THE LYSKAMM, FROM GRESSONEY, ST. JEAN.

2. THE COL DE LYS.

By William Mathews, Jun., M.A.

The season of 1859 will not easily be forgotten by any traveller who had the good fortune to visit the high Alps in the autumn of that year. The long-continued summer drought had made me apprehensive of a wet August, but the mountain weather of that month, although surpassed by its unexampled loveliness in 1861, was on the whole extremely brilliant, and finer than I had ever before experienced among the Alps. The heat had thoroughly solidified the elevated snow-fields, and rendered them easy to traverse; while it had made the steeper slopes hard and glassy, and the crevasses more than usually wide and difficult. The same cause had advanced by at least a

fortnight the flowering of the Alpine vegetation, and when I reached the mountains its too fleeting beauty was already on the wane.

On the 1st of August, 1859, my brother, Mr. G. S. Mathews, and I left London in the company of the Rev. Leslie Stephen, with whom we had arranged to have a few days' mountaineering in the Bernese Oberland, before he joined his travelling companion, Mr. Hinchliff. At Interlaken we picked up our guides, Jean Baptiste Croz and Michel Charlet of Chamounix, the former an old and trusty friend, the latter a man of comparatively second-rate qualifications, whom I had somewhat unwillingly accepted at the instance of Auguste Simond. Auguste did not feel strong enough to accompany me himself, and recommended Charlet in his stead, characterising him as a man "*qui n'aimait pas faire des dépenses inutiles*,"—a phrase which Croz translated into, "*il se pendrait pour six sous*." However, I am bound to say for Charlet, that he never flinched from his work, and that he went through a great deal of exertion without a murmur, although he did not hesitate to express a preference for the society of ladies at a lower elevation.

After spending a delightful week in the Bernese Oberland, during which my brother was introduced to the high Alps in the exciting expedition described by Mr. Stephen in another part of this volume, we arrived on the 10th at Kandersteg, where we took leave of that zealous and accomplished mountaineer. We then proceeded by forced marches to Zinal, whence we made, by the head of the Turtmann glacier, the first attempt to reach the summit of the Weisshorn,—an enterprise which, though it did not succeed, was not without its value, since it was the means of demonstrating the impossibility of traversing the northern arête. Foiled in this, the principal object of our journey,

and acting upon a suggestion made by Mr. Ball in a note to Mr. Hinchliff's paper on the Trift in the 1st Series of "Peaks, Passes, and Glaciers," we determined upon trying to effect a passage to Zermatt by the depression in the ridge between the Dent Blanche and the Gabelhorn. This spot was the only piece of snow-scenery visible from the inn at Zinal, and it had a highly alluring appearance.

The undertaking was signally successful. We quitted Zinal at 4.20 on the morning of the 17th, gained the col at 11.45, and, descending the Hochwang glacier, arrived at 12.45 at some rocks on its left bank, which turned out to be the summit of the Ebihorn. The descent to the Zmutt glacier appearing easy, the day's work was virtually accomplished; and we halted an hour for dinner. Of all the points of view in the vicinity of Zermatt, unrivalled as it is in the number and beauty of its panoramas, for near mountain scenery I unhesitatingly give the palm to this position. On our right was the Col d'Erin, from which the great Zmutt glacier flowed down beneath our feet towards the valley of Zermatt; eastwards we looked up the ice-streams of Findelen and Gorner to the pass of the Weiss Thor, while opposite to us, bathed in the full light of the midday sun, was every peak of the Pennine chain from the Dent d'Erin to the Strahlhorn. Rapt in the beauties of this glorious scene, my eye wandered from mountain to glacier, until it rested upon the untrodden ice-field filling the vast hollow between Monte Rosa and the Lyskamm, and I began to speculate whether it were possible to effect a passage among the wilderness of seracs which appeared to constitute its lower portions. At the summit of the glacier was a snow-saddle, connecting the two mountains, and it suddenly occurred to me that this must be the very spot reached by Zumstein many years ago in his ascents from

the southern side of the peak which bears his name. I had not then read the account of his interesting expeditions, but it was clear that we could descend by the route he had taken. As we were about to enter Zermatt by one new pass, we thought we could not do better than quit it by another; so we at once resolved to attempt to force the passage of the Monte Rosa glacier, and cross the col to Gressoney.

We reached Zermatt without difficulty early in the evening; and after an agreeable sojourn of three days at the excellent hotel of M. Seiler, we proceeded to put our project into execution. We judged our two guides amply sufficient for the expedition, provided they were not overburdened, and we accordingly sent our knapsacks by special messenger over the St. Théodule to Chatillon, intending to pick them up there on our way to Mont Blanc.

