BUILD YOUR OWN OLD & MODERN CLASSICAL OR CONVENTIONAL, CARBINE OR PISTOL, SINGLE-SHOT OR REPEATING CROSSBOWS, PLUS BOWS & ARROWS & EXPLOSIVE & FRAG-GRENADE ARROWS & BOLTS

BY MAD ABE, EDITOR

Folks, the weapons´ll show you how to build now are based on a very old concept.

These weapons are called Crossbows.

But the one´s I´ll show you now are modern versions of those old classical weapons.

The starting point is that these weapons are legal anywhere in the whole World, do not need to use controlled materials or substances, don´t depend on commercial ammunition nor components, and you can build any or all of them for a fraction of the cost of a similar so effective weapon for combat, defense, hunting, fishing, or survival.

That is, these modern weapons are just that: WEAPONS.

They are really deadly weapons, and you must think of them as such, all the time – they are as deadly as any combat or big-game hunting rifle in use today.

These modern Crossbows can bring down any animal on the surface of Earth, or even the Oceans´ dwellers.

About how potent one of these modern Crossbows are, you can reproduce an experiment I´ve done years ago, and repeated several times along the past years.

Take a couple of ice blocks (or more ice blocks) that you can put one in front of the other over a flat surface, covering 1,2 m.(one meter and twenty centimeters) or 4' (four feet).
Place another group of identical ice-blocks at the side of the first one, a foot (30 cm.) apart.
You´ll need a full-power Rifle, like the WWII military ones, or the current sniper rifles (in such high-penetration calibers as 7.62x63mm/.30-06 Springfield, 7x57mm./7mm. Mauser, 7.92x57mm./8mm. Mauser, or 7.62x51mm NATO/.308 Winchester, using FMJ-Full Metal Jacket or better, AP-Armor Piercing rounds), and one of the carbine-sized Crossbows detailed below, with bolts with single-point steel-tipped heads, also called field-heads (not broadheads, the so-called hunting-heads).
Position yourself 15 meters (50 feet) in a good, solid bench (or be in prone position) to be sure you´ll shoot as straight as possible.
Shot one block with the Rifle.
With a Mauser 1908 in 7.62x51mm NATO caliber, using a full-power military-grade AP round, the bullet penetrated 57 cm.
Using the Crossbow (with a 150 lbs. steel prod) to shot the other ice-block, the bolt penetrated 87 cm.

Shooting against soft body-armor vests, a similar wooden bolt with an identical steel head penetrated both sides (from the front) of a Level III-A vest (33 layers of Kevlar 29 in each side), with a plastic bag with 20 Kg. of salted pork meat inside.

Similarly, it also penetrated cars windshields as well as the 7.62x51mm NATO rounds (much better than any 5.56x45mm NATO or 7.62x39mm Russian AP rounds), completely penetrated cars doors, and deflates tires faster than the 7.62x51mm NATO rounds (in reality, almost as instantly as a 12-gauge slug does).

Any big-game or dangerous animal in existence had one of it´s exemplars killed as fast as if the hunter used the most potent rifle for the species, and men have been killed both in war and peace with Crossbows.

And this is nothing yet…

There are plans to build a Pistol Crossbow (as potent as a Magnum handgun in penetration and killing capabilities) and a Repeating Crossbow, a home-defense or jungle-combat weapon that can bring down any foe, man or beast!

Dot not take my words as granted, build these Crossbows and go try for yourselves.

And have fun!

Mad Abe.

O PORTAL DA NOVA REVOLUÇÃO CULTURAL

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My Crossbow

Well, here it is. My crossbow. It is unfortunately far from authentic as medieval crossbows go. With the help of Master Iolo (through a guy named Ailean), I learned the manufacturer of the crossbow, but I have since forgotten it. I think it was made by some business in Texas or something.

The prod is aluminum, which greatly reduced the weight of the crossbow. Aluminum gets stress cracks after a lot of use,

so it isn't the best material for a prod. Plus, it is attached to the tiller with a nut and washer, which puts a lot of unnecessary stress on the prod. Of course, I don't use it much, nor will I ever use it much (in all likelihood), so I guess it's not that big of a deal. The string is a piece of 800 pound (I think) cable.

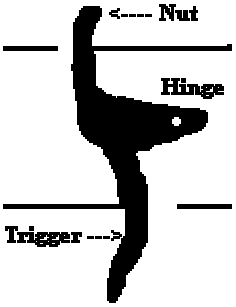
The tiller is some sort of pine. It is made more like a rifle stock, so it is certainly not in the medieval style. The trigger is also like a rifle trigger and is equally unlike a medieval style trigger. Although I have not taken it apart to inspect the mechanism, I believe that the trigger mechanism is a simple lever system. It seems that the trigger and the nut is one piece hinged on an arm protruding to the rear of the crossbow. This crude diagram is how I believe the trigger/nut mechanism is designed on my crossbow.

I have only shot my crossbow on three occasions. On the first two occasions I was using a paper plate attached to a hay bale as a target. At 30 meters, the crossbow was moderately accurate. The bolts regularly sunk into the hay bale 30 cm (12 inches) or more at that distance. A few times, the entire length of the bolts sunk into the hay bale (45 cm or 18 inches). I took the crossbow to a sporting goods store with an draw weight scale, and it maxed out their 100 pound scale. My guess is that the draw weight is approximately 125 pounds (that was their guess too).

The third time I shot my crossbow was at an archery range. (I got a lot of looks from the other archers, I believe in amazement that I was actually shooting such a beast.) In a short time, I was able to shoot quite accurately at 40 meters. The difficulty came in being forced to aim through the tiller of the crossbow. My aiming point was actually the top of the butt (target) in order to hit the yellow. Shooting at 60 meters proved to be too much for the crossbow. There was no hope for accuracy. In this respect, the bolts being used likely have much to do with the problem. The fletching of my bolts is made of a rubberized material. The cock feather travels down a groove on the tiller. The cock fletching on my bolts have become warped due to the friction of traveling down the grove, yielding unstable flight.

Since the lathe of my crossbow seems to be a bit longer than a hand-spanned medieval crossbow, it should be more

efficient, and is thus probably equal in strength to a 200 pound medieval crossbow. I do not no the difference in the
elastic modulus of my aluminum prod and the composite or steel prods of medieval crossbows though, so perhaps
my crossbow is less efficient after-all.



I guess that's about it. I'll add more as I think of it.

NEWS FLASH!!!

Someone who found this page made a crossbow exactly like the one that I have. He was kind enough to give me
some new information on it, which follows:

"I saw your crossbow page for the first time today. It brought back lots of memories for me. I have an identical
crossbow with a walnut stock.

"I built it from a kit in high school shop class. That was about 1982. The kit was about $30. I spent about a month
making and finishing the stock. I used to have a fishing kit for it. Shot a couple carp with it in the local resevoir.

"The catalog draw weight was 150lbs, but that could be changed by adjusting the size of the stock. 125 lbs for yours
sounds very reasonable.

"The only drawback to the kit was the bolts that came with it. The nocks were plastic and were standard arrow
nocks. The cable had a spring wrapped around it, to reduce friction when firing. This spring was to big to fit in the
nocks and you would split them almost immediately.

"I really enjoyed your page. I just thought you might appreciate some background info from someone with a

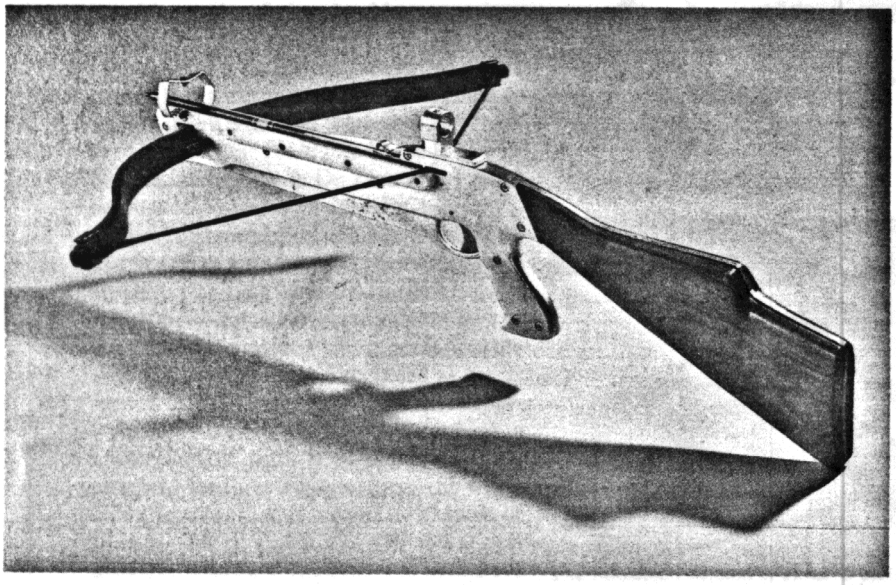
similiar crossbow

"Don . . ."

