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2,184,791

SKI AND METHOD OF MAKING THE SAME

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2 Sheets-Sheet 1

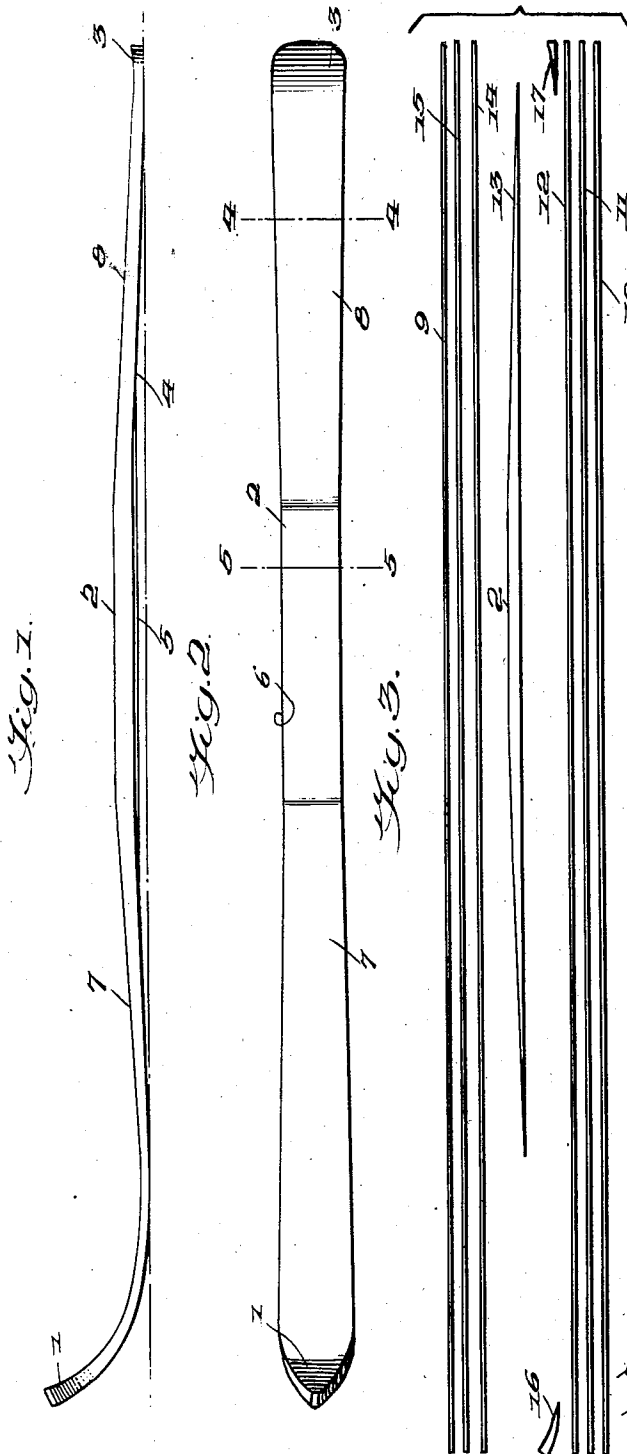
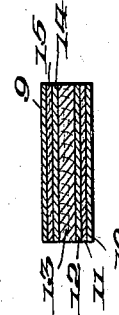
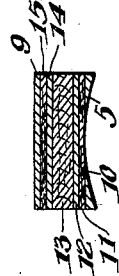


Fig. 4.

Fig. 5.

Fig. 6.