On the morning of the 21st we strolled quietly up to the Riffel, and passed a delightful afternoon on the Gornergrat and Riffelhorn, making a careful survey of the ground to be crossed on the morrow. The ascent of the Riffelhorn is amply repaid by the splendid view it affords of the Gorner glacier, from its origin in the snows of Monte Rosa to within a short distance of its extremity. This magnificent ice-field lay stretched like a map beneath our feet, and each of its constituent elements, resulting from the distinct tributary glaciers, could be traced with the utmost precision. While studying the surface, I was surprised to observe a number of hollows, looking like huge cauldrons sunk into the ice. I counted no less than eight-and-twenty of these singular depressions, arranged along two lines parallel to the length of the glacier, and at about equal distances apart. They were all dry but one, which was filled with water of the most brilliant blue. I examined one on the following day: it had a rudely ellip-

tical outline, and resembled the inside of a boat more than anything else I can compare it to. It was about thirty feet long, fifteen feet wide, and twelve feet deep, and had no orifice at the bottom. I have since discovered that these hollows have been described by Agassiz and Schlagintweit, and that they are represented (but very poorly) in the plates of the Gorner glacier in the atlases attached to their respective works. The former writer calls them "*entonnoirs*" (funnels), and the latter by the equivalent German, "*trichter*." Agassiz, in a vague and unsatisfactory paragraph*, refers their origin to the union of surface rivulets charged with gravel, but Professor Tyndall, although not distinctly mentioning them, has, I think, given the real clue to their formation.† He adopts the theory of Agassiz, that moulins are produced by a fissure of the glacier crossing a surface stream, which then plunges into the crack and scoops out a shaft, and that this shaft is carried downwards by the motion of the glacier, until the ice is cracked again in the same place as before, and the moulin is reproduced above. In support of this view, Mr. Tyndall states that he has frequently seen several extinct moulins at equal distances apart in advance of the active one. Now let us suppose the nature of a glacier channel to be such, that the crevasse in which a moulin has originated begins to close before the new crack is formed above; the water, checked in its descent, would naturally eddy at the mouth of the shaft, and produce such a hollow as those we see upon the Gorner. However it may be, these "*entonnoirs*" merit careful study; and I would especially direct the attention of travellers to the nature of their surfaces, whether even or exhibiting open or healed crevasses, to the direction of the long axes of their elliptic

* "Etudes sur les Glaciers," p. 54.

† "The Glaciers of the Alps," pp. 362, 366.

margins, and to their position with respect to active moulins, upon all which points more information is needed.

The Gorner glacier has another peculiarity which is deserving of mention. On looking along the largest medial moraine, it did not appear to be connected with any mountain ridge, but to issue directly from the middle of the snow, about half-way between the Gornergrat and the rock called Ob dem See. I presume that this moraine really originates in one of the northern spurs of Monte Rosa, and that its upper portion is smothered by the masses of snow which descend from the ridge between the Nord End and the Cima.

On returning to the Riffel we made the necessary dispositions for the morrow, ordered our guides to call us at 1.30 A.M., and retired to rest in full confidence of the continuance of fine weather and of consequent success. On the morning of the 23rd, Croz knocked at our door two hours later than the appointed time, and on coming downstairs we found a clouded sky and a strong south wind, sure harbingers of bad weather in the Alps. The deplorable accident, by which an unfortunate Russian gentleman had lost his life in a crevasse on the Findelen glacier a few days before, appeared to have completely unnerved Seiler, and he implored us to defer our excursion in such importunate language that I scarcely knew what to do. As I never like to start against the judgment of the guides, I referred the matter to Croz, who after some little hesitation decided on postponement. We sat down to breakfast in the deepest chagrin, expecting to be kept at the Riffel several days, and to have, after all, to follow our knapsacks over the St. Théodule to Chatillon. Such is the fickleness of Alpine weather, that by the time our meal was finished the wind had changed and was blowing directly from the north; in a few minutes every particle of cloud

had disappeared, and the morning brightened into as fair a day as ever lighted up the Alps.

It was now too late for Gressoney, but it did not require many minutes' consideration to fix upon a suitable excursion. The guides were instantly summoned, provisions hastily stowed into knapsacks, Seiler complimented in the most amiable manner upon his prophetic foresight, and at 5.30 A.M. we were *en route* for the Cima. It would be out of place here to dilate upon the panorama afforded by this celebrated peak; I shall merely say, that it would be impossible to imagine more favourable atmospheric conditions than those under which we beheld it, and that the Italian view was perfectly clear, and of inconceivable loveliness. While walking along the base of the Gornergrat on our return, we came upon a little rocky knoll, covered with cushions of the star gentian, each studded with countless flowers, expanded in the noon-day sun. I gathered one of the flowers and held it up against the sky. The colour of the sky was very nearly the same tint as the gentian blue, and of a depth and tenderness which defies description.