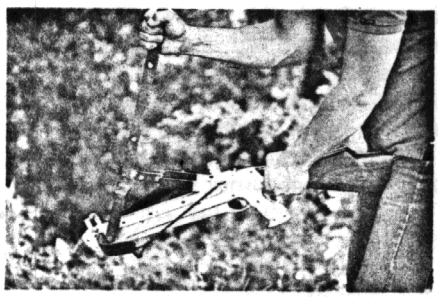
Thanks for the info Don! I really appreciate it.

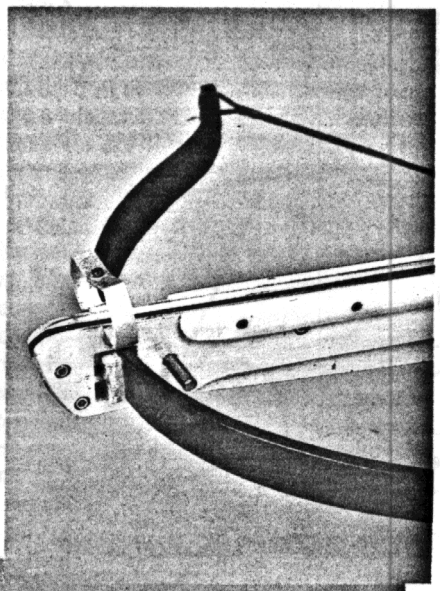
It was the "hot setup" during the Crusades . . . and it's going through a new revolution today.

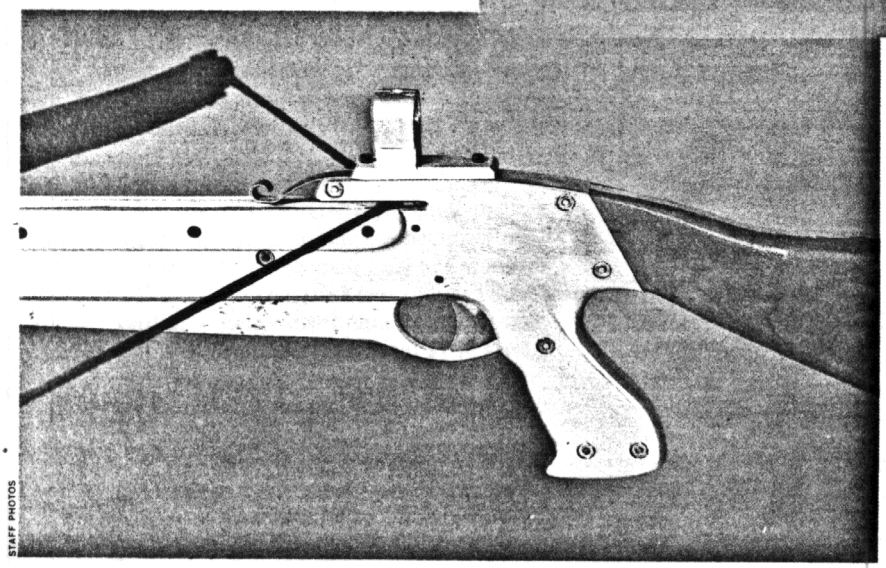
The Classic Crossbow: You Can Build



ABOVE: Our fieldpiece looks—and functions—like many of the more expensive manufactured crossbows. RIGHT: The front sight is a strap of aluminum fitted with a bead. The steel cocking rod gives the cocking lever (BELOW) a forward mount when the string is being drawn. FAR BELOW: This prototype has no trigger safety, but one can be added.







STAFF PHOTOS

An archer might consider it kin to a firearm . . . a shooter, on the other hand, most likely would think it a stock-mounted bow . . . and you wouldn't need a poll to know the general public's feeling: It looks sinister enough to be a lethal weapon!

In short, there's not much doubt that the modern crossbow suffers an "identity crisis," but—regardless of the mystery that still surrounds this curious hybrid—it's been gaining in popularity among hunters and targeteers alike . . . and that trend hasn't gone unnoticed here at MOTHER.

With several avid bowhunters on the staff, and a research department eager to take on such an interesting challenge, it wasn't *too* difficult to get the ball rolling on a project that we figured might be a first in the field: designing and building a quality crossbow from scratch . . . testing its range, accuracy, and overall effectiveness . . . and then comparing its performance to that of traditional recurve and compound bows.

A QUICK ANALYSIS

The contemporary crossbow shares little beyond a basic design with its forebear, the medieval arbalest. Though both launch arrows (bolts) by means of a short bow transversely fixed to a stock, the superiority of modern materials—along with the improved geometry made possible by the use of such lightweight plastics, alloys, and composites—has turned what was a crude but effective weapon of war into an admirable piece of fairly uncomplicated technology.

Over the past few years, crossbow design has received considerable attention from various manufacturers, with the result that the old standard has been modified to run the gamut from a paramilitary-looking assault piece to an artistic expression of classical physics. And although these developments represent improvement in most cases, they're beyond the ability of all but the best-equipped crafts people to duplicate.

We chose the path of least resistance and used the simplest common denominators in our design. The stock of our crossbow consists of a center spine covered on each side by a strengthening flank. As a bolted-together unit, this flat-aluminum assembly serves as a combination barrel (or *chase* in crossbow terminology), trigger housing, handgrip, and shoulder extension.

The bow, or prod, is set into the nose of the forestock, and the two-piece trigger mechanism, cut from 1/4" plate steel, is pinned between the right and left flank pieces just below the receiver. Walnut stock inserts were trimmed and shaped to mate with the stock

Your Own!

on either side of the shoulder extension.

Since the string does contact the barrel and is thus subject to friction, we added a pair of shoulder slides to the sides of the chase to reduce string wear and increase bolt velocity. Though these could also be made of walnut, we used Delrin (a Du Pont acetal resin) because it possesses an inherent lubricity.

Our crossbow's open sights consist simply of a front frame made of aluminum strap, and an alloy rear ring mounted to the receiver. Socket-head cap screws threaded into each of these brackets provide sighting beads, and the rear unit can be lowered or raised as necessary to zero the piece in at a specific range.

As far as we've been able to determine, a telescopic rifle sight is inappropriate on a crossbow for three reasons. First, the weapon's effective range is limited to 50 yards or so in all but an expert's hands, and at that distance, beads and the practiced naked eye should be sufficient. Second, a fired bolt's trajectory is such that, beyond 15 or more yards, its drop is enough to lower the point of impact many inches from the line of sight (see sidebar) . . . and since most scopes are calibrated for rifles, the range of adjustment may be restrictive or the zeroing-in process tedious. Finally, a scope narrows the field of view and adds weight as well.

You've probably already noticed that our photos show two different crossbows. The first, detailed in this article, is a functional, no-gadget rendition that's not overly complicated to assemble, which should serve as a fine fieldpiece or target piece. The second is a multiuse version that has some interesting features, but for the most part it's best suited to range shooting or backyard "plinking." It sports a folding front handgrip, a removable shoulder stock extension (which allows the long arm to convert to a hand piece), and —no doubt the most practical feature of all—a positive trigger safety. (This last item, by the way, can be added to our standard crossbow if desired.)

PIECE BY PIECE

You might be interested to know that we spent about $102 making our fieldpiece; that breaks down to approximately $14 worth of 1/4" aluminum flat stock (available at a scrapyard or a metals distributor); $8 in Delrin; $6 for the walnut billets; about $7 in assorted bolts, pins, and other minor hardware; and—here's the kicker—$67 worth of prod and Dacron bowstring.