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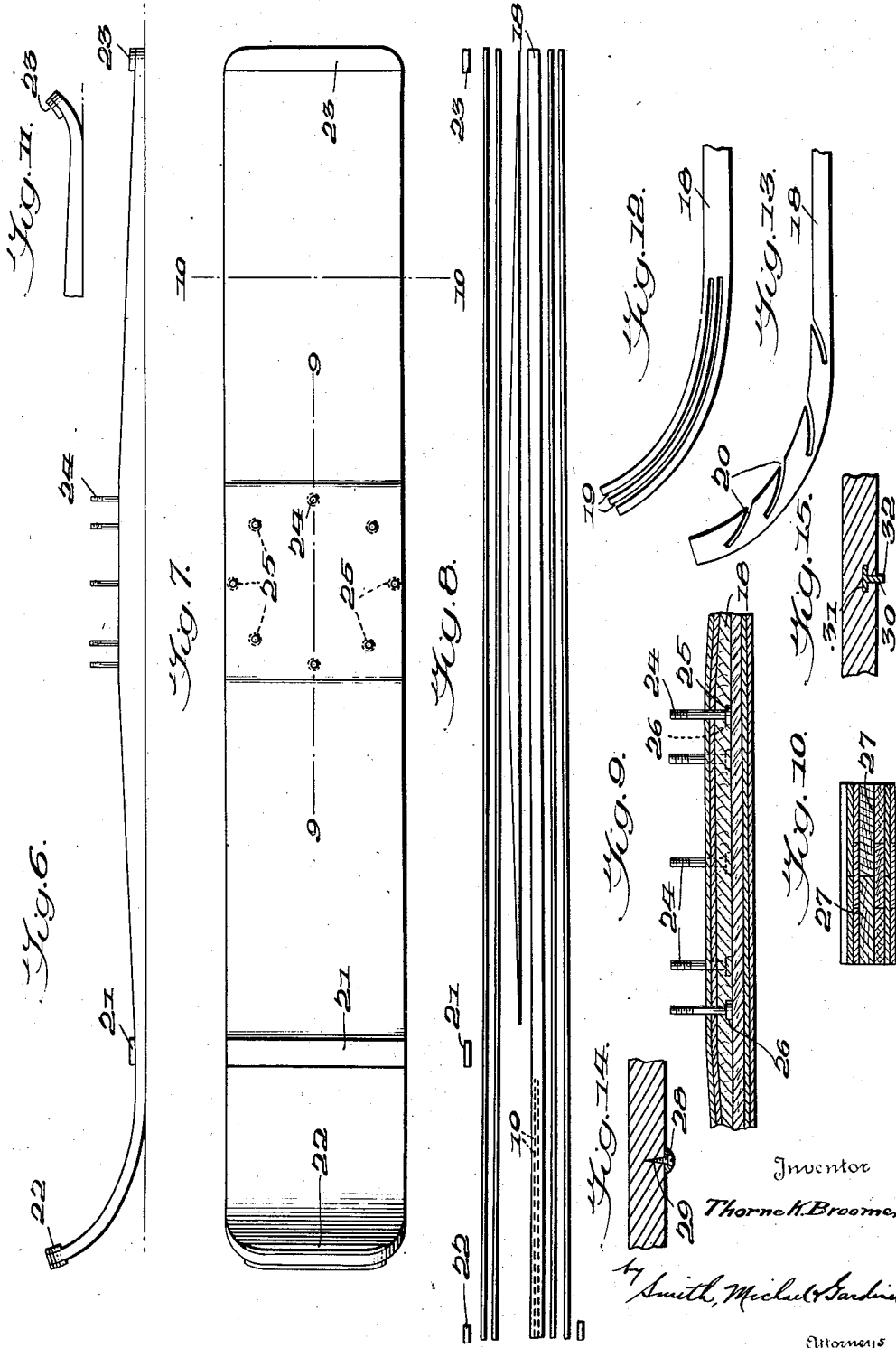
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SKI AND METHOD OF MAKING THE SAME

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2 Sheets-Sheet 2



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SKI AND METHOD OF MAKING THE SAME

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8 Claims. (Cl. 280—11.13)

This invention relates to the art of skis and the method of making the same, and contemplates skis for both foot use as well as for airplanes or other devices with which skis are used.

So far as I am aware it has been common practice to manufacture skis from solid pieces of wood which are of high density requiring careful selection of materials in order to produce a ski that will stand up under the hard uses to which it is subjected, as well as to atmospheric conditions, and to produce the proper shape of the ski by moulding the same under steam pressure.

It is also known that skis have been made from laminations which consist of top and bottom surfaces of a material of high density and a core of lighter material bonded to the top and bottom surfaces by waterproof or other glue and suitably shaped to produce the finished article.

The known methods of making skis, however, have been found to be unsatisfactory and expensive. In the case of the skis made from a solid piece of wood, a large percentage of waste is entailed because of imperfect materials or improper selection of materials, and also because of the fact that the materials heretofore employed have been susceptible in high degree to moisture which causes warping, loss of shape and sticking of the ski to the snow or ice because of the moisture present in the body of the wood employed.

Skis as heretofore made also lacked strength at the upturned toe portion because under the method of shaping by steam pressure, the fibers are broken and otherwise injured as a result of being bent.