We regained the Riffel exactly at 2 P.M., and felt almost grateful to Seiler for our charming excursion. We found the hotel crowded by a party, or rather cluster of parties, enticed by the extraordinary brilliance of the weather to make the ascent of Monte Rosa.

We spent the evening in strolling on the slopes of the Riffel, and watching the exquisite beauty of the sunset. Long after the Alpine glow had faded from the chain of Monte Rosa, the Bietsch-horn, rising up beyond the Rhone, opposite the opening of the valley of St. Nicholas, was tinted delicate violet; there was not a speck of cloud in the sky nor a breath of wind stirring; and all nature seemed reposing in deepest peace and tranquillity.

At 2 o'clock on the morning of the 23rd we were up and dressed, and on descending to the *salle* found the Monte Rosa company already assembled at breakfast. As it is necessary to walk in single file along the path which leads to the Gorner glacier, and a large party always causes delay, it was important to start first, and at 2.50 our small band of four was under weigh, followed by a line of five-and-twenty people. We at once struck into quick march, notwithstanding the cries of some guides behind, who, supposing our destination was the same as theirs, shouted to us to go more slowly. The path along the Riffelberg is troublesome enough to follow in the day-time, interrupted as it is by landslips in not a few places. After a good deal of stumbling we reached the ice at 3.55, and turned our faces towards the centre of the opening between the lowest spurs of Monte Rosa and the Lyskamm. Nothing could exceed the fascination of the scene. The sky was clear and beautifully starlight, the moon two-thirds upon the wane, and the brilliant planet Jupiter shining on either side of the Cima, above the old and the new Weiss Thor; while behind the peaks of Monte Rosa Orion's giant form was slowly climbing upwards. From the Cima in the east, to the Matterhorn in the west, lay a field of ice and snow twelve miles in length, bounded on the south by the barrier of well-remembered summits, glimmering with shadowy and almost dream-like vagueness in the faint light of the moon.

As I anticipated an unclouded sunrise, I noted carefully the successive changes in the appearance of the sky and mountains. At 4 o'clock the light of dawn began to creep over the old Weiss Thor, and to cast shadows upon the ice, and in a few minutes more those cast by the moon could no longer be distinguished. The western stars, which had formed a glittering coronet to the Matterhorn, now dis-

appeared; but it was not until twenty minutes later that those in the east, which I should have imagined would have been first extinguished, had ceased to shine. Hitherto the many moonlit snow-peaks beyond the Gorner glacier had looked scarcely more substantial than floating clouds; but when the eastern stars had vanished, and the morning glow grew stronger, the Twins and Lyskamm began to assume the appearance of reality, and to shine yellow-white; while Monte Rosa, which was in complete shadow, was the coldest blue. At 4.30 a zone of deep blue circled round the western horizon, surmounted by one of lurid red, with pale blue sky above, while the lower zone, gradually disappearing, gave place to the deepening red. At 4.40 the summit of the Matterhorn was touched with the pink flush of sunrise; a few moments more, and the Lyskamm and the Breithorn had caught the glow: the crimson colour spread gradually over them, changed suddenly to golden yellow, and then faded into the common hues of day. Meanwhile the lurid red in the west slowly disappeared, and the sky gradually deepened into the intensest blue, supported all round the horizon by a zone of pale lemon-grey. I could not make out with certainty when the sun touched the Höchste Spitze or Nord End,—we were too completely on their western side.

At 4.45 we were fairly across the Gorner, and in the mid stream of the Monte Rosa glacier, off the rock called "Auf der Platte," and, looking back, saw the cavalcade, somewhat disunited, advancing towards that point. The real work of the day was now commencing. Near the junction of the main and tributary streams the glacier channel is contracted, and the ice is riven by complicated systems of cross crevasses, dividing it into the blocks and pinnacles known as seracs, and which here, in their fantastic forms and gigantic proportions, vied with, if they

