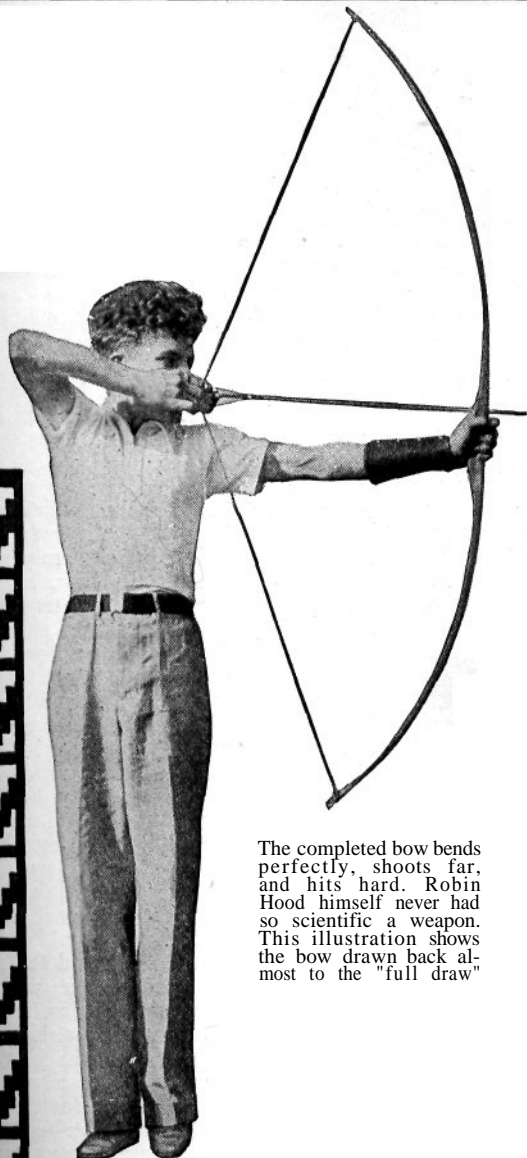


OUTDOOR SPORTS

Now you can shoot THE NEW American FLAT BOW



The completed bow bends perfectly, shoots far, and hits hard. Robin Hood himself never had so scientific a weapon. This illustration shows the bow drawn back almost to the "full draw"

Bows are among the oldest weapons in the world, yet an amazing thing was only recently discovered about them. Through mathematical analysis, laboratory investigation, high-speed photography, and painstaking field tests, it was found that the famous English long bow, after which practically all target bows are patterned, does not have the most efficient shape. Its beautifully rounded limbs are a delight to the eye, but the best cross section for a bow is something much simpler—just a plain rectangle. This discovery led to the development of the modern American flat bow, one easily made variety of which is described here.

WHEN the white man provided the American Indian with a cheap trade musket in place of his native bow and arrow, he saved himself a good deal of grief, for had the red man developed his weapon along a logical path he might have arrived at an approximation of the bow we now know as the "semi-Indian," "flat," or "American" bow. With such a bow he could have shot with accuracy at a hundred yards (about the extreme accurate range of the long rifle), and could have delivered arrows faster than any frontier scout could load his rifle.

Any home workman, equipped with ordinary tools, can readily build the most modern and most efficient bow yet designed. The best material for the amateur is the imported wood known as "lemonwood." It can be worked almost entirely by measurement, without much regard to the grain. California yew and Osage orange probably make a better bow, but not for the inexperienced builder.

Lemonwood can be had from most dealers in archery supplies, either in the rough stave or cut to approximate outline. The price ranges from about \$1.75 to \$3. In ordering you should be careful to say you need a wide stave for a flat bow.

The dimensions given are for a bow 5 ft. 8 in. long with a weight (the archer's term for the strength of a bow) of from 45 to 50 lb. at a draw of from 27 to 28 in. This combination is suitable for the average man. When new the bow will draw 5 lb. or more above these figures. For clearness, only the upper limb of the bow is shown on the drawings. The lower limb is similar but slightly stronger. It should be $\frac{7}{16}$ by $1\frac{1}{2}$ in. at a point $14\frac{1}{4}$ in. below the center line; $\frac{3}{8}$ by $\frac{3}{4}$ in. at a point $24\frac{3}{4}$ in. below the center; and $\frac{3}{8}$ by $\frac{9}{16}$ in. (instead of $\frac{3}{8}$ by $\frac{1}{2}$ in.) at a point 1 in. from the very end.