Admittedly, it would have been nice if we'd been able to construct our own short bow by using common materials . . . and believe us,

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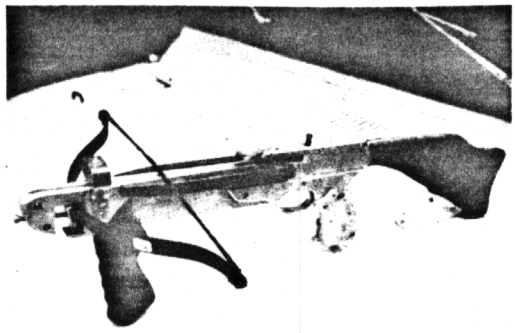
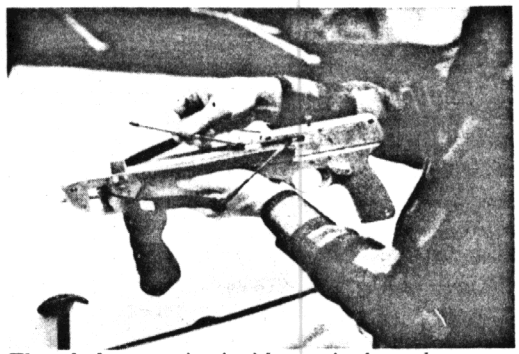
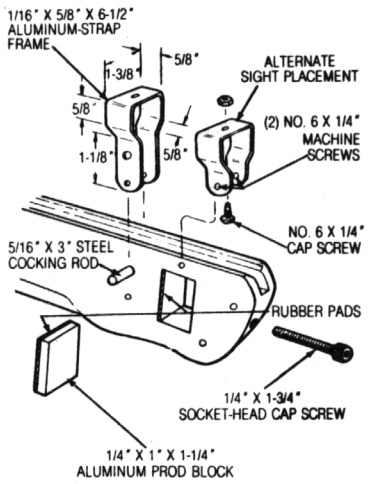




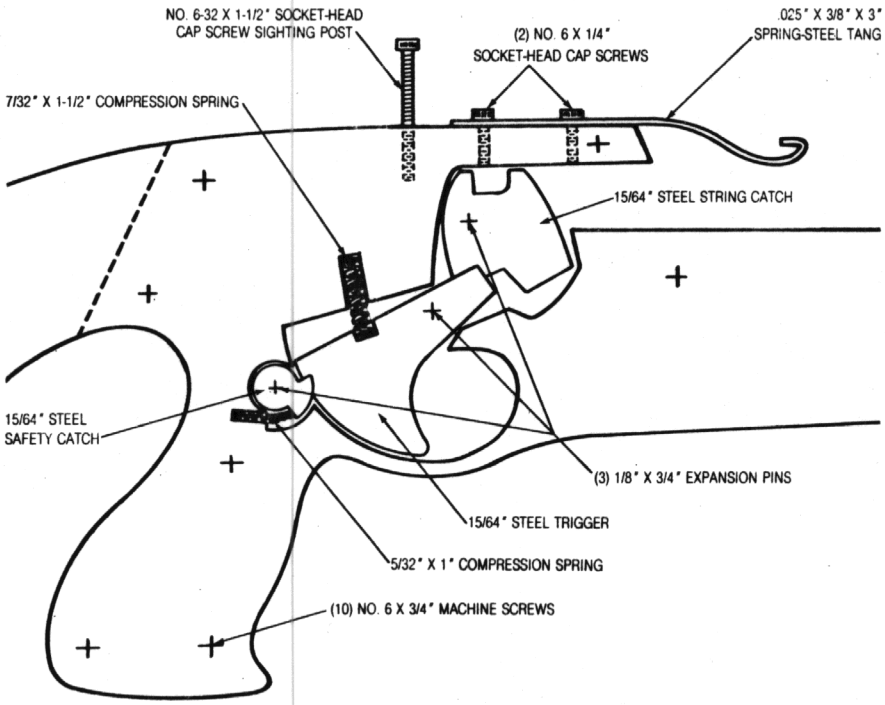
The takedown version is either a pistol or a long arm.

NOTE: Though we did build and test both of our crossbows, the potential for injury from any weapon is enough to compel us to say that whoever builds and uses this tool does so at his or her own risk.

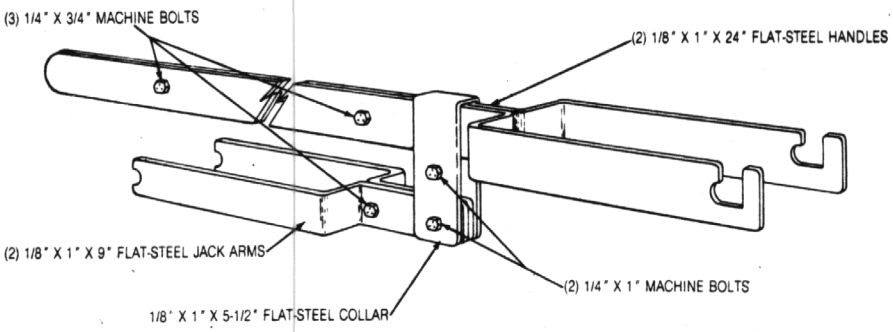
NOSE DETAIL



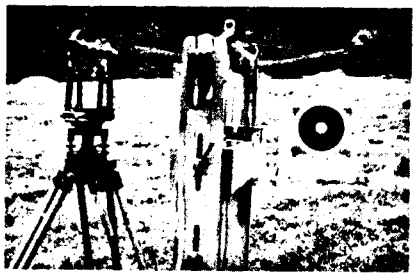
TRIGGER AND SAFETY DETAIL



COCKING LEVER



The Crossbow: Fact and Fiction



Just how effective is a crossbow? To answer that question, several of MOTHER's staffers took to the field with our project prototype equipped with a 175-pound prod . . . the smaller takedown model with a 75-pound draw weight . . . a $449 Barnett Commando (a quality commercial crossbow) rated at 175 pounds . . . a recurve bow rated at 54 pounds, full (30") draw . . . and a 70-pound compound bow. We were interested in each weapon's range, accuracy, and penetrating power . . . but, ultimately, we were searching for the crossbow's proper niche in the order of things.

Now we weren't interested in testing head-to-head with the Barnett offering, and we couldn't fairly pit a hand-held bow against a brace-mounted crossbow. So what we did was make a series of test firings with our standard model at distances of 10, 20, 30, 40, and 50 measured yards. Each group consisted of five shots with the same 24.94-gram overall (126.3-grain field point) Easton 14" aluminum bolt, and the resulting patterns then were measured and recorded. The crossbow was mounted and leveled in a sturdy brace, and a surveyor's transit was used to establish a direct line of sight to a given point on the target. The deviation of the points of impact from the sighting point was also noted. Wind conditions were fairly calm throughout the test.

The chart below encapsulates our findings. As you can see, the homemade crossbow held a respectable pattern, even out to 50 yards. (We suspect it would do the same beyond that point, but that's considered expert's range.) At that distance, drop was considerable (i.e., the weapon's barrel would have to be elevated in order to hit a target in a level line of sight) . . . but the same situation existed in the case of the more traditional hand-held bows.

Penetration was never a problem with any of the weapons we tested, since all the shafts buried themselves—some to the fletching—in the 12" of extruded polystyrene we used for a target backing. Considering the difference in draw weights between the traditional bows and the crossbows (and accounting for the standard arrows' additional mass), we could infer that prod strengths of more than 125 pounds amount to overkill; the extra power probably offers little, but taxes strings, bolts, and cocking convenience heavily. However, an understrength prod would be even less desirable unless it was matched with a short, light bolt. Our takedown pistol model uses a 75-pound prod and a 6" aluminum bolt, and has a power stroke of 6-1/4" compared to the larger weapon's 8-1/2" . . . fine for target shooting, but not really useful for hunting.

Regardless of draw weight, string life can be extended and bolt velocity increased slightly by applying a lubricative wax to the string and the barrel's shoulder slides.

In summary, much as we hate to burst a romantic balloon, we'll have to concede to the facts: Although a crossbow has the advantages of compactness and mechanical cocking and locking (it can be held at full draw without strain on the user), it is really no more accurate than a conventional bow in proficient hands . . . can't be loaded and fired as quickly . . . and doesn't even approach *the overall effectiveness of a rifle. Nonetheless, it's a valid sporting tool that's slowly but surely coming into its own once again.*

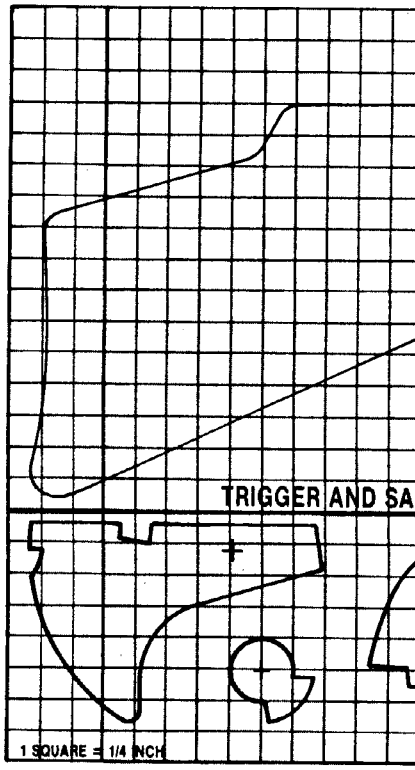
FIELD TEST RESULTS

MODEL TESTED: Homemade, aluminum frame; walnut inserts; Delrin shoulder slides
PROD: Barnett Commando, heat/pressure-cured fiberglass, 175-pound draw
WEIGHT: 6 pounds, 5-1/2 ounces

OVERALL LENGTH: 31"
OVERALL WIDTH: 26"
POWER STROKE: 8-1/2"
SIGHTS: Open, adjustable rear post
BOLT: Easton, 14" aluminum, 24.94 grams overall including 126.3-grain fieldpoint

