surface for the sun's heat.

Lower down the glacier the moraine-covered, sunken area extends more widely at the expense of the clean part of the glacier. The moraine always remains only a thin sprinkling above ice, because wherever it accumulates beyond a certain critical thickness, the lower layers, sheltered from the direct heat of the sun by those above, remain cold, and no melting of the ice beneath takes place. Any thick layer of moraine thus eventually becomes raised relative to the surrounding more thinly moraine-covered ice. This state of things is impermanent since the raised moraine slips off into the hollows. The moraine areas thus become more and more extended until near the snout they occupy the whole surface of the glacier (Plate 54).

On the East Rongbuk glacier, at about the point where the troughs first begin, the moraine-free part is fairly smooth, but it rapidly becomes cut up into hummocks, which, a little lower down, develop into handsome pinnacles of ice standing seventy feet or so above the moraine-covered glacier (Plate 55). These pinnacles seem to occur only on glaciers having troughs, and probably they have a somewhat similar origin. Even away from the moraine areas there is a good deal of dust and small pebbles on the surface of the glacier. This melts into slight hollows, perhaps at first controlled by cracks and flow structures in the ice. The hummocks of ice once established waste away less rapidly than the hollows containing the dark mud and pebbles, and gradually the hummocks grow into the pinnacles which have been admired by

the members of every expedition to Mount Everest. The steep face of the pinnacles seems to be towards the south, and this is presumably due to more rapid melting by the sun on that side, but any deductions from the East Rongbuk glacier, as Shebbeare and I found, are complicated by the turning of the glacier from a north-south direction to an east-west direction near its snout.

The scenery of southern Tibet shows no evidence that the land has ever been covered by an ice-sheet. Abrupt small hills such as occur in the valley of the Phung Chu north of the Mount Everest region would still show evidence of considerable modification of form if this valley had been occupied by an ice-stream during Pleistocene times. Hayden has stated that moraine occurs on the south side of the Kampa Dzong ridge, but if this isolated occurrence is confirmed it might still be explained by an exceptional tongue of ice extending north from the mountains of Pauhunri and Kangchenjau, which are only fifteen miles to the south. Odell, following Blandford, has suggested that during the Ice Age the more extensive valley glaciers flowing north from the Himalaya perhaps united to form an ice-sheet. The lowest definite evidence of moraine in the Mount Everest neighbourhood which I was able to find is that at the Rongbuk Monastery at 16,000 feet, and only five miles beyond the present snout of the Rongbuk glacier. Farther down the valley are river terraces which often simulate moraine. It might be expected that when the southern Himalayan glaciers extended 4,000 feet or more below their present general level, an extension of a similar order of magnitude would have taken place in the glaciers flowing north into Tibet. Had this happened it would have been enough to produce a Tibetan ice-sheet. If, however, the Tibetan plateau was very little more glaciated during the Pleistocene Ice Age than at present, then probably the factor which prevented the formation of an ice-sheet was extreme aridity. Peary Land is a present-day example of a country cold enough to support an ice-sheet but which is unglaciated because of the small precipitation.

The characteristics of the river valleys of Tibet and the gorges of the Himalaya will be given below when the problem of the formation of the Himalayan range is touched upon.

THE ROCK GROUPS

The Gangetic Plain is composed of sands and gravels, the products of the disintegration of the Himalaya which have been carried down and deposited in their present position by the powerful Himalayan rivers such as the Tista and Arun. The material is spread out over an area which was sea, geologically speaking, not long ago.

The outermost foot-hills of the Eastern Himalaya consist of coarse sandstones and pebble beds of Tertiary age, which in composition are the same as the present-day Gangetic alluvium, but are more compacted and cemented. This material was brought down by rivers in Tertiary times from the young and probably lower Himalayan range, and has since been incorporated in the foot-hills of the present range as a result of later mountain-building earth movements.

The Tertiary rocks are overlain by a group consisting of shales and sandstones with occasional impersistent and crushed coal-beds. Fossil plants have been found in the shales, and prove that the group belongs to the Damuda Series, which is of widespread occurrence in peninsular India and is roughly of Permian age. Earth movement has reversed the normal order of super-position, as the older Permian rocks are found resting on the Tertiary sandstones. This observation, made by Mallet as long ago as 1874, now affords a clue to the structure of the Eastern Himalaya, which will be followed up in the section dealing with the origin of the range.

Overlying the coal-bearing beds is a group of rocks called the Daling Series, consisting of green schists with here and there black graphitic schists and light-green quartzites. This series extends along the outer margin of the Himalaya, and also up the Tista and Rangit rivers as far as Dikchu and Trashiding. Although the Daling Series overlies the beds of Permian age, it

can be safely assumed that the present order of super-position is due to mountain-building movements, and that the Daling Series is actually older than Permian.

The Tertiary sandstones and conglomerates, the Damuda Series and the Daling Series are crossed during the first half of the journey from the plains to Darjeeling (see the geological map at end of volume; beyond this point the so-called Darjeeling Gneiss begins. This is a banded group consisting partly of igneous and partly of sedimentary material with such minerals as garnet and sillimanite in the sedimentary part, proving that the rocks have been subjected to higher temperature and pressure than the green schists of the Daling Series. At present the age and relations of the Darjeeling Gneiss are obscure.

During the journey from the Tista valley over the Nalu La into the Chumbi valley of Tibet, rocks of the Daling Series are crossed as far as Gangtok. Here for the first time a foliated granite with tourmaline and white mica is found, which is injected into rocks regarded as belonging to the Daling Series. These rocks are more metamorphosed than the typical Daling Series and have developed pink garnets; they begin to resemble the Darjeeling Gneiss, and this may one day afford a clue to the origin of the latter. It is clear that the foliated granite or granite gneiss occurring at Gangtok was injected during the mountain-building movements which produced the Himalaya and is therefore of Tertiary age.

Beyond Gangtok there is abundant foliated granite, but it is here found injecting rocks which resemble the ancient rocks of peninsular India. It is not easy to give definite criteria for distinguishing between the older granite gneisses and the younger injecting granite gneisses which are probably Tertiary in age. The older granite gneisses differ, however, in being characteristically garnet-bearing, and in being associated with amphibolite bands, and intensely metamorphosed limestones, quartzites, and shales. The sedimentary beds are up-ended and follow a north-west to south-east direction. The fact that this direction is not the general direction of the Eastern Himalaya is evidence that they once formed part of an earlier mountain



PLATE 54.—The lower part of the East Rongbuk Glacier from
above Camp I.

range trending in a different direction from that of the present-day range.

Beyond the Natu La foliated and massive granites are the dominant rock types, and I believe both are Tertiary in age. As Gautsa in the Chumbi valley is approached only the highly characteristic, massive muscovite-tourmaline-granite of the upper Chumbi valley is found. Along its northern edge the Chumbi granite injects and metamorphoses sediments of the Tibetan plateau and must be later in age than these. It is also quite uncrushed, and must therefore have been intruded after the compressive Tertiary mountain-building movements.

The Chumbi river has cut a narrow gorge through the granite, and the road has to wind between and over huge granite blocks that have fallen from the steep valley sides. Then at Dotag the valley widens abruptly because the softer rocks of the Tibetan sedimentary zone have been reached.

The rocks of the Tibetan sedimentary zone between Kampa Dzong and Lhasa were described by Hayden in 1904, and similar rocks were subsequently described by Heron in the region to the north of Mount Everest. The relatively low ground with dark rounded hills lying immediately to the north of the Himalaya is made of a thick series of slightly hardened Jurassic shales. The one-time flat bedded shales can often be seen to be intricately folded, due to compression in a north to south direction. Narrow zones which are over-folded synclines of younger rocks (Cretaceous to Eocene) stretch in roughly east to west lines across the plateau. These younger rocks consist mainly of hard limestones, and so form the slightly higher ranges, such as the hills near Kampa Dzong and the Tsipri range which stretches west from Shekar. Kampa Dzong and Shekar Dzong (plates 11 and 14), two of the important fortresses of this part of Tibet, are built on the steep rocky mountains formed of the Cretaceous limestones.

The rocks of the Mount Everest district itself were first mapped and described by Odell. The valleys occupied by the main Rongbuk and East Rongbuk glaciers were shown by him to be cut out of a succession of rocks conveniently divided

into three series. The lowest is a limestone, now highly metamorphosed, which is only visible between the Base Camp and Camp I. The middle series, some 3,000 feet thick and conveniently called the Mount Everest Pelitic Series, consists dominantly of metamorphosed shales. This gives rise to the dark cliffs worn into fantastic-shaped pinnacles which occur on both sides of the East Rongbuk glacier. The upper series is also limestone, and will here be named the Mount Everest Limestone Series, since it forms the top 1,000 feet of the mountain. All these rocks, but especially the lower ones, have been extensively injected by sheets and lenses of granite and granite gneiss (fig. 1).

The form of Mount Everest and its detailed features are to some extent controlled by the character of the rocks of which it is composed. When seen from the Base Camp the mountain consists apparently of horizontal bands of rock. Actually the dip of the beds is about 30° towards the north, that is towards the Base Camp, a feature which is not realised till the mountain either is being ascended or is seen from the east. On the north-east ridge the Mount Everest Pelitic Series is found up to a height of 27,500 feet, at which point it gives place fairly abruptly to a zone known as the Yellow Slabs. The rocks here consist mainly of yellow schistose limestones approaching marble in degree of metamorphism; they are to be regarded as the lower part of the Mount Everest Limestone Series. The Yellow Slabs form a moderately steep band from about 27,500 feet to 28,000 feet. Since the bedding dips north at 30° , and since the general angle of the slope is greater, say 50° , the arrangement of the zone of Yellow Slabs is like that of the tiles of a roof (fig. 2).

Above the Yellow Slabs is the steeper band of rock which stretches from the first and second steps completely across the north face of the mountain. A fragment of this band, brought back this year, showed it to be a dark-grey, somewhat shattered and altered limestone. Being more resistant than the schistose limestone of the Yellow Slabs, it forms a bold feature, in some places actually overhanging the zone of Yellow Slabs. There is

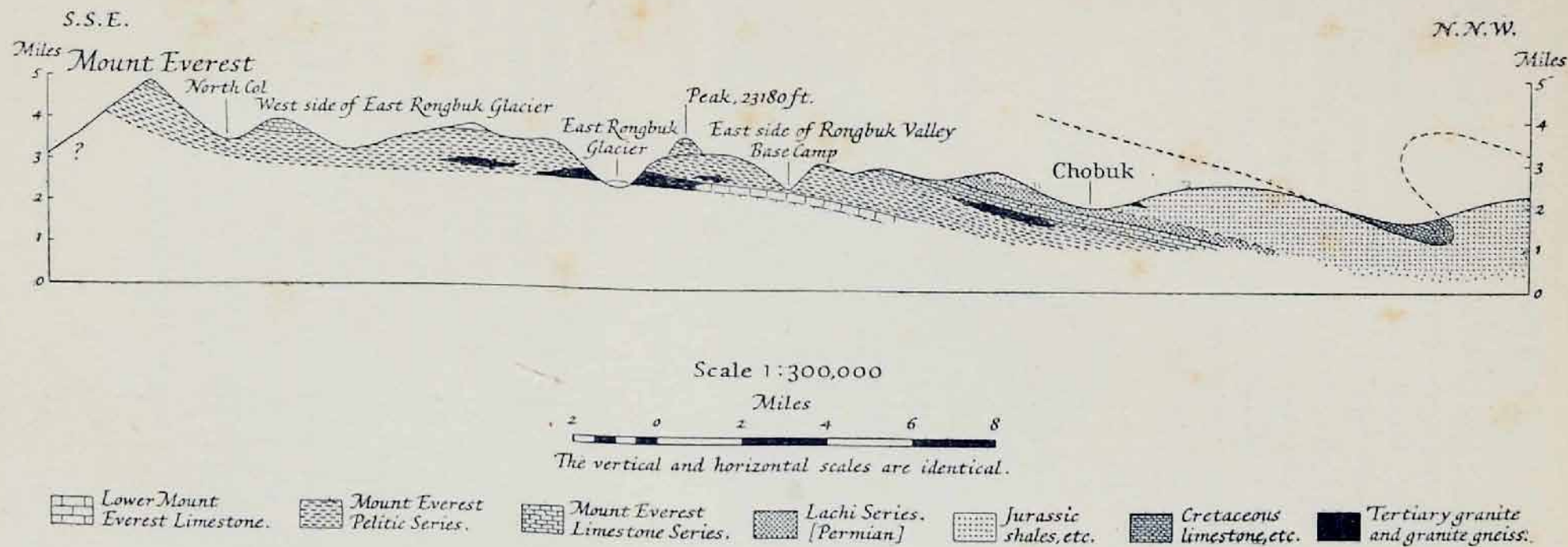


Fig. 1.—SECTION THROUGH MOUNT EVEREST AND THE REGION TO THE NORTH.
For the sake of clearness the section is generalised near Chobuk.

little doubt that the top 1,000 feet of the final pyramid is also composed of this same grey limestone.

The map which Odell has published represents as Mount Everest limestone the tops of the following surrounding peaks : North Peak, Khartaphu, Peak 23, 180 ft., and Gyachung Kang. None of these peaks has actually been ascended, but their appearance from a distance leaves little doubt of the correctness of this mapping. Nine miles north of the Base Camp the Mount Everest Limestone Series, owing to a northward dip of

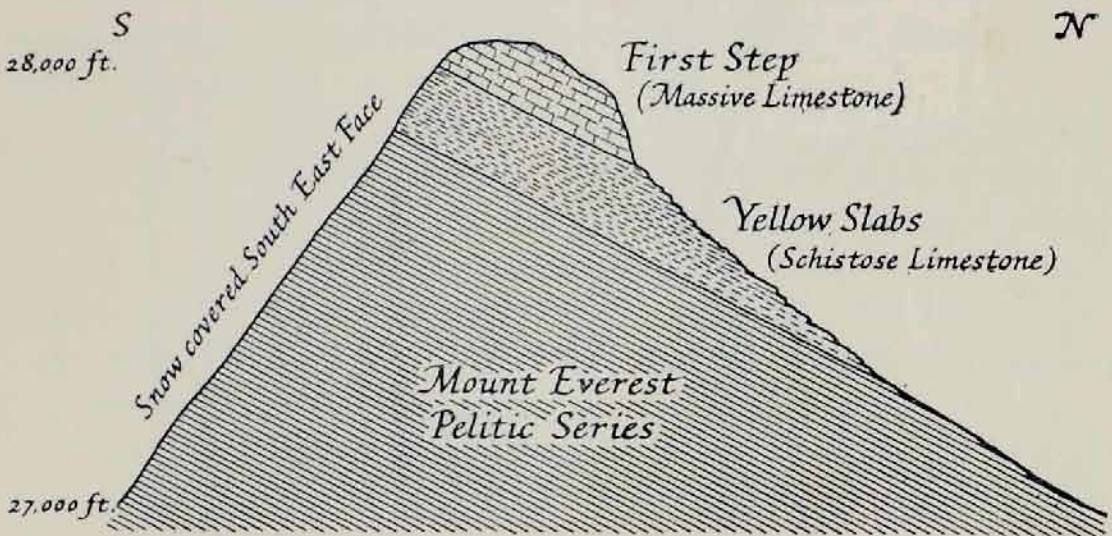


Fig. 2.—CROSS-SECTION OF THE UPPER PART OF THE NORTH-EAST RIDGE OF MOUNT EVEREST.

about 10° , descends from its position on the summit of the higher peaks and forms a continuous band along the lower ground.

Near the junction of the Rong Chu and the Gyachung Chu the combined rivers cut through the Mount Everest Limestone in a short gorge. Here the limestone is at least 1,000 feet thick, and it still overlies the Mount Everest Pelitic Series. Although there are complications due to faulting, omitted in fig. 1, the limestone continues in general its northward dip and disappears under the younger sediments of the Tibetan plateau. The Mount Everest limestone is the same as that mapped by Heron to the east and west of the Rongbuk valley, and called by him "Permo-Trias?" This year the same limestone was traced with but few breaks into Northern Sikkim, where it



PLATE 55.—Pinnacles on the East Rongbuk Glacier two miles
above the snout.

was found still to overlie the Mount Everest Pelitic Series. Here, as in the Mount Everest region, the pelitic series is much injected by granite and granite gneiss.

