

We joined the rest of our party at a delicious Alp not far from Peutelstein, at the junction of the Acqua di Campo di Croce with the stream from Val Travernanze, and found that Mr. Tuckett had been up the Tofana and had already reached the spot previously fixed upon, where they were having a picnic, having driven there with four horses and a *bergwagen*. We made altogether, including guides and charioteers, a wagonload of seventeen people, and drove our noble team of horses into Cortina much to the astonishment of the natives.

But I have already reached the limits of an Alpine paper when we have descended to roads where driving is possible, and so must not continue the record of the close of the day, which was celebrated by dancing to the band of the village (an accordion and flute) till an early hour next morning, before an audience, if I may use the Irishism, of delighted natives, who, I think, would at last come to the conclusion that, taken altogether, the English must be the most extraordinary people in the world.

THE WETTERHORN AND JUNGFRAU IN WINTER. By W.
A. B. COOLIDGE.

IT will, I think, be admitted by an overwhelming majority of my readers that the most fascinating of all summer occupations is mountain climbing, and many while admiring the indescribable beauties of the ice world at that season must wonder, however vaguely, what its appearance is in winter. It was this feeling of curiosity, greatly heightened by Mr. Moore's attractive accounts of his experiences, which induced my aunt and myself to take the first opportunity which offered itself of visiting the Alps at that season.

After a rapid journey from England we arrived in Geneva on the morning of December 29 last, accompanied by the faithful Tachingel. That evening, according to previous agreement, we were joined by Christian Almer and his son. It was somewhat strange the next morning to get into a diligence, and hear that we could get on to Chamonix that day. It was bitterly cold but very fine, and though the well-known road seemed more beautiful than ever, we were not sorry to descend from our vehicle at Sallanches. The scene here was very striking; snow covered everything, and Mont Blanc actually looked not so very much higher than the neighbouring hillocks, the uniform expanse of snow tending to dwarf the great peaks in a most singular manner. After dinner we

started in a carriage, the only passengers, for Chamonix. Unfortunately our conveyance was full of holes, and more cold air entered than was pleasant; darkness soon came on, but the moon shone out and produced a most beautiful effect on the snow-laden pine trees. The snow on the road became deeper and deeper, our progress was very slow, but at length, at 8.30 p.m., we pulled up before the hospitable doors of the Hôtel des Alpes, whither a telegram to announce our arrival had been sent. We awoke next morning much refreshed, and after consultation started for the Montanvert. We found the snow on the path very deep indeed, but the air grew warmer directly we left the level of the valley, so that we lunched with perfect comfort outside the chalet about half way up. Beyond this the walking was very heavy, and in several places traces of recent avalanches were plainly visible. This delayed us so much that on reaching the hut we were unable to carry out our original intention of crossing over to the Chapeau. The little chalet 'à la nature' was open, and we availed ourselves of its shelter, but after a short stay we started again, leaving a bottle with names, after the most approved Alpine fashion, on the table as a memorial of the last visitors of the year. It was of course much easier to come down than it had been to go up, and we were soon enjoying an excellent dinner.

The excessive quantity of snow was to be attributed partly to the Montanvert being on the south of the valley, where the sun has little strength, partly to a great snow-storm which had occurred a few days before.

We saw the old year out with all appropriate ceremonies, and retired to our rooms, which opened out on a vast sort of salon; it was impossible to get this at all warm, and every night of our stay, though a fire was kept up, the water in the jugs, sponges, toothbrushes, &c., was frozen so hard, that it was a work of some little time to restore them to a fit condition for use. I will pass over more rapidly our other excursions at Chamonix. On New Year's day we went up the Flégère, finding much less snow than on the Montanvert, but getting no view. On Jan. 2 to the Chapeau, and some way beyond the Mauvais Pas (which itself was blocked by ice and swept by falling icicles) on the Mer de Glace, where the deep snow turned us back; the weather was perfect, the view superb, and the air so warm that we spent an hour and a quarter before the hut in most delicious repose. On Jan. 3 we went up to the Plan-praz chalets, but were again disappointed of getting a view. On Sunday there was a great snow-storm, and next morning the snow had drifted in under the door of the house.