The laminated skis heretofore known have also proven unsatisfactory due to the fact that the upper and lower laminations likewise absorb moisture with consequent sticking to the snow and the presentation of an inferior sliding surface. The absorption of moisture by the wood likewise in time loosens the bonding quality of the glue, permitting the laminations to separate or blister, and consequently changing the shape of the ski and weakening the same to the extent that breakage often occurs at low loadings.

The present invention produces a satisfactory ski in an economical manner free from the defects of skis of the prior art heretofore mentioned.

The ski forming the subject-matter of the present invention has been found to possess truly permanent shape in that it is not affected deleteriously by moisture; it possesses great strength and presents a sliding surface to the snow that does not stick since no moisture can be absorbed by the various laminations making up the ski.

By making the ski of a laminated structure, great economy can be effected, since all except the top and bottom laminations may consist of wood of low quality and low specific gravity such

as pine or spruce, which can be easily procured at low market prices, or, on the other hand, the top and bottom surfaces may be of low density with a high density intermediate lamination or laminations, since the subsequent treatment which is employed in producing the finished ski of the present invention will render the low density laminations non-absorptive and produce a running surface that is of equally high density as that of the intermediate lamination.

The objects and advantages of the present invention will be readily apparent to one familiar with the art as the description proceeds, and while I have here illustrated several forms of the invention, it is to be understood that changes may be made in various details of construction, and I do not intend to limit myself to any particular type of material nor to the number of laminations employed, but may modify the same as desired so long as the changes fall within the scope of the appended claims.

Referring more particularly to the drawings forming part hereof and in which corresponding numerals are used throughout the views:

Figure 1 is a side elevation of a ski which is adapted for foot use, made in accordance with my invention.

Fig. 2 is a top plan.

Fig. 3 is a view showing the relation of the elements before they are assembled and given their final shape.

Fig. 4 is a sectional view along the line 4—4 of Fig. 2.

Fig. 5 is a sectional view along the line 5—5 of Fig. 2.

Fig. 5A is a view similar to Fig. 5 but showing the lower lamination as being concave.

Fig. 6 is a side elevation of a ski for use in connection with airplanes.

Fig. 7 is a top plan view of the same.

Fig. 8 is a view of an airplane ski corresponding to Fig. 3.

Fig. 9 is a fragmentary sectional view taken on the line 9—9 of Fig. 7.

Fig. 10 is a transverse sectional view taken on the line 10—10 of Fig. 7.

Fig. 11 is a fragmentary side elevation of the rear end of a modified form of Fig. 6.

Fig. 12 is a side elevation of one of the laminations of the toe portion of the ski.

Fig. 13 is a side elevation of another form of intermediate laminations at the top portion.

Fig. 14 is a transverse sectional view showing the utilization of a runner.

Fig. 15 is a view similar to Fig. 14 showing a modified form of runner.

By reference to Figs. 1 to 5 inclusive, it will be seen that the ski has the general shape as shown in Figs. 1 and 2 consisting of an upturned toe portion 1, an intermediate elevated flat portion 2

which forms the bearing point for the foot or pedestal, and heel portion 3, and while the heel portion in Fig. 1 is shown as being flat, it is to be understood that it may be curved upwardly as illustrated in Fig. 11.

The ski is given its proper camber indicated at 4, although it may be found desirable in many instances to eliminate the camber. Intermediate the toe and heel portions of the ski the lower surface is shaped as at 5 to present a biting surface to the snow immediately below the flat portion 2.

It will be apparent that the weight of the user will be directly above the curved portion 5 so that when in use the curved portion will contact with the snow, thereby securing a definite biting action. While I have illustrated a convex surface 5, it is to be understood that the same may be concave to present a biting surface when turning or the lower face may be flat throughout the sliding surface of the ski.

As seen in Fig. 2, the curved portion gradually merges into the flat surfaces 7 and 8 which lie on either side of the intermediate portion 5.

It will also be seen from an inspection of Fig. 2 that the ski is shaped to produce suitable waist portion 6 intermediate the ends thereof in order that it may conform to the accepted or conventional shape of the skis as they are known at the present time.

The present invention is directed primarily to the production of skis as described above from a plurality of laminations with a view to economical manufacture and the production of a more efficient and more durable ski.

To this end I employ any suitable number of laminations. The upper lamination 9 and the lower lamination 10 in Fig. 3 may be made of a wood of high density, whereas the intermediate laminations 11 to 15 inclusive may be made of relatively inexpensive low density wood which can be procured at reasonable cost.