did not surpass, the celebrated scenery of the Col du Géant. A Chamounix guide is always at home on the ice; and Croz led the way, axe in hand, almost as if he had known the glacier from his childhood. Few occupations are so fascinating to a mountaineer as fighting his upward way through difficulties such as we had to contend with, and where each step is like a move at chess,—not to be made without considering its effect upon what is to follow. But the most delightful episode in this part of the expedition was afforded when, all other means of advance appearing hopeless, Croz boldly cut his way down to the bottom of a crevasse, and we walked along it for a considerable distance. It formed a long corridor with vertical walls, rising, in some places, twenty feet above our heads, glittering with delicate tints of green, fringed at the top with pendent icicles, and roofed over by the deep blue sky. This gave us an excellent opportunity of examining the stratification of the glacier,—a phenomenon to be carefully distinguished from the veined structure developed by pressure, usually at lower levels. The snow was disposed in layers parallel to the surface of the glacier, varying from a few inches in thickness to as many feet, and divided from one another by thin discoloured bands. These layers are generally considered as annual snowfalls, and some of them may probably have been so; but it is obvious that a glacier may receive a coating of snow, which may subsequently be discoloured, more than once a year.

At 6.45 we were well out of the seracs, and halted for breakfast. The part of the glacier yet remaining to traverse rose up before us like a marble staircase, walled in on either side by frowning precipices of dark rock. Those of the Lyskamm on the right were seamed by ice couloirs, and crowned by threatening masses of snow, discharging

avalanches in quick succession with a noise like the rattle of musketry. Looking to the left, we discerned the Monte Rosa party like a line of black specks against the sky, and recognised the ringing voice of Lauener, who shouted as he went along. Our resting-place gave us a view of the Matterhorn very different from that presented in the vicinity of Zermatt, a huge flat-topped buttress appearing to support the mountain on the south. Bees, butterflies, and other insects are frequently seen at very considerable elevations, but almost close to our breakfast-place we found a stranger entomological curiosity. This was a great hawk-moth, lying dead upon the ice,—I believe *Sphinx Convolvuli*, or a closely-allied species.

At 7.15 we were off again, and made splendid progress; the snow was in perfect order, its surface hard and crisp, and rough enough to prevent the feet from slipping. In the upper part of the glacier are crevasses and snow-grottos of amazing size and beauty; happily they were all bridged, and there was not even danger enough to necessitate the use of the rope. The whole glacier surface was frosted together into a rigid mass, and was as yet untouched by the rays of the sun,—the great wall of Monte Rosa having hitherto extended over us its friendly shade. The Höchste Spitze was soon passed; after it the Zumstein Spitze; and we then arrived at the base of the Signal Kuppe, and hesitated a few moments as to the route we ought to take. We had the choice of three cols, each apparently leading across the rim of the great snow-basin of the glacier. The col immediately in front of us connected the Signal Kuppe with a snow-peak on the right, which looked so insignificant that we had no idea it was another of the summits of Monte Rosa. The other two were situated between this peak and the Lyskamm, and were separated from one another by a low dome of snow. I had not with

me Schlagintweit's map, which, although grievously incorrect in many particulars, would have been a great assistance; but I knew that the four northern peaks of the mountain lay along a line making an obtuse angle with the five southern ones,—the Signal Kuppe occupying the angular point,—and that the Lys glacier was nearly at right angles to that of Monte Rosa. It was clear, therefore, although the first col looked the most tempting, that our course was to turn sharply to the right, and pass as near to the Lyskamm as possible. But the col nearest to that mountain was cut off from us by an impassable crevasse, so we were forced to take the middle route. In a few minutes we had gained the ridge: the insignificant peak on our left was no other than the Parrot Spitze; somewhat in advance of it was the Ludwigshöhe, and before us, on the south, the snow-slopes of the Lys glacier. From the crest of the col we wound round to the right, climbed the dome of snow, and at 9.30 exactly we were standing upon its summit.

We were now on the highest point of the plateau of snow, which, stretching from the Lyskamm to the Parrot Spitze, divides the Monte Rosa from the Lys glaciers, and Switzerland from Italy. On the 31st of July, 1820, nine-and-thirty years before, Zumstein and ten companions had passed the night in a crevasse not many yards distant from the spot where we were standing. The view in the immediate foreground was highly interesting. Westward, a long and narrow arête of mingled rock and snow led up to the summit of the Lyskamm. Between the highest point of that mountain and a subordinate shoulder on the south, which terminates in the promontory of the Nase, Mont Blanc just peered above the hollow, and formed a picture of singular quaintness. Northward, we looked down upon the great basin of the Monte Rosa glacier, enclosed on the

left by the arête of the Lyskamm, and on the right by the Signal Kuppe, the Zumstein, and the Höchste Spitze; the black dots were still climbing along the edge of the latter, which presented a broad rugged wall of rock that entirely masked the Nord End. Southwards, beyond the Parrot Spitze on our left, the chain of peaks was continued by the Ludwigshöhe and the Schwarzhorn; the Vincent Pyramid, the top of which is not so high as the plateau, was, I believe, wholly invisible.