to the depth of several inches. Walking was almost impossible, and Argentière was said to be quite inaccessible. We therefore whiled away the time by driving over in a sleigh to St. Gervais, where the people were very much astonished to see us, and returning after a short stay. The cold the whole time at Chamonix was intense, and we were told unusual even for that season. But as soon as we mounted the slopes on either side of the valley it became much warmer, and it was often a positive relief to be able to sit down and rest. Two snow-storms following so close on one another probably made the snow deeper than it would otherwise have been; but the effect on the pine woods, especially when seen from above, was very striking. An unbroken mantle of snow covered glaciers, moraines, rocks, and grass slopes; even the great Aiguilles were not wholly free. One evening we enjoyed a very remarkable spectacle: just about sunset the Aiguille Verte (appropriately enough) became tinged with a decided green hue, which lasted some minutes and seemed almost unearthly in its strange beauty.

We were loth to quit our comfortable quarters, but this was absolutely necessary, for we had arranged to visit the Oberland also.

Accordingly our whole party started on the morning of the 6th in a sleigh for Argentière. We only got to the village after sundry adventures, not the least amusing of which was being nearly compelled to get out about 100 yards from the hotel, the snow being so deep that it was all the horses could do to drag us through it.

We hoped to sleep at the Tête Noire inn, and could not make any long halt at Argentière. We were repeatedly warned of the dangers of that somewhat humdrum pass, and started with the recollection of a certain cross on the Montets uppermost in our minds. However we managed to get over safely, though the snow in some places was deeper than an ordinary alpenstock; hence, although the views looking back towards Chamonix were very fine, it was not without pleasure that we reached the well-known little inn, after having passed two contrebandiers laden with tobacco just on the frontier. We were received very hospitably, and everything possible was done to make us comfortable, but of course no travellers were expected. Our four-footed companion, however, did not receive such a warm welcome from two magnificent St. Bernards who were prowling about.

We did not start very early next day, and reached the Forclaz without difficulty. There was quite a number of

peasants here, who assured us that ours was the first party of *bonâ fide* winter travellers which had passed since Mr. Moore's some years before. Here one of the party mounted on a 'traineau,' and proceeded by the ordinary road, but the others, taking short cuts by the smooth and icy paths down which great logs of wood came thundering every now and then, just managed to win a close race, and the whole party was re-united on the bridge leading into Martigny. On our arrival we learned that there was a great deal of fresh snow on the Gemmi, and our hopes being thus dashed to the ground, we had to make the long *détour* by Lausanne and Berne. The great Oberland giants came out superbly from the deck of the steamer on the Lake of Thun, and we hurried on to Lauterbrunnen, arriving there on the evening of the 9th. We started betimes the next morning to cross the Wengern Alp to Grindelwald. The snow was very deep, especially on the summit, but the weather was superb and the heat really oppressive. Instead of following the ordinary path, we kept higher up on the slopes to the left, but had actually sometimes to force our way through the snow. A curious sight greeted us on the roof of the Jungfrau hotel—the tracks of foxes in the snow. Just as we were passing, a magnificent avalanche fell from the Jungfrau, but it was the only one we saw.

The snow between the two hotels was very deep, and the passage was only made in two hours, including a halt of fifteen minutes. On the Grindelwald side we met with even greater trouble, but just as we were beginning to despair of getting to the level of the valley before dark, the tracks of a 'schlitten' appeared, and soon after we met the schlitten itself and two men. It was the work of a minute to mount on it; one man guided it in front while Almer held it back behind, and a delightful glissade of twenty minutes down brought us to the bridge, whence we soon reached our old quarters at the Hôtel Eiger, where we were expected.

On the 12th our party, reinforced by the knecht of the hotel, went up the Faulhorn by the Buss Alp; this way forms a very beautiful variation on the ordinary route by the Bach Alp, and took us only an hour longer, despite the snow, and the heat, which was really quite as great as on the hottest days in summer. We had the key of the hotel with us and passed a comfortable night, the view being very fine both that evening and the next morning.

We were so elated at the perfect success which had attended all our expeditions hitherto, and so delighted with the numberless exquisite things which had been revealed to us, that when

on our way down to Grindelwald Almer suggested the ascent of the Wetterhorn, we scouted all difficulties, and on our arrival set about the necessary preparations for the attack.