Near the Dongkya La in the extreme north of Sikkim, where Hooker in 1848 found indeterminate fossils, a new locality was found this year for quite well-preserved fossils. These occur in a calcareous sandstone associated with quartzites and hardened shales. Together these rocks form a distinct series overlying the Mount Everest limestone and underlying the typical Jurassic shales of Tibet; and it is proposed to call them the Lachi Series from the local name of the hills in North Sikkim in which the fossiliferous horizon occurs. The fossils, which are dominantly brachiopods, are being examined by Miss H. M. Muir-Wood, who considers that the series is approximately Permo-Carboniferous in age.

The occurrence of fossils by which the age of the Lachi beds can be determined makes possible certain new correlations. Thus the Mount Everest limestone which immediately underlies the Lachi Series is probably Permo-Carboniferous or Carboniferous in age and not Permo-Trias, as was formerly suggested. Also the Mount Everest Pelitic Series is probably of the same age as the Daling Series, since they were both apparently deposited in the interval immediately preceding the Permo-Carboniferous or Carboniferous periods.

The sedimentary beds of Tibet were laid down in an ancient sea to which the Austrian geologist, Suess, gave the name Tethys. This sea at one time stretched across Southern Europe and Central Asia, and its southern border, of which the present peninsular India forms part, was an extensive land mass known as Gondwana Land. The northern edge of this land was roughly the present line of the Himalaya. In Eastern Nepal and Sikkim, during a phase when the Tethys extended more to the south, the Mount Everest Pelitic Series and the Daling Series were laid down. Then, owing to uplift of the southern area, which caused a northward movement of the coastline, the Darjeeling district became land and the Damuda Series, which is a land deposit, was formed. At the same

time to the north and to the east of the Darjeeling district there was still sea, and in this the Mount Everest Limestone Series and the Baxa Series of the Duars were forming. In the north the sea persisted so that the Mount Everest Limestone Series was followed by the Lachi Series, consisting of shallow water deposits with some marine fossils. Then for a long period conditions remained the same. In the south land persisted, while to the north thick Jurassic shales and Cretaceous limestones were laid down in the Tethys sea. With the advent of the Tertiary period the Tethys rapidly shallowed, and coarse sandstones, which are almost pebble beds, were formed. This was the beginning of a mysterious series of changes which turned the eastern end of the formerly deep Tethys sea into the Himalayan ranges and the Plateau of Tibet. To the south at about this time the Tertiary sandstone and conglomerates were forming, the materials for which came from the erosion of the slowly rising Himalaya. Continued mountain-building movement later incorporated these deposits into the present-day range.

THE MECHANISM OF THE FORMATION OF THE HIMALAYA

In the preceding section the materials which compose the Eastern Himalaya have been described and their origin related to the geography of past times. In the present section an attempt will be made to explain how the sediments laid down in the Tethys sea became elevated into the high Plateau of Tibet and the Himalayan range.

From the evidence in Tibet of intricate folding of once horizontal sediments, and from the evidence in the Darjeeling district of complete overturning of the sediments, it is clear that horizontal compression has been the main factor in the production of the Himalaya as in the Alps and other ranges. This compression, in a north to south direction, folded the sediments laid down in the Tethys sea and presumably also the underlying deeply buried rock floor, but the region which was formerly Gondwana Land resisted folding. Along the southern

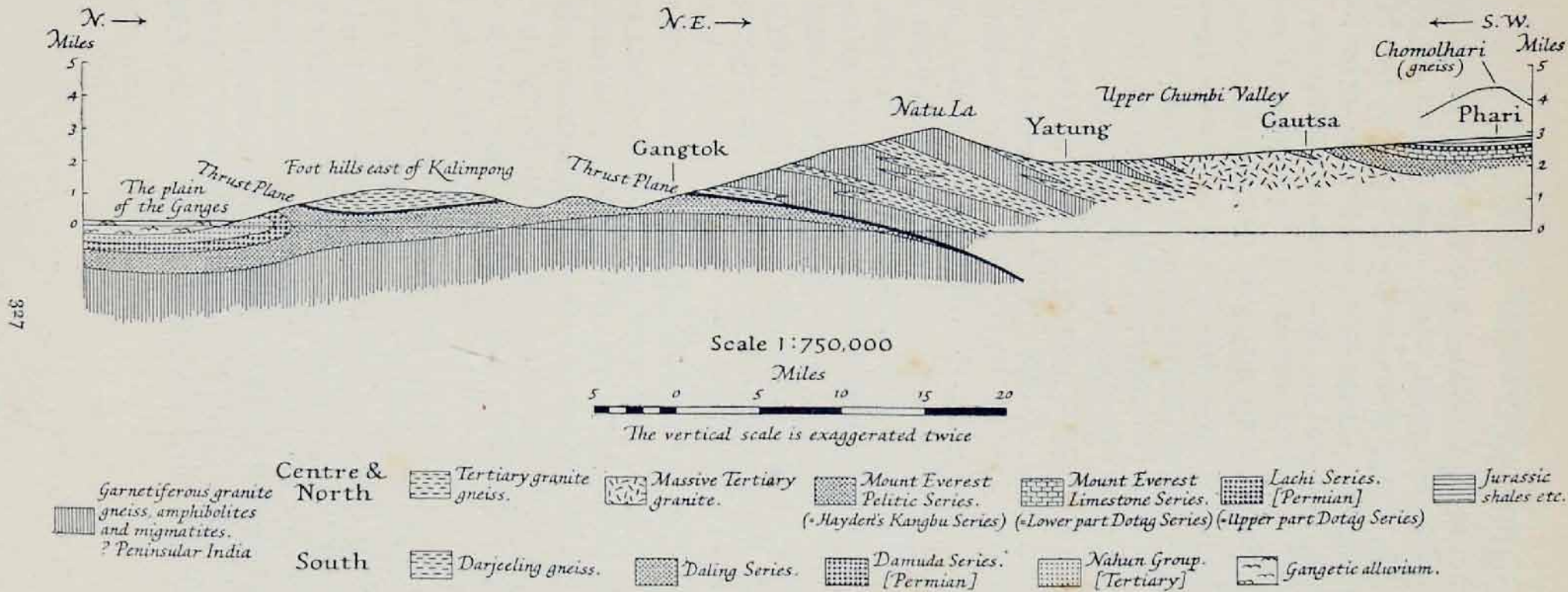


Fig. 3.—GENERALISED SECTION THROUGH THE SIKKIM HIMALAYA.

edge of the belt of folding a great slice of the Earth's crust, including old rocks which once formed the extreme northern edge of Gondwana Land, seems to have moved southwards, overriding the Daling Series and rucking up the Damuda and Tertiary beds (fig. 3). In association with this violent earth-movement granite magma was injected into the upper part of the Earth's crust and gave rise to such rocks as the massive Chumbi granite, and the later granite gneisses of Gangtok, the Mount Everest region and elsewhere.

Besides horizontal compression which has produced the folding, and which must be regarded as the primary cause of the formation of the Himalaya and the Plateau of Tibet, there is evidence of a purely vertical uplift which has considerably increased the height of the region which is now the Himalaya. As maps were gradually made, the remarkable fact emerged that many of the big rivers of the Himalaya, such as the Arun and Tista, had their source behind the main range in one of the smaller ranges that cross Tibet in an east-west direction. The Arun river, for instance, has its origin in a series of streams draining from the Ladakh range, a low watershed which lies just to the south of the Bramaputra and nowhere rises above 22,000 feet. For part of its length the Arun has an east-west course in what is now a slight depression of the Tibetan plateau between the Ladakh range and the main range of the Himalaya. Then it turns southwards and cuts through the Himalaya in a series of gorges. Here the Himalaya is at its highest; immediately to the east of the river is Kangchenjunga, immediately to the west is Mount Everest, and these mountains rise 7,000 feet above the highest peaks of the Ladakh range where the river has its source.

The remarkable behaviour of the Arun is by no means unique among Himalayan rivers, and two opposed hypotheses have been offered in explanation; one is that rivers of steep gradient and large dimension flowing down the southern slopes of the Himalaya have cut back through the range and captured east-west flowing Tibetan rivers. The other explanation, which is to my mind more probable, is that the Arun and

similar rivers have always had approximately their present course, established at a time when there was a continuous slope from the Ladakh range to the Plains of India, and that the Himalayan mountains have risen across the course of the rivers, but so slowly that the rivers managed, by rapid erosion, to keep their channels open.

There is a plausible conception of the structure of the Earth's crust which was first put forward by Sir George Airy on the basis of work carried out by the Indian Geodetic Survey. Briefly stated, the Airy hypothesis suggests that the crust of the Earth consists essentially of two different materials—granite, forming the continental masses, and basalt, in which the lighter granite of the continents is floating much as an iceberg floats in water.

Analogy with a floating iceberg is only of value in illustrating the particular aspect of the Earth's crust which is relevant here. In one way it gives a completely false idea, as the basalt in which the granite is considered to be floating has considerable rigidity and strength. Only when a large area is considered is it legitimate to postulate that the granitic layer takes up a position which is controlled by the specific gravity difference between granite and basalt. Even then the degree of approximation to the relative positions which would be taken up if hydrostatic forces were the only significant ones is open to doubt. It must be realised that this conception of floating granite continents is only one explanation of the facts on which the so-called isostatic theory rests, but nevertheless it is of value to consider the implications of this conception in the case of the Himalaya.

It is possible from the existing map of Sikkim, interpreted in the light of observations made during the expedition, to show that, for the country between Lat. $27^{\circ} 30'$ and Lat. $28^{\circ} 0'$, the volume of land above 16,000 feet is almost equal to the volume of the valleys below 16,000 feet. This level of 16,000 feet is significant because it is the general height of the southern part of the Tibetan plateau. The region for which the calculation was made includes such great differences

in height as Kangchenjunga, 28,146 feet, and the Tista valley as low as 4,000 feet. The volume relationships show that by planing off the mountains down to 16,000 feet and filling them into the valleys the country could be levelled up to a plateau 16,000 feet in height, and since no material would have been added or removed there would be no upsetting of the postulated hydrostatic balance of the crust. In its relation to the crust as a whole the Sikkim Himalaya are therefore equivalent to the extension southwards of the Tibetan plateau at a height of about 16,000 feet.

Let it be supposed that the compressive mountain-building movements produced no localised Himalayan range, but only the Tibetan plateau extending southwards over the region where the Himalaya now are and then falling away gently towards the plains, and let it also be supposed that on the plateau there was an indefinite watershed where the existing watershed of the Arun now lies. On the southern slopes of the plateau there would be high rainfall, and rivers of steep gradients would rapidly cut out deep valleys. The material removed by the rivers would tend to upset the postulated hydrostatic equilibrium, but it is suggested that this has been readjusted by an upward arching of the crust along the belt where the Himalaya now stand. The up-warping, raising the ridges and peaks, is regarded as the direct result of the lowering of the valleys by river erosion, and it has occurred in such a way that if at any particular time the mountains were levelled up by piling into the valleys the plateau so formed would approximate to the more extended Tibetan plateau, which it has been assumed was produced initially by the compressional earth movements. In this way it is believed that the border of the plateau has been slowly turned into a region of deep valleys and high peaks, while rivers like the Arun show the anomaly of flowing through a mountain range higher than the range in which they have their source.

There is evidence to show that the upward arching movement was probably by no means regular : Since the maximum

extension of the glaciers there has been in the upper Arun drainage area a period when an average of 300 feet of river gravels have been laid down in all the valleys. This may well have been due to a period of more rapid rising of the barrier of the Himalaya. Since the time of this aggradation, there has been a period during which the Arun and its tributaries have cut down 200 or 300 feet into the gravels which they had formerly deposited. This probably corresponds to a temporary cessation of the uplift of the Himalaya.

Although this is not the place to discuss more fully the evidence for these views, or to elaborate the undoubtedly over-simple statement of the mechanism, it is interesting to note that Hayden and Burrard thirty years ago, without drawing any conclusions, pointed out that for the Himalaya as a whole, the higher parts were found where the watershed lies behind the range, and the rivers cut through it in deep gorges; in those parts where the watershed is along the range, no gorges exist and the general height of the range is lower. The association of Mount Everest and Kangchenjunga, with the deep-cut gorges of the Rongshar, Arun and Tista, is a particular case of this, and, in the view here taken, the association is not a coincidence. Perhaps the high annual rainfall of the Eastern Himalaya, the greatest in the world, instead of causing the rapid eroding away of the mountains is actually an important factor in making them the highest land on the Earth's surface.

The production of the Himalayan range would thus appear to be divided into two distinct episodes; first—the formation of a high plateau due to folding caused by horizontal compression, and second—upward arching of the southern border of the plateau to give the localised belt of high peaks. The slight upward warping of the crust which actually gives the Himalaya its dominance is not easily demonstrated by the usual geological methods. The conception of a late stage vertical uplift here put forward will not be subscribed to by many geologists, and it must be regarded as a hypothesis to be confirmed or abandoned as our knowledge of the Himalaya is extended.

DATA

In the preceding sections attention has been paid mainly to general conclusions rather than the evidence on which they were based. In the present section will be given some of the evidence—especially that connected with the stratigraphical relationships. This will unavoidably involve slight repetition.

The key to the stratigraphical sequence in Sikkim and the adjacent parts of the Himalaya is, I think, provided by the Mount Everest limestone, which is easy to recognise lithologically and easy to map. It is a massive limestone, over 1,000 feet thick, with arenaceous impurities, if any, and, where it is now exposed, it has not suffered the same intricate folding as the younger, dominantly argillaceous beds to the north. Moreover, it seems to be resistant to granite injection, and from Mount Everest to the neighbourhood of Phari it usually marks the upward limit of complications due to this.

The limestone which caps Mount Everest and the surrounding high peaks forms a continuous band fifteen miles to the north, and it was here that Heron¹ mapped and called it "Permo-Trias?" This year, Heron's so-called Permo-Triassic limestone was traced eastwards into the limestone which Garwood² found in the range on the north side of the Lhonak valley. The same limestone was picked up again at the south end of the Lachi ridge, and it also occurs in the Chumbi valley at the base of Hayden's Dotag Group.³ In 1848 Hooker⁴ found and described a limestone from Tso Lhamo, immediately north of the Dongkya La in northern Sikkim. Garwood suggested tentatively that Hooker's limestone and the one which he found on the north side of the Lhonak valley were the same. It is clear that Hayden later doubted the correctness of this corre-

¹ Heron, A. M., "Geological Results of the Mount Everest Reconnaissance Expedition." *Records Geological Survey of India*, Vol. LIV, Part 2, 1922, pp. 215-34, and *Geographical Journal*, Vol. LIX, No. 6, 1922, pp. 418-31.

² Garwood, E. J., "The Geological Structure and Physical Features of Sikkim," Appendix to *Round Kangchenjunga*, by Douglas W. Freshfield, London, 1903.

³ Hayden, H. H., "The Geology of the Provinces of Tsang and Ü in Central Tibet." *Memoirs Geological Survey of India*, Vol. XXXVI, Part 2, 1907, pp. 1-80.

⁴ Hooker, J. D., *Himalayan Journals*, London, 1854, Vol. II, pp. 176-77.



PLATE 56.—Mount Everest from the Base Camp in April.
Fracto-cumulus clouds in the west wind.

lation, but he was not able to visit both localities. The Tso Lhamo limestone of Hooker is a thin blue limestone associated with shales, and is certainly not the same as the Mount Everest limestone which was found this year in the neighbourhood. It probably belongs to the Lachi Series which overlies the Mount Everest limestone. It is proposed that the name Mount Everest Limestone Series be used for the important stratigraphical unit which up to the present has received different names in different districts. Under this new name should now be included Odell's Upper Calcareous Series of the Mount Everest region,¹ Heron's "Permo-Trias?" of the district to the north, the limestone which Garwood found on the north side of the Lhonak valley, and the thick limestone occurring at the base of Hayden's Dotag Series in the Chumbi valley.

This year specifically identifiable fossils, mostly brachiopods, were found in a series of quartzites, limestones, hardened shales, and pebble beds² which form the Lachi ridge, a spur near Tso Lhamo just north of Kangchenjau. Miss Muir-Wood, who is describing these fossils, considers that the fauna is Lower Permian in age. Hayden found similar quartzites and shales in the Chumbi valley, which he included in the Dotag Group, and Odell noticed quartzites and shales which he thought might be a distinct series above Heron's "Permo-Trias?" north-west of Mount Everest. This series, especially now that its age can be determined by fossil evidence, is of sufficient importance to receive a distinct name, and it is proposed to call it the Lachi Series, from the locality whence the Lower Permian fossils come.

