SKI-RUNNING.

BY

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DEDICATED TO

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E. C. RICHARDSON.

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"Paa Skare."

PREFACE.

SINCE the first edition of this book was produced two years ago popular interest in the sport has increased by leaps and bounds. We have endeavoured to keep pace with the times, and the present volume is an attempt to give a really complete account of the sport, which will be useful to beginners and experts alike. To the historical part has been added a chapter on Continental ski-running, whilst the technical part has been remodelled, enlarged, and, we trust, rendered more lucid and complete. Wherever necessary new diagrams have been added, and the whole-page illustrations have been chosen with a view to indicating the great beauty and variety of the snow regions of the earth.

Here and there actual alterations of views previously expressed will be found. We make no apology for these, but desire frankly to acknowledge our errors, and to thank those friendly critics who have pointed them out. With ignorant criticism we have been very little troubled, and with actual hostility simply not at all.

We are further greatly indebted to the many friends who have rendered us positive assistance. The frontispiece is from Herr Halström's wonderful picture "Paa Skare," which that gentleman has given us unqualified leave to reproduce. The ski-runner which it depicts also serves as a central figure for the cover, designed by Mr. Nico Jungman. To those who have

kindly permitted us to copy their photographs we hereby take the opportunity of expressing our best thanks. The outline of the Solberg Hill is from an accurate drawing by Herr Von de Beauclair published in *Ski*, to the editor of which paper we are also indebted for the drawings illustrating Herr Sohm's detachable seal's-skin and climbing-irons. To Herr S. Höyer-Ellefsen, Herr Fredrik Juell, Herr Trygve Smith, Herr Durban Hansen, and numerous other skilful Norwegian runners we are grateful for many a useful hint and word of advice, whilst we owe to Herr Zdarsky a valuable practical demonstration of his methods of teaching. Messrs. C. W. Richardson, E. H. Wroughton, and H. P. Cox have been kind enough to help with the actual production of the little work, and if there be any others who we have omitted to mention we would hereby beg them to accept at once both our apologies and thanks.

E. C. R.

November, 1905.

CONTENTS.

THE YEAR-BOOK

OF THE

SKI CLUB

OF

GREAT BRITAIN

CONTAINS

Articles by Practical Men about Ski-running Centres in

GREAT BRITAIN,	*SWITZERLAND,*
NORWAY,	*AUSTRIA,*
GERMANY,	*ETC., ETC.*

As well as a great deal of other interesting and useful information about the Sport. The book is edited by

E. H. WROUGHTON,

and is published for the Club by Horace Cox, Bream's Buildings, London, E.C.

PRICE ONE SHILLING.

THE

ORIGIN AND HISTORY OF SKI.

By D. M. M. Crichton Somerville.

There are many people to whom the word "ski" must be an enigma, and everything connected with the pastime "ski-ing" as a sealed book. The object of the present treatise is, therefore, to solve the puzzle, open the pages of the closed volume, and thus throw light on a sport which, when once learnt, will be found more attractive, healthy, and invigorating than any other winter exercise, provided, of course, that it be not carried on (as often is the case) to excess, but is indulged in only by those who are sound of wind and limb.

For the sake of the uninitiated, it may be explained that *ski* (pronounced she) is a word of foreign origin, which, up to comparatively recent years, has been translated "snowshoe," a term which conveys a wrong idea of the appliances in question, even supposing it might be more fitly given to the forerunners of the ski, viz., pattens formed of withes or wood, which are used in many parts at the present day, and of which the Indian or Canadian snowshoe is a modified type, and best known to British sportsmen.* The ski, however, are of different construction, being formed of narrow boards, 7ft. and more in length, upturned at the toe to allow of their being shoved or slid over the snow, when attached to the feet of the wearer.

* *Ski* is really the same word as the English *skid*, meaning a slide, or something to slide upon, the affinity being even greater in the Swedish term *skid* (plural, *skidor*), meaning slides or skates. Originally it doubtless springs from the Finnish *suksi* or *suksi*, by which appellation the ski were probably known long before their introduction to Scandinavia.

With the exception of snow skates (iron shod runners some 2ft. in length, for use on roadways and hard surfaces) they are the only kind of foot gear used for the purpose of gliding on snow, and possess many advantages over other snowshoes, not the least being their capability of being used for pleasure, as well as the necessary outdoor pursuits of daily life.

Until comparatively late years the employment of ski as contrivances for travelling on the snow was unknown to the majority of those inhabiting the more populated parts of the civilised globe, where communication can nearly always be kept open by rail, steamboat, or other means; notwithstanding that they are, and have been used from time immemorial during many months of the year by a large portion of the population of Northern and Central Asia, Russia, Scandinavia, and even the southern parts of Eastern Europe, where the winters are severe. Casual allusions to them in the writings of some few sporting authors did not suffice to bring the ski into other than mere passing notice; and they would probably have remained in obscurity but for the somewhat recent discovery that they could be employed for other purposes than those of mere locomotion, or keeping open communication in lands and districts where snows are deep, and highways lie buried or are unknown.

It may be of interest to mention here that, in remote parts of England, ski appear to have been employed so late even as the middle of the past century, their use being discontinued as communication with the outer world became easier. Thus, apart from information derived from other sources respecting finds of ski, or their remains in various parts, one gentleman, writing from Cumberland in February, 1904, states that, in the dales of Yorkshire and Durham, the sport is by no means new, and that forty years ago he went to his school on "skees," which were made of beech wood, some 5ft. in length, with "nibs" about 3in., and that it was no uncommon practice in those days for the Weardale miners to go to and from their work on such snowshoes, it being a fine thing to see thirty or forty men gliding down the steep slopes from the mines at a speed equal to that of a railway train. The writer also adds that, amongst the youths, skee-jumping was a favourite pastime, and that he believes the practice was a very

old one from the fact that he knew boys of his own age who had some into possession of "skees" once owned by their grandfathers.*

To judge from the description given by the author of "Lorna Doone," a form of ski was, probably, known in Devonshire some 300 years ago, where also sledges were employed throughout the entire year instead of wheeled vehicles for carting in farm products. In the story he relates how when, during the great frost of 1625, John Ridd was told that, in the Arctic regions, any man might get along with a "boat" on either foot to prevent his sinking in the snow—such "boats" being made very strong and light, of ribs with skin across them, 5ft. long by 1ft. wide, and turned up at each end, even as a canoe is—he built himself a pair of strong and light snowshoes, framed of ash, and ribbed of withy with half-tanned calf skin stretched across, and an inner sole to support his feet. "At first," he says, "I could not walk at all, but floundered about most piteously, catching one shoe in the other, and both of them in the snowdrifts (just as a beginner would now), to the great amusement of the maidens who were come to look at me."

From the above description such ski would have resembled those of the Chukchis in North-East Asia.

It is due, however, to the youth of Norway that ski-ing has of late years been reduced to a pleasure and an art; while the notice it has received abroad is owing mainly to the prominence given to it by accounts furnished to, and published in, English sporting and illustrated journals, and to allusions to it in the writings of various arctic explorers who have lately taken ski with them on their journeys as part of their travelling outfit.

In turning to the history of the ski, it will be found that their origin is as much lost in oblivion as that of the wheel; but it is not too much to assume that human beings who have been created to adapt themselves to their surroundings at all times, have, in lands far separated and entirely apart, invented somewhat similar appliances with which they could float, as it were, and proceed over depths of snow that would otherwise bury them, or cross tracts of treacherous ice which would give way

* "W.T.," *T.P.'s Weekly*, p. 226, Feb., 1904.

under the tread of a human foot. In this connection one need not refer solely to inhabitants of wintry countries, for it will be found that the natives of other regions, who have to traverse yielding surfaces, such as the great mud flats of Hampshire and elsewhere, wear pattens on their feet, and are thus able to wander in safety over a substance too soft to bear them otherwise. Such pattens are almost identical with those employed elsewhere for travelling over snow, and consist of slabs of wood, some 16in. to 18in. long, by 12in. or so in width, which are attached to the feet by toe straps and thongs. In these pattens, no matter whether they be made of withes or solid wood, we undoubtedly find the earliest form of snowshoes or ski, a form which, however, exists to the present day, and is met with in

FIG. 1.—An early form of Snowshoe.
From a Sketch by Laurentius Urdahl.

the north-eastern and northern portions of Asia, Thibet, the Caucasus, Armenia, Scandinavia, Germany, Switzerland, and, in a modified form, in North America, the principle of construction there being identical, viz., a ring or framework of wood supporting a net work of withes or sinews. There are, however, various modifications of the original round pattern; some of the shoes, possibly to prevent straddling, are more or less elongated, the length being increased as the breadth is diminished, while some, thus shaped, have occasionally leather stretched between the frames to allow of their wearer gliding, instead of walking, over the snow, and thus become veritable ski; for while the original object of the snowshoe or patten and the ski are identical, viz.,

to support a weight on yielding surfaces, the patten remains a shoe for walking purposes, while the ski becomes a blade on which to slide. From this explanation the difference between patten or snowshoe and ski is possibly made clear for the first time.

While, as previously mentioned, it is impossible to trace the origin of the ski, mention of snowshoes is made hundreds of years before the Christian era. Xenophon refers to their being worn (as in Scandinavia to the present day) by the horses of the Armenians to prevent their sinking in the deep snow. Historical mention, from a period before Christ, is also made of the mountaineers of the Caucasus attaching discs of leather (probably leather-covered wood), studded with nails, to their feet to enable them to move over the snows of the fells. The ancient accounts, however, all refer to the patten, but Norwegian traditions dating back some 1,600 years make mention of the ski. The Greek historian, Prokopius, as well as other writers, including King Alfred of England, from 550 A.D. to 1070 A.D., drew attention to the Lapps, who were called "Skrid Finner,"* one saying they were the best of all men at ski-ing, and the fact of it being the Lapps who wore the ski, or who were the great exponents of ski-ing in those early times, would tend to confirm the theory of the ski themselves originating in Central Asia—those parts of the old world from which the Ugrians or Finns, Samoyeds, and other tribes of Mongols migrated northward and westward, till stopped by the waters of the Atlantic on the shores of the Scandinavian peninsula. There can be little doubt, however, that pattens were used for hundreds, if not thousands, of years before the thought of sliding over the snow, which led to the introduction of ski, entered the head of some inventive genius. The original ski were probably constructed by the Chukchis, or similar tribes, near the Behring Straits, or Sea of Okhotsk. They were formed, as already intimated, of elongated frames covered with leather, and were modified, subsequently, as migration increased, forests were met with, and wood was found to be a better and more durable material for the purpose required.

It will thus be seen that ski were extensively used in olden

* Scandinavian *skrïde* = to slide, glide, slip.

times by the Scandinavians as well as others. They also found their way from Norway to Iceland and Greenland. Of ski there are many types. The skridsko (sliding shoes), or ski of the

FIG. 2.—Skrid-Finner hunting (Olaus Magnus, *ca.* 1550).

FIG. 3.—Skrid-Finner (Olaus Magnus, *ca.* 1550).

Lapps, appear, if one is to judge from old illustrations from the sixteenth century (Figs. 2 and 3), to have been veritable shoes, the feet being placed in a hole made for the purpose at the

heel of the ski. They are thus depicted as elongated (some 3ft. long) sabots. There is, however, no reason for assuming these sabot skis to have been the original form, for they were, at best, but a hybrid type of ingenious construction, possibly only used by the inhabitants of certain districts. The true Lapps' ski, on the other hand, were comparatively short and broad, attached to the feet by toe straps and thongs, and covered with the skins of reindeer calves for the purpose of letting them glide easily without accumulating snow on the soles, of keeping the wood from splitting or fraying, and because, when thus covered, it was easier to ascend the slopes of the hills, the hairs which lay fore and aft, checking the tendency to slide backwards.

Such skin-clad ski were, and are still, employed by the Lapps, as well as by others in Scandinavia, Finland, and throughout Siberia; but several other types have, nevertheless, been used in Lapland for centuries. In Scandinavia and the North, these skin-covered appliances go by the name of "aandre," "ondurr," "andor," to distinguish them from the plain ski. As, however, the advantages of the skin are not now generally considered sufficient to counterbalance the disadvantages, they are gradually disappearing.

There can be little doubt but that the greatest development of the ski has taken place in Europe, notably in Scandinavia, where they have been modified to suit the different requirements of the districts in which they are employed. Thus have the varied types hitherto been many, but may be divided generally into two groups, viz., the short and broad, or loose snow ski, and the long and narrow, or compact snow variety ("skare ski"), this latter pattern being represented by the Oesterdal and Swedish ski (originally one very long and one short ski, but now generally of equal length). These are the most suitable for open country, whether in the lowlands or mountains, and on level or undulating land are superior, so far as speed is concerned, to all others; but in broken country, or on mountains where obstacles such as trees, rocks, &c., are to be met with, the shorter or "loose snow" patterns, owing to their handiness, are invariably employed.

Almost every province, it may be said almost every district, throughout Scandinavia possessed its own type of ski. In Russia they have possibly been of a more homogeneous character than elsewhere, owing to the snow-clad portions of that empire consisting of vast plains which call for no variety of form. Of comparatively late years, however, there has been a tendency in Norway to adopt one sort for universal use, and a sub (lighter) variety for leaping purposes. It is a modified Telemarken (loose snow) type, eminently suited to every purpose, and is gradually superseding all other forms throughout Scandinavia.

Of accessories to the ski, the staff has invariably been recognised as a necessity (except in leaping competitions, when it becomes a source of the greatest danger) and should always form part of the outfit on all long excursions or journeys. It assists the skier both in aiding him when ascending, and as a brake when descending difficult slopes, or as a means of defence if attacked by animals. The Lapps use it, too, as an offensive weapon when attacking wolves, which they occasionally run down on their ski, and kill by a well-directed blow on the snout, or across that most vulnerable spot, the loins of the beast. The most effectual use of the staff can only be learnt by experience or teaching. The fastenings may be regarded as other important accessories, and but a few years ago, and in many parts even still consist solely of toe straps formed of withes or leather. These simple contrivances suited all the requirements of the expert peasants, and it is only of late years, when leaping was introduced, and the ski put to other and harder purposes than originally intended, that stronger and more secure bindings became necessary. Of these, there are many sorts, all good, but none perfect as yet. In some instances the latter may be a source of great danger owing to its being impossible, when peril faces one, or accidents occur, to remove the ski from the feet, and notably so when a man breaks through treacherous snow-covered ice, owing to the ski preventing him from regaining the surface. But while several fatal accidents have occurred in this manner, it is possible that others have been avoided by the greater command of the ski afforded to most people by secure fastenings.

HOLMENKOLLEN.

Photo by Rude, Christiania.

Having now given an outline of the history and origin of the ski, it may be well to refer to the movement by which ski-ing has been brought into the prominent notice of sportsmen and admirers of winter pastimes. In the extensive and mountainous district of Telemarken, Norway, one in which ski were employed possibly more extensively than in any other, owing to its remoteness, and the wretched state of the few highways and byways to be found there, the peasants discovered that the ski might be used for pleasure as well as ordinary pursuits, and arranged meetings at which races were run, and the leaping powers of competitors tested on the slopes of selected hills. By degrees news of these trials of skill found its way to the towns and the populated districts in their neighbourhood, and some few citizens having found ski-ing to be a good, and to them attractive, exercise, determined to hold similar meetings at Christiania each winter. The accounts given of those meetings are very ludicrous, the hill being neither steep nor long, the competitors riding astride their poles down the track, and only jumping, if jumping it could be called, a few yards. The exhibitions did not "catch on," and were discontinued for many years. The townsfolk knew too little about the sport to appreciate it, and the absurd, if not painful, appearance of the competitors was not encouraging to aspirants. Towards the end of the seventies, however, owing chiefly to the exertions of the Christiania Ski Club—a select institution with but few members—some Telemarken peasants * were induced to visit the capital, and in the early part of 1879 a ski meeting was held on the slopes of the hill at Huseby, near Christiania, which was attended by a couple of the countrymen, who took part, together with other competitors, in the races and leaping that had been arranged. The Huseby slope was one which, only a few years previously, had been described as highly dangerous, and impossible to descend when the snow was fast and in good condition.

The leaping competition proved most highly interesting,

* The names of the best known of these Telemarkings were, Knut Olafsen Haugen, Aasmund Brække, Sveinung Svalastoga, and the "Hemmestvedt gutter" (Torjus and Mikkel Hemmestvedt). Ed.

though in some respects quite comical. Every man, except the Telemarkings, carried a long, stout staff, and on that, so they thought, their lives depended. Starting from the summit, riding their poles, as in former times, like witches on broomsticks, checking the speed with frantic efforts, they slid downwards to the dreaded platform or "hop" from which they were supposed to leap, but over which they but trickled, as it were, and, landing softly beneath, finally reached the bottom somehow, thankful for their safe escape from the dreaded slide. But then came the Telemark boys, erect at starting, pliant, confident, without anything but a fir branch in their hands, swooping downwards with ever-increasing impetus until with a bound they were in the air, and 76ft. of space was cleared ere, with a resounding smack, their ski touched the slippery slope beneath, and they shot onwards to the plain, where suddenly they turned, stopped in a smother of snow dust, and faced the hill they had just descended! That was a sight worth seeing, and one never to be forgotten, even if in after years such performances have been, in a way, totally eclipsed.

This wonderful exhibition of the peasants' skill naturally excited the greatest interest, and acted on the townsfolk like a charm. Their leaping was regarded as one of the wonders of the world, and in subsequent years people flocked to Christiania from far and wide to witness it. Then came the turn of the tide, the eyes of the city youths became opened—the eyes of those who, during the long winter days had, for want of better occupation, frequented billiard-rooms or ill-ventilated cafés, where the seeds of idleness and vice lay ready to strike root. By degrees such old haunts became forsaken, for the attractions of the newly-found sport proved greater than those of the bottle, and even if they failed to attract and reform the *majority* of men just at that period, they certainly had a most beneficial influence on many, and, as time advanced, on the younger generation, who were able to take to the pastime before bad customs could affect their ways. Like other things, especially before its novelty had worn off, ski-ing was, and often still is, carried to an excess, but that it is a healthy pastime is a fact beyond all doubt. To men it came as a boon and a blessing, and

subsequently to women and girls, who, in the short winter days and close confinement to the house, suffered terribly from anæmia and all its attendant evils. At the time referred to the fair sex was debarred by public opinion from participating in masculine pursuits, and it is not so very long ago that pater and materfamilias looked askance at girls who donned the ski. That is all changed now, however, and ski-ing has produced of later years a race of robust men and healthy women, presenting the greatest possible contrast to those who lived "in the good old times," unconscious of the benefits of exercise and fresh air, shut up in close and dingy rooms to escape from the dreaded cold and the touch of an icy blast.

For some years the peasants carried all before them, both in the racing and leaping competitions. They were steady on their legs, accustomed to the mountain slopes from their infancy, and could out-pace and out-distance all competitors. They did not, however, understand the art of training; the townsmen soon saw they could not get on without that, and ended at last in beating their teachers on all points, first in jumping, which they practised as an art, and, secondly, in racing given distances.

It may be well now to touch upon ski-ing proper, or the employment of ski for the purpose for which they were originally intended, viz., travelling over snow-clad land or ice. By means of these appliances people are enable to roam at will, enjoying the fresh, crispy air, the pretty landscape, and changing scenery, combined with the pleasant sensation of gliding, instead of tramping, over the surface of the country. The speed attained is certainly not very great, and is about the same in hilly as on level country, for in the former the time lost in ascending slopes is made up on the descent. In racing, the time made by the best men, travelling lightly clad, and under the best conditions of snow and weather, works out at about eight and a half miles an hour on a course of a little over nine miles, and nearly eight miles an hour on one of eighteen and a half miles. In racing, the longest distance ever run at a stretch was covered by a Lapp, who, at Jokkmokk, in Sweden, made a good 137 miles in 21 hours and 22 minutes, over comparatively level ground, thus at a rate of about six and a half miles an hour.

Ordinary travellers, or soldiers on ski, would find five to five and a half miles an hour quite sufficient to tax their powers. In 1900, a detachment of the Norwegian Guards accomplished a march of 125 miles in seven and a half days, an average of some seventeen and a half miles a day, which must be looked upon as a very good performance, considering that they carried canvas wherewith to improvise tents, sleeping bags, and provisions, and moved up hill and down dale, once ascending to a height of 4,000ft. above the sea level. It will thus be seen that, in marching trim, soldiers on ski do not travel faster, or to any great extent faster, than infantry at other times, the only advantage of the ski being that, when the snow lies, they are able to move about, and get along in parts where men not provided with such appliances, or snowshoes, would be compelled to remain idle.

Attention may now be drawn to leaping, which was originally learned by the Norwegians on the slopes of their hills when inequalities of ground would, during a rapid descent, cause the wearer to bound through the air for some distance, possibly only a yard or two, but sufficient, anyway, to create a longing for a little more. This led the peasants to make an artificial rise on the face of a hill, and there meet to see who could leap farthest. In no other country was the leaping ever attempted, and it is primarily due to it that ski-ing caught on, and became so popular in Norway as to throw all other pleasures into the shade, and attain its present position as *the* national pastime of the people. To be understood ski-leaping must be seen. No photograph or description can ever give a proper idea of it. Many of those who now appear as the best leapers are men who devote their chief energies to this branch of the sport, and who attend all the meetings they possibly can. They might be called "pot hunters," but this term can, fortunately, be hardly applied to them as yet, for the remuneration of a prize can scarcely repay the expenses they incur in loss of time, travelling, &c. They, in fact, perform for the love of the amusement, and, it may be said, nothing else except, possibly, renown. Ever since the peasants, in 1879, startled the country by their leaping powers, jumping has steadily improved,

i.e., in length, and in the courage or daring of the leapers. But, while acknowledging this to some extent, it must be considered doubtful whether the modern wonderful accomplishments equal or surpass those of the Telemarken peasants, who, some twenty odd years ago, made bounds of 70ft. and upwards, with their ordinary country outfit of home-made ski, simply fastened with toe straps of twisted withes, whereas now men wear ski specially made for the purpose, strapped securely to their boots.

It may be of interest to conclude by giving a list of those who have made the longest leaps, and continued their course without a spill.

Records of leaps in which the men kept their feet after landing on the snow, so-called "standing leaps":

Year.	Name.	Place.	Length of Jump.
1879.	Torjus Hemmestvedt	Christiania	76 feet.
1893.	Torjus Hemmestvedt	Red Wing, U.S.A. ...	103 ,,
1898.	Sven Sollid	Solberg, pr. Christiania	103½ ,,
,,	Cato Aal		
,,	Tollef Hemmestvedt (16 years old).....	Telemarken	99 ,,
1899.	Asbjörn Nielsen...	Solberg, pr. Christiania	107 ,,
,,	Morten Hansen ...		
1900.	Olaf Tandberg	Solberg, pr. Christiania	116½ ,,
1902.	Paul Nesjö (18 years old)	Trondhjem	130 ,,
,,	Nils Gjestvang	Modum	134½ ,,

From the above it will be seen that the longest leap recorded was one of 134½ft., truly a wonderful performance, and one that could only be accomplished on an exceedingly steep hill by most able performers.

In penning the above the writer trusts that he has thrown some light on the origin and history of ski, and the purpose to which they have been devoted of late years by the Norwegians, the founders of the sport of ski-ing.

CONTINENTAL SKI-RUNNING.

By W. R. Rickmers.

If dates there must be, historians will do well to take February 8th, 1891, as the day on which the sport of ski-ing took root outside of Scandinavia. On that day Dr. Pilet, French Consul at Kolmar, appeared at the Hotel Feldbergerhof, Feldberg, Black Forest, with a pair of ski, and since then the Black Forest has been the centre of ski-running in Germany, whence it has spread to Switzerland, chiefly through the efforts of W. Paulcke, whose crossing of the Bernese Oberland in the nineties caused a great sensation and induced many mountaineers to show an interest in the new sport.

There had been many sporadic efforts before and outside of Dr. Pilet's enthusiastic propaganda, but his was destined to bear fruit before all the others owing to the favourable conditions under which it started, for the Feldberg is an admirable field to insure the rapid growth of such a seed. The hotel lies at a height of over 3,000ft., and has for many years been open throughout the entire winter, whereas, most other places of a similar character were formerly shut up and deserted during the snowy season. Even before the days of ski-ing many lovers of Nature had visited the mountain to spend a few days above the mist and slush to which a series of mild winters has now accustomed the inhabitants of the plains. Add to this the close proximity of Freiburg, a university town full of young and energetic men, and we have the explanation why here the first ski-missionary was so successful. True, St. Moritz had a far

better chance, but there the first impulse would have been smothered by the conservative inertia of a fashionable crowd.