Hence on the morning of January 13 our party, reinforced by the addition of porters, in full marching order started along the path to the Upper Glacier, affording a rather unusual spectacle in winter. We soon turned off to the right and kept along the base of the Mettenberg, near an immense boulder locally known as the Halsfluh. Our destination was of course the Weisshorn-hütte, and we proposed to reach it by a route at least in part new along the left bank of the glacier, the ordinary route by the Enge being of course on the right bank. The way lay at first through pine forests and then over steep snow slopes (underneath which were, I suppose, grass and stones) to the base of the rocks which support the upper plateau of the glacier. This route had been discovered by two brothers Bohren, who were among our porters. They had arranged ladders in the most difficult places and propose constructing a hut and mule-path, so that even ladies will be able to reach the secluded upper regions of this glacier. We had mounted the first of these ladders and were admiring some very shaky looking séracs immediately above us, when one of the said séracs took it into its head to fall, creating some little alarm in our party, which, however, was in a perfectly safe situation. This danger would probably not exist in summer, and the great beauty of the route ought to attract many visitors. We then came to a very singular cavern in the rock through which a stream used to flow before the retreat of the glacier. I can give no idea of this very curious place but by comparing it to the Gouffre des Bouserailles in the Val Tournanche, if one could suppose this last to be placed in a nearly vertical position. Up this ladders had been placed, at the end of which we found ourselves in a sort of grotto commanding a fine view. After a short halt we continued our journey through a natural tunnel in the rock which brought us out after a scramble up a great sérac on one of the upper plateaux of the glacier at a point opposite to and about half way between the Enge and the Schönbühl. We crossed the ice and tried to climb up to the path leading to this last-mentioned hillock, but the snow was too loose, and we had to force our way round its base through some of the finest séracs that I have ever seen, meeting with at least one formidable obstacle in the shape of a very long, very narrow, and extremely shaky snow bridge, over which however we all got without accident. A steep climb then led us to the path on the other side of the Schönbühl, and this was followed

to the hut, the ladders being quite impassable owing to masses of ice which forced us to go round by the long way. There was a good deal of snow in the hut, but it was soon cleared out, and after announcing our arrival to the world below by waving blazing torches, we settled down for the night. The cold was not excessive, as plenty of wood and blankets had been brought up, but the night was very long and every one was glad when it came to an end. The sun of course did not rise very early, and it was 7.10 A.M. on the 15th when we got off. Our party consisted of our two selves, the Almers, and three porters to break the way. The others remained in the hut, as did Tschingel, who, having been once already to the summit, and strongly condemning the foolish habit of incurring fatigue when there was no need, spent the day I suppose in snoozing away comfortably among the blankets and hay. We followed exactly the same route as in summer. The rocks, to my surprise, were *not* glazed with ice and the snow was very good, so that there was no difficulty beyond the labour of mounting. But when we reached the saddle a fierce cold wind assailed us against which we had to fight our way to the top, the snow too being much worse here than below. At length, however, we topped the ridge, and the familiar but never-to-be-forgotten view was spread again before our eyes. The air was perfectly clear, the sky cloudless, and countless peaks were identified. Almer was naturally in very fine spirits, and declared that though he had been up the peak any number of times, he had never had so marvellous a view before. We stood in a row along the ridge, and learned afterwards that we were clearly distinguished from Grindelwald. But the wind would not allow us to stay more than ten minutes, and we turned to descend, after planting a fir tree we had brought up by the side of a green pole which was already there. The descent was not marked by anything noticeable. Instead of keeping to the right on a level before descending to the glacier we followed the ridge, which forms the left-hand limit (as seen from below) of the great couloir, straight down to the glacier, and soon regained our temporary home, Tschingel being in transports of joy at seeing us again. Next day we returned to Grindelwald by the same route, and found that great astonishment prevailed at our complete success, for the mountain had been attacked December 31, 1872—January 1, 1873, but the attempt had failed owing to bad weather. We were overdue in England, and reluctantly prepared to leave the mountains. We had reached Interlachen when Almer threw out a suggestion which made us cast all engagements to the winds and return in hot haste to