In 1922 Heron³ suggested that what is now called the Mount Everest Limestone Series was Permo-Triassic in age.

¹ Odell, N. E., "Observations on the Rocks and Glaciers of Mount Everest," *Geographical Journal*, Vol. LXVI, No. 4, 1925, pp. 289-314, and appendix to *The Fight for Everest*, London, 1924.

² Mr. J. B. Auden, of the Geological Survey of India, has seen specimens of the pebble beds, and considers that they are lithologically similar to the Blaini beds of the Simla and Mussoorie districts.

³ Loc. cit., *Records Geological Survey of India*, pp. 232-33.

This was based on lithological similarity to the Kioto limestone of Spiti and on the evidence of squashed Productids and Spirifers, found immediately above the limestone near Chödzong. The Mount Everest limestone lies immediately below the Lachi Series on the Lachi ridge, and also in the Chumbi valley and to the north of Mount Everest. It is thus safe to assume that the Lachi Series passes down without unconformity into the Mount Everest limestone. Since the Lachi Series is Lower Permian, the Mount Everest Limestone Series must be of Permo-Carboniferous age and perhaps also older.

Above the Lachi Series the oldest fauna so far known was found by Hayden in the Chumbi valley, and was ascribed by him to the Lias or Rhætic.¹ Neither Hayden nor Heron, to whom we owe our knowledge of the younger sediments of the Tibetan plateau north of Sikkim and Eastern Nepal, found any fossils of Triassic age, but it is likely that Triassic rocks, although still unrecognised, will one day be found among the shales which are now classified as Jurassic.

Odell has shown that, underlying the Mount Everest Limestone Series in the Mount Everest neighbourhood, there exists a dominantly pelitic group of rocks which he sometimes called the "Gneissose Biotite Series" and sometimes the "Banded Biotite Gneiss." This series was also found underlying the Mount Everest limestone in the Lashar plain and the Lhonak valley, and Odell has also described it from the Rongshar valley. It is clear, therefore, that between the dominantly pelitic series and the Mount Everest limestone, there is no unconformity as was tentatively suggested by Odell nor a thrust as stated by Dyrenfurth.² Because it is desirable to stress the sedimentary character of this group, it is preferable to change Odell's tentative names to the Mount Everest Pelitic Series.

Evidence has been given for regarding the Mount Everest Limestone Series as approximately Permo-Carboniferous, and thus the Mount Everest Pelitic Series, lying conformably below,

¹ Loc. cit., p. 26.

Dyrenfurth, G. O., *Himalaya—Unsere Expedition, 1930*. Berlin, pp. 293–311.

must be Carboniferous in age or slightly older. Hayden considered that his Khangbu Series in the Upper Chumbi valley lay below the Dotag Group.¹ He first suggested a Palæozoic age for the series, but later thought it more likely to be Pre-Cambrian. The series being equivalent to the Mount Everest Pelitic Series is now proved to be of Palæozoic age.

A stage in the study of the Eastern Himalaya seems to have been reached when correlation is possible between the rocks of the northern border and those in the foot-hills to the south. By showing that the Damuda Series overlies Tertiary rocks in the Darjeeling district, Mallet,² in 1874, proved the wholesale inversion of the rocks of the foot-hill region, although in those days the facts were not explained in this way. In the Darjeeling district and the Western Duars the descending geological sequence may now be interpreted :

Nahun Group (Tertiary).

(*Unconformity*)

Damuda Series (approximately Permian).

Baxa Series (present in the Duars only).

Daling Series.

On fossil evidence the Damuda Series and the Lachi Series are now proved to be roughly equivalent in age. The Baxa Series of the Duars includes thick dolomitic limestones, and is probably the continuation of the Mount Everest Limestone Series. In the Darjeeling and Katmandu districts the Baxa Series is missing. It is probable that this is not the result of earth movement, but of a non-sequence between the Damuda Series and Daling Series in these districts, a reasonable supposition, since the Damuda Series is terrestrial in origin. The Daling Series is dominantly pelitic, and is probably the equivalent of the Mount Everest Pelitic Series. These two series are different in present appearance, because

¹ Op. cit., p. 20.

² Mallet, F. R., "On the Geology of the Darjiling District and the Western Duars," *Memoirs Geological Survey of India*, Vol. XI, Pt. 1, 1874, pp. 1-96.

the Mount Everest Pelitic Series has suffered, in its type locality, a metamorphism between thermal and regional in character, while the Daling Series is dominantly a chlorite schist, the result of pure regional metamorphism

Until a microscopic examination has been made, a discussion of the intrusive igneous rocks and the various rocks of the metamorphic zone will not be attempted in more detail than has already been given in the general part of this essay. The exact separation of the Tertiary gneisses from the earlier ones will always be a matter of great difficulty. Besides their occurrence in the Natu La region, rocks considered to belong to the older series were noted about Tsuntang in the Tista valley and in the Nyönno Ri range. Similar rocks were found by Garwood in western Sikkim.

Hayden and Heron both accepted the hypothesis that the present remarkable drainage system was produced by the Himalayan rivers cutting back through the range and capturing east-west flowing Tibetan rivers. Odell was inclined to favour the alternative view here adopted of uplift of the Himalayan range subsequent to the establishment of the present drainage pattern.¹ He suggested that the uplift in the Nyönno Ri range might be due to the intrusion of a late granite, but in 1933 the range was visited and found to consist very largely of rocks belonging to the older gneisses of peninsular India type. Although not dealing specifically with the Himalaya, Nansen² and Jeffreys³ have both considered as theoretically probable such late-stage vertical uplift of mountain ranges as has been suggested here.

Hayden and Burrard's classic work⁴ on the geography and geology of the Himalaya Mountains and Tibet has been a continual source of information in considering all geomorphological problems.

¹ Odell, N. E., "Observations on the Rocks and Glaciers of Mount Everest," *Geographical Journal*, Vol. LXVI, No. 4, 1925, p. 300.

² Nansen, F., "The Earth's Crust: Its Surface-Forms and Isostatic Adjustment." *Norske Videnskaps-Akademi*, 1 Oslo 1 *Mat. Natur. Klasse*, 1927, No. 12, 1928, pp. 1-21.

³ Jeffreys, H., *Gerlands Beiträge zur Geophysik*. Bd. XVIII Heft 1/2, 1927, pp. 17-18.

⁴ Burrard, S. G., and Hayden, H. H., *A Sketch of the Geography and Geology of the Himalaya Mountains and Tibet*. Calcutta, 1907.



PLATE 57.—Capping cloud on Mount Everest, 9.30 a.m. on
the 17th June, 1933.

and snow conditions experienced by the reconnaissance expedition from the middle of June to the middle of September 1921.¹ Unfortunately, only scattered observations have been recorded for the 1922 and 1924 expeditions. Rutledge, therefore, wisely determined that this year systematic weather observations should be made. These were entrusted to me, but I received help from other members of the expedition and especially from Smijth-Windham. On the basis of these observations an account is here given of the weather experienced during our crossing of Tibet in March and the first half of April, and during our stay in the neighbourhood of Mount Everest from the middle of April to the beginning of July.

The Indian Meteorological Department offered to give us all the information that they could about weather conditions, and in particular when the monsoon might be expected. Thus weather reports and forecasts were received twice daily at the Base Camp from Dr. Sen, the director of the Meteorological Station at Alipore, and we on our side sent to Alipore our daily weather observations. Dr. Sen is, himself, to give an account of the basis of his forecasts. Since weather in mountain districts is usually so capricious, we were at first sceptical of the value of Dr. Sen's predictions, but a careful comparison with our weather log has shown an unexpected agreement. Weather bulletins of the sort received in 1933 would be of great value to future expeditions now that some faith in their validity has been built up.

THE WEATHER DURING THE MARCH FROM DARJEELING TO THE BASE CAMP

During the latter half of February we watched the Kangchenjunga group from Darjeeling. Usually the high mountains were visible early in the morning, but between 7 and 9 a.m. they were blotted out by cumulus clouds which formed above the deeper valleys. Just before this happened, Kangchenjunga

¹ Mallory, G. H. L., in *Mount Everest: the Reconnaissance, 1921*, Chap. XVI.

was usually seen to develop a cloud flag indicating a powerful west wind. This west wind became extremely familiar to us later, as it blew daily, almost without exception, during the time the expedition was in Tibet.

Near the beginning of the journey, during a stay from March 9th to 15th at Tsomgo, close to the Natu La, the mornings were clear, but usually ragged clouds (the cumulus seen from Darjeeling) surrounded us in the latter part of the day. These clouds were drifting from low levels up the valley, whatever that direction might be, and on three occasions hail fell from them which was sufficient to whiten the ground. During six days in the Chumbi valley at Gautsa, 12,000 feet, there was slight snow on three afternoons, and at Phari, 14,500 feet, on the afternoon and evening of March 22nd, five inches of snow fell; this was brought, like the snow at Gautsa, by gentle up-valley winds. The snow which fell at Phari, except that in the shadow, had disappeared by the following midday, mainly by sublimation and not by melting. Considerable falls of snow are expected by the Tibetans in March at Phari, but at Gyantse, 100 miles farther north, there is at this time practically no precipitation.¹

For one more march, that over the Tang La to Shabra Shubra rest-house, we were under the direct influence of clouds blowing up the Chumbi valley, and as we crossed the pass there was a slight snowfall from fracto-cumulus clouds drifting past us. At Shabra Shubra we had the most severe weather of the whole journey through Tibet. Here, during the afternoon of March 25th, a south-south-west wind reached force 6 of the Beaufort Scale. The minimum temperature during the night was -4° F., and it was only $+4^{\circ}$ at 6.15 a.m. the following morning, when we were having breakfast in the open. On this day, as fortunately was usual, there was no wind at breakfast time, but at 9 a.m. a north-west wind arose which was sufficient to produce blizzard up

¹ This information is derived from a paper in the *Ibis* for October 1927, on the Birds of Gyantse, by Frank Ludlow. Although there is a British Military Outpost at Gyantse, apparently no weather record is kept.

to fifty feet above the ground. Towards the end of the day's march we had reached a region where, although higher, there was too little snow lying to allow of the formation of any appreciable drift. The snow to the north of Tang La was practically confined to the Tang Pun Sum Plain. This local distribution of snow is due to the Chumbi valley, which allows moist air to be brought up from the south; as might be expected, highly local conditions prevail at the junction of the Himalaya and the Tibetan plateau.

From Mating to the immediate neighbourhood of Mount Everest, more uniform weather was experienced, as our route lay some way north of the Himalaya over the southern part of the Tibetan Plateau. The following generalisations apply to the period from March 27th to April 16th during the journey from Mating via Kampa Dzong, Tengkye Dzong and Shekar Dzong to Rongbuk.

The barometer (a Carey Aneroid) was read each day at about 6 p.m. and at the same place on the following day at 6 a.m. With only four exceptions during the eighteen days for which measurements are satisfactory, the atmospheric pressure was greater in the morning. The average difference between morning and evening readings was $\cdot 05$ inch, and the maximum difference was $\cdot 09$ inch. The maximum diurnal variation was presumably greater than this.

Over the same period, on seventeen days the early mornings were calm, and on the other five days there was a slight wind which never attained more than force 1. But between 9 or 10 a.m. on most days a west wind began to be felt which reached its maximum, about force 5 or 6, early in the afternoon. These winds are so unpleasant that, at any rate in the colder part of the year, the Tibetans travel only in the morning, often starting before it is light. The expedition followed as far as it could the native custom, and was usually in camp by 1 or 2 p.m. On five days out of the twenty-two here considered the wind is recorded as slight. Three of these days followed unusual nights when the barometer was lower in the morning than in the previous evening. The



PLATE 58.—Cumulus clouds, with false cirrus above, obscuring
Mount Everest, 2.40 p.m. on the 17th June, 1933.

daily rise and fall in the strength of the wind is perhaps directly connected with the marked daily variation in pressure, but Dr. Sen is more competent to trace such connections than I am.

The daily temperature range was always considerable, as the nights were clear and the days sunny. Minimum temperature observations were made for most nights, but daily maximum temperatures could only be taken on non-travelling days. Although the height of our camps averaged about 14,000 feet, there was considerable variation and little value therefore in quoting an exact average minimum temperature. The lowest minimum of -4° F. was at Shabra Shubra, 14,900 feet, on the night of March 25th. Between Kampa Dzong and Shekar the minimum varied from $+6^{\circ}$ to $+23^{\circ}$ F. and averaged about $+15^{\circ}$ F. The daily range of temperature was recorded for those places where we stayed for two or more nights. At Kampa Dzong on March 31st, the range was a little more than 30° F., at Tengkye on April 4th it was at least 45° F., and at Shekar on April 11th at least 30° F.

On twelve out of the twenty-two days the sky was clear in the early morning, but even on these days clouds appeared later. Over Tibet, cumulus and fracto-cumulus clouds, blown by a west wind, were commonest. Cirrus and cirro-cumulus and alto-stratus clouds appeared on several occasions, and in certain cases, namely at Kampa Dzong, Khenga and Shekar, they were succeeded by cumulo-nimbus clouds from which there was a slight snowfall. The intermittent fall of snow at Shekar from 9.30 a.m. to 3 p.m. on April 13th was the greatest that we experienced after the fall at Phari, but it only amounted to half an inch. On this occasion there was a very striking change, due to the moisture in the air, from the usual yellow-and-brown coloration of the Tibetan landscape, so well shown in Somervell's paintings, to blues and purples which reminded us pleasantly of the Hebrides or the west of Ireland. Although no hygrometric measurements were made during the march, the air was obviously dry, and it tended to affect our throats. The only exceptions were on April 12th, 13th and 14th, the

days of the blue and purple distances, and it was then a pleasure to take deep breaths of the moist air. As a result of the usual dryness of the air, hoar-frost was rare, occurring only twice. One of the occasions was the night when the expedition was encamped in the lee of Pauhunri and patches of snow were lying in hollows ; the other was on April 13th, when there had been half an inch of snow, some of which by nightfall had not disappeared from places in shadow. The usual dryness gave a harsh outline to the hills, and visibility was remarkably good except on April 7th, 8th, and the morning of the 9th, when a haze reduced visibility to three miles. These three days succeeded a day of unusually violent wind, and the haze was presumably the result of dust blown into the air.

Although travel in Tibet in March is unpleasant because of the strong and cold winds, and although the conditions would presumably be a little more severe in February than in March, yet the journey through Tibet would not, I believe, be unreasonable either for Europeans or porters if on a future occasion it was decided that the Base Camp ought to be occupied earlier than it was this year.

WEATHER AT THE BASE CAMP AND ABOVE BEFORE THE BEGINNING OF MONSOON CONDITIONS

The Base Camp, at a height of 16,800 feet, lies in the Rongbuk valley which runs approximately north and south between mountains rising to a height of 21,000 feet. Twelve miles to the north the typical Tibetan plateau country begins, and twelve miles to the south is Mount Everest. On the whole the weather at the Base Camp, since it lies north of the main Himalayan range, resembles the weather of Tibet.

When we arrived at the Base Camp on April 17th there were drifts of snow in every slight hollow, and flat areas of gravel were deeply covered by ice from streams which had continued to flow during the winter. We found drinking-water, however, at various places beneath the ice, and this would no doubt be available throughout the winter. It

was cold enough when we first arrived to make windproof clothing and gloves always necessary.

The systematic observations made for April and May at the Base Camp will be dealt with in the same order as has been adopted for those made during the march across Tibet. The barometer (the Carey Aneroid), as was to be expected at those heights, remained much more steady than at sea-level. There seemed to be no significant change when the monsoon conditions set in, and during the whole time we were at the Base Camp, that is, from April 17th to the beginning of July, the barometer fluctuated around 15.98 inches, the lowest value recorded being 15.85 inches and the highest 16.08 inches. The daily variation which was noted during the march across Tibet at an average height of 14,000 feet was equally conspicuous at the Base Camp. Out of fifty-six days for which satisfactory records exist, only on one day was the barometer higher in the evening than in the morning. Before monsoon conditions set in, a general fall in pressure independent of the daily variation was usually accompanied by slight snow. After the beginning of monsoon conditions, similar fluctuations of pressure occurred, but precipitation was by no means limited to the periods of falling pressure.