RANGE	AVERAGE DROP	AVERAGE WINDAGE ERROR	PATTERN	NOTES
10 yds.	+1"	1/2"	3/4"	full penetration
*14 yds.	0	——	——	zero trajectory point
20 yds.	11-1/4"	3-3/4"	5"	tight pattern
30 yds.	30"	6"	9-1/2"	bolt wobble
†30 yds.	21-1/2"	4-1/2"	8"	less bolt wobble
40 yds.	50-3/4"	8-1/4"	6-3/4"	pattern improved
50 yds.	83"	6-1/2"	6"	more pattern improvement; excellent penetration

* Zero trajectory point † Barnett Commando comparison



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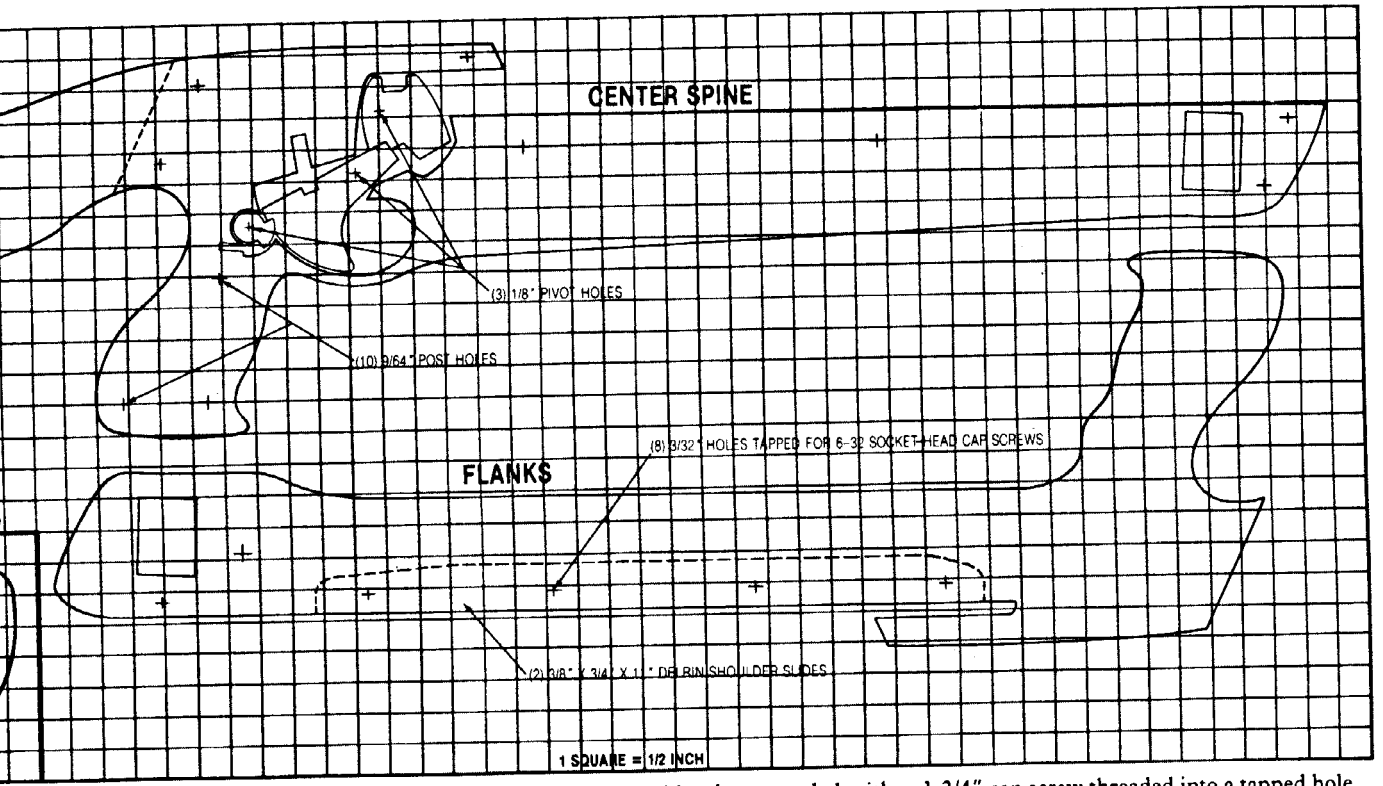
we tried! But the laminated fiberglass prods we laid up just didn't have adequate draw strength or the resiliency to stand up to repeated use, possibly because we weren't able to duplicate the heat-and-pressure curing process used by commercial manufacturers.

At any rate, we were pleased to learn that Barnett International (1967 Gunn Hwy., P.O. Box 934, Odessa, FL 33556) will sell prods, strings, bolts, and other accessories to anyone who orders the company's $2.00 postpaid catalog.

To ease construction, we've outlined the crossbow's major parts and drilling points within a grid, which will allow you to make up-scaled templates for the metal pieces. But play it safe by matching the templates perfectly *before* taping them to the metal and scribing their outline . . . and be even more careful when actually cutting the aluminum stock, since [1] the pieces must join closely, or you'll be spending a lot of time with the file, and [2] the center spine's weak spot—the trigger guard—should not be *any* thinner than 7/32".

The best way to trim the parts accurately, by the way, is to use a band saw equipped with a metal-cutting blade. Because the smooth operation of the trigger and string catch depends in great measure upon the perfect alignment of the three stock components, we suggest that you postpone drilling the flank pieces until you've bored the 9/64" post holes according to the center points indicated on the template. Once those sockets are complete, clamp the aluminum center spine to one of the flanks and recheck the alignment, using the template cutout from the trigger housing. Then drill corresponding holes in the one flank piece.



With that done, use No. 6 X 3/4" machine screws as temporary locating pins for the two bored components, and clamp the second flank piece in place. When you're satisfied that all three parts are evenly mated, drill the final member. Since the post screws are recessed, you'll need to countersink the exterior openings with larger bits according to the design of the screws and nuts you've chosen.

The steel trigger components have to be thinned by 1/64" in order to allow them freedom of movement within the stock. Once this is done, those parts can be drilled where indicated with a 1/8" bit, and the 1/8" X 3/4" expansion pin pivots can be pressed in and centered. The pivot pins ride in 9/64" sockets drilled into the right and left flank pieces; to be on the safe side, you might want to use the trigger-housing template cutout to position those openings accurately.

As we mentioned before, you can install a trigger safety mechanism according to our detail. Both the trigger and the safety catch are returned by small compression springs set into slots cut through the central spine.

Before assembling the stock for good, you'll want to bevel the inner surfaces of the barrel, and round the entire frame's outer edges. The rough work can be done with a grinder or file, and the metal then can be smoothed with emery cloth. Save the final extra-fine polishing for later, after you've bolted and pinned everything together and completed the cosmetic work.

The next portion of the project includes setting the bolt tang (the spring-steel leaf that holds the projectile snug against the barrel), adding the wooden (or Delrin) slides to the flanks, and cutting, shaping, and fastening the walnut inserts that dress the shoulder extension. (These pieces can be cut to shape using the template as a guide, then rounded with a sander and bolted or glued to the aluminum spine prior to being finished with varnish or tung oil.)

The front sight is a piece of 1/16" X 5/8" X 6-1/2" strap aluminum bent into an open frame configuration so the bolt can pass through it. It's fastened to the top of the forestock with two No. 6 X 1/4" machine screws, and a short cap screw locked through its crown serves as a bead. Though we used a machined ring at the rear (to provide a housing for an experimental scope sight), you can make an excellent sighting post by simply drilling and tapping a hole at the top of the receiver to accept a 6-32 socket-head cap screw about 1-1/2" in length. This can then be adjusted up or down for sighting.