In the usual course of events Austria would simply have followed the lead of Freiburg, and have been content with a very gradual increase of the ski-running public. But here there arose a man, Herr Zdarsky, who, single-handed, and through his untiring personal efforts, furthered the sport by leaps and bounds. He invented a special ski of his own, commonly known as the "Lilienfeld" (see p. 42). He taught himself, for he had never seen a skî-runner, and he elaborated a scientific method of teaching the various movements and evolutions. He may have opinions of his own, some of which may have been proved to be relatively wrong, or have been vetoed by a majority, but the fact remains that he was the first systematic teacher of ski-running. To him we owe a published theory of ski-ing as specially applicable to steep and difficult Alpine ground; while many, including the writer of these lines, enjoy the honour of being his disciples. This honour was not, in the first instance, without its drawbacks, for a theory, especially if it be new and original, is a fertile source of dissension. The theory would perhaps have been forgotten, and the "Lilienfeld" fastening might now be rusting in the patent office, had Herr Zdarsky not been a man of action endowed with an iron will. Practice carried the day. Ten years ago there was one pupil at Lilienfeld; last winter (1905) over 1,200 received instruction from this indefatigable pioneer, to whose village special trains carry devotees from Vienna every Sunday.

The differences between the Zdarsky school and the Black Forest threatened to assume alarming proportions, for, strange to say, both sides had seen little of each other, and a host of misunderstandings arose between them over theoretical opinions concerning style and fastening. Fortunately the storm has now blown over, for many things have been cleared up, and the old hands have ceased to bother their heads about the best fastening or the best method. Thus the "Lilienfeld Strife" is a chapter of history, an interesting phase in the evolution of our noble sport. To put the matter in a nutshell, the Black Forest looks at the question of ski and style exclusively from the Norwegian

point of view of all round excellence, whereas Lilienfeld approaches the subject with the sole idea of quickly teaching the beginner how to run safely on mountainous ground. Had this been properly understood at once, there would have been no quarrelling, for these two standpoints are not antagonistic, but complementary. The general theoretical truth is the mean between the two, whereas the absolutely practical method is their application to the age, physique, talents, and inclinations of each particular individual intent upon learning to ski.

In Switzerland there has been no less interest shown in ski-ing than elsewhere, and it is doubtless destined to be the great ski-ing country of the future, boasting, as it does, of mountains, snowy valleys, and a thriving population. Norwegians have told me that, according to their belief, they may some day be surpassed by the Swiss, who have at their disposal a much greater choice of long and steep slopes. In Switzerland the natives and the visitors, as a rule, know very little of each other. The natives have taken the cue from the Black Forest, whereas the visitors, mostly English, have exhibited a laudable impartiality and an enthusiasm which bids fair to raise ski-running to the first rank among British winter sports.

NOTE.—In the foregoing article Mr. Rickmers has omitted one or two points in the development of Continental ski-running which may here be mentioned.

The translation of books treating of polar expeditions, and, in particular, the eloquent passage about ski in Dr. Nansen's First Crossing of Greenland, was largely responsible for the first growth of the sport on the Continent. History, too, has repeated itself, and Norwegian students resident in foreign universities and technical schools have played much the same part in Germany and Switzerland as the early Telemarkings played in Christiania. We remember well the astonishment and enthusiasm which was aroused at the meeting of the Glarus Club in 1903, when Messrs. Heyerdahl and Holte gave an exhibition of leaping and quick turning. Never had the people seen such a sight before, and the good seed sown took root, and bore green shoots at once in the shape of numerous little jumps constructed by the juvenile population. And as in Glarus, so in other places, people were suddenly awakened by an exhibition of expert skill to the immense possibilities of the long unwieldy-looking boards.

Great praise is also due to such men as Dr. Paulcke, of Freiburg; Herr Iselin, of Glarus; Herr Von de Beauclair, of Bern (to mention only three), for the organisation and conduct of ski clubs in their special districts, and the holding of race meetings and courses of instruction presided over by

A Norwegian Soldier.

Photo by A. B. Wilse.

Norwegian experts. Other clubs sprang up in all directions, and a great number of meetings began to be held in different parts of the country. In Switzerland, indeed, this soon became a source of inconvenience, for every little club had its championships which professed to cover a far larger area than fact warranted. It was accordingly arranged last year (1904) to form a large central association for all Switzerland, which, in due course, held its meeting at Glarus on January 21st, 1905.

Even as these lines are going to press the news comes to hand of a large association of all the clubs of Central Europe, and, although in the meanwhile no central meeting is contemplated, it seems more than probable that some arrangement of the sort will, at no very distant period, be found convenient.

At these Continental gatherings it was last year (1904) decided to observe the same principles as in Norway, and the chief honours are now awarded to those competitors who show the greatest skill in both long-distance racing and jumping. The long-distance race is thus, in the main, a test of speed and endurance, whilst the jump shows whether a runner is courageous, quick-witted, and skilful as well as strong.

The use of ski from a military point of view is somewhat outside the scope of a book of this kind which proposes to deal with them chiefly as instruments of sport. It is sufficient to say here that the military authorities of all the principal Continental Powers have given practical recognition of the value of ski in winter warfare, and it is now usual to hold races designed specially for soldiers at all ski meetings of importance. In the opinion of all *competent* judges, ski would be of great value in the north-west frontier of India, but up till the present no good ski-runner has been invited by the Government to put matters to the test. For an interesting essay on the subject see Mr. H. Chubb's article in the Ski Club of Great Britain's Year-Book, No. 1., Vol. I.—Ed.

THE

ELEMENTS OF SKI-RUNNING.

By W. R. Rickmers and E. C. Richardson.

INTRODUCTION.

Ski-running is a sport which literally throws one into a whirl of excitement from the moment one starts learning it. Thus the novice who has once tried will not worry over the question as to how long he will take to master the art. The constant repetition, however, of the inquiry: "How long does it take to learn ski-running?" forces us to make some kind of reply, though unwilling to compromise ourselves by laying down a hard and fast rule. Given, then, a pair of ski, snow, correct methods, and a certain amount of patience, anyone gifted with average pluck and muscle should know enough after a week's practice to enjoy excursions of four or five hours' length. The practice of the first day or two is always the most trying, but after this progress becomes rapid. Every beginner falls continually and expends an enormous amount of energy in getting up again, and every beginner misapplies the greater part of his strength in other directions. But an elementary balance is soon gained, and one quickly learns how to make those little movements of the thigh muscles which save so much. We are far from saying that at the end of a week you will be even a moderately good ski-runner. Downhill your more skilful companions will be able to leave you far behind, and you will be sorely embarrassed when the ground is at all difficult. But at the end of that time you ought to be far enough advanced to enjoy something of the sensations of a swift descent, and to enter upon the confines of

that territory of snow-clad forest and mountain which it will be your special privilege to visit. And that is already much.

Whilst it is our belief that no other form of exercise offers greater opportunities for the development of individual skill, it is certain that in no other are the surroundings more beautiful or more novel. The landscape is, as it were, transfigured, for the commonest objects become ennobled when swathed in the flowing garb of the snow-drift, with its sparkle of iridescent hues. There is a stillness and a clearness and a blueness of the atmosphere, and a play of golden sunlight through the branches of the pine trees, standing so erect and silent, sleeping till the return of spring. And above the trees fresh wonders lie in store. Vast slopes of snow, broken here and there by some dark rock, and behind them the soaring watch-towers of the Alps, with their time-worn battlements and shattered walls. Below, in the gulf of the valley, lies the village, diminutive like a German toy at the bottom of a staircase; and on the other side rise whitened slopes, with clusters of tiny châlets, snow-covered and silent; and far away in the enchanted distance, clear-cut, yet mystical, stretches a fairyland of filmy peak and glacier, blending its opalescence with the blue of heaven. A week is surely a short apprenticeship to serve for the enjoyment of these wonders, and we honestly believe that, if you are reasonably strong and diligent, you can see them at the end of that time.

Like most things, ski-running is best learnt young. A certain suppleness of limb characterises the style of those who have begun in childhood, and this, like the true accent of a foreign language, is most difficult to acquire in after years. Nevertheless, it is astonishing what can be achieved long after the muscles have set. In proof of which we may instance that two really good runners with whom we are acquainted did not begin, in the one case till after thirty and in the other till after fifty. We do not, therefore, consider it likely that you are too old to learn, though we are willing to believe that you may be too lazy!

An encouraging feature of the sport is the constant improvement one makes. In many other pursuits a point seems soon to be reached beyond which further progress is very difficult.

But with ski-running every season brings its due measure of advance. A well known skater is credited with the observation that anybody could learn to skate, but that to be a first-class ski runner one must not only be born on ski, but live on them constantly for eighty years—an hyperbole which contains a strong element of truth. Of course, as in other things, an early beginning is of great value, but a natural aptitude can very well be developed late in life. It is the object of a book of this kind to provide instruction in those methods which experience has shown to be useful, and we believe that if the beginner will himself help us by using his intelligence, he will be very materially assisted by the perusal of these pages. At the same time, it must not be forgotten that the best we can hope to do is to place before him a sort of grammar of the sport. The spoken language, the unconscious and instantaneous adaptation of the various positions advocated to the circumstances of the case, can only be acquired by practice directed by common sense.

PART I.

THE GROUND AND THE SNOW.

WHEREVER there is snow, there one *can* ski; whether one safely *may* is another question, whereof more anon. Absence of snow, or snow transformed into blue ice, are therefore the well-defined limits to the possibilities of the sport.

There is no kind of surface capable of harbouring snow which has not been tried on ski, from the plain, with its unbroken sheet of white, to the rugged mountain side, where narrow channels have to be navigated amid toothed reefs and giddy precipices.

Every pedestrian knows the infinite variety there is in landscape; how an ever-changing aspect of the surface is created by the geological nature of the soil (sand, moor, rock)—the vegetation (grass, heather, forest)—the inclination of the slopes and other topographical features (downs, hills, mountains, valleys,

lakes); not to forget the work of man (his houses, fences, roads, and ditches). For the ski-runner this great variety of ground is increased a hundredfold by the different states of the snow, which he learns to distinguish in the course of his outings. The changes snow is capable of are wonderful to behold, and the observant tourist never ceases to discover some kind or condition which is new to him. There is soft, flaky, fresh-fallen snow; there is downy, fluffy, powdery, floury, crystalline, brittle, salt-like, slithery, gelatinous, watery snow; there is snow as hard and white as marble, and snow with a thick crust which breaks into big slabs; there can be a layer of soft or powdery stuff on a hard sheet, or a thin, glassy film over loose snow. We have seen it in thin scales, the size of half-crowns, rustling under the ski like the leaves of an autumn forest, or, again, in the form of long, streaky crystals, like asbestos. Often it lies pat and smooth over the rounded hills; at other times it will be a frozen turmoil of waves, ridges, and grooves!

Variable Ground is Desirable.

In stating that it is possible to ski on every kind of snow and on every form of snow-covered ground, it is at the same time to be observed that some kinds of snow and some kinds of ground are more suitable for the sport than others. And as regards the ground, most people prefer it to be as varied as possible. We do not like it to be all precipitous mountain-side or all dead level, or, for that matter, all undulating glade. Nor do we desire our slopes to be always smooth and easy, any more than we wish them always broken and difficult. A happy combination of all these things is best. We adore the straight, smooth descent of a long incline, with its wind-song in the ears and its snow spray in the face, but we have also an affection for turning hither and thither amongst trees and rocks. And even level running, which the beginner is apt to despise, is much more interesting and much more difficult than many people are inclined to believe.

The Snow Should be Uniform.

But, whilst the ground itself should be varied, it is most desirable that the snow upon it should be of uniform quality

throughout. Sudden changes, as, for example, when a thin crust will bear for some distance and then suddenly give way, are not only unpleasant, but sometimes positively dangerous. Perhaps the best of all snow is that which has rested for some time undisturbed at a temperature a few degrees below freezing point. Under such favourable conditions the tiny crystals of which it is composed settle down and pack together, forming a mass, the compactness of which increases with its depth. Nor does the surface remain unchanged, for here the dew condenses, and in freezing forms the innumerable thin leaf-like films above mentioned. The ski glide very easily over these, and sink into the compacter substratum just far enough to admit of easy steering.

Another capital snow condition is when a hard crust has been formed, on the top of which more snow falls to the depth of a few inches, the first few flakes of the new fall being wet, so as to adhere to the old crust and prevent slipping.

Wind-driven snow is not usually very good, but sometimes, if the temperature be not too low, it will form itself into a compact floury sort of substance, which will stick slightly to the ski to a degree just sufficient to help up-hill, but not enough to cause annoyance or to prevent a free passage downwards. Very hard snow is bad both for climbing and for glissading, for up-hill it becomes necessary to stamp vigorously in order to obtain a footing, and down-hill the lack of side grip renders steering very difficult. But quite watery snow, especially if it be shallow, often affords capital sport.

Sticky Snow.

The worst condition possible for ski-running is when, the temperature being slightly above freezing, the snow "balls." This sometimes occurs with old snow when the sun is very hot, but much more frequently immediately after a fresh fall. The cause of balling is that water is formed on the surface, which, being pressed down into the colder substratum, re-freezes, and adheres to the bottom of the ski: to this, being again wetted, large clods of the "binding" snow readily attach themselves; sliding becomes out of the question, and one is obliged at every

step to lift many pounds' weight of mingled snow, water, and ice. Some partial cures for this evil exist, and will be found at the end of the book at page 105; but they are at the best but makeshifts, and to our minds ski-running in sticky snow is never really enjoyable. Fortunately, this state of affairs is not nearly so common as one might at first imagine, for after the snow has settled, even if the air be warm, the ski do not usually sink in sufficiently to reach the cold under-surface, and no re-freezing, the primary cause of sticking, takes place.

Crusted Snow.

Another kind of bad snow occurs after warm weather followed by frost, when an ice crust is formed. If sufficiently thick to bear, and if slightly warm, this is not so bad; but if it bears in some places and not in others a very irritating, and sometimes even dangerous, state of affairs exists. The evil is aggravated when the sun's rays, penetrating, but not melting, the clear ice surface, are strong enough to reach the ground below. This being dark coloured, is warmed, and, of course, melts the snow which is close to it, forming large hollows, which, though capital hot-houses for plants, are veritable traps for the unwary ski-runner. On such a surface, when the crust is strong, the ski will slide rapidly, but when it is rotten they will break through, precipitating the runner forward, cutting his face and hands, and not improbably spraining his limbs and breaking his ski. Turning on such snow is a matter of extreme difficulty, for the pressure involved usually breaks the crust, with similar disastrous results. It behoves us to avoid such places, or, if we must cross them, to exercise extreme caution in doing so.

Patchy Snow.

A third, but less serious, sort of bad snow is commonly encountered, when the surface, being for the most part firm and in good order, becomes interrupted here and there by marble-like patches of very fine powder. This is a state of affairs which often occurs high up, when the cold is intense, and when strong winds blow fine snow over an otherwise good surface. The powder settles on the lee side of any inequalities and adheres to any slight irregularities. The ski glide very well over the old

snow, but are checked by the powder, and a fall forward results. A little practice, however, soon enables one to distinguish between the semi-transparent, crystalline, darker-looking, old snow and the more opaque, white, fresh powder; and one learns how to make allowances by leaning backwards or forwards.

"Skavler."

Another disagreeable variety of snow worthy of special mention is the frozen turmoil of waves previously mentioned. This, too, occurs very high up, and is caused by wind. In the Norwegian tongue it is known by the expressive name of *skavler*. The ridges are sometimes as much as a couple of feet high, and, being quite hard, they are very unpleasant to traverse. They occur, of course, on the sides of mountains more exposed to the wind. If one *must* cross them, a long ski is preferable to a short ski for the purpose, but there is often a way round if one looks for it intelligently.

An Eye for Country.

In this connection it may be said at once that to choose one's way correctly and quickly, either up hill or down, is a most important part of ski-running, demanding just about as much skill as the preservation of the balance. What is known as *an eye for country* seems to be very largely a natural gift. Some people are always in difficulties, whilst others, often less skilful in other respects, are able to find their way almost intuitively across unknown ground. But, of course, experience in this, as in other matters, counts for a great deal, and what may at first sight strike the beginner as prophetic inspiration is often nothing more than an application of previously acquired knowledge to present conditions. It is impossible to give much information of this kind in a book, but, nevertheless, a few hints on the subject may be found useful.

In the first place it may be said that as a general rule snow is in better running condition on the north sides of hills, which are shaded from the sun, than on the south, which are exposed to it. And this is true not only of mountains as a whole, but of every little hillock and inequality throughout their contour. Also it is to be observed that the sun is warmer towards the

In Nordmarken, near Christiania.

Photo by H. Abel.

middle of the day than in the early morning, but that the temperature usually falls about a degree Fahrenheit for every 300 feet one ascends. From which considerations it is evident that it generally pays to climb a mountain on the south side, where the snow will be firm, and, at all events late in the year, to start early in the morning. The north side will usually be the best for the descent, as there the snow will probably be powdery and manageable.

Again, the direction of the prevalent winds, as above mentioned, has considerable influence, and one will as a rule find the surface harder on the weather than on the lee side of mountains.

Another thing worth remembering is to proceed very carefully over stony ground early in the year. If a stone be struck it will almost certainly damage the ski, and very probably cause a spill; and in December many stones are concealed by an inch or two of fluffy snow, which is no adequate protection. By February, however, the covering will be both deeper and firmer, and the risk will not be so great. Grass or small heather, on the other hand, even though half exposed, does not stop the free passage of the ski, but earth—as, for instance, that cast up by a mole—is almost as bad as stones. So much for the mole-heap.

Let us now pass to the consideration of mountains.

The Eternal Snows.

Concerning this kind of ground it is needful to give a word of serious advice, to sound a note of warning—that is, about Alpine ground, the high mountain, and more particularly the region of the glacier. Winter among the *highest* Alps taxes to the utmost the experience and the qualities of the mountaineer. While affording the intensest excitement and causing a feeling of the greatest elation when successful, expeditions to these are never free from grave danger, as is sufficiently demonstrated by the victims whom ski-mountaineering has already claimed. The proportion of accidents is really appalling, and should make the ski-runner pause before venturing unwarily into the region of *eternal* snow. To mountaineers we need only say: "Observe

the rules of your craft with redoubled watchfulness when ski-ing in the Alps." Others we must earnestly implore not to undertake an excursion in the higher regions unless accompanied by experienced companions or native guides. Good "ski-hills" recommended for downright enjoyment, and free from conditions causing undue anxiety, are rarely higher than 8000 feet (sometimes 10,000 feet); and we strongly advise the beginner to stick to such and to leave the more ambitious summits severely alone.

In drawing this danger zone it must not, however, be assumed that every mountain under the limit is safe. The mountains, as it were, recede from us in the winter, and many summits and passes which afford a pleasant stroll in the summer become fraught with difficulty when the snow queen annexes them for a time to her dominions. Gracious to those who have been properly "presented," and who approach her in a spirit of reverence, that lady arms herself against the *parvenu* who would force his way to her presence and shake her by the hand. Giddiness, snow-blindness, frost-bites, snow-storms and mists, steep ice slopes, hidden crevasses, tottering cornices, and last, but not least, the avalanche, are amongst her weapons. In the use of these she is quite pitiless, and she usually contrives to cunningly conceal them and to pounce upon her victim when he is most off his guard.

Geographical.

The beginner who has followed us so far is probably now imbued with the idea that ski-running is a most dangerous sport, and that if he is not overwhelmed by an avalanche, he is pretty sure to break his leg in some one or other of the kinds of bad snow which have been mentioned. Let him take heart. By far the greater part of the snow-covered ground within easy reach of his abode is sure to be perfectly safe, and, provided that he is reasonably careful, the chances of an accident are very small. During the months of January and February the snow is usually in excellent condition in any of the usual winter resorts in Norway or on the Continent,* and by going further afield very good going may often be found until the end of April.

* Probably also on most of our own mountains.

Still, it is quite exceptional to enjoy a day's expedition without encountering a little bad or indifferent snow during some part of it, on which occasions the difference between the beginner and the expert will be more than ever apparent. The great secret is to go carefully, but to keep moving. Make up your mind what you are going to do, and do it. A hill is never anything like as difficult as it looks from the top, but it is usually considerably higher than it looks from below. In the clear atmosphere of such countries as Norway and Switzerland it is very difficult to judge distances. The moral is to consult maps. In Switzerland these are specially excellent, but even the very old and somewhat inaccurate surveys of Norway are far more reliable than your own or even the natives' opinion about such matters.

A corollary to the importance of maps is the importance of the pocket-compass, without which no party of ski-runners should ever venture far from home. It is surprising how easily a mist or a heavy snow-storm will cause one to lose one's way, even on ground with which one is perfectly familiar at other times. In doubtful weather take a bearing or two as you go along. To do so takes very little time, and your knowledge *may* be of great value on your return journey.

We may conclude this section by directing the reader's attention to the Year-Book of the Ski Club of Great Britain, which contains a great deal of information about ski-running from a geographical point of view. No. 1 of Vol. I., which has just been issued, deals with important centres for the sport in Great Britain, Norway, Switzerland, Germany, Austria, &c., &c. The articles are all written by disinterested and practical men, who are themselves ski-runners, and the reader could not do better than turn to it for detailed information concerning any country which he intends to visit. The book is edited by Mr. E. Wroughton, and is published for the club by Horace Cox, Bream's Buildings, London. It is issued free to members of the club and for one shilling to the general public.

PART II.

OUTFIT.

THE SKI.

Almost every valley in Norway had at one time its own special type of ski, supposed by its inhabitants to be peculiarly suited to their requirements; and in other lands the variations have been no less numerous and remarkable. Those interested in antiquities of this kind are recommended to visit Herr Welhaven's very large and complete collection in Christiania, which it is to be hoped the Norwegian nation will acquire and exhibit in a suitable museum before it is purchased by some wealthy foreigner. We do not propose to weary the ordinary reader with a minute description of the various types, especially as time has shown the special virtues claimed for them to have been largely imaginary. The very curious Oesterdal ski are, however, worthy of special notice. In that district the natives used on the left foot a very long (about 11ft.) and narrow ski, and on the right a shorter (about 8ft.) and broader one, covered with elk's or seal's skin. The hairy ski was used to push, climb, and turn on, and was called the *Andor*; whilst the long one, called the *Langski*, was for resting on when running straight. The long ski was of special value in crossing the hard, lumpy snow so common in that wind-swept region. There was much sense in this arrangement, for in point of fact one does as a rule, even now, run on one ski and steer with the other; but we fancy that the uneven movements on the level must have been somewhat fatiguing. Be this as it may, the *Andor* and the *Langski* are now practically extinct, and in hilly countries the *Telemark* ski has now superseded all others. In Sweden, Finland, and Russia, and in flat countries generally, a very long, thin, and narrow ski is found to be faster. The curve in front is very flat, and there are considerable variations in the form of groove used underneath. But for a mountainous country these are too long for up-hill work, and the sharp, flat point is not suitable for glissading. The Telemark type can, on the other hand, be used

everywhere, and we have no hesitation in recommending it to our readers.

To the inexperienced eye there is very little difference between the shape of the ski used by the Telemarkings who first came to Christiania and those now for sale in that town or on the Continent. Differences, however, do exist, and some of them are important; besides which it is unquestionably pleasant to be the owner of a handsome pair of ski which, in addition to possessing certain advantages, are always a source of gratification to oneself and of envy and admiration to one's friends. We will accordingly mention all the points of a really good pair, beginning with the most important.

The Wood.

It is, of course, necessary that they should be made of very well-seasoned wood; but, unless you happen to be a timber expert, you will have to take your dealer's word for this. Ash is the wood most widely used, and the one which we would recommend the beginner to purchase. Hickory ski are faster than ash, but they are considerably heavier, and frequently brittle. Fir ski are cheap, light, and suitable for children, but it is difficult to get really good wood strong enough for adults; moreover, they are considerably slower than ash. Walnut is also said to be excellent, but it is difficult to procure in long enough and straight enough planks, and it is little used. A combination of pine and hickory is often employed for racing, where extreme lightness and speed are of importance, but it is not as strong as good ash.

Having decided on the wood, see that the grain is as straight as possible, and that if at any place it runs out its lines when doing so point downwards towards the heel, and not upwards towards the toe; otherwise when the ski begins to wear splinters will be formed, which will stick downwards into the snow and act as breaks. Beware of very light ash, which is apt to be brittle; the best is somewhat heavy even when thoroughly dry and well seasoned. By-and-by, when you have acquired some skill, you may perhaps like to have a pair of light ski for the mountains where you intend to go carefully and take no risks,

and where consequently the chance of a break is considerably less; but you will appreciate them all the more if you have got into the way of using a heavier article down below.

Shape.

The bend in front is of importance. It should begin very gradually at a point about four-fifths of the distance between the heel end and the tip, and should not be too steep. A rise of about 5in., measuring from the ground to the bottom of the tip, is amply sufficient. A good ski should also be fairly "whippy" about the point, but the elasticity should be distributed gradually from centre to tip, and should not come suddenly at one point only. We also like a ski to be broad at the bend, a shade broader even than the beautiful form shown in Figs. 4 and 5. The two qualities of gentleness of curve and breadth at the tip assist a rapid passage *on the top* of smooth snow, whilst the elasticity is valuable on lumpy ground, besides being conducive to lightness. The desirability of elasticity is, we think, a reason for eschewing the round-upper-sided ski sometimes sold in Norway. The round upper-side does not, of course, permit of so much loose snow resting upon it as the flat, but it makes the front part of the ski very stiff, and consequently unpleasant to run on, slow, and liable to break.