As the Base Camp is in a narrow valley, the actual wind experienced was either up or down the valley, that is, either north or south. The Base Camp was also sheltered by moraines especially from south winds, and a wind recorded as force 3 from the south meant a wind of force 5 or 6 on the other side of the moraine. The site of the Base Camp, having been chosen because it offered some shelter from the winds, was thus not ideally situated for a weather-recording station. On nearly all early mornings there was a calm or only a slight wind, but usually by 10 or 11 o'clock a wind from the south had developed which was recorded at Base Camp as of force 2 or 3. The motion of the clouds between 20,000 and 30,000 feet in the pre-monsoon interval nearly always indicated a wind from the west of considerable strength. Exceptions occurred on April 18th and 19th, when the movement of the clouds

proved a high north-west current and a north wind was experienced at the Base Camp, and again on May 17th, when fracto-cumulus clouds were blowing up from the east and there was slight snow. In the pre-monsoon period, because of the violent west winds and small precipitation, the mountain appears from the north as a dark rock-face free from snow. This appearance is maintained until towards the end of May.

At the Base Camp the average minimum temperature from April 17th to April 30th was $+15^{\circ}$ F., the lowest minimum being $+10^{\circ}$ F. and the highest $+20^{\circ}$ F. The average maximum during this time was $+39^{\circ}$ F. The May records are far from complete, but the June records will be mentioned here for comparison. The average minimum temperature for the month of June was $+25^{\circ}$ F., varying from $+12^{\circ}$ F. to $+32^{\circ}$ F., and the average maximum was $+62^{\circ}$ F., varying from $+52^{\circ}$ F. to $+68^{\circ}$ F.

Almost without exception, there was less cloud in the early mornings than later in the day, yet the mornings were rarely completely clear. Even if the usual stray fracto-cumulus clouds were missing there would almost certainly be a cloud-flag on Mount Everest formed from moist air drawn up the south-east face of the mountain by the west wind. The maximum development of cloud was usually in the early afternoon. The commonest clouds were cumulus or fracto-cumulus, between 20,000 and 30,000 feet, which were blown along by the powerful westerly wind (Plate 56). There was also frequently a little cirrus cloud, while the usual cumulonimbus and stratus clouds were associated with the snow-storms.

Precipitation took place on twelve days between April 17th and May 31st, but it was mostly slight. On April 22nd there were three inches of snow; on May 3rd and 9th about half an inch, and these were the occasions of greater precipitation. The air was always very dry and the snow disappeared almost at once, except in the case of the three inches that fell on April 17th. Only one case of hoar-frost was noted. Satisfactory humidity observations were made only for a short period in June.

There are scanty observations from the higher camps. The lowest minimum temperature recorded in 1933 was -21° F., at Camp II, on May 11th. During the 1924 expedition a minimum of -24° F. occurred on May 22nd at Camp III, 21,000 feet. This year our lowest temperature at this camp was -20° F. on May 8th. The only temperatures recorded above Camp III were taken at Camp V, 26,700 feet on May 29th. The minimum was -4° F., and it was $+4^{\circ}$ F. at 8 o'clock when the party left to establish Camp VI. Average minimum temperatures for different periods at various camps compared with the Base Camp are given below. The table shows what was always suspected, namely that Camp II at 19,800 feet is as cold as Camp III at 21,000 feet.

AVERAGE MINIMUM TEMPERATURES FOR DIFFERENT PERIODS COMPARED WITH BASE CAMP
(DEGREES F.)

Time	Base Camp	Camp I	Camp II	Camp III
April 28th-May 1st . . .	$+17\frac{1}{2}$	$+14$		
May 2nd-6th	$+15$		-1	
May 3rd-6th	$+15$			-1
May 7th-17th	$+18$		-8	-7
May 28th-June 5th	$+18$			-10
June 28th-July 1st	$+30\frac{1}{2}$			$+18$

Winds at Camps III and IIIa were often violent, producing drift, but I should not care to give a definite estimate of their strength. It has been suggested by members of the earlier expeditions that high up on Mount Everest there was sometimes less wind than at the North Col, but this year we always found the reverse.

When we first arrived the almost level glacier at the foot of the North Col slopes was polished ice, and this is presumably its usual winter condition, but on May 9th it was covered by six inches of snow. Despite high winds, especially those on May 17th and 18th, precipitation remained in excess of ablation and removal by winds, so that dry glacier was not seen again here. The snow usually fell as single-crystal snow, and I find in my diary a special comment that on May 10th some of the snow came as flakes. Until the height of summer the snow on

the North Col and above was either wind-compacted or remained as a powder. Both Mallory¹ and Odell² have discussed the problem of the height to which melting of the snow or its transformation to *névé* occurs. This year two relevant observations were made. On May 22nd, drinking-water was obtained from ice chipped from the rocks behind the tents at Camp V. Melting must therefore sometimes occur at 25,700 feet. The ice was probably formed from a thin sprinkling of snow covering dark rocks which had melted on some exceptional day of a previous summer, and the water, having trickled into the shadow, had refrozen. Norton's couloir at about 28,000 feet contained mainly light powder snow, but at one point we scraped steps in what seemed not merely wind-compacted snow but genuine *névé*. Above 27,000 feet, however, most of the summer snow which whitens the northern face of the mountain must remain as a light powder until it is blown away by the winter winds.

THE WEATHER IN JUNE—MONSOON CONDITIONS

This year the exact date of the onset of monsoon conditions was not obvious to observers either on the mountain or at the Base Camp.³ By May 15th Camp IV was established and we were in a position to watch a great sea of cumulus clouds rolling up the Arun valley each afternoon. This was at first taken to be a sign of the arrival of the monsoon, but it is probably a phenomenon taking place in summer and winter alike, and comparable with the floods of cumulus which were often seen coming through all the main passes in the Himalaya during the march across Tibet earlier in the year. On May 24th at the North Col it was warmer than usual and some snow fell, but on the following day the old conditions of low temperature with violent west wind and drifting snow returned. On May 26th there was snow in the night, and the morning was

¹ *Mount Everest: The Reconnaissance*, 1921, pp. 266-267.

² *The Fight for Everest*, 1924, p. 310.

³ I am purposely using the term "monsoon conditions" because the true monsoon of India is a relatively low-lying current of wet air which only exceptionally reached the north side of the Mount Everest group.

cloudy and warm, but by evening the cloud-level had again sunk below us. On the afternoons of May 27th, 29th, and 30th snow fell at heights of at least 28,000 feet. On these days in the early morning there were sporadic cumulus clouds at about 23,000 feet; the clouds became more abundant and higher during the course of the day, generally reaching 25,000 to 28,000 feet in the early afternoon; by sundown they had sunk again to a general level of about 22,000 feet and decreased in amount. On the night of May 30th an inch of snow fell at Camp V, and during most of the next day intermittent snow occurred at least as high as Camp VI. Perhaps May 30th is to be regarded as the beginning of monsoon conditions. Snow fell on June 1st, 2nd, and 3rd, generally in the afternoons and in small quantities only. Then there followed a few days when the mountain was mostly clear of cloud and no snow fell. Throughout this period a west wind usually blew at night and in the early morning.

By June 8th monsoon conditions were definitely established. All members of the expedition had returned to the Base Camp, and the mountain was at this time watched from there. A quarter of an inch of snow fell at the Base Camp on the night of June 7th; on the 9th snow fell from 11 a.m. to 4 p.m.; on the 10th it snowed on Mount Everest but not at the Base Camp, and on the 11th, 13th and 14th there was again slight snow at the Base Camp. During this period Mount Everest certainly received more snow than the Base Camp, and by June 10th the north face of the mountain had assumed its usual summer appearance (Plate 51).

Beginning on June 7th, and therefore simultaneous with the more snowy weather, a sudden rise of the minimum temperature was noticed. For the first seven days of June the average minimum temperature at the Base Camp was $16\frac{1}{2}^{\circ}$ F., while for the remainder the average was 28° F. The barometric pressure, and the wind direction in the valley and at 25,000 feet as judged by clouds, showed no significant change. On most days the early mornings were clear except for a few ragged cumulus clouds over Tibet or a capping-cloud on Mount

Everest (Plate 57). Between 9 and 10 a.m. cumulus clouds began to creep over the low col, 19,500 feet, to the west of Mount Everest, and these quickly deepened until the mountain was blotted from sight. During the afternoons cirrus, and often handsome anvil clouds of false cirrus, were to be seen above the cumulus (Plate 58). By 6 p.m. the clouds over Everest were usually thinning, and before dusk a glimpse of the summit was generally obtained, whitened still more by the day's snowfall. To the north in the early morning there were usually isolated cumulus clouds which increased in size and abundance during the day (Plate 59), and in the afternoons several storms could usually be seen passing westwards only ten or twenty miles north of the Base Camp. During June the Base Camp was much freer from cloud and precipitation than either Mount Everest to the south or the plains of Tibet to the north. This local but advantageous peculiarity seems to be partly the result of the Base Camp lying just south of the tracks of the isolated convection storms which drift over the plains of Tibet and partly the result of its being sheltered by the Mount Everest group from most of the moist air coming up valleys from the south.

Extracts from Dr. Sen's weather reports from Alipore may be compared with the description just given. According to these reports, on May 31st the seasonal monsoon, trough of low pressure, was becoming pronounced over north and north-west India, and the monsoon was very active from Darjeeling to Mussoorie. The trough was less pronounced on the 6th. On the 7th western disturbances were affecting the Mount Everest region and the monsoon was again active at Darjeeling. On the 8th the height of the monsoon current was about 3 km. and likely to extend to higher levels. On the 10th the height of the monsoon current was 9 km. On the 12th there was a depression in the northern part of the Bay of Bengal. I cannot continue to quote even the gist of Dr. Sen's very full weather reports, but the above are sufficient to show that a close connection exists between the weather on Mount Everest and that over India.



PLATE 59.—Cumulus clouds over Tibet. Photograph taken from the Base Camp at noon on 15th June.

During the second advance up the glacier between June 11th and 22nd, monsoon conditions were well established. Particularly heavy precipitation occurred on the 19th to 22nd of June from low cumulus clouds blown up from the south-east or east. This unusual wind direction was presumably the result of the dominance of the south-east monsoon current of Bengal. During this time the basin at the head of the East Rongbuk glacier was described by those at Camp III as "alive with avalanches."

The weather was very different at Camp III from June 27th to July 2nd, when Shebbeare and I were there to evacuate the glacier camps. Then we never saw or heard an avalanche despite a powerful sun. The minimum temperatures from June 28th to July 2nd were 14°, 17°, 20°, 23° F., and the maximum temperatures 64°, 64°, 67°, and 67° F. On each day there was a short snowstorm coming from the west or north-west. The amount of snow that fell, however, never exceeded half an inch, and the wind did not exceed force 1 during the whole of this time. We were probably experiencing an exceptional fine spell. There was a good deal of water on the glaciers as high as 20,500 feet. Up to at least 22,500 feet the snow was compacted for a depth of nine or twelve inches into a coarse granular mass which overlay powder snow or *névé*. It would have been easy and safe to reach the North Col if a party had started sufficiently early to arrive by 8 a.m. Probably Camp V could have been reached, but the deep snow above which could be seen completely covering the tent at Camp VI, was presumably a fine powder which would have prevented further progress.

GENERAL CONCLUSIONS

Although our experience of the weather in Southern Tibet amounts to little more than a quarter of a year, yet it covers the change from winter to summer. From the observations of the few other travellers in this region, it is clear that the winter conditions which we experienced hold roughly from November to May, and the warmer and somewhat damper summer conditions from June to October.

The difference, however, between summer and winter is apparently not great. The general barometric pressure at the Base Camp remained the same. The diurnal variation and the longer period variations also remained unchanged in amount and character. In summer and winter alike the prevailing wind was westerly, the only difference being that the winter wind was a little stronger than the summer wind both on the Tibetan plateau at 14,000 feet and on Mount Everest at 30,000 feet, as judged by clouds.

The usual weather régime is modified, but not greatly, by two main factors, the so-called westerly depressions and the Indian monsoon. The depressions moving from the west over Southern Tibet and occurring in both summer and winter seem to cause more air to be drawn from the south, with an increase in the strength of the wind and the amount of precipitation. The monsoon had no effect on the barometer at the Base Camp, and the south-east monsoon current reached the north side of the Mount Everest group only once during the period of our observations. The monsoon, however, provides more moisture than is available in the winter, and there is consequently more precipitation on Mount Everest and in southern Tibet.

In 1933 the weather on Mount Everest was undoubtedly set against a successful conclusion to the expedition, and probably it is fair to consider that the weather was exceptional. Mallory states that in 1921, on June 19th, the expedition at Ponglet was drenched by a storm which was followed by a general break in the weather, but even a few days later the north face of Mount Everest was described as still comparatively black. Apparently that year monsoon conditions did not arrive till late June. In 1922 the snowing up of the top part of Mount Everest began in early June, which is about the same time as in 1933. In 1924, there was good weather from May 28th to June 8th, and it was considered that the monsoon did not actively break until June 16th. This year, by May 30th the slabs on the north-west face of Mount Everest had a sprinkling of snow which was enough to make climbing slow and difficult.

There was still more when an attempt was made on the summit on June 1st, and after this snow continued to accumulate until we left the district. At the end of July and the beginning of August, Darjeeling enjoyed an almost unique spell of fine weather, and it would have been interesting to have known what the conditions were like on Mount Everest at this time, but unfortunately we had all left the district. In India there is a belief that heavy and late winter snowfalls in the Himalaya mean a late monsoon; in 1932-1933 there was said to be a heavy winter snowfall, but the monsoon arrived in Bengal exceptionally early.

Whether there is any reasonable chance of climbing Mount Everest during the monsoon period or in September is not definitely decided. The only evidence so far is that obtained on the reconnaissance expedition in 1921. This year we left the mountain at the beginning of July. It was then deeply covered in snow, and it is probable that this would never become sufficiently compacted to allow a climber to walk on it easily; but it is just possible that if violent west winds occur in July, August or September they might remove sufficient snow to allow the mountain to be climbed before the excessive winter cold sets in.

In conclusion, let me set down a plea for more extensive observation of the weather conditions when next the ascent of Mount Everest is attempted. The data obtained would contribute to the success of all future expeditions to the Eastern Himalaya, and it may be that Mount Everest itself will not fall to the next attempt. Perhaps it might be arranged to include a meteorologist in the party, but in any case daily weather observations should be made and continued into September, even if the main part of the expedition should return earlier. Several members of the expedition should make themselves competent observers. The instruments should be carefully considered before the expedition sails, special instruments in some cases being designed, and the Indian Meteorological Department should be asked in good time to give all possible help.

IX. HIMALAYAN METEOROLOGY

By S. N. SEN AND N. P. CHATTERJEE,
Alipore Observatory, Calcutta

I. INTRODUCTION

Meteorology has for a long time come to the aid of shipping and aviation. During the Great War the help of this science was invoked for the offensive and defensive operations of the belligerents. It is perhaps the first time in the history of meteorological science in India that weather reports and forecasts have been requisitioned in all seriousness for mountaineering.

In 1930 the Alipore Observatory, Calcutta, issued a number of experimental weather reports and forecasts for the International Himalayan Expedition which attempted to climb Kangchenjunga under the leadership of Professor Dyhrenfurth. The weather bulletins were broadcast every evening from April 18th to June 6th, 1930. An accidental breakage of the receiving set of the party, however, put an end to all experiments.

As regards the utility of the weather reports and forecasts, it may be interesting to note that the messages prepared for the Kangchenjunga Expedition were subsequently compared with the actual weather logs kept by the party. The results of the comparison were encouraging.

Towards the end of April 1933 the Alipore Observatory was called upon to issue weather reports and forecasts for the Mount Everest Expedition. It was with considerable misgivings that the task was undertaken. An idea of the handicaps may be formed from the following facts. In the vast area of the Eastern Himalayan region there is only one high-level surface observatory, namely Darjeeling, which reports telegraphically to Calcutta. Vast regions like Nepal, Bhutan and Tibet are yet meteorologically unexplored and unrepresented. The difficulties in the way of forecasting weather over this region are therefore formidable.