Grindelwald. This was nothing less than the ascent of the Jungfrau. We were acquainted from personal experience with this peak on the Wengern Alp and Aletsch glacier sides; and it was now decided that it should be attacked from Grindelwald by way of the Mönch-joch. The next day, however, the weather was not quite satisfactory, but it cleared up in time to allow us to start on the afternoon of January 20. Our intention was to sleep twice on the way up, for we feared that the snow would be very deep. The same party started as for the Weisshorn-hütte, with the addition of even more porters (more wood and blankets being required), though I think that perhaps one or two might have been dispensed with. We mounted the ordinary path to the Bärenegg, and had got some way beyond a wooden gate which bars the road, when a dull rumbling noise was heard and at the same time shouts from wood-cutters on the other side of the glacier. The noise became louder and louder, and finally down came a most tremendous avalanche. Most providentially we were on a little projecting ridge and quite safe, but we could realise the irresistible force and mighty impetus with which the avalanche swept by. It was some minutes before it was quite over, and we then hurried across it (at least a quarter of an hour's walk). It was composed chiefly of snow which had been loosened on the upper portions of the Mettenberg by the previous day's rain, but fragments of icicles, blocks of ice, and a few stones were also visible. We went on to the overhanging rock where the horses usually stop in summer; here we halted more than an hour to allow the rays of the sun to lose their strength, for fear of another fall; and sure enough, soon after our arrival at the hut, another one did come down, utterly obliterating our footsteps. All this had delayed us so long that we had to sleep at the Bärenegg instead of at the Zäsenberg as we had intended. Next day we went up to the Swiss Alpen-Club hut 'im Bergli,' just below the Mönch-joch. Warned by the experience of the day before, we declined the ascent of the Kalliberg, preferring the safer and more circuitous, but infinitely more beautiful way by the Zäsenberg and the peak (marked 2,343 mètres on the Federal map) which is locally known as the Zäsenberg-horn. The walk from that point to the foot of the Mönch-joch slope, along the upper plateau of the Viescher-gletscher, above the Heisse Platte and at the base of the magnificent wall of the Viescher-hörner, was very striking. We had almost to dig out the hut, which even in the height of summer is not entirely free from snow; there was a good deal inside, and it could not all be got out, which made it at first somewhat uncomfortable.

At 6.40 A.M. on the 22nd, a week after the ascent of the Wetterhorn, our party left the hut, Tschingel, for the same reason as before, preferring ease to increased glory. We soon gained the summit of the Mönch-joch, from which we had a magnificent view. It so happened that although this was the third time we had visited it, it was the first on which we had had decent weather, and we were so much the more impressed by the wild beauty of the cliffs of the Eiger. Keeping along the slopes to the right, we next crossed the 'sattel,' between the Mönch and the Trugberg, which has, I believe, been called by the Swiss Alpen-Club, Hinter Mönch-joch; then descending to the foot of the Jungfrau-joch, we had a splendid *coup-d'œil* down great part of the Aletsch glacier, with all the great peaks surrounding it. The next thing was to decide upon the exact route by which the Jungfrau was to be assailed. A close examination showed that from our standing point the best and shortest way was not by the Kranzberg, but up a sort of a hollow between it and the ridge of the Jungfrau. The snow, however, was now becoming soft, and it was decided that an advanced guard should be sent on to make the track. I went on with the Almers and a porter; we crossed the bergschrund without trouble, and then gained the Roththal Sattel. From hence we saw that the final cone was composed of pure ice, and horrid thoughts arose in my mind as to the length of time it might take to cut up it. Almer, however, is never daunted, and said that having come so far we *must* get to the top. He accordingly took off his coat and set to work. We made our way up, partly by the ice but mainly along the rocks which overhang the western face of the peak, and finally reached the summit in an hour and three quarters from the Sattel. The other division of the party, profiting by our steps, soon rejoined us, and after replacing the flag on the staff, we all descended a few steps to the highest rocks, where we remained about forty minutes, it being most delightfully warm, a very remarkable phenomenon at such a height even in summer. The view was perfect; on every side rose the giants of the chief districts; but our attention was chiefly fixed on the great peaks around Zermatt and on the Aletschhorn, so familiar a sight from the Sparrenhorn, most of which we saw for the first time this year. We would willingly have lingered longer, but prudence bade us be going, and after depositing our names in a bottle which was found there, containing the card of a German gentleman, we turned to descend. We followed exactly the same route as in the morning, but the ascent to the Hinter Mönch-joch was very long and sorely against the grain. On the way a magni-