Besides the bend at the point, there is a long upward curve throughout the length of the ski, running from heel to entrance. The object of this is, of course, to prevent any bending in the opposite direction caused by the weight of the body; it also serves to provide an agreeable elasticity when one is running on the level.

Colour.

The colour of the ski is very largely a matter of taste, and in nine days out of ten is of no practical importance. Every now and again, however, there will be a time when the sun will beat fiercely on dark-coloured ski and warm them, causing the snow to adhere to them top and bottom more readily than to those of lighter colour, which throw off a greater proportion of the rays. For which reason we unhesitatingly give our vote for plain

Ski.
Modern "Telemark" Type.

Fig. 4.

Fig. 5.

varnished or white-painted ski. Black-painted ski are, however, very common in Norway. They look very smart and present a pleasing contrast to the snow, and they are frequently recommended for mountain use, for the reason that when the eye is dazzled by vast expanses of unbroken white they afford a valuable point of focus, and so act as a preventive to snow-blindness. We would, however, strongly advise the reader not to rely too much on this, or sooner or later his eyes will surely be affected. Smoked goggles, or some such arrangement as that recommended on page 50, are infinitely preferable to any black paint. Besides which, plain varnished ski are ever so much darker than the snow, and one can focus one's eyes almost equally well on them. The painting of ski is, on the other hand, often a cunning device on the part of unscrupulous dealers to hide defects in the wood—a fact which may account for their popularity to a greater extent than the guileless may suppose.

Having, then, given our vote for plain-varnished, flat-topped, fairly heavy ash ski of Telemark type, with a long, easy, flattish elastic entrance and a broadish point, it remains for us to consider how broad they shall be at the middle and how long over all, and whether they shall or shall not be provided with a groove underneath them running from end to end. We approach these questions with a certain degree of diffidence, for, in the first place, investigations with a view to their answer have not been, and perhaps cannot be, carried out with much scientific precision, and, in the second place, they will always remain very largely matters of personal taste.

Smooth-bottomed and Broad *versus* Grooved and Long.

Evidently to some extent the length and breadth of a ski must be proportionate to the weight of the runner, a certain degree of carrying surface being necessary to obviate sinking. But, apart from all questions of support, length is of great importance. In this respect ski resemble ships, for, generally speaking, the longer they are the faster they go. Area for area long ski are faster than broad. On the other hand, the shorter a ski is the more readily it will turn, and it is, of course, very important to be able to steer easily. There comes a point, how-

THE GATES OF THE JOTUNHEIM.

Photo by E. C. Richardson

ever, when ease of turning develops into wobbling, and seriously interferes with one's balance when running straight. Nor is the unsteadiness of short and broad ski confined to what may be considered as *horizontal* wobbling, due to inequalities of the ground, but broad ski are also more subject to what may be regarded as *vertical* wobbling, due to unequal snow consistency. For in the case of the long ski variations in the carrying power of the snow and consequent errors of balance occur in a backward and forward direction, but in the case of a broad ski in a sideward direction, which latter is, of course, more upsetting.

Again, almost all ski are nowadays provided with a groove along the bottom, beginning at a point a little distance below the bend and continuing to the heel. The object of this is to prevent *horizontal* wobbling and to assist straight running. Its working is most powerful. Clearly, then, some sort of compromise must be arrived at between a very smooth and broad ski on the one hand, and a very long and grooved one on the other. Now in Norway straight running is all the order of the day. Around Christiania there is scarcely a hill which cannot be, and is not, taken at full speed, and the smooth, glacier polished mountains of that country are equally suitable for a straight descent. In the Black Forest, too, straight running is paramount. For these countries we recommend grooved ski about as long as the distance between the ground and the roots of the fingers when the hand is held above the head, and of a width proportionate to the weight of the runner. In Switzerland, however, the ground is both steeper and more irregular, and in general far more difficult for straight running, hidden watercourses, rocks, and other obstacles being of common occurrence. There, it is accordingly of paramount importance to the beginner to be able to control his speed and to turn, and our advice is that in that country he should, for ordinary going, use somewhat shorter and slightly broader ski—say, about 6in. shorter than in Norway. We advise him *for all-round purposes* in Switzerland to retain the groove. But if he is going to do much climbing on very steep and difficult ground, or if he is advancing in years and has lost something of his pristine dash, he may find

it convenient to omit the groove and to travel on perfectly smooth boards.

Long Alpine Tours.

For really long and arduous mountain tours in the Alps, where every ounce of weight tells, we would recommend a further reduction of about a foot in all from the customary Norwegian length, and only a slight increase (if, indeed, any) in the ordinary breadth. On such expeditions careful going and power of control are of paramount importance, and ski-running becomes more of a means to an end than an end in itself. A little extra sinking in up-hill is not of much moment, and is more than equalised by the gain in lightness; and down-hill the loss in speed is of no consequence—indeed, in some cases a positive advantage. On such ski, too, the groove is better omitted.

Ordinary Use.

The following table may help the reader to select ski of about the usual Norwegian proportions:—

Height of the Ski-Runner.

Weight of the Ski-Runner.	—	Up to 4′ 3″	4′ 3″ to 5′ 0″	5′ 0″ to 5′ 3″	5′ 3″ to 5′ 5″	5′ 5″ to 5′ 7″	5′ 7″ to 5′ 9″	5′ 9″ to 5′ 11″	5′ 11″ to 6′ 1″	Over 6′ 1″
	Under 10 stone	$2\frac{1}{2}''$ 51″	$2\frac{1}{2}''$ 59″	$2\frac{1}{2}''$ 65″	$2\frac{1}{2}''$ 71″	$2\frac{1}{2}''$ 77″	—	—	—	—
	10 to 13 stone	—	—	—	$2\frac{3}{4}''$ 71″	$2\frac{3}{4}''$ 75″	$2\frac{3}{4}''$ 79″	$2\frac{3}{4}''$ 83″	—	—
	Over 13 stone	—	—	—	—	—	3″ 79″	3″ 83″	3″ 87″	3″ 91″

Preservation.

Ski should be treated properly if they are to retain their full efficiency. It is a capital plan to oil them from time to time like a cricket bat. Linseed oil is best for the purpose, and a small quantity of paraffin should be added to it to help it to penetrate. This treatment hardens the wood, and renders it

waterproof and not liable to splinter. Ski should be kept in a cool place, but should they be taken out of a warm room they should be left standing in the cold air for about ten minutes before they are allowed to touch the snow. One should avoid walking on them over earth and stones. After use they should be cleaned. To "set" them, place their under sides in contact, and strap them loosely together at the points where they touch —viz., extreme heel end and base of the tip. Insert a piece of wood about 2in. square and ½in. thick at a spot indicated by the usual position of your boot-heel; then strap tightly. They will then be in close touch at the ends, 2in. apart under the heel, and the "feathering" is thus preserved.

THE BINDING.

No part of a beginner's outfit is likely to cause him so much "sweet sorrow" as his binding. The chances are enormous that whatever he buys will afford him plenty to think about, and, alas! to talk about, for a considerable time to come. During his early efforts he is certain to attribute most of his misfortunes to its manifest imperfections, and if, as we hope, he is a person of an inventive turn of mind, he will spend the greater part of his evenings, and perhaps even some of the watches of the night, in designing something new and original which will at one and the same time overcome all his difficulties and make his fortune.

It is our sincere desire to assist him in this laudable endeavour, and accordingly we shall give below a few of the qualities which a perfect binding ought to possess. Before proceeding to do so it will, however, be necessary to notice some of those actual forms which other ski-runners use or have used—a task which is not nearly so agreeable or so easy. For legion is their name, and it is difficult to make a selection without hurting somebody's feelings. During the early days of the sport in Central Europe (that is to say, till quite recently) the fiercest controversy raged about bindings (see p. 15). But now, partly because of the impossibility of saying anything new on the subject, and partly because the discovery has been made that after all one's fastening is not of paramount importance, the topic is no longer of absorbing interest. Not but what our Teutonic friends retain

their love of controversy, and their earnest methods of conducting such, but the Scotchman in search of an argument would do better to start some theme other than bindings, as, for example, seal's skin or wax. A reaction has, in fact, set in, and whereas two years ago the most complicated was the best, we were surprised last season to find a Continental friend using the old (and very excellent) Lapp binding, which was so much in vogue in Norway years ago when we first learnt to go on ski. He, of course, was under the impression that he had the very latest thing, and we did not enlighten him, but we should not be much astonished to find him next year twisting birch twigs after the manner of the early Telemarkings!

Now this plan of making a stiff and strong rope by twisting birch twigs was the earliest method of connecting the *heel* of the foot with the ski. Prior to that a strap across the toe was all that was used. Any other arrangement was considered dangerous. Then came the Telemarkings (see p. 9) with their new methods. They bound the ski firmly to the toe, and lead ropes of twisted birch from the toe round the back of the heel. This arrangement was at once felt to be an advantage. Not only did it prevent the foot continually slipping out of the toe strap, but it relieved the toe itself from much of the strain involved when the ski has to be pulled forward in walking on the level or up hill; moreover, it enormously helped steering, and so it was adopted.

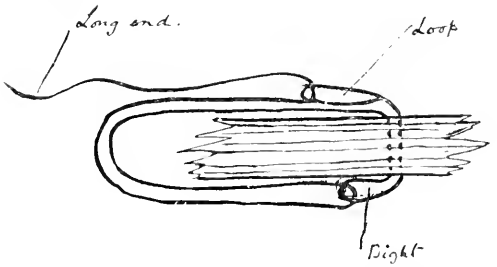
Some Common Fastenings.

People living in towns, however, either could not procure birch twigs or lacked skill in preparing and fixing ropes made from them. Something else had to be substituted, and that something was the thin cane, which so long held the field. The canes were steamed, and bent round the back of the heel and secured in front by a clamp. This form of binding was and still is widely used. But the canes, even when covered with leather and strengthened with steel wire, were found to be inconvenient. They broke and they were cumbersome, and the guiding power they allowed of was limited. So taboo was broken and metal was admitted into the construction of the fastening. Contrary,

however, to expectation, people's legs did not break oftener than before, and, as the iron also stood the strain, a binding like that given below (Fig. 6) became very popular.

Fig. 6.—Lapp Binding, Huitfeldt's pattern (left foot).

The heel is secured by means of a single thong about 7ft. long, with a loop at the end. The loop end is doubled close to the loop, and the bight passed through the hole in the ski below the ball of the foot. The long end is then passed round the back of the heel, through the bight, back round the heel, and through the hoop thus :—



The whole is then pulled tight, and the long end passed over the instep, under the thongs on the inside of the foot, back over the instep, and under and round the thongs on the outside, where it is secured by a couple of half-hitches. The loose end is then tucked away, as shown in Fig. 6.

The Lapp Binding shown above is Huitfeldt's pattern. The novelty about it was the iron toe piece; the thong arrangement had long been used by the Lapps. As previously

mentioned, many people still employ this binding, and when skilfully adjusted it can be very firm, and it possesses the merits of extreme simplicity and ease of repair.

We have, however, several objections to it. In the first place, it takes some little practice and some little strength to fix the thong properly, an operation rendered doubly difficult when the leather is frozen and the fingers cold. Again, the thong, especially if changes of temperature occur, is continually expanding and contracting; the knots in it are apt to make sore places on the foot, and, like a boot-lace, it has an irritating way of breaking just when one is in a hurry. Again, the iron toe piece must be *most carefully* adjusted to fit the boot. In short, we dislike the whole fastening for the reason that, unless it is very carefully put on and attended to, it becomes altogether too wobbly.

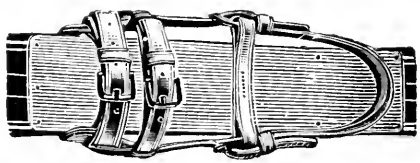


FIG. 7.—Huitfeldt Binding. Iron Toepiece and Straps.

The HUITFELDT BINDING given above is considered by many people to be an improvement on the Lapp binding, and it has attained a vast popularity in Norway. In principle it differs from the latter but little; but very stout straps are substituted for the thong with its troublesome knots, and the iron toe-piece is made of a solid piece of metal, which is bent up on either side of the ski, and which can be hammered into the exact shape of the sole of the boot. This is an advantage, as an accurate fit is insured. The disadvantage is that it is liable to be bent out of shape by the heavy-soled boot which it is necessary to wear with this and with the Lapp binding. The

straps, with it too, expand and contract with the temperature, and a very slight degree of slackness is sufficient to make the whole very loose. Moreover, the side straps catch the snow to some extent and act as a brake, though usually this is not of much consequence. The Huitfeldt binding is also troublesome to put on firmly, especially when the straps are frozen. Höyer-Ellefsen's shortening clamp (Fig. 8) is designed to get over this difficulty, but it is new, and we have not had sufficient experience of it to offer any criticism.

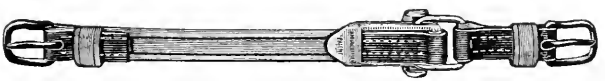


Fig. 8.—Höyer-Ellefsen's Patent Clamp for use with Huitfeldt's binding.

We now come to a new class of fastening, where the heel is connected with the ski by means of some sort of sole, generally made of the "belting" used for driving machinery, fixed to the top of the ski in front of the toe. There are innumerable variations of this plan, a very simple one being to fix a piece of the belting in front of the foot and to attach it to the heel of the boot by means of a dummy heel and a strap leading round the instep. The toe is held in position either by side irons and a strap, as in the Huitfeldt binding, or by a simple broad strap passing through the ski and buckling across the toe. In the latter form it has attained to considerable popularity on the Continent, especially in the Black Forest. We do not, however, think it worth while to give a picture of this fastening, as it is not one which we can recommend for any purpose. The dummy heel fills up with snow, and becomes uncomfortable; and as to the belting, one is in this dilemma, that if one uses it thin it buckles and if one uses it very thick it becomes heavy and too stiff for comfortable walking unless it be fastened very far forward, in which case it rises off the ski at every step and presses the toe against the toe strap, thereby causing discomfort and cold feet.

Torgersen's "Handy" Binding (Fig. 9) is, we think, vastly preferable, for it has no heel to collect snow, and the belting, only reaching half-way down the foot, is not so liable to buckle.

It cannot, however, claim to be a really firm binding, though if the strap leading from the belting round the instep be pulled tight (and a tight strap at this part of the foot does not seem to affect the circulation) it is not so loose as might be supposed at first sight. But the chief advantage of Torgersen's binding is its extreme adjustability. It will fit almost anybody, and can be taken on and off in a moment. On this account it is a very good binding for clubs or shopmen in Switzerland who let out ski to a number of different people for short periods. Its only moderate firmness also recommends it to nervous beginners who

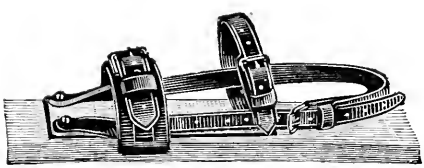


Fig. 9.—Torgersen's Handy Binding. Driving Belt and Straps. Half the sole is Driving Belt.

want to run straight and fast, and who are afraid of the slight extra risk involved by using a rigid fastening.

Ellefsen's Patent Binding (Fig. 10) is of the same class. It appeared last season (1904-5), and has scarcely been in use long enough to allow of exhaustive criticism.

As with Torgersen's, the belting only reaches about half-way down the foot, where it is terminated by an iron cross-piece with upright cheeks fitting on either side of the heel (see Fig. 10). From these cheeks a strap leads round the back of the heel, by means of which the belting is pulled tight. This stretching of the belting is the novelty of the arrangement, and is very ingenious, as, of course, it prevents all buckling. The iron toe-pieces are much the same as in Huitfeld, but they are fixed firmly to the ski by means of the little metal tongues which are part of them. The tongues at the same time secure the driving belt under the toe, giving it due stiffness in a vertical

direction and preventing pressure of the toe strap. But obviously this is the weak spot of the front part of the arrangement, and unless the belting is of the very best quality it is liable to tear there. The makers, however, claim that the best belting will not tear, and time alone can decide whether this is so or not. The binding is not readily adjustable, and when ordering it is necessary to send a sketch of the boot which one intends to use with it.

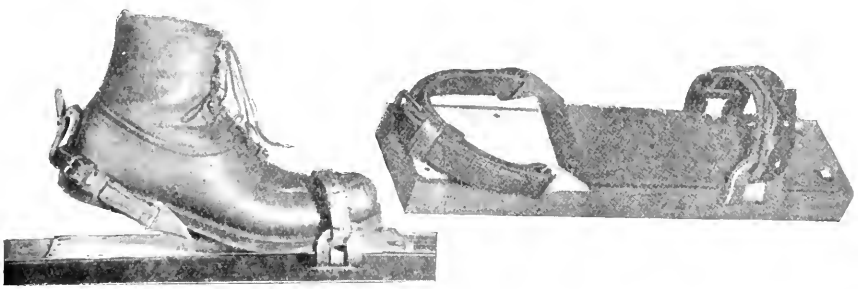


FIG. 10.—Ellefsen's Patent Binding.

The figure with the boot also shows a little strap sewn on to the heel of the boot to prevent the heel straps slipping off. This is very useful with all the above-named fastenings. See *infra*, pp. 47 and 48.

The LILIENFELD BINDING has caused more discussion and provoked more criticism than any other. It, too, is on the "sole" principle, but differs from all others in this respect, that (except for the heel and toe straps) it is made entirely of metal.

The vertical axis of the sole is, moreover, placed *in front* of the toe, and not under it as in other fastenings, and vertical stiffness is secured by means of a very ingenious spring arrangement embedded in the ski. This shifting of the axis forward makes the binding feel curious at first, but one gets accustomed to it after a while, and then it becomes very comfortable and pleasant. An objection to the plan is, however, that one is deprived of much control over the heel of the ski, and is placed, so to speak, at the mercy of the spring. It is, however, often convenient to raise the heel of the ski when going up hill, and it is annoying to find when one tries to do so that it refuses to

obey on account of the spring being insufficiently screwed up. On the other hand, if the spring be tight the heel keeps "clappering" up and down at every step. Another decidedly bad point about this fastening is its weight. It is unquestionably heavy. It is necessary, therefore, to use a considerably lighter ski with it than with any of the ordinary arrangements, and light ski are apt to be brittle. It is, however, a very powerful binding, very suitable for making "S" turns on steep and difficult ground. It seldom or never breaks, and it is adjustable to almost any boot. It is usually sold fitted to a special ski with a hole in it cut for the spring. The so-called "Alpine skee" is shortish, broadish, and flat-bottomed, with a

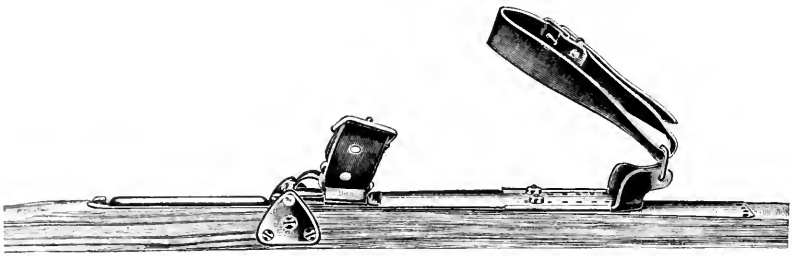


Fig. 11.—The Lilienfeld Binding. "Alpine Skee." Movable Steel Sole.

sharply turned-up bluff entrance. These qualities render it less suitable for straight running, but useful for turning on the mountain-side, for which special purpose it is, indeed, designed. People somewhat advanced in years will find the "Alpine skee," with its special fastening, of value for mountain tours, and it is, we think, easier to learn to turn on it than on any other; but your dashing youth and your jumper will certainly prefer the Norwegian article. Of course, the Lilienfeld fastening can be fixed to a Telemark ski.

Method of Fixing.

The right way of attaching all the above-named bindings to the boot will have been evident from the descriptions appended to each. It is sufficient to observe here that the straps (and particularly the toe-straps) should never be pulled tighter than occasion demands. Tight straps are the surest road to frost-bite,

besides being very uncomfortable. For all ordinary going—that is to say, during far the greater length of time that the ski are on the feet—the straps may be worn comparatively loose. It is quite easy to tighten them up for a difficult piece of ground or a jump, and there is no occasion to run unnecessary risks.

Another important matter is that with all ordinary bindings care should be taken not to thrust the foot too far into the toe-strap. The toe-strap should never cross the foot lower than the middle of the great toe. People are apt to neglect this simple precaution, but in doing so they run the risk of spraining the foot in the event of a fall forwards. In the case of the Lilienfeld binding, it is not necessary to be quite so careful, as with it the vertical axis is in front of the foot.

Conclusion.

The beginner who has read the above remarks probably realises by now that *there is no such thing as a perfect ski binding which will satisfy everybody!* Some people want extreme lateral rigidity, others a little play, and others, again, comparative looseness. It is much the same with the vertical movement; if very stiff there is great control, valuable for jumping and for lifting the heel in steep hill climbing, but the ski "clappers" on the level. If very loose, the toe has to carry too much weight,* and the advantages of stiffness vanish. There can really be no such thing as a happy mean in these matters, and everybody must choose that which on the whole is best suited to his requirements. Nor can any form of fastening last for ever, and the most that one can expect is that a binding should not be continually giving way. Do not, therefore, begin by worrying yourself too much about this part of your equipment. Buy one or other of the bindings depicted above which you think will suit you best, and learn all about its little peculiarities and something about ski-running before you decide that it is no good. Above all things, avoid boring your more experienced friends with binding talk, of which they have all had enough and to spare.

* To judge by the number of utterly foolish bindings on the market, this is a point which usually escapes the inventor novice.

FOOT-PLATES.

In order to protect the ski and to prevent snow adhering to it under the foot it is necessary to fix some sort of anti-sticking material to that part which is touched by the boot; and a thin plate of some non-corrosive metal is best for this purpose; the india-rubber or seal's skin commonly sold are of little use, and soon wear out.

THE STICK.

The stick is a good servant, but a bad master. It is little used by first-class runners, except to enable them to increase the speed by punting. There can, however, be no doubt that it greatly assists a beginner in preserving his balance on difficult ground and in turning. On the other hand, it is equally certain that it is frequently the cause of his adopting a bad style, of spoiling his balance, and of hindering or entirely blocking his progress in the art of turning. To jump with a stick in the hand is most dangerous, and, of course, there is always the possibility of the stick being lost or broken on tour.

Accordingly there are those who recommend the beginner to leave this part of his outfit at home; and much is to be said in favour of such advice, especially in the case of a young and active pupil. When, however, it is argued that anybody who can go on ski without a stick will not have any difficulty in subsequently taking to one, we venture to differ. Perhaps in rare cases it may be so, but we have had a somewhat extensive experience of beginners of all ages, and we have always found it otherwise. The novice who has learnt without a stick seems to be greatly embarrassed when one is first placed in his hand. Moreover, we have met not a few ski-runners, no longer novices, who make very pretty Telemark and Christiania swings on the practice ground with hands free, but who break down hopelessly on tour when encumbered with a stick. But everybody is agreed that a stick of some sort or other should be taken on tour, and we fail to see the use of these pretty manœuvres if they cannot be accomplished when really most required. This, however, is far from being the whole case for the pole. What is your poor

THORWALD HANSEN. King's Prizeman, Norway, '05.

Photo by Th. Thorkelsen.

elderly friend to do when he tumbles in deep snow? It frequently requires considerable activity to get up under such circumstances, and what is here mentioned half in jest might really be an ugly matter. Besides, nobody over twenty-five can be expected to enjoy continual struggling head downwards. People get exhausted, people begin to think that it is impossible to learn, and people take to some inferior sport which they find easier, and therefore more amusing. Did you mutter "Let them go"? Nay; but there we touch the very root of the matter. Is ski-running merely a pretty form of athletics for the few, or is it a noble sport for the people, leading them forth from stuffy houses and narrow roads to the glories of the winter landscape? Surely the latter; and we would rather the runner sat on his pole at every hill and visited the woods and mountains than that he was the cleverest performer on the practice ground and went nowhere else. "But," it is said, "if the beginner accustoms himself to run with a stick in his hand he will be quite helpless when he loses it or breaks it, or when he wishes to jump." This is, of course, to some extent true, but the case is not so bad as all that. In reality, as above hinted, it is a good deal easier to run without a stick than with one after a certain stage has been reached; our experience is that the more advanced pupil soon learns to appreciate this, and that the transition from stick to no stick is seldom difficult. Besides, there is no reason to carry matters to extremes and *never* to practise with the arms free.