As the establishment of a sufficient number of surface observatories over the Himalayan range was not a practical proposition, it was thought that a few upper air observatories along the foot of the Himalaya might be helpful. Dr. C. W. B. Normand therefore agreed to make the following arrangements. The upper-air observatories at Patna and Dacca were temporarily transferred to Purnea and Darjeeling respectively. These, with the upper-air observatories already at Tezpur and Agra, formed a more or less useful chain along the foot of the Himalayan range. As the Alipore Observatory does not usually receive weather telegrams from stations on the Western Himalaya, it was arranged that the surface observatories at Srinagar, Dras, Sonamarg and Leh in Kashmir, at Simla and Mussoorie, and at Mukteswar in Kumaun should report morning and evening observations to Calcutta.

In spite of the preliminary success achieved in forecasting work during the Kangchenjunga and Everest Expeditions it cannot be claimed even now that weather prognostications for a vast unknown region like the Himalaya can confidently be undertaken from the strictly scientific point of view.

2. HIMALAYAN CLIMATOLOGY

The meteorological data of most of the hill stations on the Himalayan range are set out in the tables at the end of this chapter. The names of the stations have been arranged in the ascending order of their heights above sea-level. For the purposes of study, the Himalayan region may be divided into two divisions. The Western Himalaya has been taken to be the portion of the mountain range to the west of Katmandu, and the Eastern Himalaya to be the portion to the east of that station. The positions of the hill stations are shown in the chart facing page 360. An idea of the normal annual variations of the important meteorological elements at the various levels may be obtained from a study of the tables.

(a) *Atmospheric Pressure*.—The mean monthly pressures at the various hill stations are set out in Table I. The annual

variation graph of pressure in levels up to about 10,000 feet above sea-level shows a peak during the winter months and a trough during the summer months. The amplitude of the variations, however, decreases as the height increases. In levels above 10,000 feet, the character of the curve is completely changed. In these high levels the pressure graph shows two well-defined maxima and two minima during the year. The first maximum occurs in the pre-monsoon months and the second in the autumn, whilst the first minimum appears in the winter and the second at the height of the monsoon.

(b) *Vapour Tension*.—The mean monthly vapour pressures at the various hill stations are set out in Table II. The annual variations of this element show the same characteristics over both the Western and the Eastern Himalaya. As is to be expected, the annual wave shows a peak at the height of the monsoon and a trough in the winter, and the absolute value of vapour pressure decreases with elevation.

(c) *Maximum and Minimum Temperatures*.—The normal data are given in Tables III and IV. The annual variations show the same characteristics as the stations on the Indian plains.

An idea of the order of temperatures met with at the Base Camp of the Mount Everest Expedition during the period May 4th to June 27th, 1933, may be gathered from Table V. So far as the index of human comfort is concerned, these temperatures are in no way representative, because of the important factor of solar radiation temperature. As a matter of fact, the experience of climbers in the Himalaya has been that at great heights one can hardly bear the intense solar radiation even when experiencing fierce cold blasts of wind many degrees below freezing-point. In this respect, therefore, the conditions over the Himalayan heights closely resemble those at the polar regions. As a matter of fact, it would not be surprising if, on clear days, solar thermometers at the Everest region recorded temperatures some 60° to 70° Fahrenheit above the daily maximum in shade.

(d) *Cloudiness*.—It will be seen from Table VI that the

Western Himalaya is in general more cloudy in the winter than in the other seasons, but the cloud amounts tend to increase in the monsoon. In the Eastern Himalaya, on the other hand, the maximum cloudiness occurs during the monsoon months only.

(e) *Rainfall and the Number of Rainy Days.*—Tables VII and VIII show that, on the average, the Western Himalaya has more precipitation during the cold weather or the pre-monsoon period than in any other season, while over the Eastern Himalayan region maximum precipitation occurs in the monsoon months. This peculiarity and the facts noticed in Table VI above are due to the fact that most of the rain- or snow-fall on the Western Himalaya is caused by depressions from the direction of Persia—popularly known in India as western disturbances, while precipitation over the Eastern Himalaya is mainly dependent on the Bay of Bengal branch of the south-west monsoon. (See Table VII.)

The south-west monsoon is, on the average, more active on the Eastern than on the Western Himalaya. Although precipitation on the latter is caused chiefly by western disturbances, there are some stations such as Simla and Mussoorie, where precipitation during the monsoon months is considerable. The heavy falls over these stations no doubt usually occur when a monsoon depression travelling up from the Bay of Bengal breaks up against the Western Himalaya.

The number of rainy days shows characteristics similar to those of the rainfall amounts. (See Table VIII.)

(f) *Surface Winds in the Everest Region.*—The surface winds over the hills are variable in character. Their direction and strength are mainly governed by the local orographic peculiarities. The general trend of the wind circulation, at least in the summer months, over the Western Himalaya is up-valley during the daylight hours and down-valley as soon as night cooling is effective. On the average a surging flow of the anabatic and katabatic winds across the Western Himalayan range is in operation. In the case of the Eastern Himalaya (and possibly Kumaun), however, the principal river valley is

the upper reaches of the Brahmaputra, which runs along the main mountain chain. The westerly winds down the upper Brahmaputra valley are followed by up-valley easterly winds. The latter, coming up from the lower levels, are likely to be more humid and warm than the westerly winds. Consequently, when the up-valley winds start, haze and precipitation are very often caused, especially in the summer afternoons, followed by clear weather in the nights. In this respect, therefore, weather over the Eastern Himalaya is very similar to the weather experienced on the plains of Bengal in the nor'wester season from February to June. The speed of the katabatic winds is generally at its maximum in the winter nights, and of the anabatic winds during the afternoons of April, May and June.

3. UPPER-AIR DATA

Although the surface winds are very variable over the Himalayan ranges the observations of cloud and snow drift and pilot-balloon data show that the main circulation aloft is less subject to rapid fluctuations. Upper winds, from 6 to 10 kilometres above sea-level, over hill stations such as Simla and Darjeeling, and over other stations more or less in the sub-montane regions, have been taken to be representative of winds over the Himalayan region. The pilot-balloon data picked up at random from the published records of 1928-30 and the special flights in the summer of 1933 are set out in Table IX.

(a) *Wind Direction Aloft.*—The upper wind and cloud data hitherto collected show that, in the months November to May, winds over the whole of the Himalayan region are predominantly from a westerly direction. The wind directions are steady in the winter months, from November to the first half of February, and fairly steady in the pre-monsoon months, from the second half of February to May. During the monsoon months, from June to September, the winds over the Himalayan region appear to be most unsteady. The monsoon current occasionally rises to great heights even above the

Himalayan peaks. On such occasions the air current over the Eastern Himalaya becomes southerly or south-easterly, backing to easterlies or north-easterlies over the Western Himalaya. In October, with the withdrawal of the monsoon from the hills, the usual westerly circulation sets in. This current becomes progressively steady as winter conditions are established.

(b) *Wind Strength Aloft.*—The upper winds over the Himalayan region in the months November to February are almost invariably strong, often rising to gale force and sometimes to hurricane force. Wind speeds of 100 miles per hour should not be infrequent on the summit of Mount Everest. Some falling off of the speed usually takes place in the months March, April and May, but even in these months wind often blows with gale force in 9 or 10 kilometre levels. With the setting in of the monsoon a conspicuous fall in wind speed is noticeable, and this condition persists until the approach of the winter.

(c) *Upper-air Densities.*—Almost simultaneously with the Mount Everest Expedition the Houston Mount Everest Flight party, under the leadership of Air-Commodore P. F. M. Fellowes, came out to India. A knowledge of the magnitude of air densities in the various levels of the Indian atmosphere near the Himalaya is useful in such operations as those undertaken by Lord Clydesdale. Table X, which gives the monthly averages of the air density in grammes per cubic metre in the various levels of the free atmosphere above Agra, may be useful in connection with future flights over Himalayan peaks.

4. DISTURBANCES WHICH AFFECT THE HIMALAYA

A Himalayan expedition is not undertaken in the winter months, for obvious reasons. The perpetual snow line is about 15,000 feet above sea-level, and the glaciers descend to about 12,000 feet. The prevailing low temperatures and the frequent westerly or north-westerly blizzards associated with snowfall make all human attempts on Himalayan peaks impossible. In April, May and June, owing to the effects of the rapid insola-

tion of the great Indian plains extending upwards, there is a more or less sudden break in the frequent precipitations over the Himalayan ranges, in the absence of disturbances. The frequency of fogs and low clouds also decreases in these months. Mountaineers therefore look forward to one of these brief spells of fine weather in this period before the advent of the monsoon. It is probably for these reasons that hitherto almost all attempts on the Himalayan peaks have been made in the summer months.

The disturbances which primarily affect the Himalaya are :

(i) Western disturbances, and depressions and storms in the Arabian Sea.

(ii) Storms and depressions in the Bay of Bengal.

(i) *Western and Arabian Sea Disturbances.*—So far as the Indian area is concerned, western disturbances bring winter rains to the Punjab and the adjoining areas. The majority of these depressions originate in south-east Europe or the Mediterranean and travel eastwards. They have therefore the same characteristics as extra-tropical cyclones. At the height of winter these disturbances affect the extreme north of India, but with the approach of the spring their tracks on the average are more and more southerly, affecting countries such as Persia and Arabia. On the average about four disturbances reach the frontier every month from December to April, but in individual years this number may even be doubled in some months. From July to September the effect of a western disturbance appears to be mainly the accentuation of the existing trough of low pressure over the plains of Northern India, commonly known as the "monsoon trough." In the summer months wind circulation over large areas in the Arabian Sea is often controlled by these disturbances.

In the months of April, May and June a western disturbance on reaching Baluchistan and the North-West Frontier Province from the direction of the Mediterranean is very often seen to split into two parts, owing, no doubt, to the large-scale subsidence of the Himalayan air, chiefly over the plains of the Punjab.

The first portion of the parent depression generally travels in an easterly or north-easterly direction across the Karakoram and the Kashmir hills into Tibet. While over the Punjab, it usually causes widespread precipitation over the Western Himalaya, followed by blizzards. Bad weather due to the travel of this portion of the disturbance to Tibet, however, may not be felt in the Everest region at all, beyond the formation of clouds in the subsiding westerly or north-westerly currents in the rear of the depression.

The second portion of the disturbance, which may sometimes be confined to the upper layers of the atmosphere, is, however, important from the point of view of weather in the Eastern Himalaya. It travels eastwards across Central India to Bengal, often accentuating the "heat lows" over the Central Provinces.

From the point of view of weather over the Everest region, the important points in connection with a western disturbance at the frontier are, firstly, whether a particular disturbance is of considerable vertical thickness, and, secondly, whether a portion of it is likely to affect the Central Provinces, which appear to be a sensitive spot so far as Eastern Himalayan weather is concerned.

The frequency of disturbances in the Arabian Sea is much less than that in the Bay of Bengal. The effects of Arabian Sea depressions and storms on the Himalayan region are very similar to those of western disturbances.

(ii) *Cyclonic Storms and Depressions in the Bay of Bengal.*—The average frequency of Bay storms and depressions, based on forty years' data, is given in Table XI. The question whether a storm in the Bay of Bengal should give rise to bad weather in the Everest region is best decided by considering the position of the centre of the storm and its probable direction of movement. In this connection a reference to *Storm Tracks in the Bay of Bengal*, compiled by Dr. Normand, is helpful. It may be safe to generalise that a storm developing to the east of longitude 90° E. is likely, in the first stages, to give rise to fair weather in the Everest region,

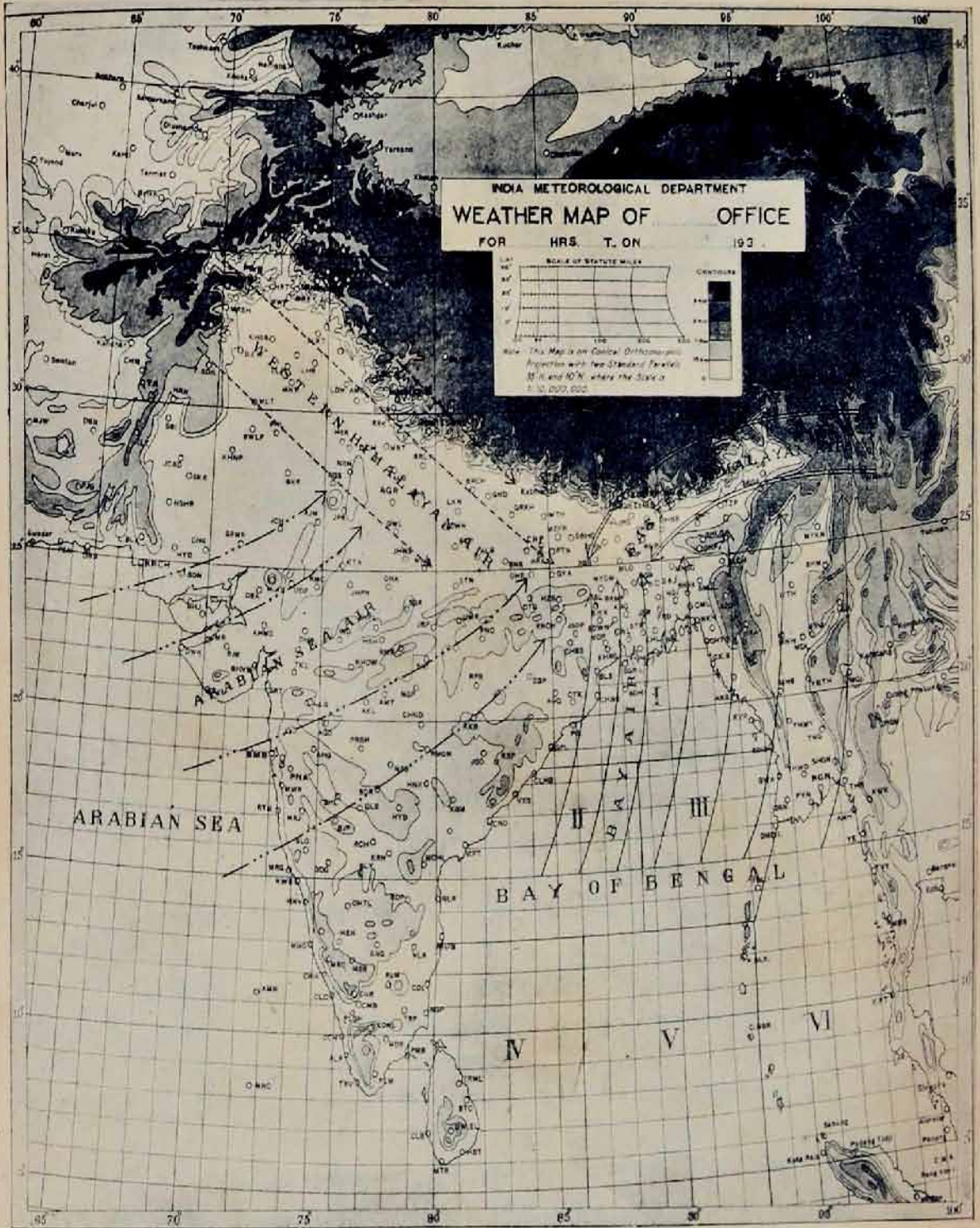
provided there is no disturbance in Western India at the time. An example of the simultaneous presence of a western disturbance over the United Provinces and a Bay storm to the east of longitude 90° E. entering Central Burma on May 13th, 1930, at the time of the Kangchenjunga Expedition may be of interest. This meteorological situation produced very bad weather on the following day over the Eastern Himalaya. The weather diary of the party records that on that occasion a snowstorm from the west was experienced until 1 p.m. of the 14th. Then the weather suddenly improved for a couple of hours, after which the weather again deteriorated, but this time a snowstorm from the east was experienced. The weather over the Everest region will gradually deteriorate if a storm begins to move west or north-west to Orissa and the Central Provinces, as is usually the case in June. The consequence of this retrograde movement of Bay storms and depressions is to make the southerly or south-easterly humid current following the disturbance, sometimes of great vertical thickness, penetrate the Everest region.

5. FORECASTING OF WEATHER OVER THE EVEREST REGION

It has to be admitted that attempts at forecasting weather at levels of 20,000 feet and above must for a long time remain speculative. Modern methods of locating the various fronts can hardly be applied to regions from which no synoptic observations are available. The object of this section is simply to make a few generalisations which may be found helpful.