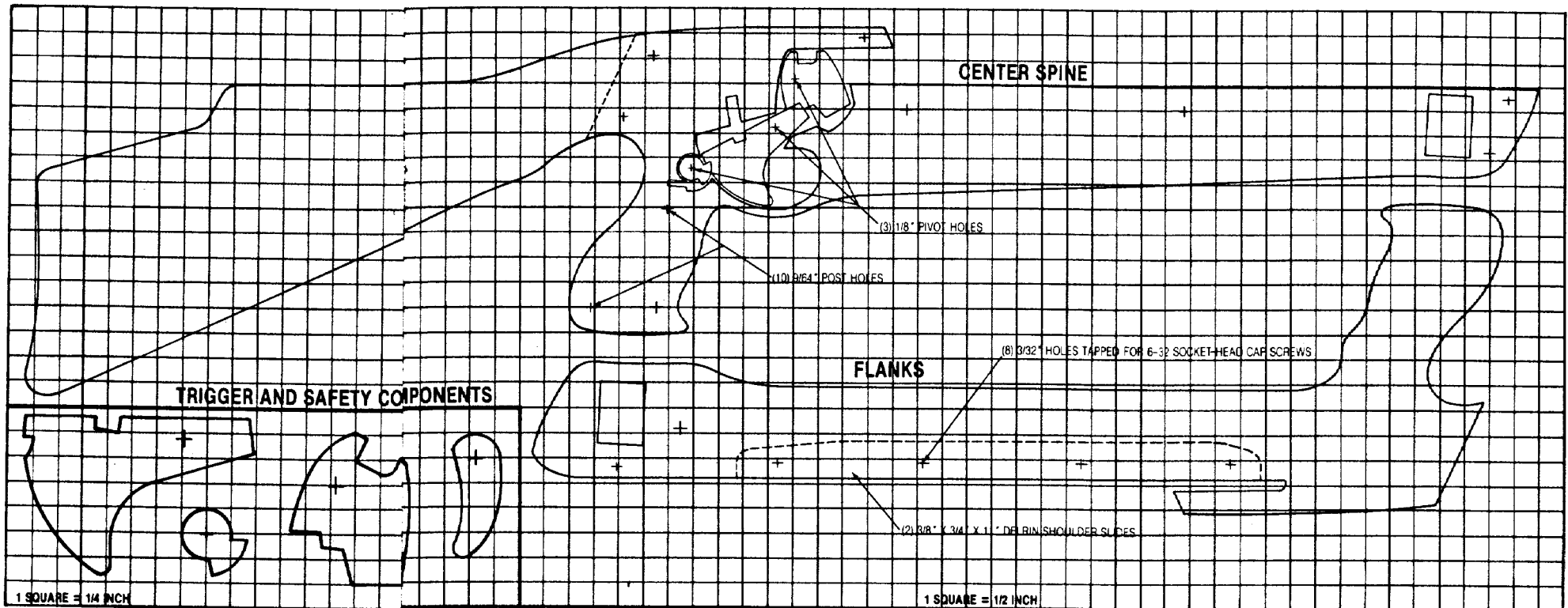
We ordered a prod with a draw strength of 175 pounds . . . but even if you choose a lighter bow to lengthen string life, you'll probably need a cocking lever to pull it into position. You can make one by bending four sections of 1/8" X 1" flat metal to create a two-armed, bolt-together yoke that uses mechanical advantage to ease cocking (see illustration). A pair of slots in the stationary part of the lever hook into a 5/16" X 3" steel rod fitted into the crossbow's forestock (this should be located as indicated on the template and pressed in place before you install the prod), and another set of slots cut into the short "jack arms" catch the string. The fulcrum's just a movable collar that can be locked into the optimal position.

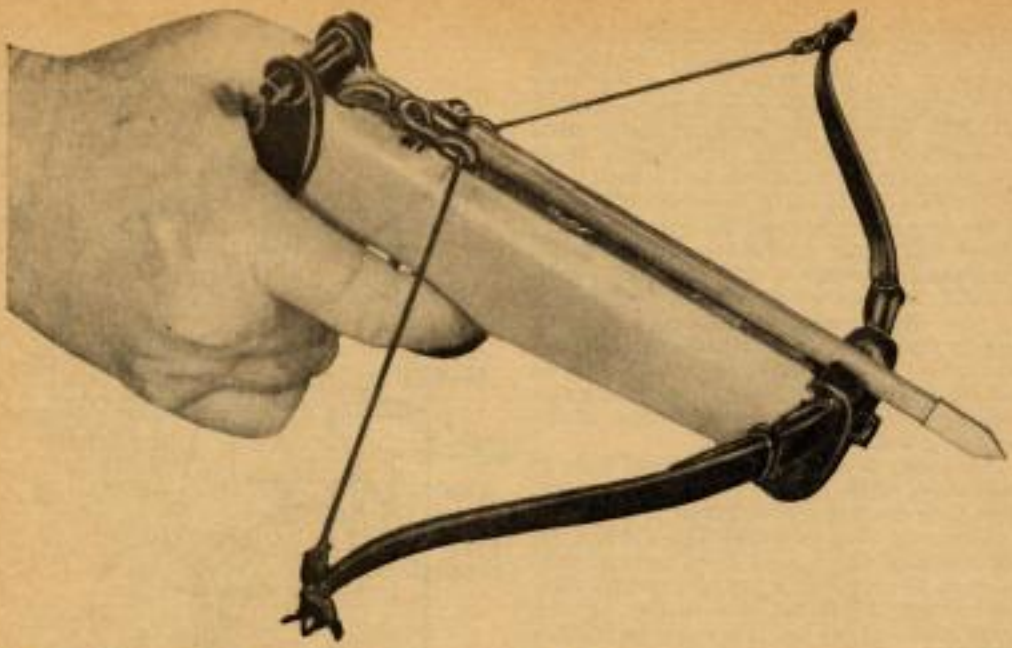
The prod is held in place by a 1/4" X 1" X 1-1/4" block of aluminum faced with a strip of hard rubber. A similar pad, glued to the rear of the prod socket, provides additional cushioning, and the metal block is forced tightly against the bow's face by a 1/4" X 1-3/4" cap screw threaded into a tapped hole at the nose of the stock.

Once the prod's installed, you'll have the pleasure of stringing it. Unless you're extraordinarily muscular, we'd suggest you purchase what's called a *bastard* string along with the regular Dacron cable. This set of strands is longer than the service string and thus can be slipped onto the prod more easily. It's then used to draw the bow's ears back to the cocked position so the real string can be looped in place. When that's done, both strings can be released with the trigger and the bastard removed. This is the *only* situation in which the crossbow should be "dry fired," since that practice can split the prod.

It should be quite obvious that your finished project has a lethal potential and should be handled with the same caution that you'd give to any longbow or firearm. Don't load it until you're ready to fire it, and don't fire it without an adequate field behind your target to safely absorb any overshots. Too, if you're interested in exploring the crossbow's capabilities for hunting, check your state's game laws before you build . . . it could save a lot of disappointment later. Meanwhile, you might want to look over the sidebar accompanying this article to see what kind of results you could expect from your modern-day arbalest!

EDITOR'S NOTE: If you're interested in making the crosbow featured here (or the smaller takedown version) but would prefer detailed, step-by-step instructions, a set of building plans—complete with full-size cutting templates—is available at a cost of $10 plus $1.00 for shipping and handling from Mother's Plans, Crossbows, P.O. Box A, East Flat Rock, NC 28726. ●


CENTER SPINE
(3) 1/8" PIVOT HOLES
(10) 9/64" POST HOLES
FLANKS
(8) 3/32" HOLES TAPPED FOR 6-32 SOCKET-HEAD CAP SCREWS
(2) 3/8" X 3/4" X 1" DELRIN SHOULDER SLIDES
TRIGGER AND SAFETY COMPONENTS
1 SQUARE = 1/4 INCH
1 SQUARE = 1/2 INCH



Make This Powerful
PISTOL CROSSBOW

By EDWIN LOVE

YOU'LL create quite a sensation at your next archery meet when you start banging away at the target with bolts from your own hand-crafted pistol crossbow. In fact, everyone will want to try his skill at shooting this rare one-of-a kind weapon. This is no toy, either, and should be treated with the same respect due any weapon. For the wallop this baby packs makes it capable of driving a 6-in. bolt through a bull's-eye at 150 ft. Its power is stored in a spring-steel bow which requires a special cocking device ("goat's foot") to provide the leverage necessary to draw back the bowstring and set it in the notched wheel of the weapon's trigger mechanism.

Your First Step in making the crossbow is to draw a 5½ x 9-in. grid of ½-in. squares on paper. Then copy the outline of the pistol stock (side view, Fig. 3) using the ½-in. squares to enlarge it. Also copy the outline of the cocking side plate and trigger guard. Use carbon paper to transfer the pistol-stock drawing to 1¼-in.-thick maple or walnut stock. After sawing the stock to shape drill a ½-in. hole up through the center of the pistol grip and then insert a ½-in. dowel, gluing it in place. This will prevent the grip from splitting with the grain.

Make the Two Cocking Plates by first transfering your full-size drawing of each to ⅛-in.-thick steel. A series of prick-punch marks spaced about ⅛ in. apart along the outline will serve as a dotted guide line to follow when cutting the steel. The latter is done by using a jigsaw or hand coping saw fitted with a fine-tooth metal-cutting blade. (In a pinch you can rough-cut these parts to size with a cold chisel, then file and grind them to the correct dimensions.) Now clamp the two plates together and drill the holes for the rivets—made from the shanks of 16d (3½-in.) common nails. Countersink these holes so that the rivets set flush.