If desired, reinforcing blocks 16 and 17 may be used at the toe and heel portions of the ski and may be suitably shaped to produce the necessary curve at these portions.

It will be seen that the blocks 16 and 17 are relatively thick at their leading and trailing ends, respectively, and taper to a knife edge at their inner ends.

The intermediate lamination 13 is shown as having substantially trapezoidal shape, that is to say, its lower surface is flat but the upper surface gradually tapers toward the center and terminates in the upper, intermediate, elevated, flat portion 2 hereinbefore described.

While in the present illustration I have shown approximately seven plies of material, it is to be understood that I do not intend to be limited to any precise number since this can be determined entirely by the thickness of the material used and the rigidity that is necessary to be imparted to the ski.

In making the ski from laminations care should be taken to select plies that have a tendency to twist in opposite directions, if there is any tendency to twist at all, or if they tend to twist in the same direction then they should be assembled by reversing alternate laminations when laying up the ski, from which it will be seen that all tendency for the finished ski to wind or twist will be eliminated since the tendency of one ply to twist in one direction is balanced by an equal tendency of the next adjacent ply to twist in the opposite direction. Therefore, these tendencies counteract

each other and the result is a ski having no wind or twist throughout its length. Care should also be taken in selecting plies that tend to bow in opposite directions, that is, from the front to the rear of the ski or from side to side, and reversing alternate layers in a similar manner. In this way there can be no tendency for the ski to bow and it will retain the camber and shape imparted to it during the molding operation.

Having selected a proper material and cut it to proper shape, the upper and lower laminations 9 and 10, respectively, are thoroughly impregnated with a phenolic resinous material so as to close all pores and prevent the ingress of any moisture thereto, although it is to be understood that I may merely impregnate the surface of the ply sufficiently to prevent moisture from passing into the interior thereof.

By the use of the term "impregnated" throughout this case I intend to cover both complete and surface impregnation, so long as the latter will exclude moisture from the interior of the ply and present the desired running surface.

I prefer to carry out the impregnation by first subjecting the plies to be impregnated to a vacuum to expel all air in the pores and then forcing a resin into the pores under pressure.

The intermediate plies 11 to 15 inclusive are coated with this same resinous material, and while it has been found that it is not necessary to thoroughly impregnate the intermediate plies, nevertheless it is to be understood as falling within the scope of my invention to thoroughly impregnate said plies with the resinous material.

After all of the plies have been treated as set forth above, they are assembled in a mold of proper shape and given their proper degree of bend and camber by applying thereto approximately fifteen pounds of pressure per square inch uniformly over the entire surface, and at the same time maintaining a relatively high temperature in dry air.

Pressure may be applied mechanically or by hydraulic or pneumatic pressure. For instance, the entire ski and mould may be enclosed in a collapsible bag and the cooking chamber filled with steam to give suitable pressure and temperature.

It is to be understood that the resinous material employed is one that hardens upon application of heat and pressure, and while I do not intend to be limited to any particular type of material except those that will produce the beneficial results here claimed, I have found that the use of so-called lump resin produces satisfactory results. This resin is well known in the trade and can be readily obtained on the open market.

When the heat and pressure have been applied for a sufficient length of time to completely harden the resin, the ski is removed from the mold in which it has been given its proper bend at the toe and/or heel portion, as well as the proper camber, and it will be seen to have acquired a running surface of very high density which is completely non-absorptive and of a strength considerably greater than the strength of the wood itself.

The impregnated plies are also found to be considerably more resistant to abrasion and gouging and in view of the waterproof nature of the resin, the detrimental effects of varying moisture content of the wood fiber are completely eliminated. The running surface will not freeze to

the snow or ice since there is no moisture in the texture of the wood and a sliding surface, therefore, of greater efficiency is provided.

It has been found that the running surface of the ski is of such hardness that steel runners and the like on the bottom of the ski are unnecessary, but of course it is to be understood that if desired such runners or edges may be incorporated in the present ski without departing from the spirit of this invention.

Due to the hardening action produced by applying heat to the resinous material, the ski will be found to retain permanently its proper shape, thereby eliminating the necessity of keeping the same in a mold or jig in order to retain its proper camber or toe bend, as is now the case. The toe portion is also increased in strength because of the increase in strength of the outer impregnated layers.