Our advice, then, is:—*Begin by carrying a stick in the hand, but use it only to overcome a difficulty. Endeavour to be as independent of it as possible, and practise sometimes without it.*

Shall the ski-runner use two sticks or one? and shall it or they be furnished with a basket arrangement at the end (see Fig. 12)? These are questions which have also been much discussed, and frequently rather unprofitably. We think that it all depends on circumstances. Two light bamboos with wicker-work discs (Norwegian *Trindser*) at the end are very serviceable when one has got beyond the beginner's stage. They help one up hill and along the level, and down hill they may be trailed behind in each hand, or on difficult ground held together and used as one. The discs are, of course, intended to prevent the

point penetrating the snow to too great a depth—*not* to act as brakes. But on very steep and hard mountain sides where one may find oneself—sometimes with a precipice below—they are far from being a source of comfort. On such occasions one prefers to have a single stout staff, which one can thrust deeply into the snow, and which one knows will not slip or break. And in general we have not found two sticks to be of much service in the high Alps, though for lower excursions in Switzerland and in the Black Forest and everywhere in Norway we prefer them. The novice, however, should, we think, *begin* with a simple staff of good ash or other strong wood, without any disc at the end. He is sure to require to use his stick to some extent (indeed, we shall advise him lower down to do so), and he

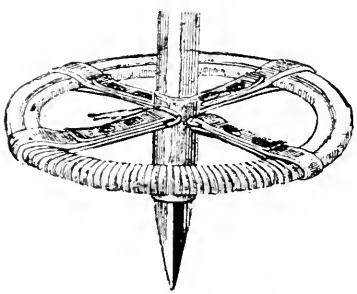


FIG. 12.—Disc for bottom of ski stick, attached by metal ears. Staub of Zürich's pattern.

would probably only break light double sticks. He should get into the habit of holding his stick in either hand, and should begin to practise with two as soon as he thinks he is far enough advanced to do so. In choosing his stick he will select one about as long as from the ground to the top of his shoulder. It should be furnished with a metal ferrule and a spike at the lower end, and a *broad* leather loop at the top for the hand.

The double bamboo sticks should also be about as long as from the ground to the shoulder. They are best cut from the root end of the plant, where it is strongest; the root also serves as a convenient lump for the hand to hold. The discs are best attached by a metal arrangement, as shown in Fig. 12, and not

by boring a hole in the cane and passing a piece of leather through it, as is common in Norway. The one method holds for a long time; the other breaks very soon.

FOOTGEAR.

This is a very important part of a ski-runner's outfit, and too much attention cannot be paid to it. Nevertheless, nothing is commoner in Switzerland than to see the early efforts of beginners enormously handicapped by unsuitable boots. English ladies, particularly, seem to find it difficult to make up their minds to spend the necessary amount of money on a suitable pair, and usually appear in thin, high-heeled shoes covered by "gouties." But the acme of thoughtlessness was in our experience achieved by a man who went out in patent-leather boots and openwork silk socks! The consequences were, of course, frost-bite, and he narrowly escaped losing a few toes.

A strongly made, waterproof, low-heeled boot is a necessity, and with most modern bindings the sole should be not less than half an inch thick. It should be roomy enough to permit of *at least* three pairs of extra thick socks being worn, and there should be plenty of room for the toes to "waggle." With bindings such as Huitfeldt's it is better not to have the toe cut too square, for a more or less wedge-shaped end fits better into the toe-irons. In order to resist the pressure of the toe-strap it is best to have the leather extra-thick in front. The boot should fit fairly tightly round the ankle and instep, for reasonable firmness at this point does not interfere with the circulation, and is of value in preventing sprained ankles and chafed heels. With Ellefsen's binding, where there are no straps across that part of the foot, this is of special importance. Nothing is gained by wearing a sloppy sort of boot and subsequently imprisoning the foot in tight and narrow straps. The strain of moving the ski has to be borne somewhere, and it is best to distribute it evenly where it is least felt.. In order to prevent the heel straps slipping down it is strongly advisable with all the bindings mentioned above (except the Lilienfeld) to have a small strong strap and buckle sewn to the heel of the boots. The buckle should point upwards, and should be fixed quite close. The end of the

strap then points downwards, and is useful as a sort of shoe-horn for pulling on the binding.

For Switzerland we would advise the addition of a *few* nails to the sole of the boot. They prevent any slipping about on icy places round the house, and they make all the difference to one's happiness in climbing on foot over a pass or the last few yards of some rocky and icy summit. They are not, however, to be recommended in Norway, where nobody wears them. Not but what there is plenty of ice round the hotels and sanatoria there, but in that country custom is everything, and it is better to bear with a bump or two than to offend.

In the Black Forest ski boots are often made of dog or calf skin, with the hair left on *outside*. An inner coating of hair is often added, but this we think is a mistake, as it is difficult to dry after use. The exterior coating of hair is, however, a great protection against cold. It wears out in course of time, and then the thing to do is to follow the classical example of the King of the Jews and buy another pair.

Arctic explorers and others who go to very cold places are unanimous as to the virtues of outside hair, and various devices exist to enable the runner to fix a covering of it over his ordinary boots. These inventions are, however, apt to be too bulky, or to fill up with snow, or to be cut by a nailed boot, and we cannot recommend any we have seen. A very simple plan is, however, to nail a piece of skin (or canvas-covered felt) to the ski in front of the foot, and to pass it between the toe-strap and the boot. It should be wide enough and long enough to cover the toes, but not, of course, so wide as to project and act as a brake. This little dodge helps to keep the toes warm, not only by the extra covering which it affords, but also by distributing the pressure of the toe-strap over a greater surface; it also to some extent prevents snow collecting under the toes and forming an uncomfortable lump there.

Boots should be greased now and again, but in moderation, for excessive greasing is said to cause cold feet. The boots should be warmed (with hot water or otherwise) before the grease is applied. Castor oil is excellent for this purpose.

The best kind of socks to wear are very thick ones made of

goat's hair; but nowadays they are difficult to get. In Norway so-called "Ragge Sokker" are no longer made of pure material, and the modern imitation is harsh and uncomfortable. Thick woollen socks known as "Ladder" are now largely used, and a pair of these over a good ordinary sock are sufficient for most purposes. It is, however, always advisable to take a dry pair in one's rücksack, for, however waterproof one's boots may be, a considerable amount of moisture always accumulates inside them. This is due to the condensation of perspiration against the cold outer surface of the boot, and is most dangerous in very cold weather, when the leather freezes and its pores are choked by ice. When this occurs the toe-straps should be loosed and the toes should be kept moving. Frost-bite is very insidious, and is frequently quite unnoticed by the sufferer till he reaches home and it is too late. The consequences may be very serious, and it is impossible to be too much on one's guard.

From the above it will be seen that there is plenty of room for improvement in the ski-runner's footgear. We recommend a thick under-sock, a pair of good "Ladder," a stout boot, fitting well about the ankle, but with plenty of room at the toes, and a piece of skin covering the toes and held in position by the toe-strap. But, all the same, we frequently suffer from cold feet, and we wish somebody would invent something better.

OTHER CLOTHES.

Other clothes are of minor importance. Remember that the season and the snow are cold, that the latter melts, that the exercise is at times very violent, and then you are not likely to try wading trousers or an umbrella. The best clothes for ski-runners are, perhaps, knickerbockers and a double-breasted jacket. Choose a material of smooth texture, for woolly stuffs catch the snow, which soon forms into icy lumps, betraying the novice and melting unpleasantly in a warm room. All openings at the neck, sleeves, knees, and ankles must have an arrangement to fit closely to keep out the snow, which is apt to find its way in, especially in the earlier stages of practice. Let the cap, or soft felt hat, be provided with flaps, to protect the ears

in a sharp breeze. The so-called St. Moritz cap is excellently adapted to the purpose. Thick woollen gloves, long enough to reach high above the wrist, are indispensable, and a second pair ought to be in the pocket as a change, for wet gloves in a cold wind are the surest road to frost-bite. Puttees are probably the best means to shut the top of the boot and to cover the stockings. Some sort of wind-jacket is necessary in the Norwegian mountains and elsewhere where strong winds prevail. A capital one is in use in Austria. It is made of very thin oil-silk in the form of a sort of smock-frock, with a hood at the back for the head. It weighs almost nothing, and is warmer than any sweater. With this and a pair of trousers of the same material one may laugh at the most biting wind that ever blew, and the dangers of a night out become greatly minimised.

ACCESSORIES.

The Rücksack—Norwegian Rypesæk—came originally from the Tyrol, and is by far the best means of carrying things. It should be made of stout waterproof canvas, and should be provided with broad shoulder-straps. We advise the novice to buy as good a one as he can afford; he will find it useful for other things besides ski-running.

Smoked Glasses, or some such device as that recommended below, will generally have to be worn above the tree-line to protect the eyes from snow-blindness. The precise nature of this complaint does not appear to be understood. It appears to be more prevalent in some countries than in others, and is not, we think, entirely a matter of intensity of light. It seems, for example, to be more dangerous in the Norwegian mountains than in Switzerland. Like frost-bite, it is insidious, and the patient frequently is not seriously inconvenienced till after the damage is done. Some people, too, are far more susceptible to it than others. Instead of smoked glass, which is liable to become dimmed by the condensation upon it of moisture, we prefer a simple oblong piece of leather, 6in. long and about 1in. broad, with two oval-shaped holes in it opposite the eyes, say, $\frac{1}{2}$in. long by $\frac{3}{8}$in. broad; a slit for the nose to hold it in position, and two pieces of string to bind it round the head.

In Derbyshire, November, '04.

Photo by C. R. Wingfield.

The WATER-BOTTLE should be of sufficient capacity; one to hold about a litre is convenient. It should be provided with a felt covering and a tight-fitting cork. What to put into it is a matter of choice, though much alcohol is not to be recommended. Personally we have given up compounding drinks of cold tea, sugar, and wine, for the reason that they are so nice that we drink more at a time than we should. Our companions, too, look at us with such longing eyes that it is difficult to resist their dumb appeal. Such a water-bottle is soon empty. Plain sugar and water is not so nice, but is very sustaining, the sugar being very rapidly digested, and a raw egg or two adds to the value of the compound. Dried prunes, acidulated drops, and other sweetmeats will be found very pleasant on a ski tour, even though one never touches them at other times. Louis Stevenson has observed that the hungrier a man is the more he appreciates delicacies, so do not let your luncheon consist entirely of plain beef sandwiches. Remember, too, that it is better to eat little and often than largely and all at once.

SOME SORT OF REPAIRING OUTFIT and a spare ski tip should always be taken with one. There are little light metal tips on the market made to fit over a broken ski which are very useful. The kind that fixes with a screw is best, as the other is apt to come off. If, however, one has the latter, a small screw-nail through it would keep it in place. With one of these tips, and the means of making an improvised binding with a few screw eyes and nails, a washer or two, and some straps, the runner should be able to get home easily enough wherever his ski may break. The reader must use his ingenuity in such matters, remembering always that it is impossible to execute very elaborate repairs with cold fingers.

There are other odds and ends more or less useful on tour, a description of which will be found in any dealer's list.

PART III.

TECHNICAL.

PRELIMINARY ADVICE.

We would very strongly recommend the beginner to make his first efforts on some one or other of the good snow conditions described on pp. 21 and 22. Freshly fallen deep snow is especially to be avoided, for not only does it afford heavy and difficult going, but a fall in it is apt to be dangerous. This is, of course, the reverse of what one would expect; but what happens is that the ski sink in deeply, and in the event of a fall they are apt to stick and sprain the ankle or knee. The firmer the snow the better it is, provided always that it be of sufficient depth and that it be fair snow, and not ice-crust.

All things considered, we would advise the beginner to learn to go slowly before he learns to go fast. That is to say, as soon as he can run straight fairly well, we would have him learn how to regulate his speed and steer by means of what is known as "stemming" (see *infra*, p. 69). In practising this movement he will at the same time learn how to balance himself with the weight on one foot, a necessary accomplishment; for, though in ski-running both ski are usually kept on the ground, *the weight is nearly always mainly on one foot*. It is well to pause and try to appreciate this very important fact before reading further.

After he has learnt something of stemming, and provided that he has followed our instructions and used his pole as little as possible (and then only as we direct), he should not find much difficulty in acquiring some speed in glissading. He should then begin to take short tours of, say, an hour or two's duration, gradually lengthening them as his proficiency increases. *He should when on tour endeavour to apply the knowledge which he has gained on the practice ground, and on the practice ground he should try to overcome those difficulties which he has encountered on tour.* There is no sense in keeping on climbing up and sliding straight down the same easy hill; yet such is the commonest form of ski-ing at fashionable Swiss winter resorts!

As soon as the beginner can "turn on the spot," run straight fairly well, and "stem," he *can* (we do not say he *should*) go where he pleases. He will, however, remain slow and awkward, and he will miss a great deal of the beauty of the sport if he rests content with these easy accomplishments. We trust that he will be of a more ambitious disposition, and that he will proceed to the mastery of the "S" turn and of the "Telemark" and "Christiania" swings; and we strongly recommend him to learn something of jumping, not only on account of the amusement which he will certainly derive from it, but because it is the very best means of gaining a good balance for ordinary running.

It is of the greatest importance to cultivate a freedom and elasticity of movement and position. The muscles should be as strong as iron, but as flexible as rope. The knees should be pliant, and should act like the springs of a carriage in relation to the rest of the body. Be watchful, but courageous, and try hard not to fall.

LEAN FORWARD!

Lean forward is the watchword of the ski-runner, and it is just as well to explain what is meant by it before proceeding further.

Place your ski parallel, one about a foot in front of the other, and throw the body forward as much as possible; one ought to feel as if about to fall on one's nose. To the onlooker one seems to be standing on the *entire* sole of the foot, but in reality all the weight rests on the front part and the toes. Thus, stand erect on the ski, the knees a little bent, and then lean forward without bending any part of your body (especially not the region of the hips) and without raising the heel; then you ought to feel what is meant. Never assume a position as if sitting down or about to do so, because that would press down the heel. Every violation of this great rule of leaning forward is punished by the ski "bolting" from under one.

TO LIFT THE POINT OF THE SKI.

To lift the point of the ski seems a very simple matter, but it is at least ten to one that the novice will do it wrong.

(1)

(2)

(3)

Fig. 13.—Turning on the Spot.

Press the heel of the ski down on the ground with your heel, and lift the point upwards with your toe. *Do not raise any part of your foot from the ski.*

To lift the heel of the ski reverse the above. Here it will not be possible to keep the heel of the foot on the heel of the ski, but the binding will raise the latter from the ground to some extent.

TURNING ON THE SPOT.

Turning on the spot is a puzzle to the beginner, though simple when shown.

Lift one ski straight to the front (see Fig. 13 (1)), putting the heel end as far away from you as you can, then turn it outwards and away from you smartly, swinging the point right round and leaving the heel resting on the snow, then put it down, point by heel, alongside of the other ski. This twisted position (Fig. 13 (2)) is the only difficulty, but very few attempts will soon show that it is not so bad or cramped as it seemed at first. In this position hold the knees slightly bent. Lastly, *raise the point* of the other ski and swing it round. You will find it easier to learn this movement with the assistance of your stick, which should first be held obliquely across the body, pointing in the opposite direction to that in which you are turning. Then after assuming position (2) shift it across as in (3), and lastly swing round the other ski. As soon as you are proficient with the help of the stick practise without it—and, of course, both to right and to left. It is not necessary to stand on the snow in order to learn these movements. The carpet will do, but remove all Dresden china from the immediate neighbourhood.

WALKING WITH SKI ON THE LEVEL.

Walking with ski on the level differs from ordinary walking or skating in this, that *one must not strike out*, there being no fulcrum or point of resistance. Keep the ski *parallel* and *as close together as possible* (closer than shown in the diagram), for a narrow spoor has many advantages, besides being "good form." Throw the weight of the body forward and *slide on the advanced leg*: the "hind" leg must be absolutely

disengaged that is to say, do not strike out by trying to press the snow with it. Begin with long, slow steps, lunging forward with bent knee (Fig. 14). Do not lift the ski from the ground, but slide along regularly and conscientiously; do not hurry or flurry, but save your breath. In one's first steps one must specially cultivate precision, sliding forward with ski

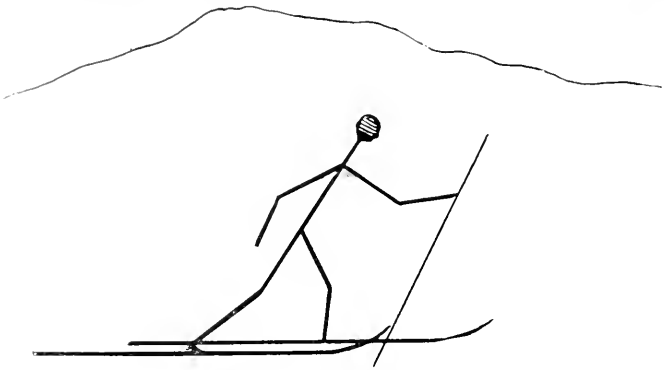


FIG. 14.—On the Level.
The ski should be kept closer together than shown. The closer the better.

exactly parallel, and distributing the weight properly. Lean forward! slide! *

A single stick on the level is of but little service, but with two sticks the pace can be considerably increased, especially on a good firm surface. Both sticks should be thrown forward simultaneously, and the slide on the advanced leg accelerated by a vigorous push with both arms. When proceeding in this way it is well to observe some kind of rhythm; and, as the snow is seldom slippery enough to admit of a push at each step, one should run, for example, one, two, three steps (swinging the sticks forward), and then push with the arms, sliding on, say, the right leg; then run one, two, three steps and push, sliding on the left leg, and so on.

UP-HILL.

To the laity it is a matter for wonder how it is possible to climb any considerable hill at all on ski. We remember

* Look at the frontispiece for an example of first-class level-running.

A Stiff Climb.

Photo by E. C. Richardson.

well the look of polite incredulity which passed across the face of a mountaineering friend some years ago when we told him that a certain well-known pass in the Alps had been traversed in winter. He had tried ski himself, but had made very little of them, and the pass in question is a stiff one to negotiate even in summer. But now long climbs on ski in winter have become so common that it is unnecessary to pursue the subject further than to quote the classical observation of Olaus Magnus, "There exists no mountain, however high, which by means of cunning by-ways he (the ski-runner) cannot surmount."

It is, however, well to observe here that some of the accounts of the ease with which one can climb hills on ski have been exaggerated. In rare conditions of perfect snow one may perhaps ascend as quickly as in summer, but, roughly speaking, it may be said that ski are about twenty-five per cent. slower uphill than boots. We are here, of course, speaking of climbing a steep mountain where it is necessary to zig-zag (see *infra*), and not of walking straight up a moderate slope. Moreover, whether we slide the ski upwards in winter or whether we carry a corresponding weight on our backs in summer, the fact remains that some 10lb. or so have to be raised so many feet, and we are handicapped to that extent. Where ski really have the advantage is after the summit has been reached—of which more anon.

Up to a certain degree of steepness (varying with the quality of the snow) there is little or no difference between the methods used for climbing and for walking on the level. Snow is not an absolutely slippery substance, and the ski always adhere to it to some extent. There comes, however, very soon a point beyond which we can no longer slide as on the level, and shortly afterwards another, where the force of gravity overcomes the "stickiness" of the snow and we begin to slip back. These points are very different with the expert and the beginner, and the former will slide easily straight up a slope upon which the latter will slip hopelessly.

In ascending a steep incline the art lies (1) in knowing (and only experience can teach one) just how steeply one can go without a slip; (2) in the correct placing of the ski in the snow;

and (3) in the correct balancing of the body upon the ski when so placed. The correct placing of the ski is not a difficult matter. The secret lies in raising the point of the ski (see p. 53) an inch or two from the ground and bringing it *straight* down with a *firm* stamp. The stamp is at first nearly always made too gently by ladies and too hard by men. Imagine you are cracking a walnut—that will be about right. Remember that *where the foot is brought down there it must stop.* If it slips even the least tiny bit you must stamp again.

Next bring the weight forward as evenly as possible on to the ski you have stamped, and advance the other leg. In doing so

FIG. 15.—*Climbing a slope.*—*s* = the fall of the slope; *t* = turn here. The shaded parts are obstructions (rocks, thick growth, &c.).

take the greatest care to balance the weight of the body *straight over* the stamped ski; lean neither backwards nor forwards, or you are certain to slip.

In hill-climbing it is, of course, expedient to go as steeply as possible, but the beginner will find that it pays best to take things easily at first, as a single slip backwards is more exhausting than twenty steps forwards.

To negotiate a steep slope one must go across and upward at a convenient angle, making a zig-zag track, as an engineer would plan a good mountain road (Fig. 15). Turn at the corners as described, p. 55, and when so doing remember to assume a safe

standing position, for a slip on a steep slope may be attended by unpleasant consequences. The correct position in which to stand

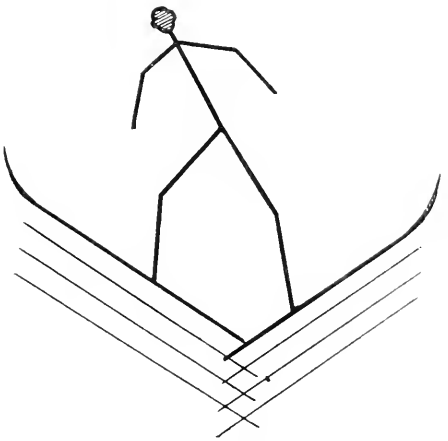


Fig. 16.—"*Herring-boning.*"—The figure is in the act of lifting the right ski over the heel of the left. The light lines are his tracks.

Note.—Swing the body well, as shown.

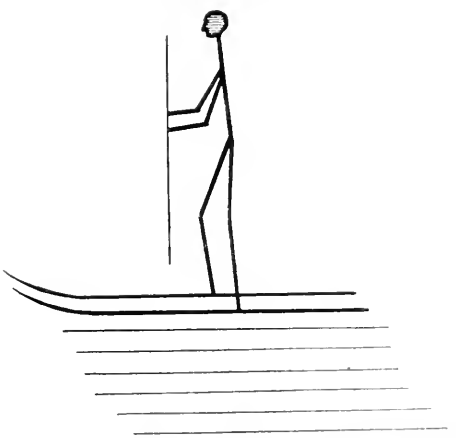
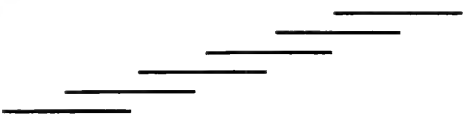


Fig. 17.—*Hill climbing sideways.*—Used only on *very* steep slopes. The light lines are old tracks.

before turning is clearly with the ski horizontally in space—that is to say, at right angles to the direction of the gradient; then one cannot slip while engrossed in the task.

The diagrams on page 59 show two other methods of hill-climbing which are chiefly useful for short slopes. They are both too fatiguing to be employed for any length of time. A modification of the style shown in Fig. 17 is, however, very useful, especially on crusted snow. It consists in going forwards and upwards at the same time, lifting the ski at every step. This is not so very tiring, and may on a hard surface be kept up for a considerable length of time without undue fatigue. The track formed will appear as under.



It is important when proceeding in this way to remember, when lifting the *upper* ski, *to raise its heel from the snow* (see p. 55) *and place it well up-hill in a horizontal position.* Most beginners move only the front part of the ski, and place it in the snow with the heel pointing down hill. Even if the upper ski does not slip in this wrong position (as usually happens), the lower ski, when it comes to be lifted, is sure to be placed across the heel of the upper ski, imprisoning it and preventing the next step being taken. You are certain to make this mistake very frequently at first, and it will land you in all sorts of difficulties and entanglements, but do not forget that we warned you against it.

A single stick is not of any very positive assistance up-hill, though it has a negative value on *very* steep ground both in aiding the balance and in giving a feeling of security against slipping. In traversing a slope it should be held across the body with the point touching the snow on the upper side. The beginner will also find it useful to assist him in rising to his feet after a fall. He should, however, entirely abandon all idea of pulling himself up-hill with his stick; to do so is quite impossible. Balance is what is required, *plus* a little thigh muscle, which will come with practice.

Two sticks are, however, of considerable help, especially on moderate slopes up which it is possible to go straight. They

should be placed in the snow alternately, after the manner which nature dictates. In traversing steep ground they cease to be of service, for the lower one is not long enough to reach the slope below one's feet, and the upper one cannot be used effectively on the bank at one's side. Under such circumstances it is better, and safer, to hold them together and to use them as one, as described above.

In general for long climbs it is best to go comparatively slowly and to "keep at it." The speed of a party should be that of the slowest man. If you happen to be that unfortunate individual, don't lag behind if you can help it, but don't hesitate to shout to the others if they are going too fast for you. If, however, they are novices and persist in rushing, slow down and go your own pace. It is not at all improbable that if you go steadily you may be the first at the top, after all; but even if you arrive twenty minutes later than the others you are in no wise dishonoured.

Strictly between ourselves, we rather like to be last man, and to allow our more energetic friends to go on ahead. The last man has far the easiest place on a newly made track, and we do not thirst for the glory of breaking the snow.

But, of course, a properly organised party should keep together, and its members should take it in turns to go ahead. It is in itself a pleasure to move steadily upwards in this way, the ski and the sticks keeping time, and it makes the way seem shorter and easier for everybody.

