

From Tree to Trail

By R. W. E. Burnaby

LORD FREDERICK HAMILTON brought the first pair of skis to Canada in 1887 and used them at Ottawa. Since that time ski-ing as a sport and as a means of travel has increased in popularity, until today Canadian skiers are counted in tens of thousands, and place well in international competitions. Ski manufacture in Canada has progressed with the popularity of the sport and today most of the skis used in Canada are of Canadian manufacture.

Good skis are much more than shaped pieces of wood. They cannot be made successfully under modern mass production or piece-work methods. To the experienced each ski has an individuality.

The four best woods used in the making of skis are white hickory, white ash, yellow birch and sugar maple. These woods are used because they possess to a high degree all of the four following properties—toughness, flexibility, hardness and lightness of weight.

The following table is compiled from information issued by the Forest Products Laboratories at Ottawa, and gives the relative values of the various woods for ski making:—

WOOD	Weight, dry pounds per cubic foot	HARDNESS		FLEXIBILITY The distance which a 50 lb. hammer must drop to break a piece of wood of a di- mension of 2" x 2" x 30"
		Edge grain	Flat grain	
Hickory (Shagbark).....	50	2260	2040	72
Ash (White).....	40	1220	1250	56
Birch (Yellow).....	44	1360	1330	60
Birch (White).....	40	980	960	49
Maple (Sugar).....	47	1640	1670	55
Beech.....	47	1310	1330	57

One can see that hickory possesses the greatest hardness and greatest flexibility, also the greatest weight. If hickory were not quite such a heavy wood it would be ideal for ski making. It is an ideal wood for jumping skis, where weight is required. Ash has the lightest weight but is not particularly hard. Yellow birch is light in weight and is next to hickory in flexibility but not in hardness. Sugar maple is next in hardness to hickory, is almost as flexible as yellow birch and nearly as heavy as hickory. Beech is the same weight as sugar maple, and a little more flexible, but not quite as hard. White birch is light in weight but very soft and lacks much flexibility.

Good skis cannot be made from red hickory, black, brown or swamp ash, soft maple or white birch. On account of the lower lumber cost, these woods may be used for making low priced skis but should never be confused with white hickory, white ash, sugar maple and yellow birch.

The particular pieces of wood from which the skis are to be made are chosen with great care. Where possible the trees are selected before they are cut down. The logs must be sawn so that the boards will be straight grained and free from defects. Ash ski billets should always be edge grain and can only be sawed economically from logs 12 inches or more in diameter. There are five different methods of sawing a log to produce the maximum number of edge grain billets with the minimum amount of waste and sometimes two or three of these methods must be used in sawing one log to the best advantage. Ash skis should be made from edge grain lumber because it is only from such stock that the minimum number of the large cells of the spring-growth in the wood are exposed on the running surface. If many such cells are exposed, they will roughen up when they become wet and retard progress.

Some skiers prefer flat grained hickory skis and give as their reason that the skis slip over the snow more easily than skis made from edge grained wood, but from the above table it can be seen that those who prefer flat grained hickory skis do sacrifice hardness. There are others who prefer edge grain hickory and say that such have greater strength than flat grained skis.

The figures given are only an average taken from a number of tests and represent generally the characteristics of each of the woods tested. No two pieces of wood are exactly alike; not even two pieces cut from the same log. For this reason it is very important when mating skis into pairs to get two as near alike as possible in weight, flexibility and grain of the wood. Only about 40% of the lumber obtained from selected logs is of a quality good enough for making skis. The lumber is graded at the saw mill and the choicest pieces are trimmed and ripped into ski billets $4\frac{1}{4}$ ins. wide and $1\frac{3}{8}$ ins. thick, in lengths of 6 ft., $6\frac{1}{2}$ ft., 7 ft., $7\frac{1}{2}$ ft. plus 3 ins. extra in length. It is necessary to have this extra length because lumber dries most rapidly from the ends of the boards. This drying is accompanied by shrinking and if one part of the board dries more rapidly than another, splitting occurs. It is difficult to prevent splitting in the ends of the boards even though they may be waxed or painted. The extra three inches on the length allows for the cutting of $1\frac{1}{2}$ ins. off each end when the ski is finally trimmed to its proper length.