In the following paragraphs it is proposed to leave out considerations of local instability, subsidence, etc., which may produce bad weather at places in the Everest region. In the issue of weather reports and forecasts, only the broad features of the possible interactions of the different air masses could be considered during the Kangchenjunga and Everest expeditions. The details are explained below as briefly as possible.

In the mechanism of weather in the Everest region four



principal air-masses depicted in the weather chart facing page 360 appear to be involved.

(a) *The Western Himalayan Air*.—This air current, which is dominant in the winter months, is the coldest continental current in the Indian region. It flows down the Gangetic valley as a westerly or north-westerly current into Bengal and the Bay. With the advent of the spring, however, a hot patch of air appears over the south of the Indian Peninsula, shifts to the Central Provinces by the month of May and then proceeds north-westwards and disappears in Persia across the north-western frontier. The movement of this "thermal focus" suggests that the coldest continental air in the winter becomes the hottest continental air (apart from fresh subsidence of cold air) in the summer, so far as the Indian area is concerned. The history of the temperature changes in the various levels of this great Western Himalayan current from year to year should furnish a clue to the peculiarities of the distribution of the monsoon rainfall.

(b) *The Eastern Himalayan Air*.—This current usually comes down as an easterly or north-easterly current, mainly along the Brahmaputra valley. It appears to have an uncanny power of affecting the weather wherever it happens to find its way. The westerly course of the monsoon depressions from the Bay of Bengal appears to be determined to a large extent by the westward movement of this air mass. Except in the winter months, this current is the coolest of the various air masses in the Indian region. As such, it is responsible for the majority of the storms in the Bay of Bengal.

(c) *The Bay Air*.—In the pre-monsoon months the southerly Bay air brings moisture inland in varying quantities, obviously depending on the length of its trajectories over the sea area. By the middle of June or beginning of July, on the average, the Bay air usually merges in the Bay branch of the monsoon current.

(d) *The Arabian Sea Air*.—This air penetrates Western India very often under the influence of western disturbances. The heating effects of the Rajputana desert on this moist

air-mass, at least in the lower levels, have to be taken into account in considering its interaction on the Western Himalayan air. In the upper levels, at any rate, the interaction of these two currents often produces clouds and precipitation, but in the forecasting of these phenomena over the Western and parts of the Eastern Himalayas, great caution has to be exercised. This air merges into the Arabian Sea branch of the monsoon current some time also in June or July. It may be interesting to note that the monsoon rainfall in Western India does not normally commence in the usual fashion until July, by which time the Eastern Himalayan air normally penetrates Western India.

Whether the disposition of the various currents at the heights of the Everest region and intermediate layers is more or less similar to that depicted in the idealised chart (facing page 360), must remain a matter for further investigation. On individual occasions, however, an approximate idea of the position of the discontinuity lines may be formed if pilot-balloon data up to 8 to 10 kilometres are available from a more or less satisfactory network of upper-air stations, especially along the foot of the Himalaya.

Let us now consider under what conditions these four air masses may simultaneously operate in producing bad weather over the Everest region.

If, for example, on a particular occasion a western disturbance, while over Rajputana, is deep in the sense that it is able to affect circulation to large heights, then the Arabian Sea air may strike even the Eastern Himalaya as a south-westerly current. With the advance of the disturbance eastwards, the Arabian Sea air-current may further be reinforced by the south-easterly Bay air-current. Thus a moist air-current of considerable breadth and height may invade the Everest region. This current coming in conflict with the cold westerly winds over the Everest region (flow induced by a depression in Tibet) is likely to cause widespread foggy and cloudy conditions and precipitation. With the eastward progress of the disturbance towards the East Central Provinces and the formation of a

depression in the north of the Bay an easterly Himalayan current of considerable thickness may also flow down along the Brahmaputra and minor valleys opening out to the plains of Bengal. A conflict between the various air masses may then begin along the Darjeeling hills, giving rise to exceptionally bad weather over the Everest region.

6. MISCELLANEOUS

(a) *The First "Burst" of the Monsoon.*—Himalayan climbers are generally anxious to know the probable date of the first "burst" of the monsoon. It is therefore necessary to explain what is meant by the phrase "burst of the monsoon." A reference to Table XII will give an approximate idea of the average rate of growth of the Bay air-current during the various months over the plains of Bengal.

It will be seen from the table that the Bay current steadily increases in thickness from February onwards. When the first depression forms at the head of the Bay, generally by the second week of June, the monsoon current skirts the Arakan-Chittagong coast before entering Bengal. In some cases the Bay air, whilst merging in the monsoon current, may suddenly double or even treble its pre-monsoon thickness in the course of forty-eight hours or so. It is obvious, therefore, that the monsoon current is likely to enter the Tibetan Plateau almost in the course of twenty-four hours, establishing a wide front of fog and clouds associated with local snowstorms. These phenomena presumably are popularly described as the "burst" of the monsoon over the Eastern Himalaya.

(b) *Temporary Cessation or a "Break" of the Monsoon.*—The rainfall in the monsoon season need not be a daily occurrence over large areas. So far as precipitation on the plains is concerned there are spells in which very little rain falls. A typical "break" weather chart is one in which the southern half of the monsoon trough is visible over the Gangetic plain, the northern half being hidden by the Himalaya. The "break" usually appears in the Punjab and extends eastwards

along the foot of the Himalayas to North Bengal. A study of the "break charts" shows that the discontinuity surface between the monsoon and the Eastern Himalayan air masses is generally along the Himalayan range. Consequently a "break chart" for the plains may often indicate heavy precipitation along the Himalaya. The same type of pressure distribution as in the "break charts" often comes into evidence when a monsoon depression strikes against the Himalaya and begins to dissipate. The paucity of observatories in the Himalaya is a great handicap to the proper study of the "break charts." It is well known, however, that on these occasions precipitation over the hills may be so large as to cause unexpected floods in rivers of Himalayan origin.

7. THE MISFORTUNES OF THE MOUNT EVEREST PARTY

From the point of view of weather the Mount Everest Expedition of 1933 was most unfortunate. On the average the westerly Himalayan current was appreciably colder than usual. Table XIII suggests that the weather in April, May and June, 1933, was probably worse than that in the corresponding period of 1924.

Most of the western disturbances in 1933 were well marked, and under their influence the Arabian Sea monsoon frequently penetrated right into Nepal. The 1933 distribution of rainfall led to serious floods in south-west Bengal, Orissa, Central India, and parts of the Punjab.

8. CONCLUSION

From the preceding paragraphs it appears that a year having the following characteristics should be ideal from the point of view of an expedition to the Eastern Himalaya:

(i) The frequency of western disturbances should be below normal in the months of April, May and June. In other words, less than one disturbance per week should appear on the north-west frontier. Moreover the portion of a western

disturbance which travels across the country and affects the Central Provinces should be feeble and shallow.

(ii) There should be no depressions in the Bay of Bengal in June. This may happen, on the average, once in six years.

(iii) The westerly drifts at great heights over the Himalaya should be comparatively weak.

A Suggestion.—It is not known whether there is any year of which the summer months will satisfy all these specifications. It is, however, conceivable that in years of early retreat of the monsoon there may be brief spells of good weather over the eastern Himalaya in the autumn when the mountain slopes may be free from fresh snow. In this season the vast Indian plains begin to cool down, and storms usually originate far away from the Himalayas in the south of the Bay of Bengal. The climatological and other tables quoted in this chapter do not contradict this view. It would therefore be interesting to undertake an Everest expedition in this season.

TABLE I.—MONTHLY AND ANNUAL NORMALS OF BAROMETRIC PRESSURE IN INCHES OF MERCURY AT 8 HOURS LOCAL TIME

Stations.	Ht. above m.s.l. in ft.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
Kalimpong .	3,933	26·098	26·051	26·013	25·972	25·927	25·827	25·807	25·857	25·949	26·057	26·115	26·115	25·982
Drosh . .	4,500	25·227	25·155	25·144	25·096	25·008	24·873	24·801	24·835	24·980	25·137	25·210	25·231	25·058
Gilgit . .	4,890	25·272	25·214	25·173	25·134	25·102	24·957	24·873	24·899	25·057	25·229	25·314	25·323	25·129
Srinagar .	5,204	24·988	24·953	24·925	24·898	24·853	24·741	24·673	24·709	24·845	24·983	25·034	25·037	24·887
Gangtok .	5,667	24·512	24·483	24·469	24·450	24·421	24·347	24·336	24·368	24·445	24·515	24·573	24·564	24·457
Parachinar .	6,000	24·491	24·450	24·444	24·418	24·375	24·298	24·267	24·315	24·403	24·509	24·550	24·531	24·421
Simla . .	7,232	23·095	23·069	23·090	23·096	23·073	23·003	22·969	23·009	23·092	23·170	23·184	23·154	23·084
Darjeeling .	7,376	23·020	22·997	23·001	23·001	22·985	22·918	22·909	22·947	23·017	23·083	23·096	23·064	23·003
Skardu . .	7,505	22·952	22·920	22·886	22·880	22·865	22·772	22·690	22·702	22·844	22·959	23·033	23·008	22·876
Mukteswar .	7,592	22·845	22·826	22·852	22·850	22·835	22·753	22·727	22·761	22·840	22·914	22·926	22·892	22·835
Dras . . .	10,059	20·771	20·758	20·775	20·804	20·822	20·756	20·706	20·727	20·811	20·878	20·898	20·838	20·795
Leh	11,503	19·649	19·624	19·666	19·706	19·748	19·690	19·647	19·668	19·740	19·790	19·798	19·722	19·704

TABLE II.—MONTHLY AND ANNUAL NORMALS OF VAPOUR TENSION IN INCHES OF MERCURY AT 8 HOURS LOCAL TIME

Stations.	Ht. above m.s.l. in ft.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
Kalimpong .	3,933	·287	·299	·349	·439	·563	·670	·687	·688	·651	·515	·379	·301	·485
Drosh .	4,500	·148	·157	·189	·264	·340	·400	·501	·542	·377	·236	·154	·145	·288
Gilgit .	4,890	·140	·134	·169	·244	·314	·350	·428	·463	·381	·237	·152	·131	·262
Srinagar .	5,204	·146	·159	·230	·322	·436	·548	·630	·616	·462	·286	·189	·152	·348
Gangtok .	5,667	·235	·258	·309	·385	·474	·564	·601	·598	·559	·454	·341	·254	·419
Parachinar .	6,000	·149	·155	·194	·248	·310	·347	·503	·519	·371	·211	·168	·151	·277
Simla .	7,232	·120	·128	·145	·188	·254	·378	·499	·503	·398	·209	·131	·106	·256
Darjeeling .	7,376	·187	·203	·243	·336	·417	·495	·524	·521	·478	·377	·268	·195	·353
Skardu .	7,505	·106	·120	·174	·217	·260	·292	·355	·380	·316	·214	·154	·129	·226
Mukteswar .	7,592	·126	·141	·163	·183	·272	·402	·501	·508	·432	·254	·164	·115	·272
Dras .	10,059	·051	·049	·086	·147	·220	·278	·338	·337	·244	·154	·108	·065	·173
Leh .	11,503	·041	·044	·078	·111	·131	·171	·262	·283	·193	·113	·090	·052	·131
Gyantse .	13,110	·074	·090	·133	·143	·206	·276	·290	·275	·243	·155	·111	·079	·173

TABLE III.—MONTHLY AND ANNUAL NORMALS OF MAXIMUM TEMPERATURE IN DEGREES FAHRENHEIT

Stations.	Ht. above m.s.l. in ft.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
Kalimpong .	3,933	58·9	60·7	68·3	73·1	74·3	74·9	75·1	74·7	74·3	71·6	66·5	61·0	69·5
Drosh . .	4,500	47·8	49·7	58·0	69·0	82·2	92·2	96·6	95·5	88·6	77·0	64·6	51·3	72·7
Gilgit . .	4,890	45·6	51·4	61·6	71·5	83·3	92·3	95·9	95·2	87·1	74·9	63·3	49·4	72·6
Srinagar .	5,204	40·6	43·5	55·8	66·6	75·7	82·4	85·0	84·7	79·4	70·1	61·3	48·3	66·1
Gangtok .	5,667	57·5	59·1	66·3	70·4	72·4	73·9	74·6	74·6	73·9	70·8	64·7	60·3	68·2
Parachinar .	6,000	49·7	50·2	58·1	67·6	79·0	87·6	86·5	85·6	81·6	74·6	65·6	54·5	70·1
Simla . .	7,232	45·7	46·2	55·5	65·2	73·0	74·2	69·1	66·7	66·1	62·8	56·1	49·9	60·9
Darjeeling .	7,376	46·6	48·4	56·3	62·5	64·0	65·5	66·3	65·9	64·9	61·3	55·1	49·2	58·8
Skardu . .	7,505	34·5	38·2	50·0	61·5	71·3	79·4	85·5	87·1	77·5	66·4	54·8	41·5	62·3
Mukteswar .	7,592	49·8	49·9	60·2	69·3	75·0	75·1	70·3	68·8	69·1	66·5	60·4	54·4	64·1
Dras . . .	10,059	19·2	23·1	33·6	43·8	60·4	73·9	78·9	79·7	70·4	57·4	44·3	27·7	51·0
Leh	11,503	30·3	32·5	44·3	55·5	63·6	72·0	77·2	76·9	70·3	58·6	47·7	36·0	55·4
Gyantse . .	13,110	42·2	44·8	50·7	57·8	65·8	72·6	72·5	70·2	70·1	63·0	50·3	43·6	58·6

TABLE IV.—MONTHLY AND ANNUAL NORMALS OF MINIMUM TEMPERATURE IN DEGREES FAHRENHEIT

Stations.	Ht. above m.s.l. in ft.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
Kalimpong .	3,933	45·9	47·4	52·7	58·2	62·1	65·9	66·9	66·9	65·4	60·3	52·5	46·8	57·6
Drosh . .	4,500	31·7	33·3	38·7	48·9	59·2	68·4	72·9	72·2	64·7	53·1	43·7	35·0	51·9
Gilgit . .	4,890	32·0	36·5	45·0	52·8	60·3	67·1	71·8	71·7	64·3	52·8	42·8	33·9	52·6
Srinagar .	5,204	26·5	28·4	37·3	45·0	51·8	57·6	64·0	63·4	54·0	41·1	32·1	27·9	44·1
Gangtok .	5,667	32·2	34·9	41·7	47·1	50·5	54·9	56·0	55·6	53·6	48·4	40·8	34·1	45·8
Parachinar .	6,000	28·7	30·3	38·4	46·7	55·7	63·5	66·0	64·8	58·9	49·2	41·0	32·8	48·0
Simla . .	7,232	35·1	35·3	43·9	51·4	58·3	60·8	60·1	59·2	56·6	51·1	44·9	39·3	49·7
Darjeeling .	7,376	34·7	35·5	42·1	48·5	52·1	56·2	57·7	57·4	55·7	49·9	42·7	36·7	47·4
Skardu . .	7,505	16·6	18·8	32·7	42·2	49·3	55·3	60·9	61·1	53·8	41·3	30·2	22·6	40·4
Mukteswar .	7,592	35·3	35·2	42·9	50·4	55·4	58·0	58·3	57·7	55·4	49·8	43·1	38·2	48·3
Dras . . .	10,059	10·6	10·8	4·1	19·8	33·1	41·1	47·6	48·4	39·5	26·8	15·9	0·2	21·3
Leh . . .	11,503	8·5	9·8	20·8	30·3	36·7	43·9	50·1	49·7	41·6	30·3	20·7	13·1	29·6
Gyantse . .	13,110	3·3	8·9	16·2	25·4	32·3	41·1	43·7	42·1	38·7	28·9	14·1	4·2	24·9

TABLE V

Date.	Air Temperature.
30.5.33 . . .	} Maximum { Highest, 94° F. Lowest, 46° F.
4.5.33 . . .	
26.6.33 . . .	} Minimum { Highest, 29° F. Lowest, 11° F.
7.5.33 . . .	

TABLE VI.—MONTHLY AND ANNUAL NORMALS OF CLOUD AT 8 A.M. LOCAL TIME
(Whole sky cloudy = 10·0.)