The stave, as it comes from the dealer, has been shellacked or varnished to prevent checking. Remove this coating from the back—the side away from the archer as the bow is held in position to shoot. Plane and sandpaper the wood just enough to provide a smooth surface. Stretch a fine piece of uninked copper wire tightly down the center line of the stave, mark dots at regular intervals, and connect the dots, using a long T-square or other straightedge and a sharp, hard pencil.

Lay out cross lines as shown on the drawing and mark the widths by dots. Connect these dots with straight lines, giving a rough idea of the back of the bow. Since the sharp shoulders and angles are unsightly, change them free-hand to graceful curves along one side, then trace paper templates in order to reproduce the curves on the opposite side.

With drawknife, spokeshave, and finally a pocketknife or scraper and garnet paper, work to the lines marked on the back, keeping the cuts at right angles to the surface of the back.

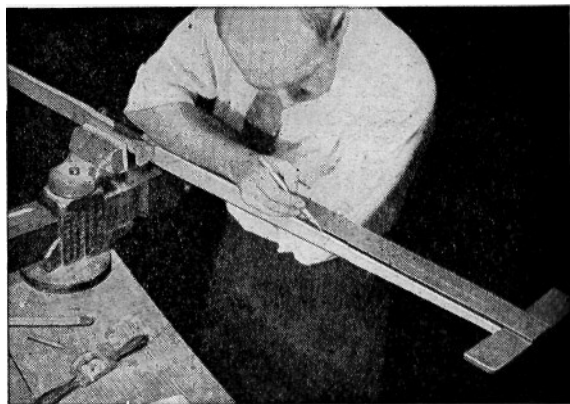
Run straight lines along the edges of the stave from the center

out to the tips to mark the thickness of the bow, following the dimensions on the drawing. Both edges of the stave should be marked. Now mark the profile of the riser at the grip, dipping it boldly into the run of the belly at each side of the handle. If the stave did not come with a piece glued on to form the handle, you will, of course, have to cut a suitable block of hardwood about 1/2 by 1 by 8 in. and glue it on.

Set the bow in the vise, belly up, and shave off the wood above the lines just drawn. For the deeper part of the cut near the tips, a drawknife may be used with caution; but nearer the handle where the cut is shallow, a spokeshave and small block plane are safer. When the bow has been worked to a rectangular cross section over its whole length, except at the riser, which is rounded, you are ready to test it for curve.

This work has probably consumed an evening, and you are obliged to lay the bow away until you have more spare time. Before you do so, rub the whole bow with shellac to prevent any possible checking or absorption of water.

You now need what is known as a "tiller" for testing the bow, as well as a temporary or working bowstring and a shooting tab for protecting the fingers. The tiller is a piece of scrap wood about 7/8 by 3 by 30 in., notched at 2- or 3-in. intervals as shown to catch the bowstring and notched at one end to fit over the handle of the bow. As the tiller may be used later on the finished handle, it is just as well to pad the end jaw with leather.



Using an old T-square to mark the lines showing the height of the belly of the bow. The vise is faced with removable wooden jaws