The best ski billets are cut during the winter and are carefully piled in the open air to dry and season. Before beginning to shape them into skis

they are further seasoned in a special type of kiln which, experience has proved, produces better lumber than by further seasoning in the open air or in sheds.

Each manufacturer has his own method of shaping the billets, but generally speaking skis are shaped in the following steps. The top and bottom surfaces are planed parallel to each other. Some manufacturers bend their skis as the next operation. Then it is determined which end is to be the tip of the ski and which the heel. In the case of a flat grained ski billet this is most important because it is a decision which determines whether the ski will slip easily over the snow or whether it will be "draggy." If it were possible to saw and plane a flat grained ski billet so that the bottom surface were parallel and followed exactly the annual growth rings, there would be no problem in determining which end was to be the tip and which the heel. It is only in a very small percentage of the pieces that the top and bottom surface follows the annual rings. Where the surface cuts across the annual rings, the tip of the ski must be such that the layers of annual growth lap over each other like shingles on a roof.

When it has been determined which end of the billet is to be the tip, the next step is to put the groove in the bottom of the ski and to shape the sides. The side shaping is done with the use of a pattern; the cutting being done by machinery which does more accurate work than can be done by hand. The billet is next shaped on the top. This operation is also done on a pattern, and the cutting done by special machinery. Except in the case of what is known as an Oval Top Ski, the top surface is not rounded in this operation but is done by hand later during the process of manufacture. The next operation is bending, which is done either by steaming the wood and putting it on a form to shape or by some other method. When the wood fibres are moist and hot they are plastic and can be moulded into any required shape within limits. While the wood is hot and moist it is held in a form and when it has cooled and dried the form is removed. The wood thus bent holds its shape unless it is again exposed to heat and moisture.

The bending of skis is a most important operation. The tip or toe must have just the right upward bend and gradually curve backward into the arch or spring of the ski. If the toe bend is too abrupt, the ski will have a tendency to run against or into the snow, whereas, if too straight, the ski would be useless in deep snow. The amount of arch also varies according to the texture of the wood, whether it be naturally stiff or supple and its purpose is to distribute the weight of the skier equally over the whole ski. Without it, the under-foot part of the ski would take the whole weight and the front and back would have a tendency to turn upward. On the other hand, if there is too much arch, there will be undue wear at the toe and heel. A properly formed arch assures steadiness, both on the level and downhill and prevents side-slipping, especially over hard packed snow.

It aids in hill climbing and helps back-slipping. The width and thickness of the ski, the flexibility of the wood, and the weight of the skier are all factors to be considered in deciding the amount of arch. The ski maker determines the flexibility of the wood, but of course does not know the weight of the skier. The purchaser should, therefore, exercise the utmost care in buying skis with the correct arch for his particular weight. The bending of skis is an art which must be studied, and proficiency is gained only through years of experience.

To a person unfamiliar with woodworking, the skis now appear smooth and almost ready for use, but they are really only half finished. They have not yet been sanded. This is a painstaking and tedious job, and one which requires skill because a ski can be ruined by sanding too much or in some cases can be improved by sanding more wood off one part of the ski than another.

After sanding the flat surfaces the top of the ski is rounded to a graceful dome by hand with a simple spoke shave and scrapers, and great skill is required in this operation. The ski must have a gradually diminishing amount of flexibility from the bend to the point of balance and if too much or too little of the wood is removed in this operation it is not a perfect ski. At the same time, the dome must have a graceful shape. Many people have the idea that a dome on a ski is just for the sake of appearance but its real object is to prevent snow from accumulating on the top of the ski. The sanding of the rounded surfaces is done by hand after the dome is made.

There are a variety of types of finishes used on skis and most of them are closely guarded secrets. Usually they consist of a stain, wood preservative, and a protective outer coating. The stain should be one which penetrates the wood. It should be in the wood rather than on it. Likewise, the preservative, which usually contains tar, should penetrate the wood, for two reasons, first, to expel moisture and second, so that scratches and small splinters will not leave the wood unprotected. The preservative also acts as a filler and seals any open grain, making the wood practically waterproof. The outer coating should be hard yet elastic, to allow for the bending of the ski without cracking the finish. The bottoms of well made skis should be free from varnish or shellac, which would have to be removed before applying ski wax. The bottoms of the skis, however, cannot be left unprotected or they would absorb moisture and warp. The bottoms are, therefore, coated with a waterproof wax which is easily removed before applying ski grease.