Stations.	Ht. above m.s.l. in ft.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October	November.	December.	Year.
Kalimpong .	3,933	2·6	2·7	1·8	3·3	4·2	7·1	7·5	7·5	6·5	3·3	1·9	2·6	4·2
Drosh .	4,500	4·4	4·7	4·8	3·8	2·2	1·4	1·8	2·4	1·8	1·9	2·2	4·1	3·0
Gilgit .	4,890	7·3	6·9	6·8	6·1	4·4	3·0	3·9	3·9	3·4	3·4	4·0	6·0	4·9
Srinagar .	5,204	7·7	7·6	6·1	5·1	3·5	2·9	4·5	4·8	3·2	2·1	2·4	5·5	4·6
Gangtok .	5,667	3·1	3·2	2·2	2·7	4·0	6·1	6·7	5·9	5·5	3·4	2·4	2·0	3·9
Parachinar .	6,000	4·0	4·1	4·5	3·5	2·4	3·3	5·3	4·3	3·4	1·1	1·9	3·4	3·4
Simla .	7,232	4·8	4·5	4·2	3·3	2·5	4·1	8·0	8·2	4·2	0·8	1·5	3·6	4·1
Darjeeling .	7,376	4·1	4·3	3·6	4·9	6·8	8·6	9·0	9·0	8·1	5·3	3·3	3·1	5·8
Skardu .	7,505	6·7	6·4	6·6	5·6	4·5	3·3	4·1	4·1	3·5	2·8	3·5	6·0	4·8
Mukteswar .	7,592	3·8	4·1	3·6	2·8	2·5	4·6	8·2	8·7	5·3	1·3	1·3	2·8	4·1
Dras .	10,059	6·1	5·3	5·7	5·1	3·8	3·0	4·0	4·1	2·8	2·0	2·7	5·1	4·1
Leh .	11,503	6·7	6·4	6·3	5·7	4·6	3·9	4·7	4·5	3·4	2·4	3·4	5·7	4·8
Gyantse .	13,110	0·7	1·1	1·1	1·4	1·8	1·6	3·5	3·6	1·9	0·5	0·4	0·1	1·5

TABLE VII.—MONTHLY AND ANNUAL NORMALS OF RAINFALL

Stations.	Ht. above m.s.l. in ft.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
Kalimpong .	3,933	0·45	1·50	1·13	2·59	4·45	15·55	22·97	19·17	10·93	2·55	0·29	0·24	81·82
Katmandu .	4,388	0·99	0·86	1·09	1·94	4·01	9·22	14·91	14·66	7·35	2·29	0·15	0·31	57·78
Drosh . .	4,500	0·91	1·13	3·42	4·15	1·95	0·64	0·57	0·70	0·63	1·22	0·36	1·07	16·75
Gilgit . .	4,890	0·21	0·21	0·49	1·05	0·94	0·40	0·59	0·45	0·37	0·25	0·04	0·11	5·11
Srinagar .	5,204	2·98	2·79	3·52	3·65	2·63	1·73	2·87	2·41	1·82	1·08	0·35	1·41	27·24
Gangtok .	5,667	1·00	2·54	5·12	11·43	19·45	20·62	24·90	22·69	19·30	5·34	1·83	0·89	135·11
372 Parachinar .	6,000	2·14	2·01	4·37	3·82	2·76	2·21	3·57	2·83	1·63	0·78	0·48	1·25	27·85
Mussoorie .	6,940	2·73	3·01	1·99	1·10	2·25	9·01	29·74	31·85	9·99	0·84	0·33	1·00	93·84
Simla . .	7,232	2·64	3·31	2·44	1·75	2·68	6·91	16·95	18·16	5·71	0·87	0·45	1·24	63·11
Darjeeling .	7,376	0·64	0·99	1·77	3·66	8·74	22·77	32·37	26·60	18·46	4·49	0·29	0·22	121·00
Skardu . .	7,505	0·78	0·63	0·87	1·11	1·27	0·34	0·57	0·41	1·08	0·06	0·04	0·32	7·48
Mukteswar .	7,592	2·38	2·54	1·55	1·40	2·09	5·88	13·50	12·67	6·15	1·70	0·21	0·83	50·90
Sonamarg .	8,250	11·50	9·48	16·75	10·26	5·82	3·11	4·06	3·38	4·67	1·76	1·18	5·87	77·84
Dras . . .	10,059	2·73	2·39	3·82	4·01	3·09	0·71	0·81	0·48	1·31	0·42	0·30	1·71	21·78
Leh	11,503	0·37	0·34	0·30	0·22	0·21	0·17	0·47	0·52	0·28	0·17	0·04	0·17	3·26
Gyantse . .	13,110	0·01	0·04	0·05	0·21	0·49	1·17	2·65	3·74	1·10	0·14	0·07	0	9·67

TABLE VIII.—MONTHLY AND ANNUAL NORMALS OF NUMBER OF RAINY DAYS

Stations.	Ht. above m.s.l. in ft.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
Kalimpong .	3,933	1·3	3·0	3·1	6·5	8·8	15·9	23·3	21·1	12·8	3·4	0·5	0·5	100·2
Drosh . .	4,500	2·8	3·1	7·4	8·1	4·1	1·9	1·5	2·3	1·7	2·6	1·3	3·2	40·0
Gilgit . .	4,890	0·7	0·8	1·6	2·9	2·7	1·3	1·9	1·8	1·2	0·6	0·1	0·3	15·9
Srinagar .	5,204	6·3	6·3	7·9	7·4	5·7	4·1	5·7	5·4	3·8	2·5	1·1	3·5	59·7
Gangtok .	5,667	2·9	5·2	8·5	14·7	20·2	22·8	27·7	27·2	21·6	9·1	3·6	1·9	165·4
373 Parachinar .	6,000	4·4	4·3	9·2	8·7	7·8	4·8	7·1	6·8	4·1	2·0	1·3	3·3	63·8
Mussoorie .	6,940	4·3	4·5	4·2	2·3	4·3	10·0	22·1	22·4	10·4	1·2	0·6	1·9	88·2
Simla . .	7,232	4·9	5·8	4·6	3·7	4·8	9·5	19·4	19·8	8·3	1·3	0·9	2·1	85·1
Darjeeling .	7,376	1·5	2·4	3·6	7·1	13·9	20·6	25·0	24·4	17·0	4·3	0·8	0·7	121·3
Skardu . .	7,505	2·2	2·3	3·1	2·8	2·7	0·9	1·2	1·1	1·5	0·1	0·1	1·0	19·0
Mukteswar .	7,592	4·1	4·8	3·5	3·6	5·4	9·3	19·0	17·9	8·6	1·4	0·2	1·8	79·6
Sonamarg .	8,250	12·2	9·9	15·7	13·0	9·8	8·8	9·9	9·2	8·0	4·6	1·8	6·8	109·7
Dras . . .	10,059	8·2	7·1	11·1	9·1	5·9	2·4	1·6	1·1	2·1	1·4	1·0	6·1	57·1
Leh	11,503	1·1	0·9	1·1	0·7	0·7	0·6	1·2	1·7	0·7	0·1	0·2	0·6	9·6
Gyantse . .	13,110	0·1	0·1	0·2	0·9	1·9	3·9	7·8	9·5	3·6	0·6	0·3	0	28·9

TABLE IX.—PILOT-BALLOON DATA

Direction given in degrees from north through east. Velocity given in metres per second

Stations.	Date.	Time hrs. I.S.T.	Height above sea-level.									
			6 km.		7 km.		8 km.		9 km.		10 km.	
			D.	V.	D.	V.	D.	V.	D.	V.	D.	V.
JANUARY												
Simla . . .	2.1.28	9	270	8	—	—	270	13	260	18	—	—
Agra . . .	11.1.28	7	300	18	—	—	290	27	280	42	—	—
	12.1.28	7	250	19	—	—	250	30	—	—	250	47
	9.1.29	8	250	17	—	—	250	19	—	—	240	20
	22.1.30	16	240	13	—	—	250	11	270	13	—	—
Patna . . .	18.1.29	12	260	21	260	30	—	—	—	—	—	—
	31.1.30	15	260	27	250	36	—	—	—	—	—	—
Tezpur . . .	26.1.29	8	270	25	290	28	—	—	—	—	—	—
	10.1.30	7	280	23	300	29	—	—	—	—	—	—
FEBRUARY												
Agra . . .	11.2.28	10	270	30	—	—	290	34	290	43	—	—
	26.2.29	17	270	19	—	—	280	18	240	23	—	—
	19.2.30	17	260	20	—	—	260	32	270	30	—	—
Patna . . .	17.2.29	7	280	36	—	—	280	47	—	—	—	—
	12.2.30	6	300	21	—	—	290	29	290	40	—	—
Tezpur . . .	22.2.29	8	300	13	—	—	280	18	290	15	—	—
	13.2.30	7	330	7	—	—	300	19	—	—	—	—
MARCH												
Agra . . .	17.3.28	7	270	21	—	—	280	42	290	36	—	—
	19.3.29	8	270	4	—	—	270	11	230	13	—	—
	28.3.30	7	280	9	—	—	270	10	260	15	—	—
Patna . . .	5.3.29	7	320	12	—	—	330	26	330	31	—	—
	12.3.30	6	310	20	—	—	280	31	280	32	—	—
Tezpur . . .	13.3.29	14	280	11	—	—	280	16	290	21	—	—
	13.3.30	7	290	19	280	22	—	—	—	—	—	—
Purnea . . .	16.3.33	5	250	16	250	15	240	14	240	23	—	—
	16.3.33	15	250	13	250	16	240	15	260	17	—	—
	18.3.33	6	320	7	210	1	70	1	300	1	—	—
	19.3.33	5	290	13	290	14	290	19	270	14	—	—
	29.3.33	5	280	17	280	20	260	20	280	26	—	—
	29.3.33	15	280	13	270	17	270	27	270	35	—	—
	30.3.33	5	280	19	270	23	260	28	260	36	—	—
	30.3.33	15	270	17	270	22	270	25	270	37	—	—
Darjeeling . . .	17.3.33	6	300	6	300	5	250	6	300	6	—	—
	27.3.33	6	280	35	290	40	290	46	—	—	—	—
	27.3.33	16	280	21	280	27	270	31	280	37	—	—
	30.3.33	6	280	21	280	25	280	30	—	—	—	—
	31.3.33	16	280	20	280	30	270	35	270	44	—	—

TABLE IX.—PILOT-BALLOON DATA—(continued)

Direction given in degrees from north through east. Velocity given in metres per second.

Stations.	Date.	Time hrs. I.S.T.	Height above sea-level.									
			6 km.		7 km.		8 km.		9 km.		10 km.	
			D.	V.	D.	V.	D.	V.	D.	V.	D.	V.
APRIL												
Simla . . .	22.4.28	7	260	5	—	—	270	10	—	—	270	15
Agra . . .	23.4.28	6	280	14	—	—	270	34	—	—	260	73
	17.4.29	18	270	15	—	—	270	14	290	16	—	—
Purnea . . .	3.4.33	6	270	11	280	13	290	19	290	23	—	—
	3.4.33	15	300	18	290	17	290	17	290	10	—	—
	4.4.33	5	290	19	290	19	300	18	290	17	—	—
	12.4.33	15	280	21	290	21	300	31	310	33	—	—
	25.4.33	15	290	23	280	27	270	34	270	51	—	—
	28.4.33	15	280	18	290	27	270	30	280	29	—	—
Darjeeling . . .	30.4.33	5	270	18	270	24	270	30	270	40	—	—
	1.4.33	6	290	4	290	6	290	10	270	19	—	—
	1.4.33	16	290	12	310	15	310	17	300	23	—	—
	3.4.33	6	290	10	270	10	290	19	300	26	—	—
	3.4.33	16	290	13	300	17	290	20	310	16	—	—
	26.4.33	6	280	18	290	22	280	35	290	35	—	—
Tezpur . . .	3.4.30	7	240	16	240	21	—	—	—	—	—	—
	7.4.30	14	330	7	310	15	—	—	—	—	—	—
MAY												
Simla . . .	3.5.28	7	260	5	—	—	310	5	—	—	—	—
	4.5.28	7	240	6	—	—	250	9	—	—	—	—
Agra . . .	13.5.28	7	270	10	270	13	—	—	—	—	—	—
	3.5.28	6	300	8	—	—	300	9	—	—	290	13
	11.5.28	6	320	11	—	—	300	20	—	—	310	28
	7.5.29	18	260	20	—	—	270	28	—	—	260	40
	28.5.29	6	250	2	—	—	40	5	—	—	70	6
	7.5.30	6	320	5	—	—	320	13	310	14	—	—
	7.5.30	6	320	5	—	—	330	14	310	15	—	—
	9.5.30	6	350	7	—	—	330	14	310	15	—	—
Purnea . . .	1.5.33	5	260	13	270	14	270	20	260	35	—	—
	1.5.33	15	280	13	270	16	250	7	240	15	—	—
	2.5.33	5	240	14	260	15	250	22	250	23	—	—
	2.5.33	15	230	12	230	15	240	17	240	23	—	—
	13.5.33	5	230	8	310	10	300	12	310	15	—	—
	15.5.33	15	230	8	290	24	290	29	290	36	—	—
	16.5.33	15	270	17	260	19	270	23	260	30	—	—
	28.5.33	5	290	5	300	4	290	8	270	12	—	—
Darjeeling . . .	2.5.33	16	230	9	250	16	250	20	260	19	—	—
	3.5.33	6	220	16	230	19	230	22	240	26	—	—
	10.5.33	16	290	13	280	14	270	16	—	—	—	—
	11.5.33	5	280	8	270	12	260	14	270	13	—	—
	19.5.33	5	260	17	280	21	270	23	270	31	—	—
	21.5.33	5	270	16	280	19	290	25	290	39	—	—
Tezpur . . .	29.5.29	13	230	3	280	9	—	—	—	—	280	16
	13.5.30	6	290	10	—	—	310	12	—	—	—	—
	14.5.30	6	250	11	—	—	240	13	240	16	—	—

TABLE IX.—PILOT-BALLOON DATA—(continued)

Direction given in degrees from north through east. Velocity given in metres per second

Stations.	Date.	Time hrs. I.S.T.	Height above sea-level.									
			6 km.		7 km.		8 km.		9 km.		10 km.	
			D.	V.	D.	V.	D.	V.	D.	V.	D.	V.
JUNE												
Agra . . .	5.6.29	6	360	15	—	—	280	8	—	—	320	15
	22.6.29	7	80	10	—	—	120	5	170	2	—	—
	17.6.30	17	330	9	—	—	310	15	—	—	330	20
	18.6.30	6	10	8	—	—	310	14	—	—	320	13
Purnea. . .	30.6.30	6	150	4	—	—	100	8	—	—	80	8
	1.6.33	5	310	6	290	13	290	14	290	13	—	—
Darjeeling . . .	10.6.33	5	130	9	120	9	130	6	160	9	—	—
	14.6.33	6	230	7	210	6	—	—	—	—	—	—
Tezpur . . .	23.6.33	6	140	4	200	2	310	3	310	6	—	—
	15.6.29	14	210	8	—	—	200	9	—	—	—	—
	24.6.29	14	270	8	270	6	—	—	—	—	—	—
	27.6.30	14	350	5	270	5	—	—	—	—	—	—
JULY												
Agra . . .	12.7.29	18	110	15	—	—	100	17	—	—	—	—
	16.7.29	18	310	4	—	—	10	4	—	—	—	—
	4.7.30	6	150	2	—	—	180	6	—	—	—	—
Patna . . .	25.7.30	6	80	6	70	6	—	—	—	—	—	—
	16.7.29	14	70	7	—	—	90	9	—	—	—	—
	23.7.29	6	100	8	—	—	90	9	—	—	—	—
Tezpur . . .	29.7.29	6	60	8	—	—	80	12	—	—	80	9
	15.7.30	6	130	6	—	—	100	7	—	—	80	10
	21.7.29	14	320	3	—	—	210	1	—	—	60	4
	9.7.30	15	50	7	—	—	90	9	80	7	—	—
	15.7.30	7	40	1	—	—	120	3	—	—	10	3
AUGUST												
Agra . . .	22.8.29	6	110	7	—	—	100	11	—	—	—	—
	28.8.29	18	80	5	—	—	80	5	—	—	—	—
Patna . . .	20.8.30	6	50	2	—	—	120	3	330	1	—	—
	17.8.29	7	100	2	—	—	110	6	50	3	—	—
	30.8.29	6	130	2	—	—	110	4	—	—	100	7
Tezpur . . .	24.8.30	15	310	3	—	—	100	1	—	—	100	8
	10.8.29	14	10	3	—	—	40	1	—	—	60	12
	5.8.30	7	130	6	—	—	130	8	—	—	—	—
	9.8.30	14	350	5	—	—	250	5	—	—	230	4
SEPTEMBER												
Agra . . .	4.9.30	6	270	6	—	—	260	11	260	12	—	—
	19.9.30	6	230	5	—	—	210	8	—	—	240	12
	20.9.30	6	250	12	—	—	250	12	260	11	—	—
Patna . . .	27.9.30	6	360	3	—	—	260	8	240	7	—	—
	8.9.30	7	90	8	—	—	90	7	90	6	—	—
Tezpur . . .	10.9.30	15	150	3	—	—	100	4	130	11	—	—
	25.9.30	7	220	5	—	—	200	3	—	—	170	6
	6.9.30	7	120	3	—	—	130	3	—	—	—	—
	20.9.30	15	240	2	—	—	200	3	250	5	—	—
	28.9.30	7	270	5	—	—	210	4	—	—	—	—

TABLE IX.—PILOT-BALLOON DATA—(continued)

Direction given in degrees from north through east. Velocity given in metres per second.