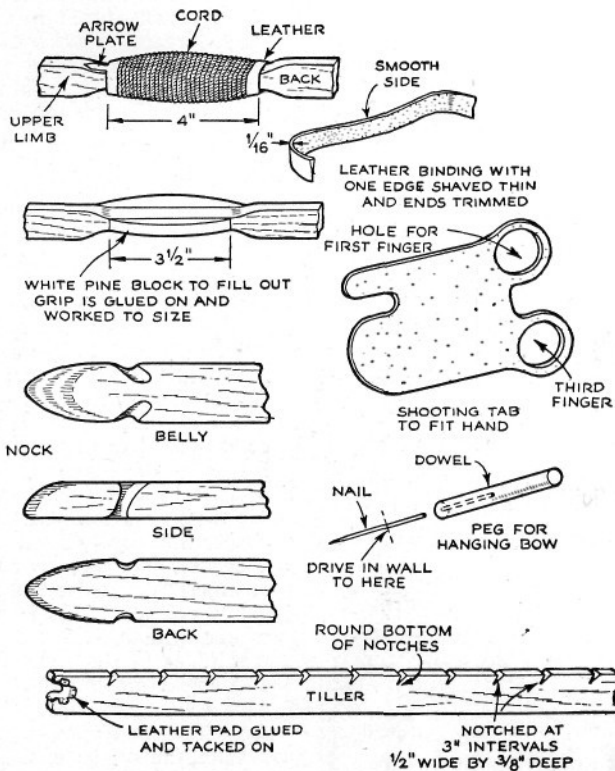
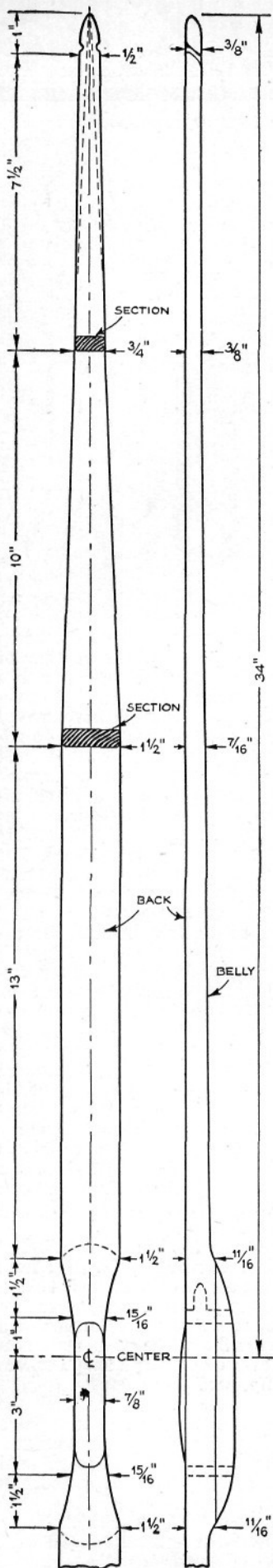
The tiller serves to hold the bow bent for inspection during construction and, as it will be used often, should be carefully and accurately made.

The string for tillering must be far stronger than the one ultimately used for shooting—at least 60 strands of No. 20 linen thread. Lay up twenty strands 18 in. longer than the bow, stretch them smoothly, and wax them together. Make two more sets and tie the three together. With the tied ends over a hook twist each of the three groups of thread individually to the right and have an assistant hold the twist in. Now take all three and lay them round each other to the left, as if making rope. The right-hand twist makes them grip one another and cling together. Put the string under tension and rub thoroughly with beeswax. Work it round and compact by rubbing with a small piece of leather held between the fingers. Tie a permanent loop (bowline) at one end and use a timber hitch to fasten the lower end to the bow.

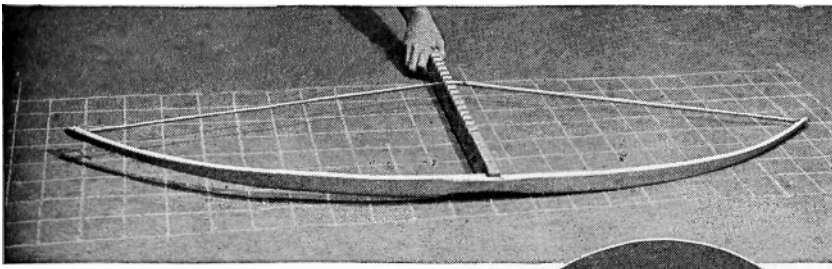
Later you will need a shooting string, and because a breaking string endangers not only the bow but the archer and bystanders as well, it is better for a beginner to buy a few strings. When one of these becomes frayed, take it apart, study the make-up, read a bit on the subject, and try to make one yourself. You will soon be able to produce a creditable string.

The notches at the ends of the bow, or "nocks" as an archer calls them, are best put in with a small round file. At the side, near the back, the nocks are half round, slanting across the side toward the grip and flaring slightly to give room for the string to change direction as the bow is drawn. They should not extend across the back of the bow as this would seriously weaken the bow tip.