Next rough-file down each side of the stock grip to a thickness of 1⅛ in. Clamp the cocking plates to the sides of the grip so that they are positioned as shown in Fig. 3 and drill rivet holes through the grip. Then mark the grip for mortising the plates into it by tracing around the plates with a sharp pencil. Remove the plates and cut around the mortise edge with a gouge or narrow chisel making it slightly undersize. Make several cut lines across the grain to break up chips and

establish the ⅛-in. depth of the mortise. Hollow out the mortise by hand chiseling or with a router bit in a drill press. Replace the plates and hammer-tap them into the mortise edges so that an imprint is left; after trimming to this imprint the plates will fit snugly. Before replacing the plates, work the grip down to its rounded form with chisel and rasp. To aid in forming it symmetrically, make a couple of cardboard templates (Fig. 3B) to check the roundness of the grip. Fair off the grip toward the top and round the corners of the stock.

Mortising for the Trigger Mechanism can be done now or after the plates are riveted to the grip. In either case lay out the size of the mortise on top of the stock and bore it out, starting with the end holes and working toward the center with holes overlapping (Fig. 3C). Set the drill-press depth gauge to avoid boring too deeply. Chisel the sides of the mortise smooth and square the ends.

Before attaching the cocking plates grind them roughly to the contour of the grip. Then force them into the mortises, push the nails

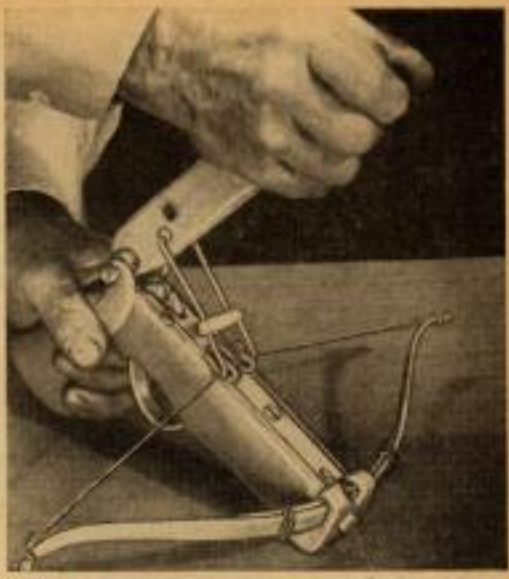
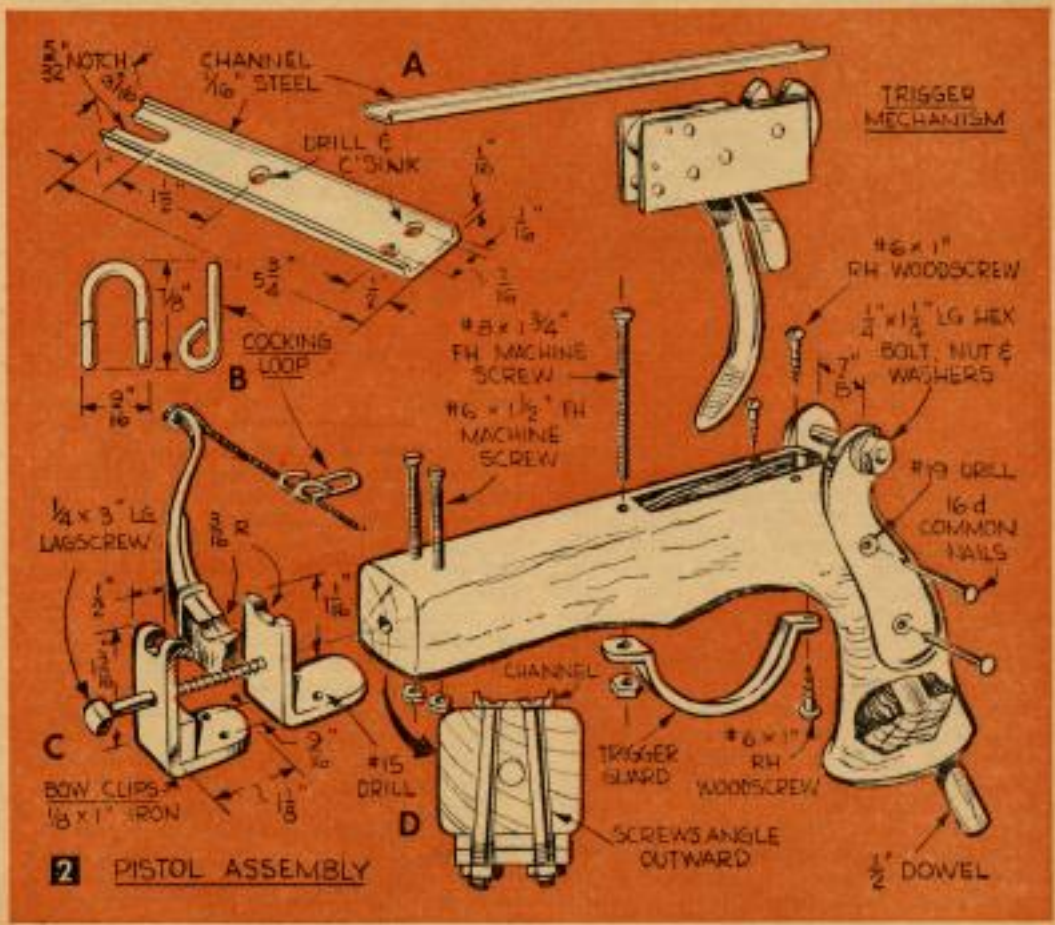
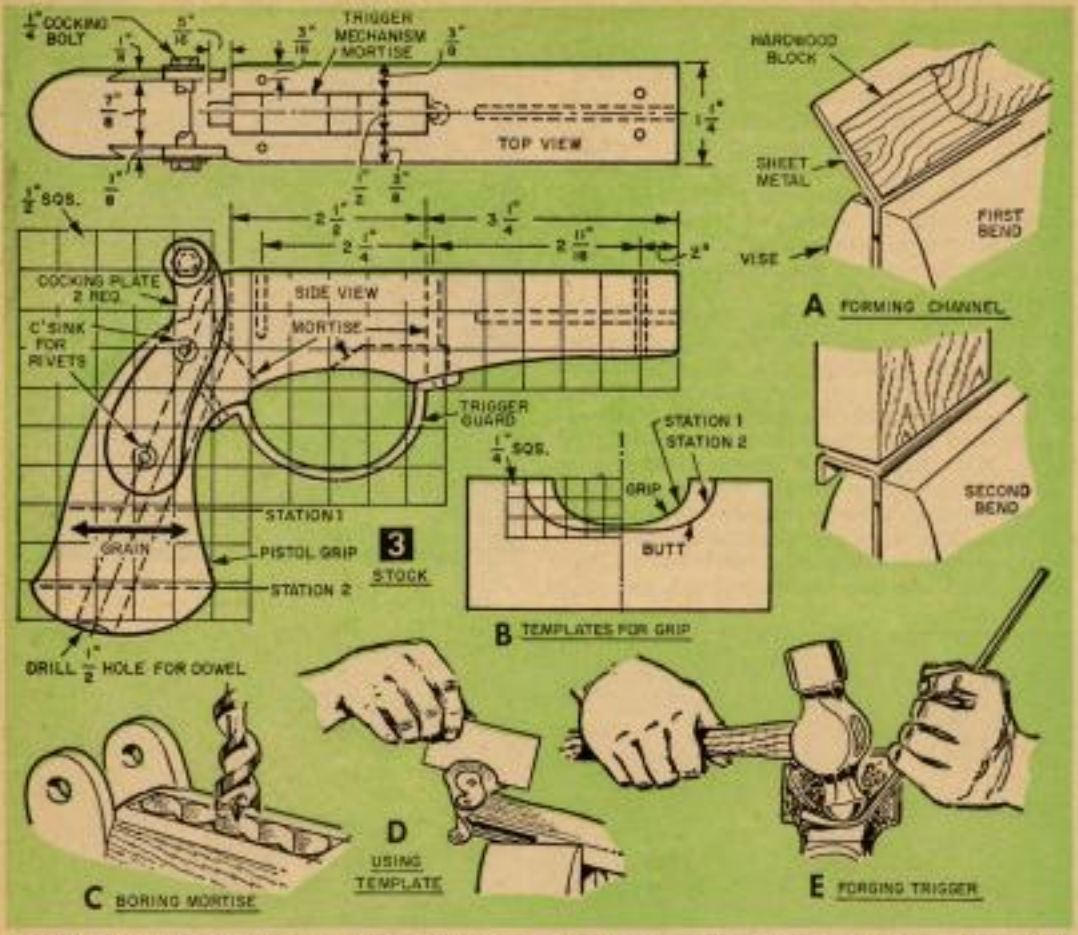


Fig. 1. "Goat's foot" cocks crossbow—hooks to channel sides, draws back bowstring, sets it in wheel.





through and cut them to length for riveting. By the way, the nails can be softened for easier riveting by heating the ends red hot with a torch and allowing them to cool slowly. Now rest the pistol grip on the vise anvil, nail heads down, and rivet the cut ends. Turn the stock over then and hammer the nail heads into the countersunk holes. Finish by filing the rivets flush with the plates.