The distant view was still more charming, and on the north was absolutely cloudless, comprising all the mountain ranges in the vicinity of Zermatt, and extending to the Wildstrubel, Altels, and Blumlis Alp, far away across the Rhone. In the south-west, the eye rested upon the magnificent cluster of the Graian Alps, at that time almost unknown: conspicuous among their many summits were the vast mass of the Grand Paradis, and the still more striking pyramid of the Grivola. Little did we think that two members of the Alpine Club were at the very moment climbing up it. In the south-east we ought to have looked upon the far-stretching plain of Piedmont, and even distinguished the houses in Turin; but a dense layer of white cloud was spread out horizontally before us, hiding Italy from view, and pierced only by the rugged peak of Monte Viso, which shot up through it a hundred miles away. What mountaineer could resist such a sight? I gazed with admiration on the noble pinnacle, and resolved that, if health and strength permitted, I would one day try to climb it. "If it were clear," said Croz, "we should see the Mediterranean;" and perhaps he was right. Genoa was only twenty miles farther off than Monte Viso, which was remarkably distinct, and we might have seen as far, unless the prospect were bounded by the Ligurian Apennines or Maritime Alps.

I carried no barometer in 1861, and a sympiesometer, by Adie, which I had with me, in consequence of a defect in construction had long ceased to be of use. As the only means of approximating to the height of the plateau, I mounted a pocket-level on the top of an alpenstock, and endeavoured to connect our position with a peak of known height. After several trials, I found that the optic axis of the instrument passed through the summit of the Roth-horn. The bearing of this observation on the determination of the height will be discussed hereafter.

We had so much time before us that the propriety of climbing some neighbouring peak was not long in suggesting itself. The arête of the Lyskamm did not look encouraging, but we could, with very little labour, have walked up to the top of the Parrot Spitze, and looked over into the Val Sesia. Croz, however, was averse to any such proceeding, alleging that, with an unknown glacier before us, our first duty was to secure our descent. I was at the time under the erroneous impression that Zumstein had encountered tremendous obstacles in his excursions, so that I acquiesced in the wisdom of the advice. I have never ceased to regret the excess of prudence, as I thereby lost an opportunity of examining the Italian side of the saddle between the Parrot Spitze and Signal Kuppe, and of ascertaining whether it would be possible to effect a passage across it direct from Alagna to the Riffel.

At 9.30 we roped ourselves together and commenced the descent. We found the slopes of the Lys glacier very different from those on the other side. Hitherto we had walked in the shade almost all the way to the plateau; we had now to traverse a snow-field softened by the morning sun, and producing a glare so blinding, that veil and spectacles combined were a very insufficient protection. We ran merrily downwards, often up to the knees in wet

snow, and occasionally plunging waist-deep into concealed crevasses. Passing the Vincent Pyramid, we made for a ridge of rock below, separated from that peak by the snow-slope which connects the névé of the Lys glacier with that of the Garstelet. The rock was found to be the Hohelicht. We landed on it at 11.15, flung off the rope, and called a halt for dinner.

We had another charming view from this position, the Combin and Velan having come into sight, and the noble mass of Mont Blanc towering proudly upwards at the extremity of the Val d'Aosta. The Italian valleys at our feet were filled with clouds, but we could just see underneath the roof of mist which covered the Val de Lys, and trace the line of the silver Lys, winding through meadows of delicious green. Being all of us unacquainted with the southern side of Monte Rosa, we were in some doubt as to our downward course. Southward, the view was completely intercepted by the main ridge of the Hohelicht, which rose several hundred feet above our heads; far down below, upon the right, was the Lys glacier, apparently very steep, and much crevassed and broken, and on the left flowed the glacier of Garstelet, presenting a gentle and unfissured snow-slope, terminated by some easy rocks. The latter route was at once chosen. At 12.15 we were off again: a swift glissade carried us over the snow, and we walked without difficulty down the rocks. We ought to have continued in the same direction to the Indren and Gabiet Alps, and thence by the path leading from the Col d'Ollen into the main valley at Edelboden. But, fearing we were in a branch of the Val Sesia, we crossed the Salzia Furke on our right, and descended upon the châlet of Cour de Lys, close to the termination of the Lys glacier,—a detour which probably lengthened our journey nearly an hour. We arrived at this spot at 1.30, and, soon starting off again,

worthily concluded our excursion by a delightful walk down one of the loveliest of the Italian valleys of the Alps.