One concluding word of advice may here be given. Eat your lunch some little distance below your intended highest point. The tops of mountains and passes are apt to be draughty, and, besides, it is much better to begin the run down when the muscles are warm and supple than to wait till after they have turned cold and stiff from sitting about.

GLIDING DOWN.

Gliding down is the characteristic part of ski-running, as distinct from the use of pattens, Canadian snow-shoes, &c. It is the reward reaped after the labours of the climb. The ascent is, indeed, a struggle against gravity, but the descent is

the highest advantage that any physical exercise can safely derive from terrestrial attraction.

Let us imagine ourselves on the top of some long Norwegian mountain ready for the plunge. There is a clear course between the steep rocks near the top, and an open run across the glacier below to the terminal moraine a mile off. We can see every yard of the way, and all is fair going, yet we feel just the merest tinge of nervousness, for the incline is steep, and looks steeper than it is. But there is really no danger, so it is over the edge and off! In an instant all fears are left behind, for now balance and quickness of eye are to be put to the test, and the wind is whistling and the snow dust spurting. We whiz past the rocks and over a few inequalities, negotiated here by a spring and a flight of a few yards through the air and there by a compensating yielding of the knees. Now we rush out on to the smooth surface of the glacier, where there is no jar and no vibration. Our feet seem to have vanished, and we lean, as it were, in space, with the ice-wind pressed against us. There is no more need for balancing, and no thought of falling, so even is the motion and so trustworthy the snow. Smoothly our wooden wings bear us onwards, and the furlongs lie behind! But the end approaches, the slope becomes less steep, the pace slackens, and presently we glide gently up the opposite slope of the moraine and turn to watch our companions.

Such is the best picture we can give you of a good straight glissade on ski; but there is not the slightest reason, friend novice, why you yourself should not enjoy the reality ere long. You must, however, learn to walk before you can run, and we would have you make your first attempts on some quite easy slope, removed if possible from the public gaze. A few obstacles, such as trees, scattered about do not matter, as you are not in the least likely to run into them, and they serve to accustom the eye to their presence. If possible, let there be a gradual outrun at the bottom of the hill. Practise there awhile, and as soon as you can run down without a fall move on somewhere else to a place where the ground is steeper and more uneven.

To start on steep ground is a little difficult at first. Stand horizontally to the direction of the slope. Then *as quickly as*

possible lift round first the lower and then the upper ski. Lean forward and off! If you are quick and lean forward, the ski will not bolt from under you; if you are slow and hang back, they will.

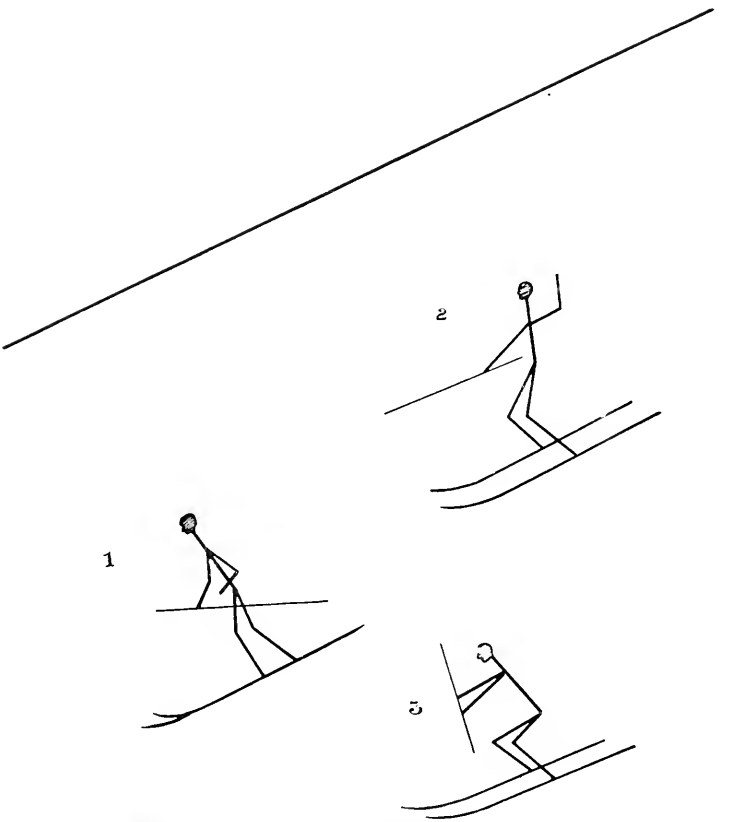


Fig. 18.—*Gliding on ski.*—1. Correct position; 2 and 3. Dangerous and incorrect.

The correct position for descending a hill is that shown in Fig. 18 (1) above. Keep the ski parallel and *as close together as you can* (touching if possible), advance one foot about twelve inches, and let the main weight of the body rest on the ball of

the "hind" foot; feel your way, so to speak, with the front foot. *Lean forward. Bend the knees slightly, and be as free and as elastic about them as possible.* Practise with either foot leading. Avoid any affected and ridiculous pose. Do not, for example, if you are running without a stick, hold the arms straight out from the body as though you were walking a tight-rope. To do so may slightly assist the balance, but you cannot run like this with a stick in your hand, and it is far better not to get into bad habits. No. 3 in the diagram (p. 63) is a very common attitude, but it is as bad as bad can be. The wide spoor is a cause of instability, the *extreme* bending of the knee is a source of weakness, and there is a very fair chance of the runner (if he falls forward) knocking out his front teeth against his stick. Hold that article *clear of the ground* in a safe position as shown (No. 1, p. 63), and practise sometimes without it. *Above all things, do not lean backwards on to the pole*, for the consequence of so doing is that the upper part of the body is retarded in its speed, and, being thus left further and further behind, a spill on lumpy ground becomes inevitable. There is a right way of using the pole for breaking and turning, which will be explained further on, but until some little skill in simple straight glissading is gained it is best not to trouble about this. We strongly advise you in the meanwhile not to use the stick at all, but, for reasons previously stated (see pp. 44 and 45), to practise with it held in the hand clear of the ground.

Double sticks should be held up one in each hand or trailed behind.

The position shown in Fig. 18 (1) is the safest position for running over unbroken snow, for by advancing the foot one lengthens the running surface and so glides more easily over any inequalities, and by holding the ski together one is less disturbed by any lateral irregularities. But on an icy road it will be found easier to run with the feet more level and somewhat apart, for there another disturbing factor, side slip, comes into play.

So, again, when changes of the snow's surface are likely to occur, causing the ski at one time to run freely and at another to stick, it will be found better to crouch close down to the

ground, for by doing so one lowers the centre of gravity, and is less likely to be pitched forward when entering the slow snow. And there will be other occasions when the runner will find it necessary to more or less modify the position shown in Fig. 18 (1). Nevertheless, this attitude may safely be considered the *normal* one for descending hills on ski, and the beginner is recommended to study it carefully, and to adhere to it as closely as circumstances will permit.

FALLING AND GETTING UP.

As to the former, we beg to offer Mr. Punch's advice to those about to marry—"don't." Every ski-runner falls more or less, the beginner very much, the expert very rarely. But most novices are apt to throw themselves down far oftener than there is any occasion for. Do not, therefore, give up simply because you lose your balance a little; very frequently if you try hard you will be able to keep upright. If you make up your mind to "stand" down a difficult hill, the chances are that you will succeed in doing so; but if you are nervous and hang back, you are almost certain to come to grief. It is specially true of ski-running that fortune favours the brave. When, however, a fall cannot be avoided, we would advise you, if possible, to cast yourself down sideways and backwards; but if the whole affair is beyond your control, then relax every muscle in your body and let yourself go. Make no attempt to save yourself or stop rolling. Then there will be no snapping of tense sinews.

You will generally find out the easiest way of getting up for yourself, but two little artifices may here be mentioned. One is to get on to the back of your ski in deep snow; and the other is to bring the ski below you on a steep slope and to place them at right angles to the gradient before attempting to rise.

SLIGHT CHANGES OF DIRECTION.

Slight changes of direction can be made by leaning the body a little this way or that. This is very easy, and requires no explanation.

"SKATING."

Another way of steering is to lift one of the ski and place it down in the direction in which one wishes to go, at the same time striking out with the other foot as in skating. This accomplishment is not exactly pretty, but it is very useful. One can thus help the ski round a bend in a road or thread one's way down a gentle slope amongst trees without losing speed. It is, however, impossible to execute a very rapid turn in this manner. A good way of practising "skating" is to do a sort of "inside edge" on any firm surface (*e.g.*, a snow-covered lake) on the level. One strikes out with the ski in the same manner as with skates on ice.

BRAKING WITH THE STICK.

This method of controlling the speed has been the subject of a good deal of discussion. The objections to it are (1) that it is a less powerful method than any of the others to be mentioned later on; (2) that it requires greater strength; (3) that the stick is liable to break and leave the runner helpless; (4) that *its constant use is conducive to a bad style of running, spoiling the balance, and making the learning of the other movements more difficult.* Nevertheless, we doubt whether even the cleverest novice will be able to stop quickly by means of the "Telemark" or "Christiania" swings for at least a month or two, and most people will take far longer to learn to do them even moderately well. How, then, are the poor things to manage in the meantime? "By snow-ploughing and by stemming," you reply. Certainly, but the fact is that with these methods when no stick is used it is quite impossible, when travelling very fast, to stop suddenly, though with the help of the stick it is easy to do so.

But we will here go a step further and assert that there are places and conditions of snow where the use of the stick becomes imperative even to the expert, as, for example, when traversing a steep and crusted slope with a precipice below it. We propose, therefore, to deal with the proper way of managing it before proceeding further.

The important thing to remember in using the stick is to hold it quite short, and *as far in front as possible*. Do not let it drag behind.

The accompanying diagrams illustrate a right and a wrong method. Note that in (1) the left forearm and hand of the runner should rest against the inside of the shin of his left (advanced) leg. The left hand serves as a fulcrum, the long end of the lever being held in the right. Considerable power may be obtained in this manner, but it is not always feasible on lumpy ground. You must use your own judgment as to when to employ it, bearing in mind the above principle. But, above all things, do not assume the position depicted in (2). Here, even though

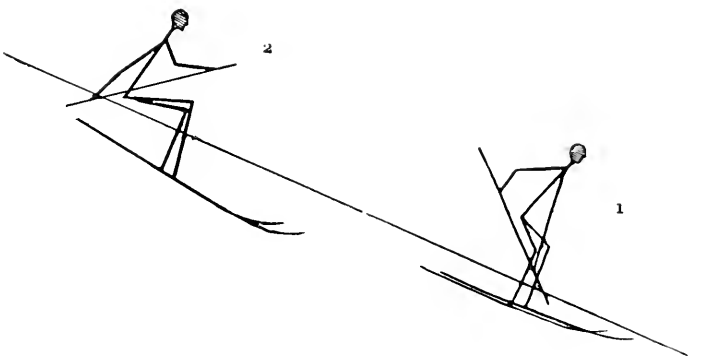


FIG. 19.—*Braking with the stick.*—1. A right way; 2. A wrong way.

the entire weight of the body rests on the stick, its braking value (owing to the angle at which it touches the snow) is very slight. In this position the ski gradually slide further and further ahead, leaving the stick, with the runner clinging to it, further and further behind; all balance and all control are lost, and as soon as a little inequality is met with a spill occurs.

There exists a way of sitting with the *thigh* on the pole (*not* with the junction of the legs) for braking on narrow, steep, and icy roads, where all other means are simply out of the question (see Fig. 20); and for the successful execution of this manœuvre it is necessary to note the following points very carefully. Assuming one wishes to sit on the left thigh, then the left hand grasps the end of the pole which protrudes below. Let this hand be close to the seat, and let the part of the stick between

hand and point be as short as possible. The right hand *rests on the right knee*, and seizes the upper end of the pole. This is important, for it is the use of the knee as a support for the upper hand which gives rigidity to the whole arrangement and allows one to hold out over long distances. The leg—the one on which one sits (in the example to the left)—is stretched out in front, and by shifting the weight from the ski to the point of the pole one can stop instantly, even on clear ice.

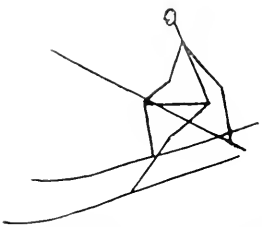


FIG. 20.—*Correct stick riding.*

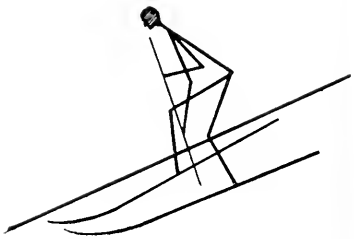


FIG. 21.—*Snow ploughing.*
Showing a method of using the stick.

SNOW-PLOUGHING.

We now come to a better method of stopping and braking. Snow-ploughing is used for reducing the pace and stopping *when running straight down*. In principle it is very simple, and it is quite easy to learn. The heels of the ski are pressed apart, and the toes held together, by which means a V-shaped kind of plough is formed, the friction of which against the snow causes one to stop. The wider the angle of the V the greater, of course, will be the braking power. The weight is distributed evenly between the two ski, and when the snow is hard both are turned slightly on to their inner edges. When the snow is soft it is best to hold them flat. The method is particularly serviceable on a hard road, and under such conditions, even when travelling fast, it can be employed quite suddenly without fear of accidents. But on soft snow any attempt to use it when running fast will result in the ski crossing and a fall forwards. Under such conditions nobody has

Reconnoitring. Half-way up Piz Nier.

Photo by E. C. Richardson.

strength enough to hold the ski apart. One must accordingly stop (by some other means) and then, if one wishes to proceed slowly, place the ski in the V-shaped position and restart.

The stick is a useful adjunct to snow-ploughing, and Fig. 21 shows a serviceable way of holding it.

SIDE-SLIPPING.

On *very* steep slopes, especially if such be icy, it is sometimes necessary to slip down sideways. This is simply accomplished by holding the ski at right angles to the fall of the slope and keeping them *flat* on the snow (or ice-crust) instead of edging them. The stick is held in the snow above the runner, and assists him in preserving his balance, for the motion is necessarily somewhat irregular. Side-slipping is, however, nothing but a method of descending a dangerous slope where snow-ploughing, "stemming," &c. (see *infra*), are out of the question. It is not amusing or pretty, but merely occasionally useful.

STEMMING.

Stemming is akin to snow-ploughing, and by some German writers the stemming position is termed the half-snow-plough position. It is a most valuable way of reducing the speed when *traversing* a slope which one does not desire to, or cannot, descend straight, and it is also of great service for turning and stopping under all circumstances. Whilst of ancient origin and known to all good Norwegian runners, stemming is but little used in Norway. The chief reasons for this are that the ground in that country is not in general steep enough to necessitate traversing, and that most Norwegians are from early childhood familiar with the more difficult Telemark and Christiania swings. On the Continent, however, the ground is usually steeper and the skill of the runner less, and there stemming has been found to be very useful. We have no hesitation in recommending the beginner to learn it at this stage if he wants to tour as soon as possible, and eventually to become a good all-round ski-runner.

At Lilienfeld, a small village near Vienna, stemming was hit upon, quite independently, by a Herr Zdarsky (an Austrian gentleman to whom we have already referred), who turned a philosophical mind to its scientific development. The description which we give of it is practically the same as that given in his book. Herr Zdarsky recommends the use of his own special binding, and employs a shortish, smooth-bottomed ski with a bluff entrance. We have found, however, that the movements can be made with any good firm binding and with any ski, though they are undoubtedly easier, both to learn and to accomplish, on a flat-bottomed short ski, than on a relatively long and grooved ski. (See p. 32.)

In learning stemming one distinguishes between the "glider" (the sliding ski) and the "braker" (the stemming ski). On a

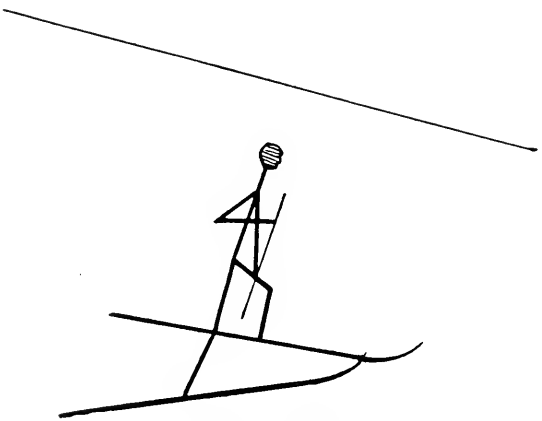


FIG. 22.—*Stemming.*

hillside the glider is the upper of the two. The glider must point in the direction in which one wishes to go. The lower ski, the braker, is kept a little behind the other, so as to prevent the glider crossing it, and is held in the position shown in the above diagram (Fig. 22). In order to ensure smooth and accurate progress it is highly important to remember to *keep both ski flat on the snow.*

Begin by running obliquely across and down a good steep slope in this position, *keeping all the weight of the body on the glider, and merely brushing the snow lightly with the braker.* Choose a gradient of sufficient steepness to keep you moving at a rate of, say, three or four miles an hour, and endeavour to run smoothly and to keep in a straight line.

In practising this you will discover that by pressing more or less on the braker you can turn up-hill, stop, or go slow, just as you please. We accordingly formulate directions for so doing.

To Turn Up-hill.—Press lightly on the braker, edging it into the snow.

To Stop.—Press hard, and turn the body up-hill. You will find yourself come round with a swing. This method of stopping can, of course, be used anywhere—*e.g.*, on the level after running straight down, where, if one wishes to stop by (say) a turn to the right, one stems with the left ski, at the same time turning the body to the right.

To Slightly Reduce the Speed.—Press a little on the braker without altering your direction.

Practise these three things patiently, constantly remembering the injunctions: Glider flat! Weight on glider! (or on braker, to stop!) Lean forward! Heels apart! Points together! (which latter means that one must keep the tip of the braker close to the *side* of the glider, and about a foot behind its tip).

On hard snow both ski will have to be edged so as to afford a grip on the impenetrable surface and to prevent side-slip. And between the extremes of the softest and the hardest snow the runner will discover many instances where he may have to edge the braker a little while going. But let him, all the same, interpret these remarks as absolutely as he can, and always try hard to hold the ski *as flat as possible.*

Practise on steep ground, because there mistakes are more easily discovered, and the correct way soon proclaims its advantages.

Fig. 23 illustrates the proper position for the ski in stemming. The arrow "s" is the fall of the slope, for the reader is looking straight at the mountain; "d" is the direction in which the runner wishes to go obliquely across this slope. This direction

is on the whole that of the glider "g." The braker "b" brushes the snow with its entire length, thus producing a *broad* track, the direct evidence of the braking power *i.e.*, friction. Therefore, weight *off* the braker for going, *on* for stopping. The steeper the slope the wider must be the angle formed by the two ski. The little circle "p" shows whereabouts the point of the pole should be—that is, a little behind the upper foot.

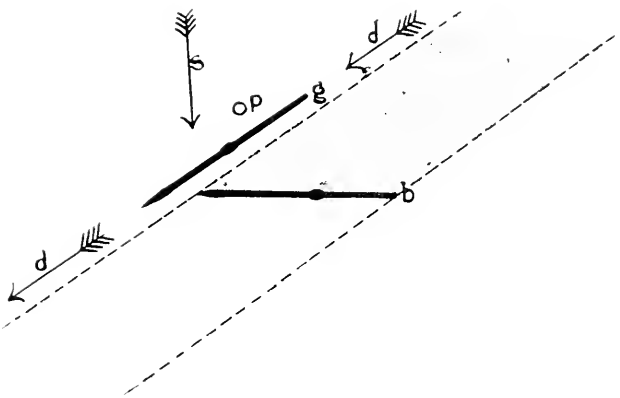


FIG. 23.—*Position for the ski in stemming.*

The pole may be used to facilitate balance when executing these movements, its point lightly furrowing the snow. It will also be found to considerably assist a sudden stop, for by pressing it into the ground and throwing all the weight on to the braker the glider becomes entirely disengaged, and there is less chance of its crossing the braker, as is otherwise apt to happen when running very fast. Hold the pole fairly short, do not lean back on it, and do not use it more than is really necessary.

TO MAKE A DOWN-HILL CURVE.

The foregoing section gave the beginner directions for turning quickly up-hill, but how shall he, when crossing a steep slope, turn quickly down-hill and, without stopping, continue his traverse in the opposite direction?

To do this is evidently a most valuable accomplishment, for if

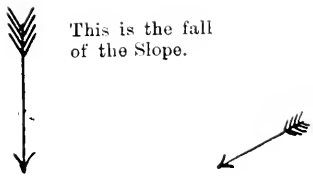
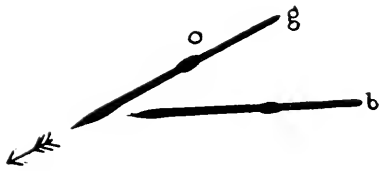


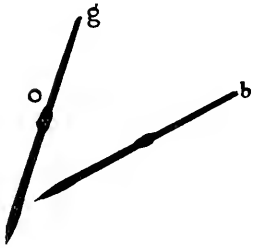
FIG. 24.

A circular curve to the left.

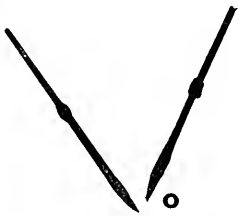
(O represents the pole.)



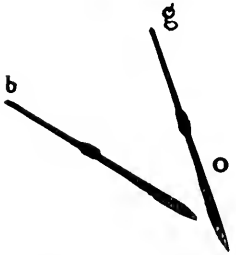
1.—You are coming obliquely from above, in the direction of the arrow "*d*." First give a vigorous stem with the lower ski "*b*." Then



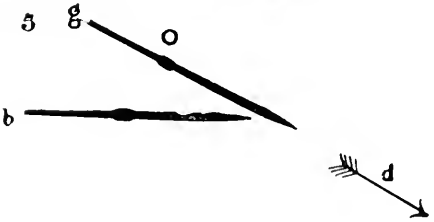
2.—Let your body sink forward to the left; pull heels more apart.



3.—Now you are looking straight down the slope. Just before this moment you had time to change your stick over. *Both ski flat. Weight on ski nearest this print.* Note the position for the pole.



4.—Coming into stemming "right."



5.—*Done.* Continuing your way stemming "right."

the runner cannot achieve it he is obliged at the end of his traverse to stop and turn as described on p. 55 before he can start off again on the other tack.

Here is the easiest way to learn.

First reduce the speed by a vigorous "stem," *taking care not to turn up-hill* in so doing. Then, keeping *both* ski rigidly *flat* and holding the heels far apart and the points of the ski close together, turn the body down-hill. LEAN FORWARD, AND THROW ALL THE WEIGHT ON TO THE OUTSIDE (LOWER) SKI.

You will then, if you have followed these directions *in every particular*, come round with a delightful swish and find yourself starting off comfortably in the other direction.

Change the stick to the other side of the body when about half round, because at that instant one is almost stationary for half a second or so.

The more one pulls the heels apart the shorter and neater the curve will be.

If success does not follow, it is due to some mistake, such as not leaning forward (one will then sit down), or edging the ski (they catch in the snow and overthrow the runner), or not tearing the heels sufficiently apart and throwing the weight on to the lower ski (which causes one to go off at a tangent instead of completing the arc).

The words of command for the curve are, then: Lean forward! Ski flat! Heels apart! Weight on the lower ski!

The diagrams pp. 73 and 75 should be of assistance in enabling the beginner to understand what is meant. On a really steep hill it requires a considerable amount of nerve to make up one's mind to plunge for an instant headlong downwards. One's natural inclination is to hang back and lean inwards, but this is precisely what one must not do.

The stick will be found to be of considerable assistance in making this curve, a little touch with it in the snow just as one is coming round being a great help to the balance. When shifting it across as above described, hold it rather short and place it in the snow well *in front of you*. This will assist you in leaning forward. Do not, however, attempt to spin round leaning on it; to do so throws the weight inside, which is quite fatal. It is, of

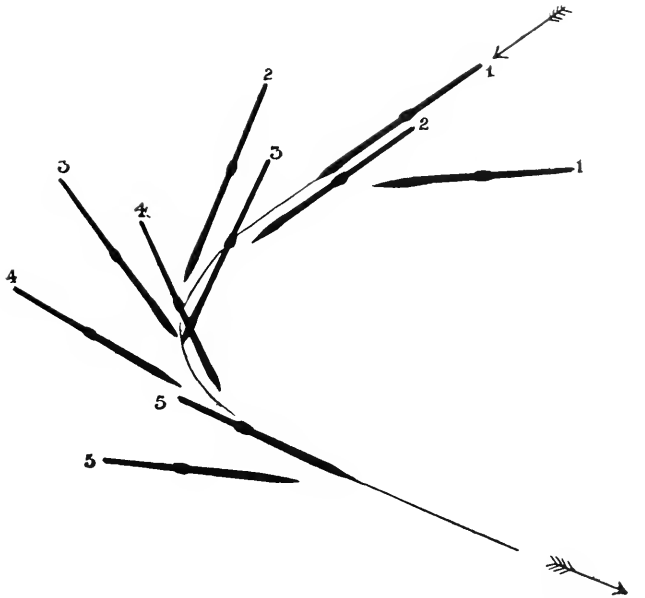


Fig. 25.—Positions 1—5 arranged on a curve. It must, however, be remembered that in nature the movements follow so closely that the ski on the drawing would have to overlap. The sweep of a well-made curve clears a semi-lunar space with a wall of snow at its lower rim.