Stations.	Date.	Time hrs. I.S.T.	Height above sea-level.									
			6 km.		7 km.		8 km.		9 km.		10 km.	
			D.	V.	D.	V.	D.	V.	D.	V.	D.	V.
OCTOBER												
Agra . . .	6.10.30	16	310	9	—	—	300	13	290	15	—	—
	12.10.30	15	290	20	—	—	270	22	—	—	—	—
	24.10.30	15	270	14	—	—	280	15	280	29	—	—
Patna . . .	1.10.30	7	220	1	—	—	150	3	200	6	—	—
	3.10.30	6	270	7	—	—	240	13	—	—	240	14
Tezpur . . .	19.10.30	7	270	12	—	—	270	22	270	27	—	—
	9.10.30	16	10	3	—	—	290	10	—	—	—	—
	13.10.30	7	290	8	280	15	—	—	—	—	—	—
NOVEMBER												
Agra . . .	6.11.28	7	290	10	—	—	290	16	310	15	—	—
	11.11.28	7	280	15	—	—	290	25	—	—	280	35
	13.11.28	6	260	12	—	—	270	36	—	—	270	48
	17.11.28	16	250	12	—	—	250	27	—	—	230	51
Patna . . .	6.11.28	6	310	8	—	—	330	15	340	20	—	—
	9.11.28	6	270	12	—	—	270	16	—	—	300	23
	18.11.28	6	270	12	—	—	260	29	270	40	—	—
Tezpur . . .	24.11.28	6	310	17	—	—	280	39	280	41	—	—
	22.11.28	6	290	17	—	—	290	38	—	—	290	63
	24.11.28	6	240	15	—	—	240	33	240	42	—	—
DECEMBER												
Agra . . .	4.12.29	7	290	17	—	—	290	24	290	29	—	—
	18.12.29	8	290	34	—	—	290	54	—	—	—	—
	22.12.29	16	270	17	—	—	260	31	250	29	—	—
Patna . . .	10.12.29	7	280	14	—	—	280	19	260	22	—	—
	23.12.29	7	260	23	260	27	—	—	—	—	—	—
Tezpur . . .	11.12.29	14	240	15	—	—	240	14	250	17	—	—
	23.12.29	7	260	26	—	—	250	37	—	—	—	—
	31.12.29	7	250	38	250	48	—	—	—	—	—	—

TABLE X.—AGRA MEAN MONTHLY DENSITIES IN GRAMMES PER CUBIC METRE

Ht. in km.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual mean.	Range.
14.0	236	236	240	238	244	250	251	251	252	251	242	236	244	16
13.0	273	271	275	276	280	285	286	286	285	282	278	276	279	15
12.0	312	307	313	318	319	322	319	320	321	321	317	318	317	15
11.0	357	350	357	359	360	359	355	357	359	359	356	364	358	14
10.0	406	395	403	407	404	401	398	399	402	403	402	411	403	16
9.0	458	457	457	459	458	458	443	446	449	455	452	463	455	20
8.0	513	517	514	514	510	500	496	497	499	509	510	517	508	21
7.0	574	572	574	575	570	559	552	554	559	567	571	577	567	25
6.0	643	640	641	640	636	625	614	619	623	632	638	644	633	30
5.0	717	714	713	712	706	696	685	688	698	704	711	716	705	32
4.0	795	794	789	790	780	770	758	765	773	782	795	790	782	37
3.0	884	891	874	868	856	849	843	848	858	870	882	879	867	48
2.0	984	979	963	953	932	925	933	938	943	958	979	975	955	59
1.0	1,090	1,079	1,055	1,047	1,017	1,009	1,034	1,030	1,035	1,046	1,083	1,085	1,051	81
0.5	1,145	1,132	1,104	1,090	1,064	1,058	1,085	1,078	1,088	1,094	1,136	1,140	1,101	87
Surface (0.17)	1,190	1,173	1,138	1,130	1,100	1,090	1,120	1,115	1,130	1,140	1,175	1,175	1,140	100

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TABLE XI.—AVERAGE NUMBER OF STORMS AND DEPRESSIONS IN THE BAY OF BENGAL, 1891-1930

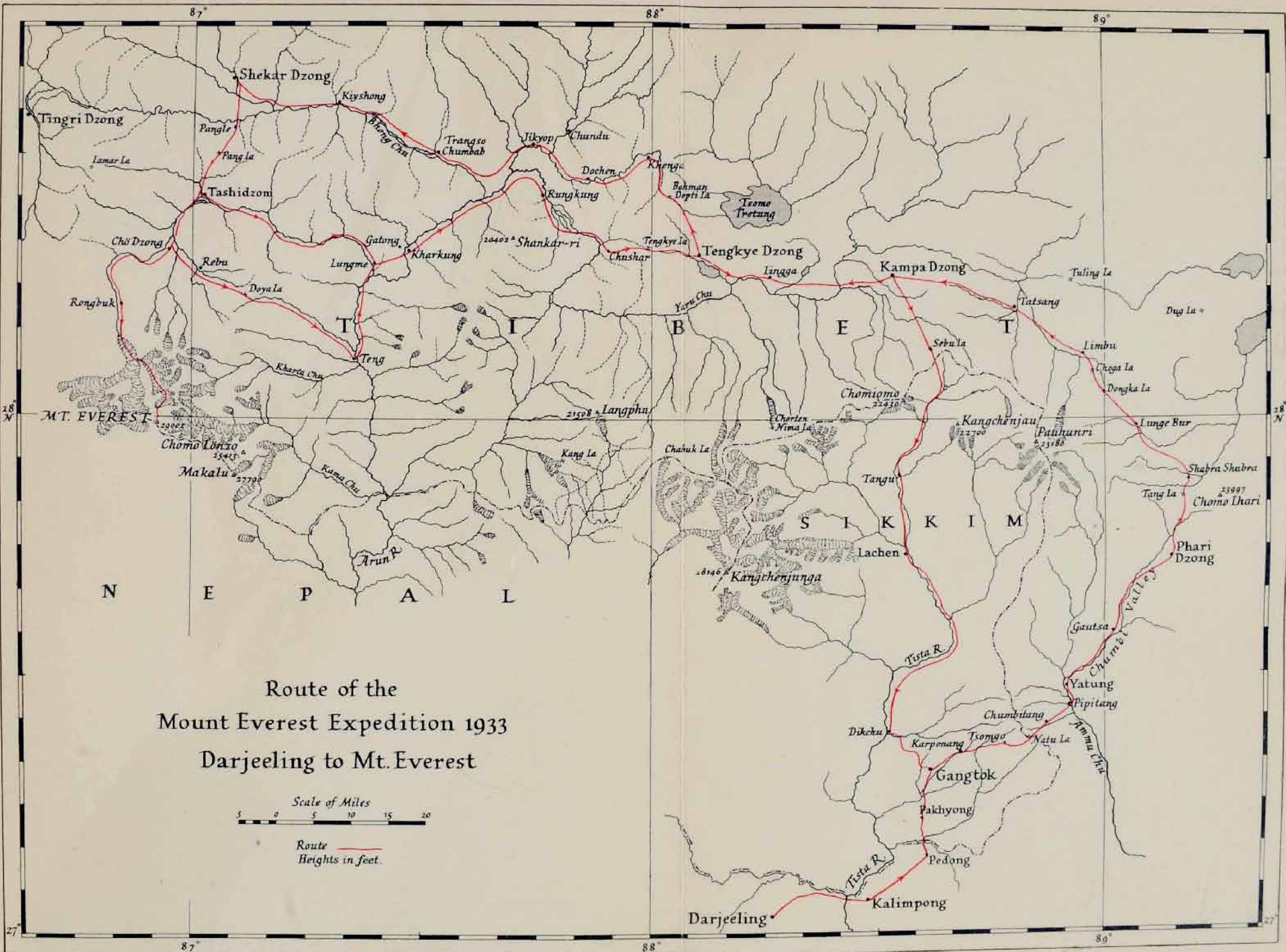
Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
0·3	0·0	0·3	0·3	0·9	1·3	1·8	1·8	2·2	1·8	1·7	0·8

TABLE XII.—AVERAGE DEPTH OF THE BAY OF BENGAL CURRENT OVER BENGAL

Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
km. 0·0	km. 0·5	km. 1·0	km. 1·4	km. 1·9	km. 2·3	km. 3·1	km. 3·9	km. 2·7	km. 2·0	km. 0·0	km. 0·0

TABLE XIII.—COMPARATIVE STATEMENT OF WESTERN DEPRESSIONS AND BAY DISTURBANCES IN 1924 AND 1933

—	March.		April.		May.		June.	
	1924.	1933.	1924.	1933.	1924.	1933.	1924.	1933.
Western depression	5	8	5	9	6	5	3	1
Disturbance of Bay of Bengal origin	0	0	1	0	1	1	1	3



Route of the
 Mount Everest Expedition 1933
 Darjeeling to Mt. Everest

Scale of Miles
 0 5 10 15 20

Route ———
 Heights in feet ———

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MOUNT EVEREST AND THE GROUP OF CHOMO LUNGMA



SCALE OF MILES

One Inch to One Mile, or 1:63,360

Contours are figured in Meters at 100 metre intervals
Contours on Glaciers in Blue

Glaciers are traced pale blue

Drawn by Charles J. G. Guillemin from the photographic
survey of Major Wheeler, R.C. Survey of India, on the Mount Everest
Expedition of 1921, with additions by Surjewan Datt Singh on the Expedition
of 1924, and from the photographs of the three expeditions. * Reproduced
for the Mount Everest Committee of the Royal Geographical Society
and Alpine Club by the Ordnance Survey, 1925.

SCALE OF KILOMETRES

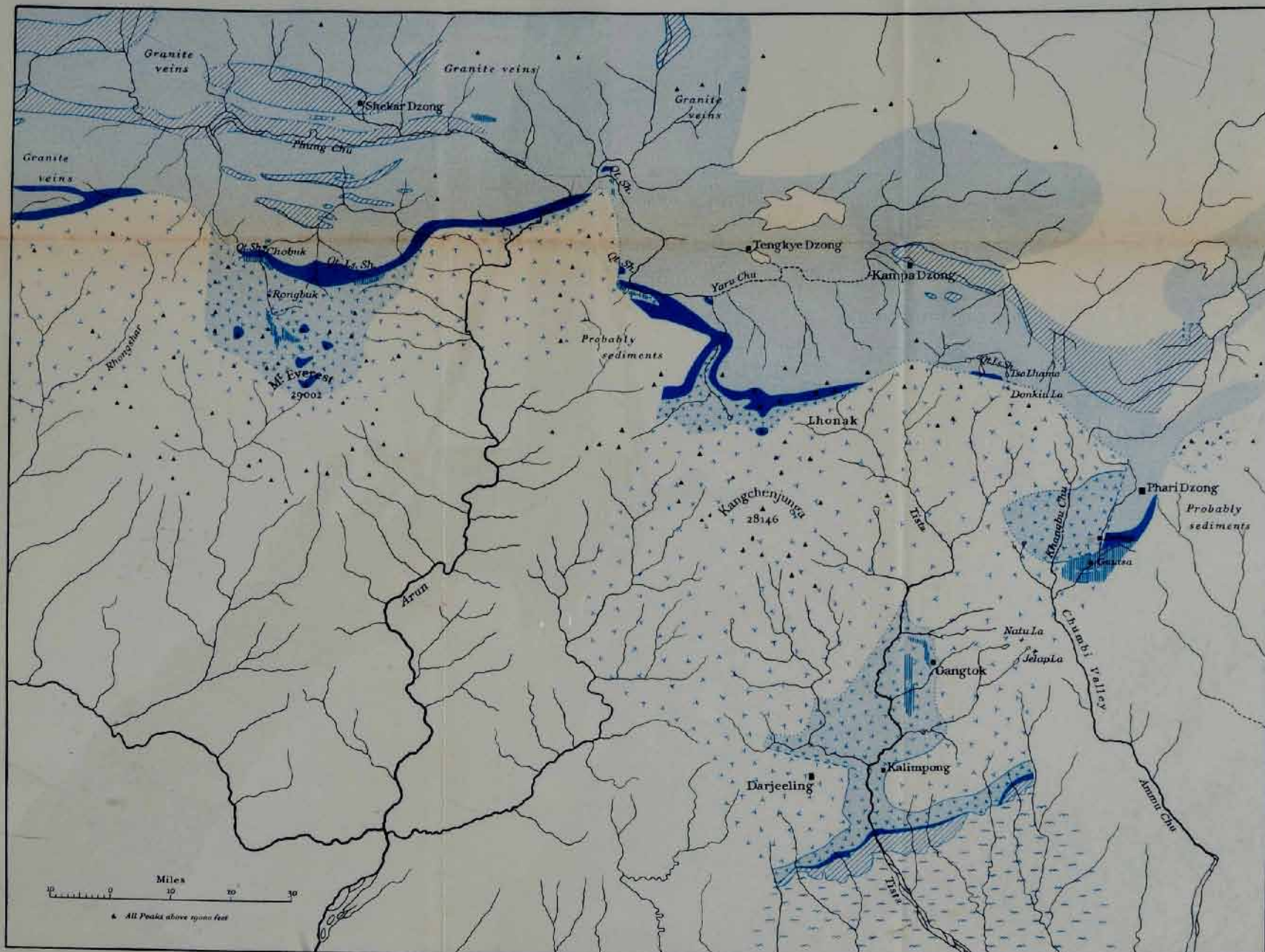
Figures are given in Meters and Feet
Points triangulated by Survey of India, this
Camera Stations, this
Intersected points, this

Roads and Camps in Red

Approved case with Comps. 1118 1119 1120 1121 1122 1123 1124 1125 1126 1127 1128 1129 1130 1131 1132 1133 1134 1135 1136 1137 1138 1139 1140 1141 1142 1143 1144 1145 1146 1147 1148 1149 1150 1151 1152 1153 1154 1155 1156 1157 1158 1159 1160 1161 1162 1163 1164 1165 1166 1167 1168 1169 1170 1171 1172 1173 1174 1175 1176 1177 1178 1179 1180 1181 1182 1183 1184 1185 1186 1187 1188 1189 1190 1191 1192 1193 1194 1195 1196 1197 1198 1199 1200

Geological Sketch Map of Drainage Areas of the ARUN, TISTA, AND AMMU CHU

From observations by Hooker, Mallet, Garwood, Hayden, A. M. Heron, N.E. Odell & L.R. Wager



Metamorphic Complex
(including Peninsular India and
some Tertiary Granite Gneisses etc.)

Later Granite and Gneiss
(Tertiary)

North
only

Lower M^t Everest
Limestone & M^t Everest
Pelite Series

M^t Everest
Limestone Series

Qt. Ls.
& Sh.

Lachu Series
(Permian)

Jurassic etc.

Cretaceous
& Eocene

South
only

Daling Series

Dumuda Series
(Permian)

Nahun Group
(Tertiary)

Gangetic
Alluvium