It would be impossible to conceive a change more complete than that which we experienced in passing from the north to the south of the great Alpine chain. We had left in the morning the chill atmosphere and barren rocks of the Riffel, and we were now enjoying the soft climate of Italy and the exquisite verdure and beautiful scenery of the Val de Lys. Lofty cliff and noble pine forest, and foaming torrent, and huge erratic blocks, islands in a sea of green, are here thrown together by the hand of nature in exhaustless variety and profusion; and the effect of all this natural beauty is increased by the apparent comfort of the dwellings, and the bright and picturesque costume of the inhabitants. We passed La Trinité at three, and in another hour reached Gressoney St. Jean, with its cluster of white houses and elegant Italian campanile, situated in the midst of verdant meadows, on the banks of the foaming Lys. We walked through the little town, and exactly at 4.15 stepped into the comfortable Pension Delapierre, where we were warmly received by the proprietor, who displayed such rapture at the account of our excursion, that we thought he must discern certain commercial advantages from the opening of the new col. We were not a little gratified at the complete success of the expedition, and at the unexpected rapidity with which it had been performed. In little more than thirteen hours we had made the first traverse of the loftiest pass in Europe, at least 1000 feet higher than any passage previously effected across the Alpine chain, by a route conducting the traveller past every one of the nine peaks of Monte Rosa, and rich in scenery of the most magnificent and varied character. If the pass were taken in the opposite direction, it would be

wise to sleep on the Hohelicht, where a cabane ought to be erected, as it would be important to descend the Monte Rosa glacier before its surface became softened by the morning sun. Could we have counted upon such a camping place, I believe we could before nightfall have scored off all the peaks between the Zumstein Spitze and the Vincent Pyramid.

About the time of this excursion, the Rev. S. W. and Mrs. King were enjoying the hospitality of the Baron Peccoz at his hunting châlet at Salzen near to the Lys glacier, where Delapierre brought them tidings of the fact, that two Englishmen had reached Gressoney from the Riffel, by way of the snow plateau between Monte Rosa and the Lyskamm. At this absurd announcement, the Baron burst into a hearty fit of laughter, evidently relishing the joke that Delapierre had been made the victim of such a hoax. Vain were the assurances of Mr. King that English gentlemen always spoke the truth: the famed chasseur declared that he knew the glacier of his own mountain intimately, and that the thing asserted to have been done was absolutely impossible. At length Mr. King suggested, that if the passage had really been made, some traces of it would probably be still remaining, and the Baron consequently started next day for the Hohelicht, for the purpose of proving that such was not the case. On arriving at the spot, the deep furrow we had ploughed through the snow was still plainly visible, and there was no denying the fact that a passage, unknown even to so great a hunter, had been effected on his own domain. When Mr. King returned to Gressoney, the report he heard was that the guides had dragged their weary steps into the village an hour or two after the travellers, completely knocked up.

Before discussing the nomenclature and altitude of the

new pass, a brief history of the first ascent of Monte Rosa from the south will not be out of place.

The plateau was first reached in the year 1778 * by seven chasseurs of Gressoney, under the guidance of Nicholas Vincent, the father of the first ascender of the Vincent Pyramid. There was a tradition that a fertile valley of the Valais, called the Hohenlauben, had been suddenly enclosed by the advance of a glacier, and so shut out from mankind. The chasseurs, incited by an old priest, undertook to search for it, and imagined they had discovered it when, on arriving at the plateau, they looked down upon the valley of Zermatt. They repeated the expedition in 1779 and 1780. From that year to 1819 nothing more was done. On the 5th of August in the last-named year, Nicholas Vincent ascended the peak which has since borne his name. On August 10th *the* ascent was repeated by M. Bernfaller, canon of the Great St. Bernard, who was at the time in parochial charge of Gressoney La Trinité. On the 12th the summit was a third time reached by Joseph Zumstein and Nicholas Vincent. On July 31st, 1820, Zumstein with two Vincents, an engineer from Turin named Molinatti, and guides and porters, making in all eleven, spent the night in a crevasse on the plateau, and the following morning made the first ascent of the Zumstein Spitze. In the above expeditions Zumstein and Vincent had passed the first night near the base of the Stollenberg, which entailed upon them an unnecessary traverse of the Garstelet glacier. In 1821 Zumstein shortened the journey by camping on the Hohelicht, and on Aug. 2nd in that year he made his second ascent of the Zumstein Spitze. On the 25th

* Von Welden, "Der Monte Rosa," Wien, 1824, pp. 123, 124. Compare also Saussure, "Voyages dans les Alpes," vol. iv. p. 373, § 2156, who, however, places the incident in 1783.

of the same month Von Welden climbed the peak which from his christian name is called Ludwigs-Höhe. On July 12th, 1822, Zumstein made his fourth journey, in which, after gaining the plateau, he was forced to retreat by bad weather. On the 1st of August he was more successful, and on that day he made his third and last ascent of the Zumstein Spitze.