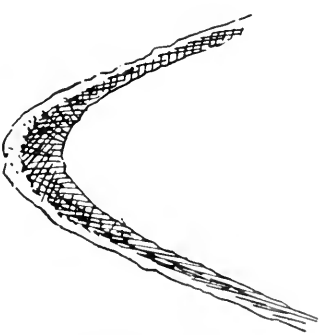


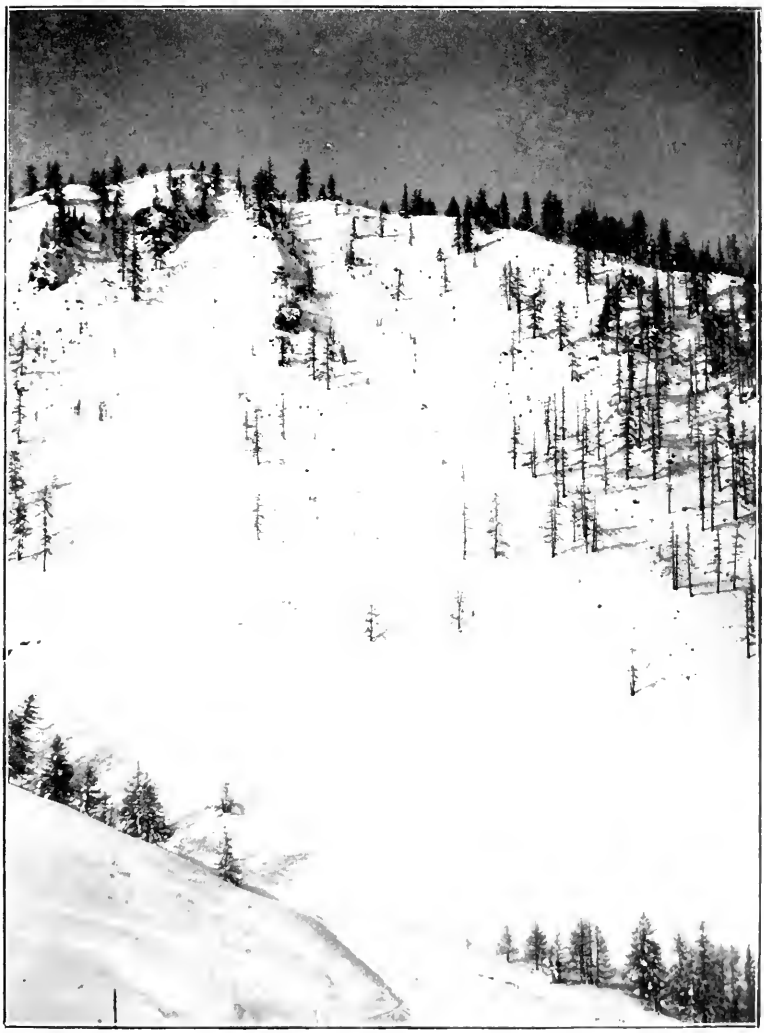
Fig. 26 Shows this.

course, perfectly possible to make the turn without a stick at all, but to do so is difficult on very steep ground. Practise on a moderate slope to begin with; when you become proficient move on to steeper and yet steeper places; but, of course, look out for avalanches!

Coming down a long and complicated slope one joins one curve to another without a break, thus dodging the trees and rocks. On a steep incline, if there are obstacles in the way of a straight descent, the S-track, as it is called, affords a safe reduction of speed and a prolongation of the pleasurable slide.

The ski-runner who has reached this stage enjoys himself wherever there is snow, even if there be little of it, for he can circumvent the patches where it has melted away. The photograph on the opposite page shows what can be done after a single winter's patient practice. It is a "snake-line" made in the winter of 1903 by one of the writers of this chapter, and by no means an accomplishment requiring more than ordinary skill or talent. The slope in question descends from Alp Laret, near St. Moritz, to the valley in which lies the world-famed Cresta toboggan run. The gradient is between 40 deg. and 50 deg. (55 deg. to 60 deg. near the top), and the vertical distance from top to bottom amounts to exactly 300 metres (1,000ft.). The small avalanche about the middle was started by the ski of the runner, and the marks and remains of older avalanches on the left give sufficient testimony as to the steepness of the spot. The length of the run must be at least half a mile, and the entire distance was covered without a single fall or stumble. May the beginner draw the proper conclusion: that where there's a will there's a way, and that both in this case are within the reach of the ordinary individual who can walk, row, shoot, ride, play tennis, cricket, or football.

What is it that makes the votary of the slender plank count the shortening days, and greet with boyish glee the slowly falling flakes? What makes him tremble with excitement at the sight of the whitening hills? It is the memory of past delights, the impatience to taste them again. He sees himself on the top of the mountain. From his feet a vista of stately firs on



THE SNAKE OF LARET.

Photo by W. R. Rickmers.

a slope of dazzling white stretches away into the valley a thousand feet below. Above, the clear blue sky. Off he goes! For ten minutes the swish of the spurting snow is sweet music to his ears; for ten minutes he scorns the soaring albatross, as he feels himself buoyed by the feathering ski, swaying from curve to curve. The excitement of the start has left him, and though ten minutes may seem a short time he enjoys them to the full, for he is calm, and glides easily, without a show of strength, without effort or strain. He feels the mighty power of the rush, the living force which is gathering as he flies, which drives him along, but which is nevertheless under his absolute control. He toys with the weight that impels him; by small movements of his ski he steers and directs the energy within. He can make the snow yield like water, or resist like steel. He is swung from turn to turn, irresistibly, but with safe and stately motion, by the force which he commands; he feels himself rocking softly, like the petrel on the waves.

Then comes the end; the stream at the bottom is near. A sudden twist; a swirling cloud of white, and, as the crystals settle glittering in the sun, there one sees him firm and erect, the ruler of the mountain, the master of the snow and ski!

THE "TELEMARK" SWING.

We now come to other more rapid, more brilliant, and more difficult methods of turning and coming to a sudden standstill. The stemming turn can hardly be performed quickly when running very fast without the aid of the stick, especially when long grooved ski are used. But with the "Telemark" and "Christiania" swings, about to be described, a good runner can stop suddenly almost anywhere when travelling much faster. It is indeed a worthy sight to see such a one come sailing past, his every sinew as pliable and strong as the good ash beneath his feet, yielding to each dip, as a smart racing vessel yields to the waves. Twenty-five miles an hour he is travelling, and not a furlong less. To stop suddenly at such a speed seems impossible. But, swish! and he is round as easily and as quickly as you can read these words. How was

it done? It was all so rapid you could not follow. You saw a little sinking on one knee—perhaps not even that. The snow hid nearly everything. You slide up to our friend and ask him to show you what he did. He will be most polite and most anxious for you to learn—especially if he be a Norwegian, as will almost certainly prove to be the fact. You will be shown just how to place your feet, and just how to bend the knees, and just how to lean the body. And you will start off and fail hopelessly again and again. By and by, however, especially if your teacher be an intelligent man who has had previous experience with beginners, you will begin to understand the knack of the movement, and by the end of the afternoon you should be rewarded by some measure of success.

But perhaps you may not be fortunate enough to meet with such a runner, or, what is by no means improbable, it may be that, though a clever performer on ski, he is not a good instructor. He makes the swing, but knows not himself how he does it. And small blame to him, for how many people trouble to analyse the things they have learnt as children?

We venture to offer our services. But is it possible to learn these subtle manœuvres from a book? Most certainly it is; but you must either take it with you into the field, or else (what is as good, or better) have some preliminary practice in your bedroom, where you will have only your looking-glass for an audience, and no small boy in the immediate neighbourhood to point the finger of scorn. If you do this, we are sure that you will learn very quickly, or if you fail, then our instructions must be wrong. If, however, you simply glance through what we have written without making practical experiments, book in hand, we can accept no responsibility. These turns are really not at all hard to make fairly well, which is all that we can pretend to teach; but to make them with certainty requires long practice. And that is, of course, entirely your own affair.

We propose to deal with the "Telemark" first—not because it is easier or more useful, for in this respect there is little to choose between them, but because it is customary to do so. Besides, the Telemark is a much prettier swing than the "Christiania," and it will make a greater impression on your

admiring friends should you be so lucky as to succeed in making one when showing off.

You will not find your stick (on which we trust you are not in the habit of riding) of the slightest assistance to you in *learning* either of these swings. It *may* help you a little to *make* the Christiania once you have acquired the knack of it, but we are very doubtful even about that, and we strongly advise that from now on you do not use it at all. Hold it in your hand.

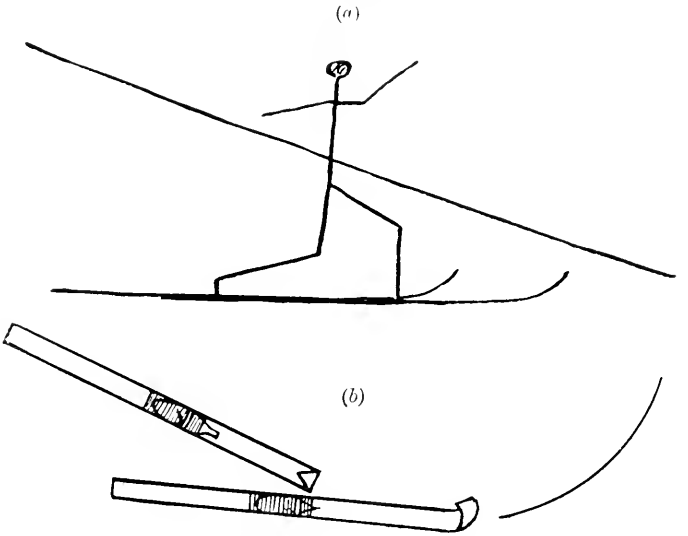


Fig. 27.—The Telemark swing.

except when jumping, as previously recommended (p. 45), but make no attempt to use it.

Each of these swings can be made in two directions—to right or to left; and each has its special use for special occasions. Apart, therefore, from being a graceful accomplishment and from the excellent practice it affords, it is of considerable practical value to be able to make all four of them. Nevertheless, most people are content with one of each kind—a Telemark to the left and a Christiania to the right—which enables them under ordinary conditions to turn in either direction without changing

the foot (see *infra*). But the best runners can make all four swings, and we recommend you to emulate their example.

The Telemark swing is easiest in loose snow, where there is little side slip. We find it rather easier on the level than the Christiania (*e.g.*, to stop after making a jump), but it is more difficult to make quickly on a hillside, and in general it is not quite so rapid as the Christiania.

Fig. 27 (*a*) shows the position in which the body and limbs are held throughout a Telemark swing to the left. It is convenient to call this position the Telemark position. Fig. 27 (*b*) shows the position which the ski assume after the swing is over.

The following directions are for making a Telemark swing to the left.

The directions for making a Telemark swing to the right are identically the same, substituting left for right and right for left throughout.

To Make a Telemark Swing to the Left.—(*a*) From the normal position for running down (see p. 63) advance the right ski till the right ankle is opposite the bend of the left ski. Raise the heel of the left foot off the left ski, bend the left knee, and throw all the weight forward on to the right foot. (This is what we mean by "the Telemark position.") (*b*) Place the right ski slightly on its left edge and turn and lean the whole body to the left.

If these directions are correctly carried out, the runner will come round with a sweep, the sharpness of which will depend upon the force with which he turns his body as advised in (*b*).

An excellent way of learning this turn is to practise running straight down hill in the Telemark position. Note especially to raise the heel of the left foot as shown. This is highly important, and is, in fact, the key to the whole affair, for if the runner raises his heel he is almost compelled to throw the weight forward on to the right foot, and if he can once succeed in doing this everything else is comparatively easy. So remember to *raise the heel of the left foot and to kneel well down on the left ski.* Cultivate as narrow a spoor as possible, and as soon as you can run straight like this at a moderate speed try turning the body ever such a little. *Look the way you wish to go.* You

will be delighted to discover what a small amount of turning will cause you to come round very quickly.

To compensate for the centrifugal force exercised by the turn on the upper part of the body, you will have to lean inwards; in fact, after you begin to get the knack of the thing, you are pretty certain to be thrown outwards once or twice. But do not trouble about that too much; *do not at first make any conscious effort to lean inwards*, or you will probably fall in that direction; you will very soon begin to compensate for the outward throw quite unconsciously.

Do not try to turn too quickly when learning, but rather take matters easily; *speed will come by and by*—in which connection note that both the "Telemark" and the "Christiania" are *swings* and *not jerks*, and that, however rapidly they be performed, the body should be turned *crescendo* and *not* (to continue the music metaphor) *sforzando*.

Another capital way of practising is to stand on some level space at the edge of a steep hill in the position shown in Fig. 27 (*a*) and then to slip over the edge and instantly to begin to swing. This method will allow you to practise a great number of swings in a short time without the trouble of walking a long way up-hill in order to gain speed. The following diagram shows graphically how to do so:—

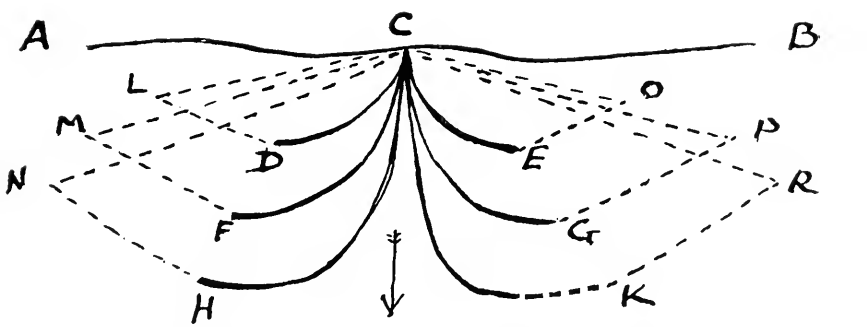


FIG. 28.—A C B is the edge of a steep slope falling in the direction of the arrow. Stand at the point C. Slip over the edge, and at once make a swing to the left, stoping at E. Walk up the dotted line to O, turn (*see* p. 55) and return to C. Then make a swing to the right, stopping at D, and returning to C *via* L. Next, run a little further down, and swing to G, &c., &c. In this manner the difficulty of the swing is gradually increased.

The "Telemark" swing can also be used to make down-hill turns in the manner described above, p. 72, and the principles there given hold good here, except that the "Telemark" position, instead of the stemming position, is held throughout.

A succession of S turns made in this way looks very pretty, but on a very steep hill their execution becomes rather uncertain, for the snow, unless perfect, is apt to slip irregularly, and with a true "Telemark" the stick is no use to help matters out. We have found, however, that a sort of half-stemming, half-"Telemark" position plus a little stick is useful in inducing long ski to come round.

THE "CHRISTIANIA" SWING.

The "Christiania" swing differs materially from the "Telemark" swing in this, that in making it the normal position of the ski is retained, and the turn is effected in the direction of the advanced foot—that is to say, to the right if the right foot is leading, and to the left with the left foot in front. It is easiest on hard snow and on steep hills, where the ski are liable to skid, on which ground the "Telemark" is especially difficult.

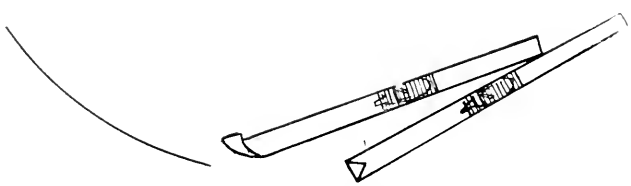


Fig. 29.—The Christiania swing.

The term "Christiania" swing for this movement appears to be a misnomer. For we are assured on very high authority that it was in common use in Telemarken long before the inhabitants of the capital acquired any skill in the art of ski-running. We are inclined to suspect that the name is of Continental origin, for, though we practised the "Christiania" years ago in Norway, we never there heard it called by any other name than "Telemarking." Be this, however, as it may, the turn in question is

a perfectly distinct one, and well deserves a name of its own, and, as it is known all over Switzerland, Germany, and Austria as the "Christiania," we have not dared to take upon us to alter the name.

Besides being easier in shallow snow and on hillsides than the Telemark, the Christiania is considerably the more rapid swing of the two, and a skilful runner can by means of it stop suddenly when travelling at almost any speed.

Fig. 29 shows the position which the ski usually assume *after a swing to the right is over*, but diagrams are, in describing this turn, of very little value, for the great secret of success is to endeavour to hold the ski in the normal position (see p. 63) throughout.

Here are formal directions for making the swing to the right. To make it to the left all that is necessary is to substitute left for right and right for left throughout.

To Make a "Christiania" Swing to the Right:—(*a*) hold the ski in the normal position (see p. 63), *press the feet close together* and distribute the weight evenly on both ski. Bend both knees a little. (*b*) Gently *swing* the whole body, but especially the region about the hips, round to the right, at the same time leaning in that direction, throwing the weight on to the *heels* and edging both ski.

You will, when you have mastered the knack of the movement, be astonished how quickly you will come round. The ski will assume the position above shown, and the weight will of itself fall almost entirely on to the right foot. This latter fact accounts, we believe, for the directions commonly given for making this turn—viz., to swing almost entirely on the inner (here the right) foot and to place the ski as shown. This was also the description given in the first edition of this book, but a closer analysis and more experience in teaching have induced us to alter it. We have found that any conscious effort to swing on the right foot and to place the ski in the position shown invariably results in the left ski rushing off at a tangent. To avoid this it is necessary to press the ski tightly together throughout and to *begin* the turn with the weight evenly distributed on both.

Beginners will find that the great difficulty in this swing is to get it started. It involves a peculiar kind of catch of the back part of the ski in the snow, which is very difficult to explain. Perhaps it will assist you to arrive at the sort of "feel" of the movement if you place a chair in front of you and then (standing before it in the normal position, and without moving the feet) endeavour to sit down on it.

In this turn also the precepts given above as to swinging easily and not jerking, and leaving the lean inwards to take care of itself, apply.

It may also be practised after the manner shown in Fig. 28.

As a substitute for stemming a little of the swing is very useful for braking when traversing a steep slope. To practise this select a steep hill and run straight for a short distance obliquely down and across it; then make a little of the swing, reducing the pace; then run straight again; and so on. This is also a very good way of learning the turn itself.

There seems to be no reason why one should not make S turns by means of the "Christiania" swing, though to do so must be rather difficult.

In order to save time in changing the foot, skilful runners when threading their way through a wood (for example) usually make their turns by the "Telemark" for one direction and the "Christiania" for the other.

In the above description we have advised the beginner to learn the "Christiania" swing in the normal position with one foot leading, but it can also be made with the feet perfectly level. We well remember our delight and astonishment on one occasion when we saw a first-class Norwegian runner, after making a 70ft. jump, and when travelling at a great speed, avoid colliding with a friend and two trees by making with wonderful rapidity three "Christiania" swings—left, right, and left.

There are, of course, other ways of combining these various methods of turning which an expert employs quite unconsciously. Indeed, it is highly probable that your Norwegian friends will never even have heard of a "Stemming turn" or a "Christiania swing," any more than a South Sea islander has heard of a verb or an adjective. This does not, however, prevent the Norwegian

from being an expert on ski or the coloured gentleman from being a fluent speaker. Nor has it any bearing on the fact that you as a foreigner will find a grammar of assistance in learning Kanaka. It is our hope that the classification we have adopted may similarly prove of assistance to you in becoming a proficient ski-runner.

JUMPING.

By E. C. Richardson.

So many strange and perverted ideas prevail in England and on the Continent as to what ski-jumping is, that it is, perhaps, excusable to begin by mentioning a few of the things which it is not. To begin with, there are people who think that ski are a sort of seven-league boots on which one may fly across the snow planes as fast as an express train, jumping any minor obstacles, such as houses or trees, which happen to be in the way. This is not so. Four or five miles per hour is very good going on the level, and it is impossible to jump upwards from the level over anything higher than a small gooseberry bush. Again, one frequently hears that Norwegians are born on ski, and jump before they can walk; but, though the writer of this article has made every inquiry, he has, so far, failed to authenticate a single case in point. The truth is that Norwegians of all ages are fond of ski-running and jumping, but, owing to such things as the melting of the snow in summer, extreme youth and old age, business and the like, only a comparatively small number are worthy to be called real experts. Further, it is not the fact that a special exercise place, with an elaborately built take-off, is essential. On most hills it is possible to build, in a few minutes, a jump which will give entertainment both to the skilful and unskilful; and it frequently happens in the course of a tour that a little natural drop presents itself, from which one may skim through the air for several yards before again touching the snow. True that in Norway hills are specially prepared and elaborate take-offs built, but these are chiefly used for

SOLBERG HILL.

A successful leap. The jumper's cap thrown off in flight may be seen behind him.

Photo by D. M. M. Crichton Somerville.

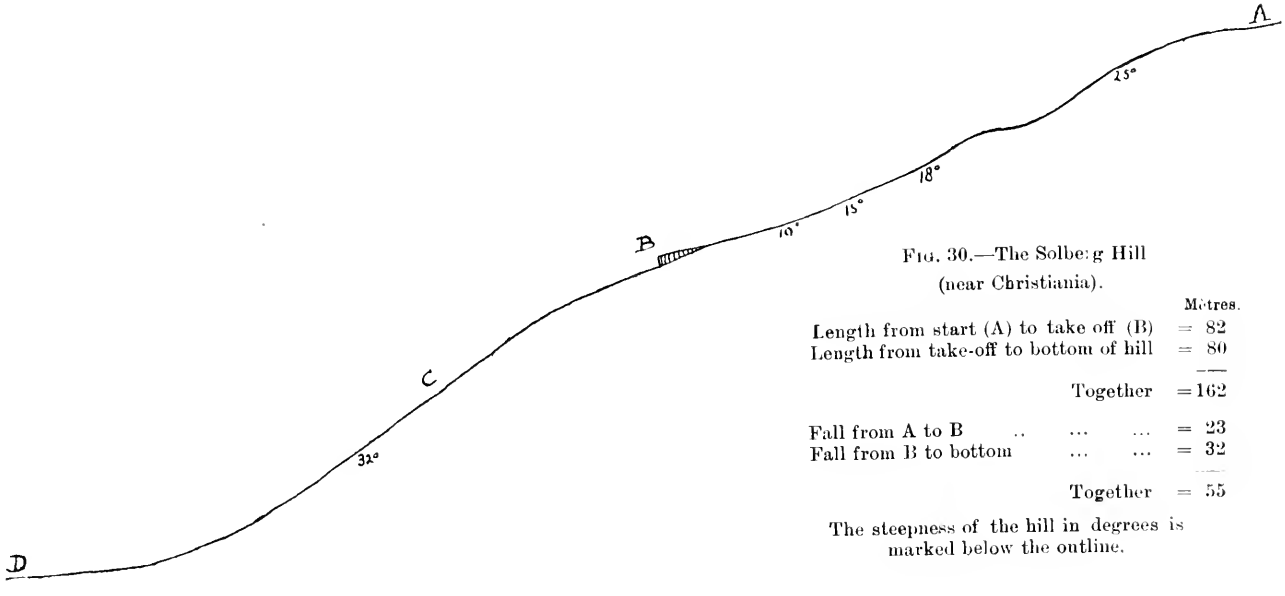


FIG. 30.—The Solberg Hill (near Christiania).

	Metres.
Length from start (A) to take off (B)	= 82
Length from take-off to bottom of hill	= 80
Together	= 162
Fall from A to B	= 23
Fall from B to bottom	= 32
Together	= 55

The steepness of the hill in degrees is marked below the outline.

competitions, where long and difficult leaps and spectacular effect are required. It cannot be too strongly insisted that the sport is wholly independent of such things, and that, whilst the jump affords by far the best means of judging the skill of a ski-runner, its enjoyment is by no means dependent on elaborate construction or mere competition.

Like other great sports, ski-jumping calls forth the qualities of courage, skill, and endurance; a good jumper must have a cool head, a quick eye, and, above all, a nice sense of balance; but, given these things, it is open to all to succeed in some measure, be they old or young, born near the north pole or the equator.

These misapprehensions having been removed, it is expedient to give a detailed description of what ski-jumping really is, detailed instructions following later. Your attention is directed to Fig. 30, p. 87.

This represents the section of an exceptionally suitable hill. The jumper starts from the point A, and slides down to B, where he leaps. The impetus gained from his journey from A to B, coupled with the leap, sends him like a cannon ball through the air to C, where he alights, and continues his course to D. Here he usually stops himself by a Telemark or Christiania swing. The distance from B to C is the measure of the length of the jump, which may be anything up to 134ft. (the record to 1903), according to the condition of the snow; shape, length, and steepness of the hill; and the skill of the performer.*

It will be seen from this that the jump is not a jump *up*, but a jump *down*; and it can readily be guessed that the difficulty lies not so much in attaining great length as in retaining an upright position on alighting. It takes considerable practice to make a jump of 10ft. and stand, whilst anybody, provided the hill be sufficiently steep, can jump 100ft. and fall.

