

The Hupa bows (Fig. 103) all belong to one type, sinew-lined as distinguished from the sinew backing of the Eskimo. There are two varieties, called by the collectors war bows and hunting bows, the former 4 feet long, the latter 3 feet 4 inches, about. They are all made of yew, a little over 1 inch wide and $\frac{1}{4}$ inch thick at the handle, expanding to $1\frac{3}{4}$ inches in width in the limbs, and contracting gracefully to about $\frac{3}{4}$ of an inch at the nock, which is about 1 inch long, less than $\frac{1}{2}$ inch wide, and bent at an angle of 45 degrees.

The back of this bow is covered with a lining of sinew so carefully put on as to mimic the bark of wood, its thickness exactly fitted to the exigencies of the work to be done. The sinew of the larger animals is carefully shredded (Fig. 86) and laid on with glue made from the lower jaw of the sturgeon, making a solid mass. The back of the wood bow is gashed so as to afford a good sticking surface for the glue and sinew.

The sinew is doubled over the nocks, whipped down with strips of buckskin, and tufted with a stripe of otter fur (Fig. 103b). The grip is also seized with a strip of buckskin and bound by two rings of otter fur. The bow-string is of two-ply sinew twine, $\frac{1}{12}$ inch thick. Lieutenant Ray thus describes bow and arrow making among the Natano and Kenuck Indians:

Manufacture of Bows and Arrows among the Natano (Hupa) and Kenuck (Klamath) Indians.—The bow-makers of both these tribes are specialists, and the trade is now confined to a very few old men. I have here seen no man under forty years of age that could make a bow or an arrow, and only one old man who could make a stone arrow-head.

To make a bow, the wood of a yew sapling $2\frac{1}{2}$ to 3 inches in diameter is selected and rough hewn to shape, the heart side inward and the back carefully smoothed to the form of the back of the bow. The sinew is laid on while the wood is green, and held in place until dry by means of a twine wrapping. In this condition it is hung in the sweat-house until the wood is thoroughly seasoned, when it is finished and strung, and in some cases the back varnished and painted. The most delicate part of the operation is to get the proper tension on the sinew backing. If too tight the wood crimps or splinters when the bow is strung, and a lack of proper tension leaves the bow weak and worthless. When the bow is seasoned it has a reverse curve of about 3 inches.

The sinew for the backing and bow-string is taken from the back and the hind leg of the deer at the time of killing, and dried for future use. When required it is soaked until pliable, stripped into fine shreds and laid on by commencing at each end and terminating at the center of the bow. The sinew is slightly twisted and dried before it is placed on the bow.

The glue used to fix the backing is obtained by boiling the gland of the lower jaw and the nose of the sturgeon. This is dried in balls and preserved for use, and is prepared by simply dipping it in warm water and rubbing it on the wood.

The arrow-shafts are usually made from the wood of the wild currant and are worked to shape with a knife and tried by the eye. After roughing they are allowed to season and are then finished. Any curves are taken out with a straightener, made of a piece of hard wood, spindle-shaped and perforated in the middle. The arrow-heads used for

war and for big game are usually made from flint and obsidian, and more recently of iron and steel. The flakes for the stone heads are knocked off by means of a pitching tool of deer antler. The stoneheads are made with a chipper composed of a crooked handle to which is lashed a short piece of antler precisely similar to those which I collected at Pt. Barrow. The work is held in the left hand on a pad and flaked off by pressure with the tool in the right hand in exactly the same manner as I found the Innuits doing in Northern Alaska.

The bows made by these people are effective for game up to 50 or 75 yards, and would inflict a serious wound at 100 yards. At 50 yards the arrows will penetrate a deer from five to ten inches. I never heard of one passing entirely through a deer. The elk-skin armor which I send to the Museum, Fig. 105, is proof against any arrow.

The eye is formed in the middle of the bow-string, by a running knot, the bow-string is then twisted, the right length measured off, and the noose formed by making a half hitch so as to bring the string in the middle of the belly side of the nock. The rest of the string is wrapped around the nock and fastened off by gluing and tucking.

The ornamentation of these bows is done in red and blue paint, the forms being chiefly the triangle omnipresent in the Hupa decorator's imagination.

I shall speak more fully of the development of the sinew back in a paper on savage archery now preparing, and will merely draw attention here to the perfect success which has been achieved in converting the breaking strain upon a brittle wood into the tensile strain upon the toughest fiber in the world.

Another point noticed by Mr. John Murdoch is the similarity of these bows to those of some Tinnéh tribes in the elliptical shape of the limbs. The Eskimo have in some localities this form in the sinew-backed bow.

For a quiver (Fig. 104) the Yurok takes the skin of a raccoon or martin, turns it wrong side out, sews it up, and suspends it behind him by a string passed over one shoulder and under the other, while the striped tail flutters gaily in the air at his shoulder.

In the animal's head he stuffs a quantity of moss, as a cushion for the arrow-heads to rest in, to prevent breakage.

The Hupas employ the skin of the coon, martin, deer, fox, and otter for making their quivers.

The Hupas and Klamath Indians no longer use the stone club of the meri or patoo pattern. The specimen described by Lieutenant Ray was found in a grave; it is made of chloritic schist, and measures 12 inches long. The old men informed Lieutenant Ray that they were in common use before the advent of the white man. The meri form occurs here and there in the new world, but never so graceful in outline, so beautifully polished, nor in such hard material as the typical weapon which reached its perfection in New Zealand.

The function of weapons belonging to this class in our day is the killing of large fish, like the halibut of the Pacific coast. The National Museum contains several fish-killing clubs, somewhat resembling this