The Trigger Mechanism Itself is started by first making the notched wheel and detent, following the same procedure used when making the cocking plates (note that these parts are shown full size in Fig. 5). Forge the trigger from a $\frac{5}{16}$-in. round steel rod by heating it red hot and hammering it to shape. Flatten the upper part and shape the trigger section with a ball peen hammer (Fig. 3E). Cut, clamp together and drill the holes through both side plates. The plate drawing (Fig. 5) is full size so just paste it on the plate and centerpunch the hole locations. Be sure to pair and countersink the plates on the outsides so that the pivot post ends can be riveted flush on the outside after assembly.

Make pivot posts from nails, shouldering them on a metal-turning lathe (Fig 10). Lacking a lathe you can do this work on a drill press by gripping the nails in a chuck and filing the ends down to fit the plate holes. Use a file having smooth or safe edges to make the shoulders square and sharp.

Here's How the Trigger Mechanism Works: The slot in the notched wheel is held in position for accepting the bowstring loop by a small helical spring beneath the wheel and anchored to the left plate with a screw (Fig. 9). The flat spring which holds down the detent is bent from a hair curler. The detent locks the wheel against the pull of the cocked bowstring. The lower end of the detent, pressing against the back of the trigger, holds the trigger against its stop. When pulled, the trigger pushes back the detent, the detent releases the wheel and the bowstring springs forward and fires the bolt.

When assembling the trigger mechanism, first rivet the pivot posts to one side plate. Then add washers, working parts and upper washers. Before riveting the second side plate, test the action by pressing the wheel forward with your fingers until it stops,

checking to see if the wheel releases when the trigger is pulled.

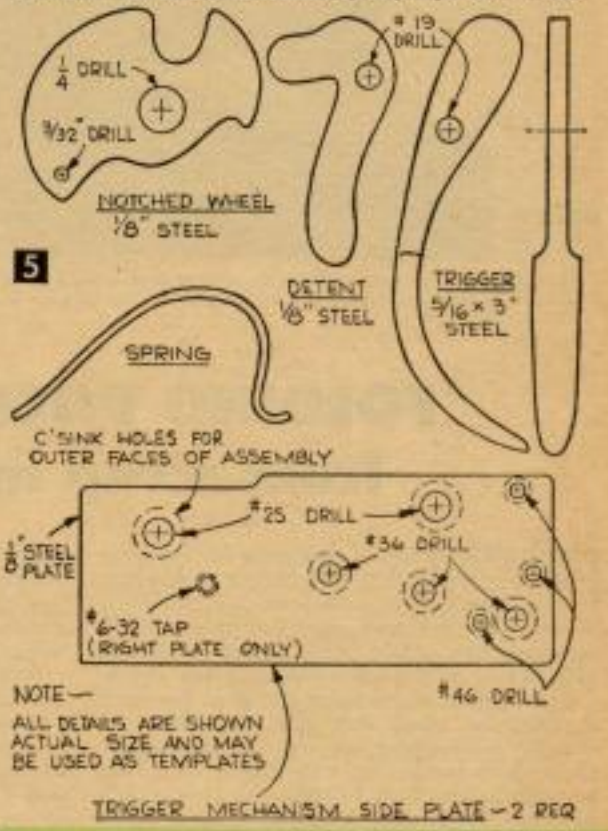
The Spring-Steel Bow was made from the coiled spring of a hood hinge from a 1953 Ford and was obtained from an auto wrecking yard. It is straightened by gripping it in a vise (Fig. 6A), lifting the free end of the spring and sliding a steel bar under it so that the latter rests on the vise jaws. Now hammer the curved spring to flatten it on the bar. Then draw another curved section over the bar for straightening. Straighten 15 in. of the spring, then nick it on a grinder and break it to length.

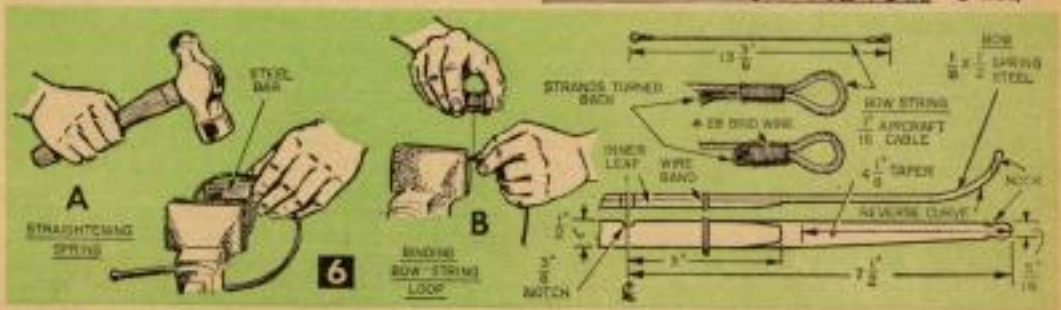
The unstrung bow should be bent somewhat in a reverse curve, as shown in Fig. 6. Bend the ends by spanning them over vise jaws opened to 1¼ in. and hammering them with a ball peen. Grind a taper on the lower edge of the bow toward the ends so that the bowstring will clear the channel. Also grind the nocks (notches) at the ends of the bow to take the bowstring.. To strengthen the bow straighten a 6-in. length of spring steel and taper down the thickness toward the ends. Center this spring leaf behind the bow and secure it with loops of bind wire. For an even stronger bow you can put a 10-in.-long leaf between the main bow and the 6-in. leaf. Complete the bow by grinding the ⅜-in. notch—in the center of the upper edges of the bow and leaves—which serves to clear the shot bolt.

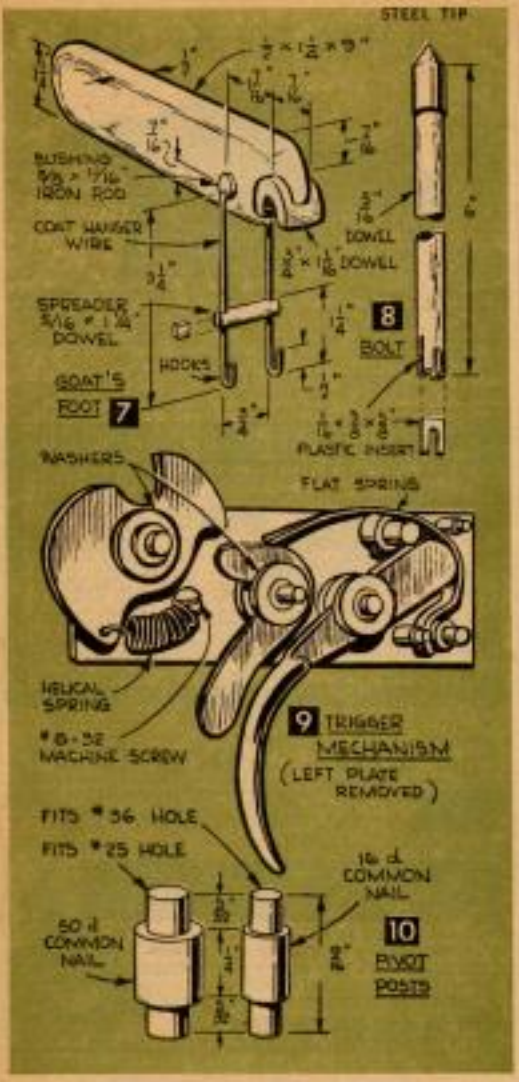
The bow is held in place with clips bent from ⅛ x 1-in. steel (Fig. 2C). A lag screw passing through the clips into the end of the stock locks the bow between the clips. Two machine screws passing through the forward end of the stock, and at an outward angle toward the bottom so as to clear the lag screw, fasten the

(*Continued on page 122*)

Fig. 4. Turning bolt in butt end of this scrap-wood jig bends the bow until free end of the bowstring loop slips into its nock.