Slip the loop down over the upper tip, draw the string down the bow, and fasten it at the lower nock with a timber hitch. Have the string about 3 in. shorter than the length of the bow, that is, measuring from nock to nock.



At left are the back and side views of the upper limb and handle of the flat bow. Above are sketches showing how the handle and nocks are finished and how a shooting tab, tiller, and peg are made



Testing the curve of the tillered bow on a grid-iron chalked on the floor. *In circle:* Using a spokeshave to cut the belly down to guide lines



Place the bow in the vise and have an assistant pull carefully on the lower tip while you pull the upper and slip the loop in place in the nock. Do not push on the limbs, for a breaking bow nearly always throws splinters forward with murderous force. The string is likely to stretch considerably, and you will have to adjust the timber hitch several times before you hold the bow bent to any great depth.

AS soon as you have a bend of some 5 or six in. in the bow, place the tiller on the handle and hold the bow, back down, on the floor, steadying it with your toes. Then pull the string up a few notches on the tiller with both hands. Have your assistant ready with a piece of chalk to mark any section which does not bend evenly, or the whole bow must contribute to the shot to obtain the utmost efficiency.

Let the bow down, unbrace it—that is, slip the loop out of the upper nock—and replace in the vise for scraping at the spots marked by the chalk. To make sure that the whole section is reduced evenly, rub the part to be scraped with soft pencil lead. By scraping the marks away, you remove a thin layer of wood and will not risk reducing one side more than the other.

Flat bows bend in a different arc than ordinary long bows—practically a perfect arc, slightly flattened in the center opposite the grip. So slight is this flattening that the radius of the curve of each limb should be the same as the length of the draw—in this case 28 in. If a template like that on the following page is laid on the floor and the bow worked down carefully until it fits neatly within the arcs, you are practically sure to produce a bow which will give flat trajectory, good distance, and little jar. Do not keep the bow at full draw more than a few seconds at a time.

Generally speaking, the bend should show first in the center of the limbs, then in toward the grip, and lastly in the third of the limbs nearest the tips. Allowing the tips to bend too early in the work weakens them excessively and produces what are known as "whip ends."

Finally the corners of the limbs are rounded slightly to lessen the danger of denting. Draw a line $1/16$ in. each side of the back corners and $3/32$ in. from the belly corners and round only to these lines. Sand with No. 6/0 garnet paper until fairly smooth and rub on a good coat of shellac.

The bow is now ready to shoot for the first time. Although it is not essential, a good practice in breaking in a new bow is to select arrows considerably heavier than those to be used later. If heavy arrows are available, use them for about 200 shots, as this works the bow down without permitting it to recoil too sharply. Bitch hunting arrows $3/8$ in. in diameter

are about the right weight for this purpose; otherwise use cheap birch target arrows. They can be obtained from archery dealers or sporting goods stores for so little that it hardly pays to attempt to make them. Besides the shooting tab to protect the fingers, an arm guard or "bracer" is needed to prevent the bowstring from bruising the left forearm. The conventional bracer is made of heavy leather, but a piece of fiber or thin, narrow strip of hardwood may be tied on to serve the purpose.

Now tiller the bow again. It will have lost weight and changed shape slightly, and will need further correction.

Glue on a thin piece of white pine to round out the back of the bow. Taper it in gracefully to meet the back of the bow, and round it into the sides. A serviceable grip is made by serving the bow with crab



line, chalk line, or braided trolling line. The total length of the grip should be about 4. in., the winding occupying $3/4$ in. of this space and the balance being covered by leather circlets. The upper circlet has a projection at the left of the bow; this serves as an arrow plate and prevents arrows from wearing the wood as they leave the bow. Use rather thick leather so it may be whittled away from the underside to a thickness equal to the string binding. The outer edge is trimmed to a feather edge and the ends thinned to make a neat joint; then the leather is dampened, glue coated, and bound in place with narrow strips of cloth until dry. As soon as the leather is dry, shellac the whole handle. The cord may then be painted as suits the bowyer's fancy, and another coat of shellac applied to protect the color.