The next actor upon the scene is Signor Giovanni Gnifetti, the curé of Alagna, who in 1834 opened the trenches against the Signal Kuppe, and whose expeditions were made, like Zumstein's, by way of the Lys glacier and the plateau. On the 27th of July, after nearly reaching the summit, he was driven back by bad weather. His second attempt, July 28th and 29th, 1836, was not more fortunate, as he was stopped for want of an ice-axe within half an hour of the top. The third attempt, August 12th and 13th, 1839, was frustrated by bad weather before he gained the plateau, and it was not until his fourth journey, August 8th and 9th, 1843, that his enterprise was crowned with success. The worthy curé appears to have gone about his work in a very deliberate manner, as it took him just nine years to climb a single peak.*

The ascent of the Vincent Pyramid by the Messrs. Schlagintweit on September 12th, 1851, completes the expeditions from the south, so far as I have any knowledge of them. I do not know whether the Parrot Spitze has ever been climbed.

On perusing the records of Zumstein's expeditions as they are recorded in the work of Von Welden, especially those undertaken from the Hohelicht, they appear to have been very straightforward pieces of business, and not to have involved danger or difficulty of any unusual kind.

* "Nozioni topografiche del Monte Rosa ed ascensioni su di esso di Giovanni Gnifetti, Paroco d'Alagna. Torino, 1845."

The Nord End seems to have been entirely unknown to Zumstein, who completed the nine peaks of Monte Rosa by including the Lyskamm in the number. The space between that peak and the Parrot Spitze being thus a part of the mountain, was called by him the Grosses Plateau of Monte Rosa, a nomenclature in which he has been followed by Gnifetti and Schlagintweit. Now, however, that the Lyskamm is held to be a distinct mountain, the above term is somewhat inappropriate, and as it is unknown at Zermatt and rather cumbrous, it is necessary to choose a better name. I propose to call it the *Col de Lys.* It is true that the Lys glacier has two branches east and west of the Lyskamm, which unite into a common stream at the Nase. According to Zumstein, the eastern and western affluents are the Salzia and Felik glaciers, while it is only the united stream that bears the name of Lys. I do not see, however, that later writers have adopted these terms, and if they had it would not affect the propriety of my designation. I have been informed that at Zermatt the col has been called the Silber Pass, a name which it is not desirable to perpetuate, as the ridge between the Höchste Spitze and Nord End has long been known as the Silber Sattel.

The probable altitude of the pass is the next matter for consideration. Zumstein took barometrical observations in all his excursions, and appears to have conducted them with considerable care. Most of his heights are the mean of the calculations from the three bases of Turin, Milan, and Ivrea. Unfortunately his observation on the Vincent Pyramid was affected by some special error, the resulting altitude being nearly 1000 English feet too great; a circumstance which has thrown undeserved suspicion on his other calculations. Singularly enough, although in going and returning he crossed the plateau

eight times, he only made one observation upon it, whereas he made three upon the Zumstein Spitze, one at each visit. That on the plateau was taken July 31st, 1820, and gives an altitude of 14,100 English feet. The first observation on the Zumstein Spitze, taken the following May, gives 15,214 feet, 210 feet in excess of 15,004 feet, the recent trigonometrical determination of M. Bétemps. The second and third calculations are 15,012 and 15,046 feet respectively, and are very near the truth.

The levelling operation I made upon the col showed that it was upon the same apparent level as the summit of the Rothhorn, a mountain about twelve miles distant. The height of this peak, as determined by M. Bétemps, is 13,852 English feet. The combined correction for curvature and refraction due to a distance of twelve miles is eighty-two feet, and, subtracting this from 13,852, we have 13,770 feet as the height of the col. It is clear, however, that a barometrical determination ought not to be impeached by so rough an observation as the one here described, made by an instrument without a telescope, and where a small deviation from horizontality would produce a very serious error in the result. Happily, we are in possession of a far more satisfactory check to Zumstein's measurement, as I shall proceed to show.