ificent fall of séracs from the Mönch took place, the dust of which floated across our path. Daylight fades soon in January, and though there was a moon, yet light fleecy clouds floated across her face which greatly obscured her light. Still the effect from the Mönch-joch must have been very grand, but we were all too thoroughly tired out with an expedition so novel and entirely beyond our experience to appreciate it. Those of my readers who know what it is to walk and walk without apparently getting any nearer to the desired end, will be able to realise our feelings when Tschingel's loud bark was heard and we were back again in the hut. In no very long time we were all enjoying the sleep of the just, and only awoke late next morning to find that the weather was even finer than the day before. Vague thoughts arose of doing something else, but alas, there were no more provisions and also no more time to spare, so we had to make the best of our way down to Grindelwald, the only incident being a rencontre near the Zäsenberg with two well-known members of the Swiss Alpen-Club, Herr Bischoff of Basle, and Herr Bohren of the Adler at Grindelwald, who, accompanied by one of the Michels, Peter Bohren, Peter Baumann, and other guides were on their way up to the hut which we had just left. We failed utterly to elicit what their plans were, but I have since heard that they got up the Mönch, but encountered very stormy weather, and were in great danger of being frozen. We were received in triumph at Grindelwald, and found that our former ascent had got into the local papers in a highly edifying form, but nothing to compare with the statement which has appeared in an English paper, that one of the members of our party 'ascended the Jungfrau accompanied by a dozen English tourists,' guides being altogether left out!

Next day we quitted Grindelwald, and two days later we were in England.

It only remains to make a few general observations.

We were very fortunate in our weather, and also in having Almer, who organised every expedition and carried it through with his well-known daring and quiet perseverance. The work was on the whole more laborious and perhaps more dangerous than in summer, the great avalanche above described being, however, due to the unusual fact of a fall of rain the day before. Mr. Moore had given accounts of the extreme heat which we had scarcely been able to credit, but again and again the correctness of his statements was confirmed. Still it is hard to persuade persons that such is the case, as it is commonly believed that the cold in all those high regions must be intense, espe-

cially in winter. We also found that the quantity of snow on the higher peaks was much less than at lower elevations or in the valleys, being probably blown away soon after it falls. Hence it would appear that the snow which makes it somewhat dangerous to travel in May or early in June, must be the remains of that which has fallen during the spring.

The great inconvenience of winter travelling seems to me to consist in the total absence of water; we had to melt snow in order to make tea, soup, &c., and those who have tried it know what an unpleasant flavour it imparts.

The views were generally very clear, more like those in September than anything else; and the beauties which were revealed to us are either not visible or at any rate not so striking in summer.

To conclude, I would advise every one who can to try a winter campaign. There are no doubt drawbacks, such as the extreme uncertainty of the weather; but I cannot believe that the splendid weather which we enjoyed on our expeditions was altogether exceptional. Against these are to be set the clearness of the atmosphere and the many singular and lovely things to be seen. This was our first journey in the winter, and I, for one, hope that it will not be our last.

A NEW METHOD OF MEASURING HEIGHTS.

NOTE SUR LA DÉTERMINATION DE LA HAUTEUR D'UNE MONTAGNE INACCESSIBLE, À L'AIDE DU BAROMÈTRE ET D'UN INSTRUMENT POUR MESURER LES ANGLES.—PAR M. LE COMTE PAUL DE SAINT-ROBERT.

ON sait que la méthode ordinaire pour déterminer la hauteur d'une montagne inaccessible consiste à mesurer une base horizontale, et à prendre, à chacune de ses extrémités, l'angle que fait avec cette base la projection horizontale du rayon visuel dirigé vers le point dont on cherche la hauteur.

Une fois que la base a été mesurée, on connaît un côté et les deux angles adjacents du triangle dont le sommet est le pied de la verticale passant par la cime de la montagne; on peut dès lors calculer la distance d'une extrémité de la base au pied de cette verticale. La longueur obtenue est le côté d'un triangle rectangle dans lequel la hauteur de la montagne au-dessus de la base est l'autre côté, et dont on mesure d'ailleurs directement un angle, celui du rayon visuel avec l'horizon. Le calcul de ce triangle rectangle donnera la hauteur cherchée.

Cette méthode présente des difficultés d'exécution telles qu'un voyageur isolé ne saurait surmonter, surtout dans un pays montagneux, où l'on trouve bien rarement un terrain uni permettant de tracer une base horizontale. La mesure directe d'une base est une opération longue et délicate qui exige l'emploi d'appareils coûteux.