Formerly, in Norway, the take-off used to be so placed that the jumper alighted on the level, instead of on the hill side, and, at first sight, such an arrangement might be thought to make

* In competitions the jump is measured from the point where the runner leaves the ground to the middle of the deepest part of the impression which his ski make on alighting.

matters easier. This is, however, very far from being the case. A jump of anything over a few yards on the level involves a considerable shock on alighting, which is not only unpleasant, but renders "standing" a much more difficult matter, whilst, in the event of a fall, serious injuries may result. On the other hand, a jump downhill is attended by little or no shock on alighting, which makes "standing" much easier, and falling nothing more serious, in the vast majority of cases, than a long roly-poly, broken by the snow.

Assuming, then, that the slope and snow are suitable, the chief requisites to success are a sense of balance and great daring. The bolder, almost rasher, one is, the better. The outlook from the top of a ski-jump of any magnitude is indeed alarming; for note that the slope above the take-off is usually, and properly, less steep than that below; and this means that a man of ordinary stature standing at the point A (see diagram) sees nothing of the slope B C, and his sensations, at least at first, are as of one about to launch himself into a vast abyss. The danger is, however, very largely imaginary, and a bold, coolly-calculated spring vastly increases the chances of standing.

But to proceed from these general remarks to details. The ski used for jumping should be suited to the runner in accordance with the table given (p. 34). It is not easy to jump on ski shorter than this, but they may very well be a trifle longer. They should be rather on the heavy side, so as not to flutter about in the air, and in order to withstand the strain to which they are put on landing.

Any good firm binding may be used which permits of vertical control over the ski.

No other special equipment is necessary.

The best snow for jumping is that which has been down for some days, and which has been trodden by ski into a fairly firm mass. The temperature of the air should be below freezing point. On such a surface the ski will glide swiftly and at an even rate of speed, sinking in about an inch or so—*i.e.*, sufficiently to avoid side-slip. Sticky snow is dangerous, for the reason that it is apt to occasion a nasty fall forwards, due to the checking of the ski on alighting. For a similar reason, very

deep soft snow is to be avoided, but it should be noted that freshly fallen snow will often cease to stick after it has been trodden down, especially should the temperature of the air be low.

HOW TO SELECT AND PREPARE THE HILL.

As above mentioned, we frequently come across natural jumps when on tour which require little or no preparation. On most hill-sides there are places where sudden little dips occur. Give a kick or two with the ski just below such a dip, so as to make the step (see B, Fig. 30) more pronounced, and scrape together a little snow on the top of it to raise it somewhat. Then with half a minute's stamping about the spot where you intend to alight your preparations will be complete. Or, again, a stone lying on a steep hill-side may be pressed into service after the manner shown below.

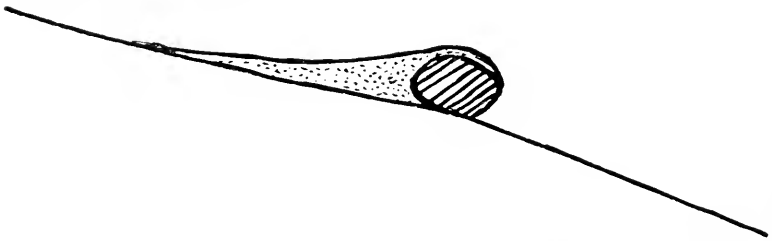


FIG. 31.—*Spraet hop*, made by piling snow above a stone lying on the hill-side.

Care must, of course, be taken that the top of the stone be covered with snow. This sort of jump, the point of which turns upwards, is called a *spraet hop* in Norwegian. It has the effect of throwing the runner high into the air and is excellent practice.

Edges of cornices (not, of course, large, dangerous ones), stumps of trees, buried fences, &c., &c., can often be used for take-offs, and the runner when on tour should keep his eyes open for such, as they cause very amusing variations to ordinary going.

But, though when a little skill has been acquired one should practice on all sorts and kinds of places, it is probably best to begin on something very easy, in order to gain confidence.

Choose, then, a good steep hill with a fair out-run at the

bottom. The gradient should be not less than 20 degrees, but if it be steeper, all the better. It is a great mistake to begin on too gentle a slope; a steep hill is far easier and far safer.

If you can find a hill with a little dip in it, well; but, if not, never mind.

First select the place for building your take-off. This will usually be at the edge of the dip, supposing you have found one. If, however, the slope below this point is less than about double the length of jump you contemplate, or, say, 20 yards in all, you must place the take-off somewhat back from the extreme edge, as shown in Fig. 30. But very likely you may not be able to find any suitable hill with a dip in it. Never mind; a smooth hill will do quite as well, or perhaps at first even better. Choose a point on it 20 yards or so above the bottom, and build a long take-off there in the shape shown below.

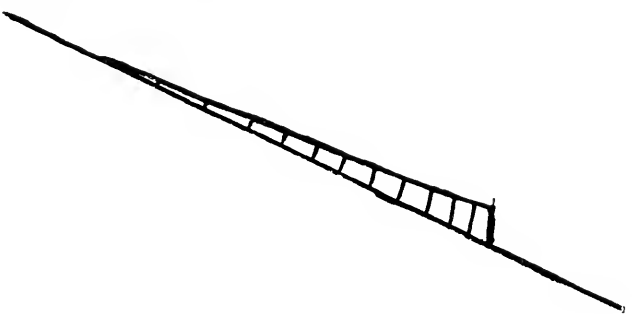


Fig. 32.—A long take-off built on a smooth hill.

This is the form of hill on which you should practise for some time. Do not at first let there be too much change between the slope of the take-off and of the hill below, for the greater this difference the more difficult will be the jump.

In choosing a hill it is, of course, desirable to select one as smooth and free from difficulties as possible. In Nature, however, such are seldom to be found, and one generally has to be content with something less perfect. *It is, however, to be noted that smoothness of surface and regularity of snow, whilst everywhere desirable, are of special importance for a distance of ten*

yards above the spot selected for the take-off, and for about a similar length below the point of alighting.

So, having chosen your hill, stand down it once or twice to ascertain the best lie for the track. Then stamp the snow well down with your ski at the two important places above mentioned, making lanes down them about nine feet broad, and filling up any hollows with good firm snow.

Then construct the take-off.

This may conveniently be done by making a little fence of tree branches to the height of a foot or so, at right angles to the track, and then filling up the space above them with layers of snow and more tree branches placed flat. The structure should be made as firm as possible, especially at the edge, and it should combine with the hill above it, so as not to leave any sudden angle at the join.

Begin with quite a little drop—about 1½ft. should be sufficient—and as soon as you can "stand" over that build higher and higher.

It is not *necessary* for practice to make a very wide take-off—2ft. or 3ft. should be amply sufficient. And in general do not waste valuable time which might be spent in jumping in building a very elaborate affair.

The case is, of course, quite different if the hill is intended for a competition. In this event too much care cannot be taken to give every competitor an equal chance. Fig. 30 shows an outline of the Solberg jumping hill, near Christiania, which may be taken as an example of what a hill ought to be. The snow on a competition hill should be thoroughly stamped down with ski *some hours before* the intended jumping. The take-off should be 3 or 4 yards wide, and there should be plenty of men both above and below the take-off armed with rakes to keep the snow in order. The spectators should not be allowed to approach too closely to the track. The illustrations opposite pp. 9 and 87 show how this is arranged in Norway.

HOW TO JUMP.

First study closely the figures in the diagram (Fig. 33), then read the following instructions, referring back from time to time.

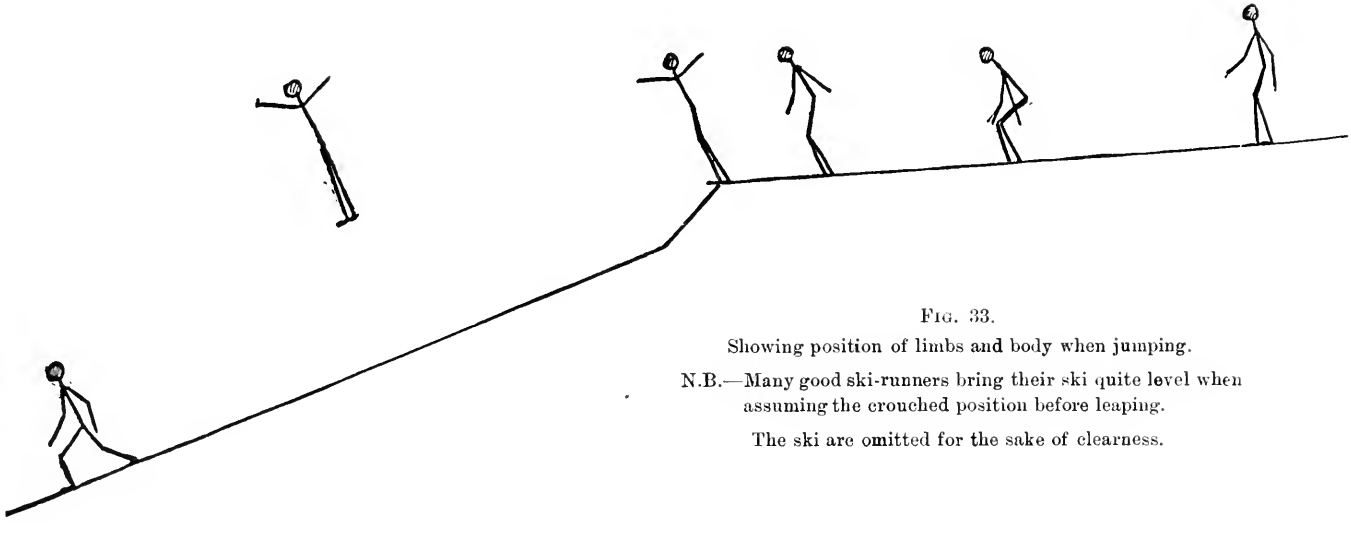


FIG. 33.

Showing position of limbs and body when jumping.

N.B.—Many good ski-runners bring their ski quite level when assuming the crouched position before leaping.

The ski are omitted for the sake of clearness.

The Approach.

Imagine yourself, then, standing some 20 or 30 yards above the take-off. (The precise distance will, of course, depend on the steepness of the hill and the speed which you wish to attain; but as regards speed do not attempt too much at first; it is difficult, of course, to give an exact measure, but a rate of about 5 yards per second when approaching the edge of the jump should be sufficient to begin with.) See that your ski-fastenings are in order, and polish your ski a little on the snow, or on some fir branches or other twigs, to remove any lumps adhering to the bottom of them. *Be altogether without fear*, and start.

Hold the ski close together, with one of them somewhat in advance—say, with the heel of the one foot about in line with the toe of the other.

About 15 yards or so before reaching the edge of the take-off bend down, leaning a little forward (see Fig. 33). N.B.—About this point many good jumpers bring their feet quite level.

The Sats.

Some few yards before reaching the edge swing the body evenly forwards, at the same time straightening up.

This movement is termed the "sats."

Note particularly that no attempt must be made to *lift* the feet as in ordinary jumping. The body should be swung evenly forwards, and at the same time straighten up from the crouched to the erect position. The movement, if made vigorously, does, in fact, cause a slight rising from the ground, but it is best not to be too vigorous at first. *Unroll* yourself, so to speak, with an easy sweep, avoiding all stiffness and jerking.

It may perhaps help you to understand what is meant if you make an *attempt* to rise on the toes. You should not, indeed, actually rise, but just at first, if you make an effort in that direction, it will probably assist you to arrive at the knack of the thing.

Another very important point is the timing of the movement. The body should be nearly straight just as the take-off is left. Therefore, as the movement itself takes time, the greater the

speed at which you are travelling the earlier you must begin. Whilst, on the other hand, the more vigorous the straightening you intend to make the later you can defer it. You are, however, advised to take things easily, especially at first, and to aim rather at accuracy and elegance of style than at mere length. Accordingly it will be necessary for you to begin the straightening movement rather early. Remember when you first learnt to shoot how often the tails of the rabbits and pheasants suffered. For very similar reasons most beginners make the *sats* too late.

It follows from the above that the object of the *sats* is twofold—firstly, to increase the length of the jump, and, secondly, to bring the body into the proper position for alighting. The former is achieved by the straightening movement, and the latter by the swing forward.

"But," you ask, "why swing forward at all, why not keep quite still?" The reason is that in descending all hills on slippery things like ski the body must be kept quite straight over them—or, in other words, at about right angles to the slope on which they are travelling. This is sufficiently obvious. But observe that in jumping the slope below the take-off is considerably steeper than that above (see p. 93). The body must accordingly be brought forward when passing from one to the other, or a fall backwards will result. And such is, indeed, the common fate of the beginner, whose tendency is invariably to hang back!

Now look at the *sprat hop*, shown in Fig. 31. Here the take-off itself is turned upwards, and the difference between its direction and that of the slope below becomes greater than ever. On such a jump it is especially necessary to swing well forwards, for which reason it is the very best practice, for once one has learnt to do that everything else is easy.

Position in the Air.

The whole body should be straight and erect. So do not check the straightening of the knees and thighs if you have not quite finished your spring when you leave the take-off.

You will feel a compelling necessity to wave your arms round and round when in the air. Everybody does so more or less,

but, of course, your object should be to be reasonable in this. Frantic waving looks very ugly. Endeavour to keep your ski parallel to the slope below. There is always a tendency for the toes to fly up and the heels to drag, which should be checked as far as possible by pressing down the toes.

On Alighting.

Slide one foot forwards and the other backwards, relieving any shock by a slight bending of the knees. This extending of the feet is of great assistance in preserving the balance, and with a little practice becomes almost instinctive.

Resume as soon as possible the normal position—*i.e.*, ski close together, one foot slightly in advance, body slightly crouched. As soon as possible after reaching the level stop yourself by making a Telemark or Christiania swing.

Points to be remembered:—

1. *Don't be frightened.*
2. *Ski close together.*
3. *Swing forward, "unroll."*
4. *Extend ski on alighting.*

Pay great attention to your "form," which is all important, as in rowing. Think of nothing else, and you will soon succeed. At competitions the prize is not necessarily awarded to the competitor who jumps furthest, even if he "stood" after alighting. For if the jump was made in bad style assuredly it was a fluke, and will seldom be repeated. All ski-jumpers fall more or less, but it is equally a matter of surprise if the awkward should "stand," or the elegant and correct should fail.

The style of jumping above recommended is that known in Norway as the *Svæve*—one swoops motionless through the air. It is certainly the prettiest, as well as the easiest to learn. Another method, however, exists, known as the *Trekke op*, in which the leaper draws up his legs during his flight, the object being to cover a longer distance. This, however,

Leif Berg Jumping 90 Feet, at Glarus, '05.

Photo by E. Jeanrenaud.

however, looks rather ugly (according, at least, to most people's ideas), and it is questionable whether one comes so much further with it, after all.

But there is yet another point which it is far more difficult to decide. Shall the runner jump with feet perfectly level or shall he advance one of them as shown in Fig. 33? As will be seen from the above description, the writer has not ventured to speak positively as to this. On the one hand he has the authority of one of the Holmenkollen judges for asserting that it is best for the beginner to keep one foot in advance, whilst on the other the general practice of many (if not, indeed, most) first-class performers undoubtedly is to keep the feet quite level. The advocates of the advanced foot contend that extreme steadiness is of vital importance in taking the *sats*, and that, inasmuch as the advanced foot position is admittedly steadier than the other for glissading, it should also be adopted at this stage. In addition to which they argue that, after the flight through the air, when the runner first touches ground the advanced foot is the more stable position of the two. On the other side, those in favour of the "level-footed" style contend:—Firstly, that to jump with one foot forward looks ugly (and the writer is inclined to agree with them in this), and, secondly, that it defeats its own ends, for it involves leaning forward on to one foot, and accordingly jumping chiefly with it. And this (they say) is conducive to a crooked flight through the air. It is not, however, apparent how this is a necessary consequence, for in ordinary long-jumping the spring is taken almost entirely with one leg without the balance being in any way upset.

These are, however, theoretical matters, as to which the reader interested may well be left to work out conclusions for himself, whilst those who do not care for argument can console themselves with the reflection that whichever style they like to adopt they have excellent authority for their choice.

Is it possible that this is another question like that of the bindings and that perhaps it does not matter so very much, after all? Or may not both sides be right? May it not, for example, be best to jump with level feet when the track is smooth and easy, but with one foot forward when it is irregular

and difficult? On the Continent rough jumping on tour has hardly yet "caught on," everything being regarded, so to speak, through competition spectacles. And perhaps this is why the level-footed style is there so much insisted on. He, however, who limits himself to jumping at competitions and on elaborately prepared tracks will never be a really clever ski-runner, and will miss a vast deal of the possibilities and pleasures of this branch of the sport.

SKI MOUNTAINEERING.

By W. R. Rickmers.

It is quite impossible to define exactly what constitutes mountaineering as apart from strolling and short excursions, but its chief characteristics are distance from human dwellings and human help, and the presence of special dangers. The term "mountaineering" comprises a multitude of rules which teach how to overcome the difficulties and how to avoid the dangers of rising ground. Mountaineering is a science admirably expounded in a series of classical text-books, the result of the experience of thousands of climbers, and the essence of a literature of over 10,000 volumes. From a subjective point of view mountaineering begins when a wanderer, approaching a hill or mountain, is conscious of the fact that he will meet with special conditions which demand a special knowledge. And the minimum required of a man who wishes to be called a "mountaineer," a good mountain climber, an expert, is that as to the theory he should have "Dent" at his finger-ends (C. T. Dent, Mountaineering, Badminton Library); and as to the practice, he must be a man who can be trusted to attempt any peak in the world without endangering the lives of his companions.

Now, it would be absurd to try to teach mountaineering in a chapter of this book, for it takes ten years at least to make a mountaineer. Still less dare I insult the mountaineer by advising him how to behave in his element, for he will not go high and far until he feels at home on the planks. By the time he has mastered the technicalities of ski-ing, he knows everything about the outfit which suits him best, and about his line of

conduct on any expedition he may plan. My remarks on the subject in hand cannot, therefore, be anything but a series of very general reflections and impressions, simply intended as a loud warning to ski runners that they should study "Alpinism," and as a gentle reminder to mountaineers, that ski-running is a somewhat tricky complication of their art. Why should I tell the latter what type of ski to take on long tours, seeing that he knows on which kind he travels best; why should he ask me about his ice-axe when he is sure to take one or not according to the object in view?*

Ski-runners, unless they are climbing experts, or accompanied by such, must confine themselves to the usual practice-grounds and safe excursions, for only a mountaineer can decide on the spot whether hill craft is necessary or not. To explain how he arrives at this decision would mean a very thick volume. The ski-runner, therefore, who wishes to form a correct opinion of his own should make up his mind to learn from amateurs, guides, and books how to look about, think, and behave when he leaves the beaten track where multitudes are accustomed to go unthinking and unadvised. My random observations are to impress him with that necessity, and for the mountaineer they shall be an epitome of familiar principles.

In the winter the problem of the avalanche eclipses all others. The rule to go only with guides or experienced friends disposes of the general advice respecting glaciers, crevasses, slips, strategy, and discipline, for in these things a man must train himself during many seasons. The rule that only good ski-runners dare aspire towards high peaks saves a long repetition of detail as to outfit.† The ski-runner-mountaineer ought always to be a man

* The ski which are suitable for ordinary excursions on undulating ground are not necessarily equally useful for long mountain climbs. In the one case ski-running pure and simple is the object in view, in the other the ski are merely a means to an end—the ascent of some difficult summit or pass. Some remarks as to the kind of instrument which may be found serviceable for the latter purpose are to be found at p. 34, and in the chapter on "Aids to Climbing."—Ed.

† This, perhaps, scarcely goes far enough. The outfit suitable for undulating wooded ground on which a runner may attain to great skill is not equally serviceable high up. In particular, a cap covering most of the

who, during his apprenticeship, knew something of cold, hunger, slow companions, and broken ski. To have no spare gloves and no provisions, to fall where one ought to stand, to step on a hollow, or to risk a dashing slide, may have merely disagreeable results two miles from home; but the same omissions and commissions can be suicidal, nay, even criminal, when ten miles from the nearest human habitation. If you wish to kill, go alone, and kill yourself, for every party of mountaineers suffers for the thoughtlessness of each of its members, while the greatest skill or ability of one of them is as nothing in the balance of fate when the whole has to bear the inadequacy of the lowest unit.

Extreme suspicion and wariness are the only correct attitude towards the mountains in their winter garb. The number of factors which combine to prepare or prevent an avalanche is truly bewildering, and any single one of them may be the prime mover or the reliable safeguard in a given instance. And this one was perhaps overlooked in weighing the evidence. *The secret of the avalanche is the breaking strain and snapping point of an unseen tension.* Avalanches owe their growth and collapse to some or all of the following indications: The angle of the slope; the surface of the ground; the quantity of the snow; the snow of a month ago, of yesterday, and to-day; the temperature and the wind of a month ago, yesterday, and to-day, while the snow fell, or before it fell, or after it had fallen. And to consummate or prevent the catastrophy there are, in conjunction with the above, the temperature at the time of our arrival on the spot, the weight of the party, its methods of walking or ski-ing, and sundry other accidents. So many possibilities produce tantalising doubt rather than definite conviction, and more often than not a slope, which presents all the visible elements of danger, may be perfectly

face and neck, smoked glasses or the simple arrangement described on p. 50, a light wind jacket of some sort, extra-thick gloves, extra-thick socks, and extra-stout nailed boots are essential. The runner should accustom himself to carrying a large heavy rucksack, which is a disagreeable, but, alas! an indispensable, companion on a long mountain tour.—Ed.

harmless. On the other hand, well-known guides have walked into mouse-traps because one exceptional condition had altered the internal character of a particular slope which, throughout their lives, they had known as perfectly safe. A strong sense of human weakness is therefore the proper frame of mind towards the mysterious and overwhelming power of the snow.

The mountaineer must condense the theory of avalanches into a few comprehensive rules of thumb, and when in doubt he must give the benefit to himself and not to the avalanche.

Suspicious.—Every open slope of about 25 deg. or steeper, and *all new snow in warm weather*. A thaw after a heavy fall of snow is the most common cause of the thick and heavy slides known as ground avalanches.

Dangerous.—Every heavy accumulation of snow at an angle of 40 deg. or more, on long open slopes, and in gullies. At lesser angles all snow which lies on a hard and smooth surface (grass, earth, old snow, crust, ice, &c.). Hard snow under the lee of ridges. This is liable to crack and to become suddenly transformed into what looks like a huge waterfall of lumps of sugar. Therefore, one ought to cross such slopes as high up as possible. The cornice which overhangs the ridge is more dangerous to those who walk *on* it than to those *under* it.

Safe.—All slopes under 25 deg.; all slopes evenly dotted with trees or rocks; almost every perfectly homogeneous snow not deeper than 2ft. which lies on a rough surface (screes, &c.).

More cannot be said without conjuring up a flood of detail. This experience and acquired instinct must fill in. The tourist can find almost daily an opportunity of making experiments on a small scale, though he should not forget that a cubic yard of snow can dislocate his arm or break his leg.

As an instance, showing the effect of surface, I may mention that, in the Alpine spring, the grass slopes send down in huge avalanches the solid layer accumulated and consolidated during the winter. At the same time the firm, wet snow of exactly the same texture which lies on screes remains perfectly safe, and affords splendid ski-ing. It never slips off, but gradually melts, evaporates, and vanishes as the summer draws near.

The only exact method of dealing with avalanches would be to

make "avalanche maps" of popular centres. In these maps the slopes and gullies which are always bad are coloured, let us say, red. A blue slope would be dangerous under such and such conditions; a green slope becomes threatening in the spring, &c. On these maps all those expeditions should be marked which can be guaranteed as safe.

The fear of the avalanche must always be before the ski-runner's conscience. All the rest is a matter of well-defined dogma, of strict attention to well-known precautions, which belong to the routine of every mountaineer deserving of the name.

(1) Never go alone; three is the minimum.

(2) One man at least must be an Alpine climber of experience.

(3) All members of the party must be equal in skill.

These three commandments are the essence. Let a few comments suffice.

(1) The solitary mountaineer is a fool. This is an article of faith. Permissible exceptions are rare.

(2) The experienced leader will tell his friends all about the crevasses, outfit, provisions, the importance of an early start, the duty of keeping together, and the courage to turn back before the approach of the night or bad weather. He will ask if everyone has his goggles, spare gloves, provisions, snow-helmets, repairing tools. He will take from everyone the promise to be strictly obeyed.

(3) This is a necessary complement to 1 and 2. Ten stumblers of equal proficiency are a good party, for they will generally get as far as they deserve. Nine good men and one stumbler are bad, for they will probably make that one poor man feel worse than he is.