The skis are now carefully mated into pairs. A pair of skis must be of the same kind of wood, the same length, width and weight, the same bend, spring and flexibility, the same grain, style and colour. With so many exacting details to take into consideration, the task of mating skis into pairs is by no means an easy one and it is only when they are made in large quantities that it is possible to find the correct mates for them all.

The last operation before being stored away or being shipped out is branding. The maker's name and the length of the ski is branded into the wood with hot iron dies. If the skis are to be stored they are put in a place where the variations in the humidity of the air are slight. Everything containing cellulose will vary in shape to a greater or less degree with variations in the humidity of the atmosphere. It is, therefore, just as necessary to keep a pair of skis in a press as it is a tennis racket. Most manufacturers put their skis in a press as soon as they have been paired.

Minor operations such as mortising, heel reinforcement, and decorating are done at various

points throughout the manufacturing operation.

Successful ski making requires the utmost care and skill from the time of the selection of the standing tree to the branding of the length on the finished ski.

Skis are subjected to great strain and exposed to all kinds of weather conditions. Every precaution should be taken to keep them in good condition when not in use. They should be kept in presses well oiled and never allowed to come in contact with extreme heat or be stored in a damp cellar and if given the same care as golf clubs, tennis rackets, or other sporting equipment, they will last indefinitely.

The Development of the National Ski Association of America

By Harold A. Grinden, Secretary

SKI-ING in the United States dates back to 1840 when Norwegian pioneers first introduced the sport, and many stories are told of the early days. One Thompson who used ski in the "49 Gold Rush" days; Knut Simeon who travelled on ski from Glenwood to St. Cloud in Minnesota during the civil war period; The Vikings who first promoted ski-ing in Minneapolis, Minn., in 1885; Carl Conradson who skied across the Brooklyn Bridge and up to Herald Square during the famous blizzard of "89" in New York City. It was not, however, until 1886 that a group of men at Red Wing, Minnesota, formed the first ski club while another group organized at Altoona, Pa., the same year. The first ski tournament of record in the United States was held at Red Wing, Minn., where the Hemmestvedt brothers, fresh from Norway, introduced the art of ski jumping.

Ski-ing became organized when the National Ski Association was formed on the evening of February 21, 1904, by a handful of men at Ishpeming, Michigan, and the first National Championship was held the following day. Five charter member clubs made up the original Association and by 1907 fourteen clubs in all had joined. Askel Holter, secretary for fifteen consecutive years of the National Ski Association, has written an interesting article of the early days and struggles of the Association—"Inspiration—Work and Attainment." The gradual development from 1840 up to the Olympic Games at Lake Placid is an interesting story. First, the use of ski for travel only, then the sporting angle of racing and jumping, and recently the combined, slalom and down mountain activities, and the growth of ski clubs from five in 1904 to over one hundred and twenty-five organized clubs in 1935. The pioneer work of the early days and the fine

instructive and constructive efforts of our enthusiasts all culminated in the Olympic Games at Lake Placid, an occasion ever to be remembered by we who were there. And now today, 1935, a great Association, an organized sport, a ski-ing nation and thousands ski-ing in one or the other branches of the sport, and while the competitive angle still has a firm foothold, of far greater interest is the thousands of men, women and children, throughout our entire snowbelt, getting out on skis over week-ends and through the fun of ski-ing, building for themselves stronger bodies, becoming mentally keener and more interested in what the sport holds for the human race.

The National Ski Association now comprises five divisional ski associations—the U.S. Eastern, the Central U.S., the U.S. Western, the California and the Pacific Northwestern, all interlocked through the National and all working in harmony towards a greater development.

The year 1935 was supreme in National Ski Association history. Local club tournaments, divisional association championships, a great National Championship at Canton, South Dakota, divisional Olympic try-outs, the final cross-country and combined Olympic try-out at Lake Placid, the final Olympic jumping event at Salt Lake City, Utah, all ending up with the National Championships and Final Olympic Try-Outs for the slalom and downhill at Mount Ranier. The American Olympic Ski Committee are now selecting our American Team for Germany in 1936, and I know we will be most ably represented. To all those in Canada who have done so much to promote and organize ski-ing in your great Dominion I extend my congratulations and best wishes for a still further development in the future.