While I have stated that I prefer to remove moisture by means of vacuum, it is of course to be understood that the resinous material may be applied by pressure without previously removing the moisture by vacuum.

The coating of the intermediate or filler laminations with the same resinous material as that employed for impregnation may be applied by brushing or by wet rolling or any other suitable manner, it being necessary only to apply a sufficient thickness of the resinous material to insure proper bonding between the various laminations, and of course it is to be understood that varying pressures may be employed.

As a modification of the foregoing method of producing a ski, instead of coating the intermediate or filler layers, I may employ thin, impregnated, fibrous material or fabric which can be inserted between the layers, pressure and heat applied and the process carried on as before. This method will produce as permanent a bond and yet eliminate the coating operation. Furthermore, this impregnated fibrous material can be applied to the bottom surface of the ski, thereby forming a running surface on the ski of thick synthetic resinous material. Either method will produce a surface impermeable to water.

As so far described the ski has been produced with its proper bend and camber and it has been formed to approximate size and shape. There still remains, however, a certain amount of carving to do, such as forming the sides to give the proper degree of waist and forming the toe portion and heel portions to the proper radius. These normally exposed surfaces are then coated with suitable waterproof material which may be the same resinous material used for impregnation and the ski may be dried at any suitable temperature warranted by the coating employed.

In order to give additional strength to the ski, it has been found that if the center layer or alternate layers are selected which have their grains running in a direction at right angles to the length of the ski, a much more strongly constructed ski can be made.

In Figs. 6 to 13 I have illustrated a ski made in accordance with the same process as described in connection with the preceding figures, but in this instance the ski is intended for use in connection with airplanes and similar vehicles. Such skis must of necessity be of greater width than those heretofore described and must be of necessity of sturdier construction. In order to produce skis for this use that have the requisite width, I utilize filler layers that are

considerably thicker than those necessary for use in foot skis.

In order to produce the necessary toe bend as well as the heel bend, if desired, I provide the thick intermediate layer 18, as shown in Fig. 8, with a plurality of longitudinal cuts 19, extending parallel with the bottom surface of the ski, and of a length equal to the bent toe and/or heel portion, so as to permit bending of the toe portion during the moulding operation without breaking fibers in that portion. As an alternative form the toe and/or heel portion may be provided with sloping cuts as indicated at 20, Fig. 13. But in either event the object is to facilitate bending to prevent breaking of the fibers during the bending operation.

In utilizing the structures of either Figs. 12 or 13, it is to be understood that after the cuts have been produced the ply is coated with the resinous material hereinbefore mentioned, including the raw walls of the kerfs, so that when the ski is placed in the mould and the proper bend imparted thereto, the resinous material will, upon hardening, retain the toe and/or heel portions in their particular position due to the fact that the walls of the kerfs move toward each other until the coating material on opposite walls contacts, thereby forming a binder for holding the bent portions in proper position, it being understood that in connection with the form shown in Fig. 12, proper slippage will be permitted between the cut portions so that the bent portion can assume its proper position. It is also to be understood that this same slippage between the various laminations will be permitted when the molding operation is performed to form either type of ski, but the laminations will be retained in their final position by the hardened resinous material.

In Figs. 6 and 8 I have illustrated reinforcing elements 21, 22 and 23. These elements consist merely of wooden strips extending transversely of the ski and having the grain thereof running at right angles to the length of the ski. These reinforcing elements can be secured to the top only of the ski, or to the top and bottom at the toe portion thereof, as shown in Fig. 6, or they may be included between the several layers forming the toe and heel portions.

In using skis in connection with airplanes, it is necessary to provide means for attachment and in the present form I have shown a series of bolts 24 which extend upwardly from the upper surface of the ski and are arranged in circular formation, as shown in Fig. 7, although of course they may be arranged in any suitable manner.

The bolts are attached by embedding the heads thereof in recesses 26 in one of the intermediate laminations and projecting the shanks upwardly through the laminations, it being noted that the bottom surface of the ski has no openings therethrough so as to present a flat uninterrupted running surface.

In order to secure the bolts rigidly to the ski structure the openings for the heads and shanks may be filled with the resinous material herein employed and upon hardening it will be found that the bolts have been sealed rigidly in place.