On long tours only persons can go who do not fall when they have the will not to fall. He is not a fit companion for difficult expeditions who is not sure that he can keep on his feet throughout the day. A mountaineer never has a spill unless he forgets himself, his companions, or his surroundings.

Note.—In our experience by far the commonest form of winter avalanche occurs when a ski-runner crosses (or some other influence disturbs) a long steep slope of *freshly-fallen* snow. The weight of the runner is the last

straw which causes the slenderly coherent mass to snap. It does so with a curious report, something like the cracking of thick ice on a frozen lake. Below the dividing line, which may be half a mile long, the snow slides off the hill side much as it slides off the roof of a house, forming itself into thick slabs like paving stones which accumulate one on top of the other, and which ultimately overwhelm the runner. The snow usually breaks only a short distance above the runner, and consequently, in the event of an accident, search should first be made in that part of the mass which is highest up the hill.

Freshly-fallen snow is accordingly quite the most serious danger of ski-running, and, inasmuch as it usually affords but poor going, it is seldom worth while venturing far on very steep ground after a recent fall. After a few days of fine weather, however, the snow settles down, the avalanches run off, and what remains becomes firmer and more crystaline in structure. Under the pressure of its own weight, and owing to the peculiar property of *regelation* which solid water possesses, the new fall attaches itself to the old crusts, and the conditions become, comparatively speaking, safe.

It is a common saying amongst the Swiss that it is unsafe to venture above the tree-line, as long as any snow is left clinging to the trees on the sunny side of the valleys. This rough test we have found to be a very useful one.—Ed.

Broad Peak, Kashmir.

Ski in foreground at a height of 20,000 feet.

Photo by Dr. Guillarmod.

ODDS AND ENDS.

By E. C. Richardson.

ANTIDOTES TO "STICKING" AND AIDS TO CLIMBING.

In warm weather snow is apt to stick to the bottom of the ski (see page 22). It accumulates there in large watery clods, and renders progress very slow and laborious. Under such circumstances the advice commonly given is not to go out at all, and unless there is a prospect of better things, either in the shade or higher up, it is certainly best to stop at home. Nevertheless, the boundary line between sticking and not sticking is an extremely narrow one, and, moreover, one is not always sitting comfortably indoors when the trouble begins. It is therefore important to consider what is to be done to avoid or cure it.

Waxing the ski is the simplest plan, and proves effective in the great majority of cases. It is true that with waxed ski hill-climbing may become a matter of considerable difficulty, for the wax is apt to carry matters too far, and to make the surface unduly slippery. But anything is better than carrying all that dead weight of snow, and by using only a little wax under the foot (where the sticking chiefly occurs), by choosing an easy gradient, and by side stepping, &c., one can generally manage to get along somehow.

Various kinds of wax are sold for this purpose, and all are more or less efficacious. There is, however, a difficulty with the solid kinds in inducing them to "bite" when the ski are cold and wet, and the writer prefers the semi-liquid variety sold in tubes. A tube of wax, plus its attendant piece of rag, takes up very little

room in the pocket or rucksack, and its weight is in no way commensurate with that of the lumps of snow which it is not infrequently its office to prevent.

Sealskin.—From time immemorial seal's (or elk's) skin has been attached to the bottom of the ski. The hairs, set towards the heel, serve the double purpose of preventing the ski slipping backwards, and of keeping the surface free from sticky snow. Until quite recently it has been usual to fix the skin permanently; but whilst this works fairly well for certain purposes, it is open to many objections. The hair is a very serious impediment, both down-hill and on the level, for it not only reduces the speed, but, owing to its inherent "wobbliness," it renders steering and balancing much more difficult. Then, again, the hair soon wears out, a day of hard snow being sufficient to quite spoil it; or it tears, or, being wet, the weather turns colder and it freezes solid. But perhaps the most serious objection of all is the nasty *feeling* of a skin-clad ski. There is a certain cleanness and crispness about the movement of the plain wood through the snow which one learns to love, and which one sorely misses. Besides which there is much art in getting up-hill to the best advantage on uncovered ski, and this keeps one's mind busy, and greatly alleviates the labours of the climb; whereas with the skin any duffer can get along, and climbing becomes pure drudgery. It is, however, certain that, given a long and steep ascent where much zig-zaging is necessary, or even an only moderately steep slope and hard snow, one can with the skin arrive far more quickly and easily at the top than without it. It will, therefore, either when attached permanently or when detachable as about to be described, be found to be of great value for long and arduous mountain tours on steep Alpine ground. But even in the Alps, under all ordinary circumstances, where ski-running, and not the ascent of any particularly difficult summit, is the object in view, and where it is of no consequence whether one arrives an hour sooner or later, there is no sense in encumbering oneself with unnecessary gear and spoiling the pleasant "feel" of the bare ash.

On undulating ground, where one can usually go straight up and down hill (as in most parts of Norway), nobody nowadays dreams of using skin in any shape or form.

Detachable Sealskin is quite a recent invention, and is vastly preferable to the fixed article. For it can be used for a long climb, and removed when the summit is reached.

Thus a strip of the material mounted on webbing can be attached to the bottom of the ski by means of a loop over the point, a strap at the heel end, and a few transverse straps. But the plan is open to the objection that the skin is apt to slip about sideways, and that the fixing of it is troublesome, and takes time.

The latest method of fixing is that invented by Messrs. Sohm and Madlener, and is highly recommended by those who have tried it. But it involves boring two holes through each ski—an unpardonable sacrilege in the eyes of some people. Surely, however, if we are going to commit the outrage of using sealskin at all we may just as well be hanged for a sheep as for a lamb, and bore holes or do anything else which may assist us in our fell (joke!) design.

The detachable skin of Herren Sohm and Mad lner is sewn on to stout webbing, and is only about half as long as the ski themselves. It is attached to the ski immediately in front of the foot, and reaches from there to the back end. The arrangements for fixing it are extremely ingenious, and permit of its being attached or removed with great rapidity. The photographs and drawings (p. 108) show exactly what they are.

A hole is bored in the ski just in front of the binding; and another about halfway between it and the heel end of the ski. Through each of these holes a bolt passes, the bottom of which is shaped like a flat sort of button. The bolt sticks up through the ski; and it is threaded and fitted with a wing-nut. (See Fig. *a*.) When not required the button is screwed by means of the wing-nut into a recess cut for its reception in the bottom of the ski.

The front part of the skin is buttoned to the front bolt, the middle part to the second bolt, whilst the heel end has a strap sewn on to it by means of which the whole is first stretched perfectly taut, and then secured by passing the strap round the heel of the ski, and fixing it to a catch on the top of the ski. The strap is fitted with eye-holes, and the catch is of the simple, but ingenious construction shown in Fig. *b*, and in the photos.

The front part of the skin, of course, requires protection. This

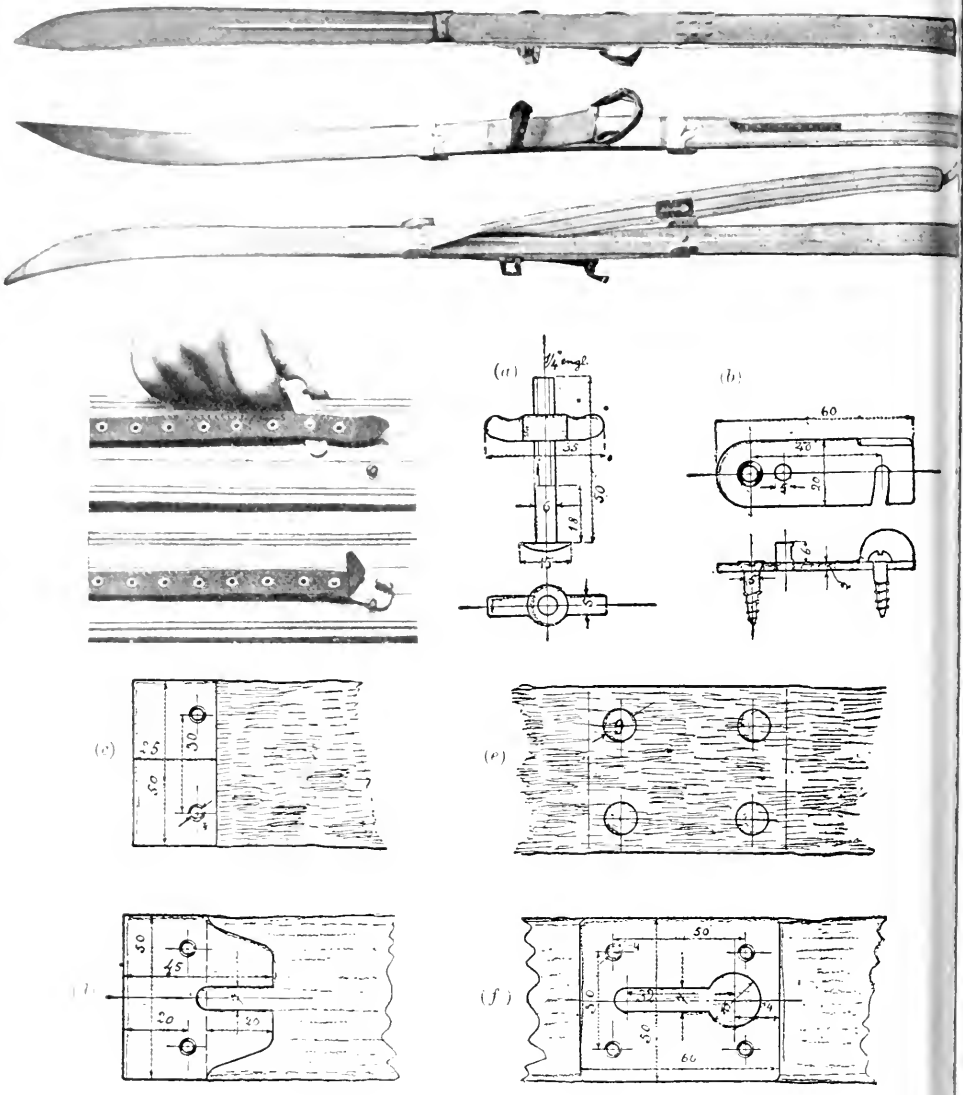


FIG. 34.—The Sohm-Madlener Detachable Sealskin.

(*a*) Bolt with button and wing-nut. Two are needed for each ski.

(*b*) Catch for securing strap leading from back end of skin. The photos showing catch half open and shut.

(*c*) Lower side of front edge of skin, showing sharp brass entrance.

(*d*) Upper side of front edge of skin, showing button-hole on brass entrance.

(*e*) Lower side of middle of skin, showing rivets for button-hole. There should be six rivets instead of only four, as shown.

(*f*) Upper side of middle of skin, showing button-hole.

The measurements, when not otherwise stated, are in millimètres.

is afforded by soldering two pieces of sheet brass together so as to form a sharp tent-shaped V.

The skin, mounted on its webbing, is placed between the jaws of the V which are then closed and secured by a couple of copper rivets. (See Figs. *c* and *d*.) The "button-holes" on the skin are not, of course, of the ordinary kind. The front one is shown in Fig. *d*. The second one in Fig. *f*.

The front "button-hole" is cut out of the upper part of the tent-shaped brass V as shown in Fig. *d*.

The second "button-hole" (Fig. *f*) allows the button to slide backwards and forwards in it so as to permit of the skin being pulled quite taut. This "button-hole" is made by simply cutting a hole and slot in another piece of sheet brass, and attaching it to the skin by means of rivets. (See Figs. *e* and *f*.) N.B.—Only four rivets are shown in this drawing, but probably it is better to make the slot a little longer and to add another rivet at each side.

In fitting this kind of detachable skin to a pair of ordinary ski, it is probably best to fill up the customary groove cut in the bottom of the ski. The ski will then be devoted exclusively to steep mountain work where it is in any case advantageous to dispense with the groove. (See page 33.) If, however, it is desired to retain the groove it will be advisable to make the button holes extra strong, or else to make them up so as to fit close against the wood.

It will be observed (as was mentioned above) that the skin only covers about half the under surface of the ski. To prevent snow sticking to the uncovered part in warm weather, a liberal coating of wax may be applied, or else (as Herr Sohm advises) the whole of the bottom of the ski may be painted with smooth and hard enamel. This gives a very fast surface for running on, and of course no slipping back need be feared when walking up-hill with the skin attached.

Climbing Irons.—Herr Sohm recommends the use of climbing irons invented by him in combination with his detachable skin. The object of the irons is to prevent slipping on very steep icy slopes. The writer has had no experience of these, and, as criticism without practical knowledge is seldom of much value, he prefers to leave the reader to try them or leave them alone, just as he pleases. This much may, however, be safely assumed that these appliances (like the skin itself) can only

be of value to the skilled ski mountaineer desirous of making long and difficult excursions in the high Alps. They are (as Herr Sohm himself insists) quite unnecessary on ordinary ground, and are certainly not for the beginner.

The climbing irons are made of some strong metal unaffected by

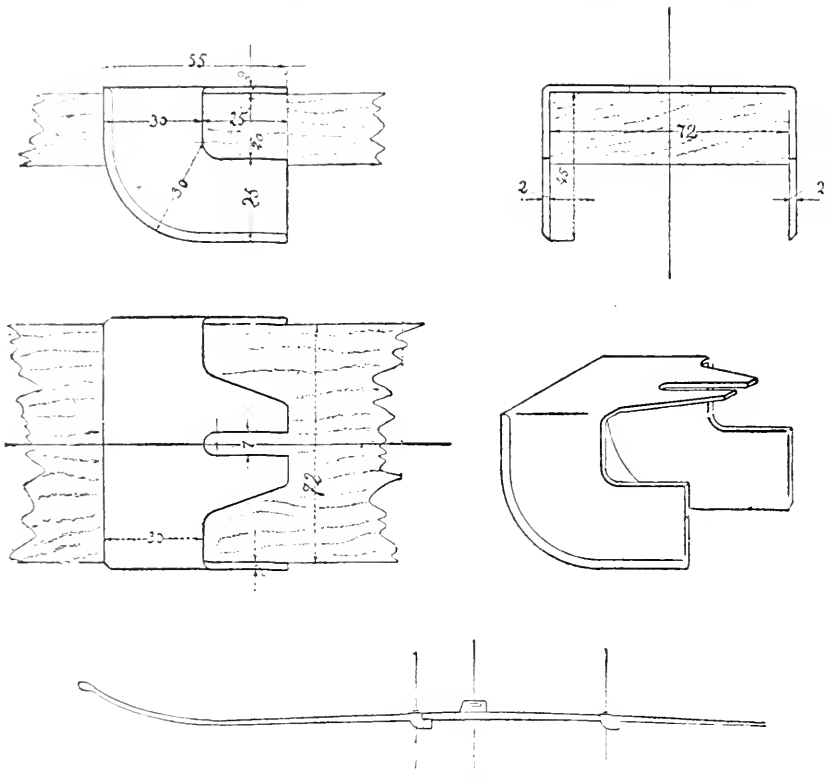


FIG. 35.— Sohm's Climbing Irons.
The measurements are in millimètres. See also the photos, page 108.

rust, and their shape and the method of fixing them in conjunction with the skin is shown clearly in the accompanying diagrams.

Tying a piece of rope to the bottom of the ski is resorted to by some in order to help them to get up-hill. The writer has,

In Nordmarken, near Christiania.

Photo by H. Abel.

however, never found this to be of much use. It is true that if plenty of rope is used, and if it is properly fixed (no easy matter by the way), it largely obviates slipping back; but it also seriously hinders slipping forwards, and necessitates a lifting or heavy dragging of the ski at every step. Snow is very apt to stick to the rope, and of course no glissading with it is possible. The net loss seems therefore to be greater than the gain, though possibly there may be occasions when the reader may find something of the sort useful. The plan has at least the merit of cheapness.

Dipping part of the ski into water is also recommended by some in order to help climbing, the idea being to form a lump of ice on the bottom, which may be removed when the summit is reached. But this, too, is open to much the same objections as the rope, and is scarcely worth while. If it is to be adopted, it is well to be provided with a metal paper-knife, or something of the kind, to scrape off the ice, and, incidentally, it may be here mentioned that some sort of scraping appliance will always be found useful; for cleaning one's ski with the stick or an ordinary knife takes a long time, besides being apt to injure both the wood and the blade.

COMMON FAULTS AND FAILINGS

(Mostly dealt with already, but repeated here to impress the beginner).

I.—Kit.

(1) Too heavy clothes. Woolly clothes. Have light, windproof, smooth materials.

(2) Tight boots with thin soles. Have large strong boots which won't pinch the toes, even with three pairs of socks on, and which won't buckle in the middle of the sole.

(3) Ski brittle, of bad shape, or of great weight. Get some one who knows good ski to choose for you, or, if this is impossible, send to a good maker for his best.

(4) Too short gloves. Have long gloves to draw over the sleeves of your coat.

II.—Condition of the snow.

(1) Abusing the snow. The better the ski-runner the less he complains, and *vice versâ*. Notice how the good men manage.

(2) Continuing a tour when danger may be expected. Only greenhorns and fools do so. Turn back, and try another day.

(3) Waxing ski when snow is *just* binding. Best not. The slight clinging will help you up, and won't interfere seriously with the run. Probably, too, it will be colder higher up.

III.—Technique.

(1) Short waddling steps on the level. Lean forward. Slide.

(2) Can't get up hill. Raise front of ski and stamp. Don't go too steeply. Go slowly, but keep at it.

(3) Rushing up in front of others when on tour. Don't show off. Probably you are one of the worst of the party; in any case, you are only annoying the others.

(4) Side stepping, ski cross. Raise heel of lower ski. (See p. 60.)

(5) Can't start down hill. Be quick about it, and then you can.

(6) Legs apart and feet level. Keep legs close together and one foot forward.

(7) Leaning back on stick. Practise without one.

(8) Falling inwards when making a down-hill curve. Lean forward! Throw the weight on to the lower ski.

(9) Telemark swing. Can't get round. Raise heel of the back foot.

(10) Christiania swing. Ski runs off at a tangent. Hold ski together. Swing on both of them.

(11) Not learning to turn to both right and left. Don't keep on practising that which you can already do.

(12) Dropping over a jump without *sats*, or recklessly hurling yourself over. Both forms of funking. Keep cool and think of your form.

(13) Jumping too late. Don't go quite so fast, and begin to straighten up earlier.

(14) General stiffness. Don't get into any fixed style of running. Keep on changing your ground and trying new things.

SKI-RUNNING ETIQUETTE.

Introductions are very informal on the snow.

You may ask anybody for advice, and be certain of receiving a polite answer, provided that you yourself are polite, and that your question is not idiotic.

If you contemplate joining a touring party, you should ask somebody who is going, and who has already made a tour with you, whether you are likely to be welcome. If he hesitates, don't go. If he assents, go by all means, even though you may be doubtful whether you are up to the work in hand.

You should not instantly rush to the assistance of a lady who may have fallen. Do not let your gallantry get the better of your common sense.

In Norway ladies put on their own ski, and manage their own bindings, and it is not good manners to offer to assist them. Would that the custom extended to Switzerland!

However amusing your conversation may be, you should refrain from chattering during a long climb. Not everybody's wind or everybody's temper is perfect.

You will not add to your popularity on tour by continually accepting hospitality at the hands of others, especially if your water-bottle be small, and you carry no repairing outfit.

You should pay up punctually, and without demur, to the man who finances a touring party; it is at least ten to one that he is out of pocket, anyway.

It is a gross breach of manners to tread on the back of another man's ski. You should at once apologise and fall back five yards.

You should not come plumping over a jump which others have been at some pains to construct, without first asking their leave, and it is always your solemn duty to repair as well as possible any damage you may occasion to the track.

Unless you are really a very good runner, it is better not to imitate too closely the Norwegian style of dress. People may be disappointed.

Always be polite in your dealings with foreigners, and you will seldom have cause to complain of their want of manners.

SOME USEFUL FIGURES.

1 inch	= ·0254 metres	1 metre	= 39·370 inches*
1 foot	= ·3048 metres	,,	= 3·280 feet
1 yard	= ·9144 metres	,,	= 1·0933 yards
1000 metres	= 3280 feet.	1 kilometre	= 1093·3 yards
1000 feet	= 304·8 metres	8 kilometres	= 4·969 miles
		,, ,,	= 5 miles, less 50 yards

* The exact figures are not as yet settled, and are given—39·37043196 39·37079, 39·37008, &c.

France and Switzerland and Italy.

£4	=	100 francs	100 francs	=	80/-
4 -	=	5 francs	5 francs	=	4/-
1/-	=	1·25 francs	1 franc	=	-/9½ about

Norway, &c.

£1	=	18·2 kroner	1 krone	=	1/1¼ about

Germany.

£1	=	20·4 marks	1 mark	=	-/11¾ about

Austria, &c.

£1	=	24 kronen	1 krone	=	-/10
		10·2 florins or gulden	1 florin or gulden	=	1/11½

1 kilogramme = 2·2046 pounds avoirdupois.
In trade 1 kilogramme is reckoned 10 per cent. more than 2lb.
11lb. = 5 kilogrammes.

Temperature falls about
1° Fahrenheit for every 300ft. rise
or, say,
1° Cent. for every 200 metres.

THERMOMETER.

Comparison between Scales of Fahrenheit, Réaumur, and the Centigrade.

Cent.	Fah't.	Rmr.	Cent.	Fah't.	Rmr.	Cent.	Fah't.	Rmr.	Cent.	Fah't.	Rmr.	Cent.	Fah't.	Rmr.	Cent.	Fah't.	Rmr.
°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
100B.	212B.	80B.	75	167	60	50	122	40	25	77	20·0	Zero	32	Zero	25	13	20
99	210·2	79·2	74	165·2	59·2	49	120·2	39·2	24	75·2	19·2	1	30·2	0·8	26	14·8	20·8
98	208·4	78·4	73	163·4	58·4	48	118·4	38·4	23	73·4	18·4	2	28·4	1·6	27	16·6	21·6
97	206·6	77·6	72	161·6	57·6	47	116·6	37·6	22	71·6	17·6	3	26·6	2·4	28	18·4	22·4
96	204·8	76·8	71	159·8	56·8	46	114·8	36·8	21	69·8	16·8	4	24·8	3·2	29	20·2	23·2
95	203	76	70	158	56	45	113	36	20	68	16	5	23	4	30	22	24
94	201·2	75·2	69	156·2	55·2	44	111·2	35·2	19	66·2	15·2	6	21·2	4·8	31	23·8	24·8
93	199·4	74·4	68	154·4	54·4	43	109·4	34·4	18	64·4	14·4	7	19·4	5·6	32	25·6	25·6
92	197·6	73·6	67	152·6	53·6	42	107·6	33·6	17	62·6	13·6	8	17·6	6·4	33	27·4	26·4
91	195·8	72·8	66	150·8	52·8	41	105·8	32·8	16	60·8	12·8	9	15·8	7·2	34	29·2	27·2
90	194	72	65	149	52	40	104	32	15	59	12	10	14	8	35	31	28
89	192·2	71·2	64	147·2	51·2	39	102·2	31·2	14	57·2	11·2	11	12·2	8·8	36	32·8	28·8
88	190·4	70·4	63	145·4	50·4	38	100·4	30·4	13	55·4	10·4	12	10·4	9·6	37	34·6	29·6
87	188·6	69·6	62	143·6	49·6	37	98·6	29·6	12	53·6	9·6	13	8·6	10·4	38	36·4	30·4
86	186·8	68·8	61	141·8	48·8	36	96·8	28·8	11	51·8	8·8	14	6·8	11·2	39	38·2	31·2
85	185	68	60	140	48	35	95	28	10	50	8	15	5	12	40	40	32
84	183·2	67·2	59	138·2	47·2	34	93·2	27·2	9	48·2	7·2	16	3·2	12·8	41	41·8	32·8
83	181·4	66·4	58	136·4	46·4	33	91·4	26·4	8	46·4	6·4	17	1·4	13·6	42	43·6	33·6
82	179·6	65·6	57	134·6	45·6	32	89·6	25·6	7	44·6	5·6	18	—	14·4	43	45·4	34·4
81	177·8	64·8	56	132·8	44·8	31	87·8	24·8	6	42·8	4·8	19	2·2	15·2	44	47·2	35·2
80	176	64	55	131	44	30	86	24	5	41	4	20	4	16	45	49	36
79	174·2	63·2	54	129·2	43·2	29	84·2	23·2	4	39·2	3·2	21	5·8	16·8	46	50·8	36·8
78	172·4	62·4	53	127·4	42·4	28	82·4	22·4	3	37·4	2·4	22	7·6	17·6	47	52·6	37·6
77	170·6	61·6	52	125·6	41·6	27	80·6	21·6	2	35·6	1·6	23	9·4	18·4	48	54·4	38·4
76	168·8	60·8	51	123·8	40·8	26	78·8	20·8	1	33·8	0·8	24	11·2	19·2	49	56·2	39·2

THE SWISS SKI.

Made by

RICHARD STAUB,

ZURICH.

TRADE MARK.

MARQUE DÉPOSÉE

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THE SKI are light and elastic, and are made from the celebrated Swiss mountain ash.

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