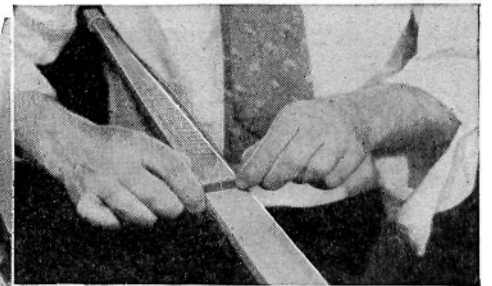
PLUSH, velvet, leather, and gimp braid are also used to pad handles, but cord affords a firm grip and is very durable.

Once the new bow has been well tested and has proved itself satisfactory it should be cleaned carefully. Remove all tool marks and thoroughly sand it with the finest garnet paper. Thin some white shellac about fifty percent with alcohol, turn a little on a soft, lintless cotton cloth, and rub the bow briskly until the shellac has dried and a surface begins to show. It will be necessary to work a short section at a time and to go over the whole bow several times to build up a shellac surface. Smooth lightly with very fine paper or steel wool and rub with furniture or piano polish until a dull gloss finish results. This method builds up a surface so thin that it will not crack with bending, yet thoroughly water resistant and beautiful to the eye. A bow carefully waxed and polished after each field day soon takes on a fine luster, and the surface becomes toughened.

If, after a month or so of regular shooting, the bow is found too strong for comfort, it can be reduced to suit.

So far as the making of various types of arrows, bowstrings, bracers, quivers, targets, and other archery tackle is concerned, there are several excellent handbooks and a variety of booklets that give detailed information.

Keep the bow unbraced when not in use. Hang it from a peg or lay it on a shelf or across a pair of pegs supporting the middle third of the bow. A good bow rack can be made by driving sharp-pointed finishing nails from which the heads have been



Slight reductions are made with the blade of a penknife or a steel scraper. The wood is first marked with soft pencil so no spots will be overlooked

Especial care and delicacy are required in trimming down the tips or ends of the limbs where the bow is narrow. The best safeguard is to test the bend frequently by using the tiller

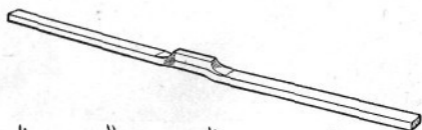
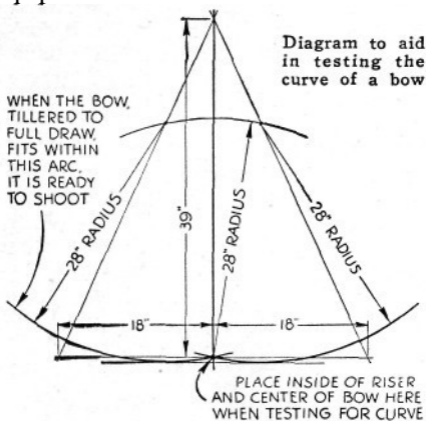


Wrapping the grip with crab line. The line is clove-hitched to a convenient nail or hook

clipped part way into a plaster wall and slipping over them dowels in which a hole has been bored. The holes in the dowels should be a close fit. If the nails are driven at a slight upward angle and the dowels are cut to fit the wall closely, the effect will be that of wooden pins set in the plaster. If the nails alone were used, the iron would corrode and leave unsightly marks on the bow.

A SHELF, too narrow to accumulate other impedimenta and with a raised edge, makes an excellent place to lay a bow. It can be provided with a backboard bearing pegs for hanging other tackle.

If you must keep your bow in a steam-heated apartment during the winter, place it in the coolest dry room. Hot, dry heat soon makes a bow brittle. When storing the bow, wrap it from end to end in a strip of woolen cloth, such as an old spiral legging before slipping it into a bow case. It should be inspected from time to time, warmed occasionally, and strung and bent at intervals during the off season. In short, it should have about the same consideration that you give your rifle or your golf equipment.



BOWLINE KNOT

TIMBER HITCH

A flat bow stave with handle riser glued on, as purchased from dealer; and the knots used at upper and lower ends of the bowstring