Referring to Fig. 10, it will be seen that the ski used in connection with airplanes is made up of a number of laminations with each lamination consisting of several pieces of material. This is often required due to the fact that the

ski is of greater width than the width of available material, and accordingly the various layers are formed by laying strips of wood side by side, impregnating the upper and lower surfaces with the resinous material herein mentioned, or coating the intermediate surfaces, and applying heat and pressure to the same while in a suitably shaped mold so that all of the elements are bound together into substantially an integral body of great strength and rigidity. By reference to Fig. 10 it will be seen that where the ski is wider than the maximum width of the elements that can be procured, the butt joints in alternate layers should be staggered with reference to each other to insure uniform stiffness throughout the breadth of the ski.

It may also be desirable to select material for use in the airplane ski in which the grains in alternate laminations are at right angles to the grains of the next adjacent ply.

Where it is desired to employ metal runners or edges on the bottom surface of either form of ski, these can be readily secured as shown in Figs. 14 and 15. In Fig. 14 the runner is attached by means of a suitable nail or screw driven into the lower surface of the ski. This penetration of the surface will not permit moisture to affect the ski because this surface to which the runner is attached has already been impregnated and is incapable of absorbing moisture.

In the form shown in Fig. 15 the lower surface of the ski is grooved as at 30 and provided with an undercut groove 31 into which a T-shaped runner 32 is slid and held in position by the hardening action of the impregnating resin in the lamination.

While I have described this invention primarily as employing wood, it will be understood that I do not intend to limit myself to this material. It has been found that a suitable number of impregnated plies of fabric will produce an acceptable ski, and accordingly I intend to include such material and such other analogous materials.

In connection with the ski for use in connection with airplanes, while no camber has been illustrated, it is to be understood that the ski may be so formed, if found desirable, and that the heel portion may be bent upwardly as shown in Fig. 11.

From the foregoing it will be seen that while various details have been shown and described, the fundamental thought of the present invention is to provide a ski having a running surface consisting of resinous material and utilizing this resinous material to bond together a plurality of thin laminations so as to produce a ski of greater strength than one made of a single piece of wood. It is also obvious that one of the principal points of the invention is the economy of manufacture and the lightness of the skis without sacrificing strength due to the fact that either of the filler layers or the outer layers may be of material of low density and, after treatment, are found to possess the requisite strength and hardness of more expensive and more dense material.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A ski comprising a plurality of laminations, one of the intermediate laminations having an upturned toe portion provided with horizontally extending spaced kerfs extending throughout said upturned portion, and a synthetic resinous coating on said laminations extending into the kerfs and bonding the walls thereof together.

2. A ski comprising a plurality of laminations, one of the intermediate laminations having an upturned toe portion provided with spaced diagonal grooves extending throughout the length of said upturned portion.

3. A ski comprising a plurality of laminations, one of the intermediate laminations having an upturned toe portion, kerfs in said upturned portion, and a synthetic resinous coating on said laminations extending into the kerfs and bonding the walls thereof together.

4. A ski comprising a plurality of laminations of wood bonded together by a synthetic resinous material, and reinforcing members extending transversely of the ski and having the grain thereof at right angles to the length of the ski.

5. The method of making skis which consists in subjecting strips of material from which the ski is to be formed to a vacuum to expel moisture, impregnating said strips with an infusible and insoluble synthetic resinous material, superimposing the strips in a mould and applying heat and pressure thereto to shape the same and harden the resinous material whereby the laminations are bonded together in a unitary structure.

6. The method of forming a ski including a curved toe portion which consists in cutting kerfs in a flat strip of material, coating said strip including the walls of the kerfs with a synthetic resinous material, placing said strip between other flat strips of material, placing the thus assembled strips in a mould curved to the shape desired in the finished ski, applying heat and pressure to the strip to bow the same and harden the coating material, said material on the walls of the kerfs being brought together during the bending operation and when hardened retaining the plurality of laminations in their curved position.

7. The method of forming a ski which consists in superimposing in a mold a plurality of plies of wood impregnated with synthetic resinous material and having a tendency to twist in opposite directions, one upon another whereby the twist in one ply in one direction is counteracted by the opposed twist in the next adjacent ply, and applying heat and pressure thereto to shape the same and harden the resinous mixture to bind the plies together.

8. The method of forming skis from plies of material having a tendency to twist in the same direction, which consists in impregnating said plies with synthetic resinous material, placing the plies in a mold with alternate plies reversed with respect to each other so that the twist in one ply in one direction is counteracted by the opposed twist in the next adjacent ply, and applying heat and pressure thereto to shape the same and harden the resinous material to bind the plies together.

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