The passage of the Col de Lys once opened, other travellers were not slow to take advantage of the new route. On August 13th, 1860, two parties ascended from the Riffel to the head of the Monte Rosa glacier. The first, consisting of the Rev. Leslie Stephen and Mr. Robert Liveing, with Melchior Anderegg as guide, climbed the Zumstein Spitze, which had not been visited since Zumstein's last ascent in 1822. The peak gave them no trouble, and they found the iron cross safe upon the top. The second party was composed of Messrs. E. B. Prest,

J. L. Propert, and an American gentleman from Boston, Mr. J. K. Stone, with the guides Johann zum Taugwald, Moritz Andermatten, and one of the Simonds of Chamounix. These gentlemen made the passage to Gressoney, starting from the Riffel at 3.45 A.M., reaching the plateau at 10 A.M., and arriving at St. Jean at 4 P.M., thus accomplishing the journey in twelve hours and a quarter, including a rest of half an hour on the col, and of an hour at the Hohelicht. It will be observed that they effected the descent in three-quarters of an hour less time than we did, owing to their having taken the shortest cut from the Hohelicht to Gressoney. On the 29th of the same month the Rev. T. G. Bonney and Mr. J. C. Hawkshaw, accompanied by Michel Croz, ascended to the col from the Riffel, returning the same way. They started at 3.45 A.M., reached the summit at 9.5 A.M., and regained the hotel at 1.15 P.M., —a remarkably quick performance. These expeditions indicated the desirability of following the Monte Rosa route over *Auf der Platte* before diverging to the glacier, thus avoiding the most difficult seracs, and of selecting thenceforward the Monte Rosa side of the glacier rather than that under the Lyskamm, which, though it appears more tempting, is dangerously swept by avalanches.

In 1861 the expeditions to the Col de Lys were commenced by Mr. Tuckett. On the 15th of June, in company with Messrs. C. H. and W. J. Fox, and the guides J. J. Bennen and Peter Perren, he crossed to Gressoney, returning to the Riffel a few days subsequently by the old Weiss Thor. On the 22nd the same party made the first attempt on the Lyskamm by the eastern arête, but, prevented from reaching the summit by the state of the snow and violent wind, they climbed the Signal Kuppe instead, afterwards descending directly to-

wards the Gorner glacier, without returning to the col. On July 29th the Rev. Leslie Stephen and Mr. Reilly made the second attack on the eastern arête of the Lyskamm, an enterprise again frustrated by the state of the snow. Descending on the southern side, they rounded the Nase, and crossed the Bettliner Pass into the Val d'Ayas, returning to the Riffel the following day by the Schwarz Thor. Next comes the successful ascent of the Lyskamm on Aug. 19, described by Mr. Hardy in the following paper; and a passage of the col from the Riffel to Gressoney, made by Mr. A. P. and the Rev. H. Whately with François Devouassoud of Chamounix on Aug. 30, concludes the list for 1861.

Among such a crowd of climbers it is disappointing to find that there should have been only one to undertake scientific observations. It is to my friend Mr. Tuckett, whose untiring energy has added so much to our knowledge of the Alps, that we owe the only accurate hypsometrical observations made upon the col since the time of Zumstein, and I am greatly indebted to him for his permission to publish them in this paper.

On June 15th he spent an hour and a half upon the col, and at 11 A.M. he registered the following observations: —

Barometer reduced . . .	456·00 Millim.
Boiling-point (Therm. No. 1) .	187·35 Fahr.
„ („ No. 2) . .	187·5 „
Air temperature . . .	2·5 Cent.

The mean of the boiling-points converted by Regnault's tables into equivalent barometric pressure gives 456·4 millim., a near coincidence with the actual barometer reading.

Comparing these observations with corresponding ones at the Great St. Bernard, and employing tables based upon

Laplace's formula, Mr. Tuckett deduces the following altitudes above the Mediterranean :—

Barometer . . .	14,053 English feet.
Mean of two boiling-points .	14,028
Mean . . .	14,040·5

If the comparison had been made with Geneva, Aosta, or Turin, the heights would have come out somewhat greater, so that Mr. Tuckett's calculations establish the accuracy of Zumstein's results. On the whole it will certainly be within the mark to put the height of the Col de Lys at 14,000 English feet.

We found the Pension Delapierre at Gressoney a most agreeable resting-place, and it was not without reluctance that, on the morning of the 24th, we quitted that charming spot. On ascending the Col de Ranzola, I carefully reconnoitred the western branch of the Lys glacier, which descends from the depression between the Lyskamm and the Twins, and felt convinced that a passage from the Riffel to Gressoney might also be effected over that part of the chain. After descending from the Ranzola, we crossed the Col de Jou to Chatillon, and arrived the same evening at Aosta, where we met the party just returned from the Grivola. A successful passage of the Col du Géant, and an equally successful ascent of Mont Blanc, during which we had the good fortune to see a magnificent Aurora from the Grands Mulets, closed our Alpine work. Passing into Italy again by the Bonhomme, Iséran, and Cenis, we rested from our mountain labours, and spent a week of delicious idleness at Turin and Genoa before returning to England.