MATERIALS LIST—PISTOL CROSSBOW

No. Req'd	Size and Description	Use
	WOOD STOCK	
1	1½ x 5½ x 31½" hardwood	pistol's stock
1	½ x 1 x 9" hardwood	goat's-foot handle
1	¼ x 1¼" hardwood dowel	handle pivot
1	½ x 5" hardwood dowel	grip
1	¼ x 1¼" hardwood dowel	cocking-hook spreader
2	¼ x 36" hardwood dowels	bolts
	METAL STOCK & HARDWARE	
1	⅛ x 1 x 20" hot or cold rolled-steel	metal parts
1	¼ x 1½ x 6" sheet iron	channel
1	⅛ x ⅝ x 4" steel or aluminum	trigger guard
1	⅜ x 1¼" cold rolled steel rod	goat's-foot hook bushing
1	⅛ x 3" steel rod	trigger
1	¼ x 36" steel aircraft cable	bow string
1	spool of #28 bind wire	loop binding
1	coiled engine-hood hinge spring (from junk yard)	bow
1	¼ x 1¼" hex bolt, washers and nut	cocking bolt
2	#6-32 x 1½" fh mach. screws and nuts	channel, bow clips
1	#8-32 x 2" fh mach. screws and nuts	channel, trigger guard
1	#8-32 x ½" rh mach. screw	helical-spring anchor
1	¼ x 3" lag screw	bow clips
3	#6 x 1" rh wood screws	channel, trigger guard
1	no. 11 helical spring	wheel return
	several 8d, 16d, 50d common nails	pivot posts, rivets
	hair curler spring, bale wire	

Pistol Crossbow

(*Continued from page 97*)

clips and channel to the stock.

To Make the Channel detailed in Fig. 2A, bend ⅛-in. sheetmetal as shown in Fig. 3A, then trim and file the upper edges. Cut the notch at the rear of the channel with a file and drill the holes for the screws. The center screw also serves to fasten the forward end of the trigger guard, while a couple of round-head wood screws near the back bear against the sides of the channel, their heads bearing on the top edges.

Make the trigger guard from ⅛x⅝-in. steel or aluminum bar stock, bending it as indicated in the drawing of the gun stock.

In assembling the pistol, place the trigger mechanism into its mortise, set the channel on top of the stock, insert the screws, then add the bow, clips and trigger guard as shown in Fig. 2.

Make the bowstring (Fig. 6B) by bending one end into a loop just large enough to slip over the end of the bow. Holding the loop in a vise, wrap half the length of the short cable with spooled binding wire. Then fray out the cable end, bend the strands back over the binding and wrap these also with wire.

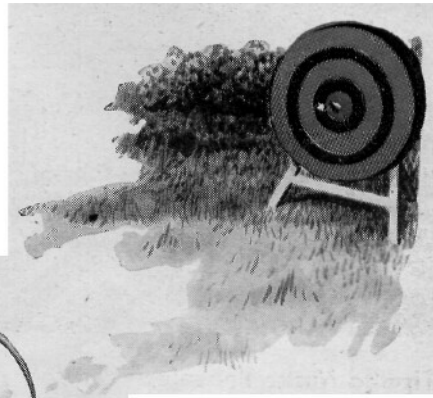
Make the Cocking Loop (Fig. 2B) from coat-hanger wire and slip it in the bowstring before binding the other loop. To "brace" or string the bow, make a jig from scrap wood as in Fig. 4. The bolt on the end of the jig presses against a piece of metal set between the cocking plates. As the bolt is tightened the forward end of the jig is pulled against the bow, bending it. Futher bending can be achieved by driving wedges between the jig and bow. Slip the bowstring loops over the bow ends, and to keep them from slipping out of the bow nocks wrap binding wire behind the nocks, around to the front and then back over the bowstring loops. Twist the wire ends tightly and cut them off short.

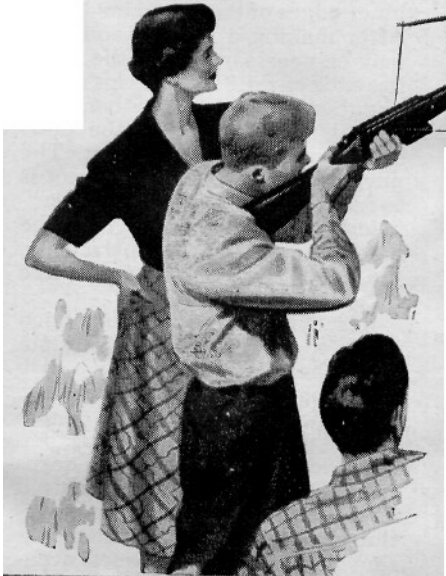
The Goat's Foot or cocking handle (Fig. 7) is shaped from hardwood and fitted with a half cylinder made from a hardwood dowel which bears on the cocking bolt. The hooks are bent from coat-hanger wire passed through an off-center hole in an iron bushing. A spreader made from a dowel is fashioned to make a sliding fit between the hooks and the outer edges of the channel. The goat's foot cocks the crossbow by drawing the bowstring back and setting it in the wheel notch which is attached to the trigger mechanism. Once the crossbow is cocked the goat's foot is removed. For easy carrying, the goat's foot can be fitted with a hook and you can hang it from your belt.

Finish the wooden parts of the pistol and the goat's foot with three coats of floor sealer. Polish the metal parts and blue them with bluing compound obtainable at gun shops. ■

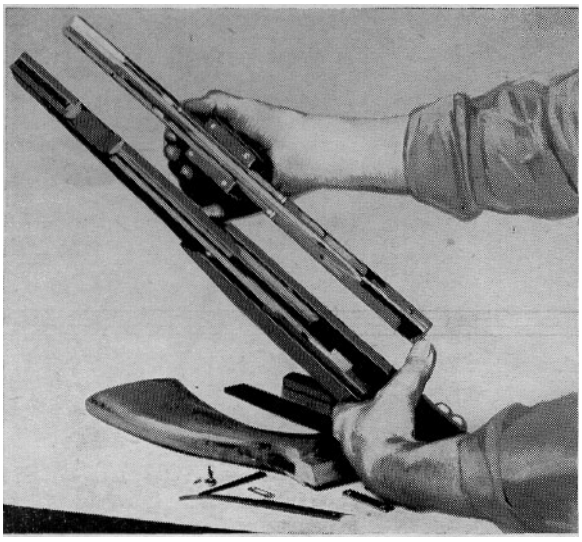
REPEATING CROSSBOW

By Austin H. Phelps

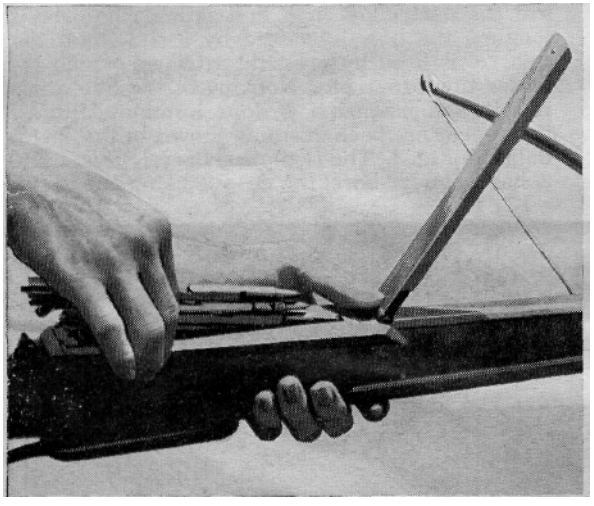




THIS REPEATING CROSSBOW has all the handling characteristics of a fine repeating rifle of the slide-action type. In the hands of an experienced crossbowman it will deliver five shots in five seconds with near-rifle accuracy over ranges up to 40 yards. The steel-pointed arrows, or quarrels, as they are correctly called, are loaded from the top into a magazine just as are the cartridges in a bolt-action rifle. After loading, the bow is cocked by a slide, and the quarrel is fired by pressing a trigger which releases the bowstring. Nocking of the five quarrels in the magazine is done automatically by the repeating mechanism as shown in the lower detail in Fig. 3. The two-piece barrel, Figs. 1 and 2, has a square bore, the groove being cut to full



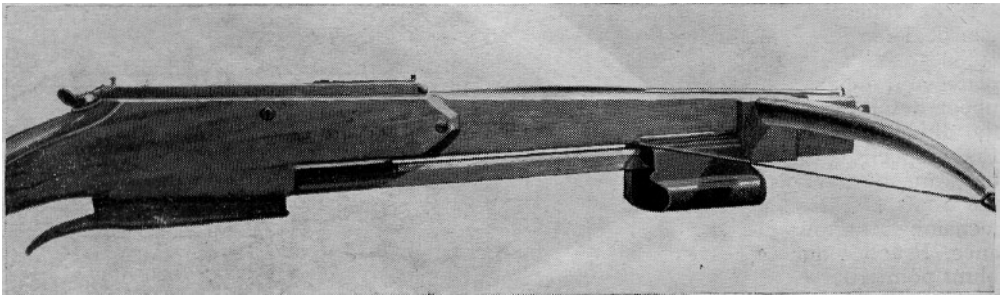
An assembly view of the two-piece barrel showing the pump slide, brass runners, and the top barrel in position. Stock should be handmade to specifications that fit individual user in the same way as a rifle or shotgun stock. Use hardwood for all parts

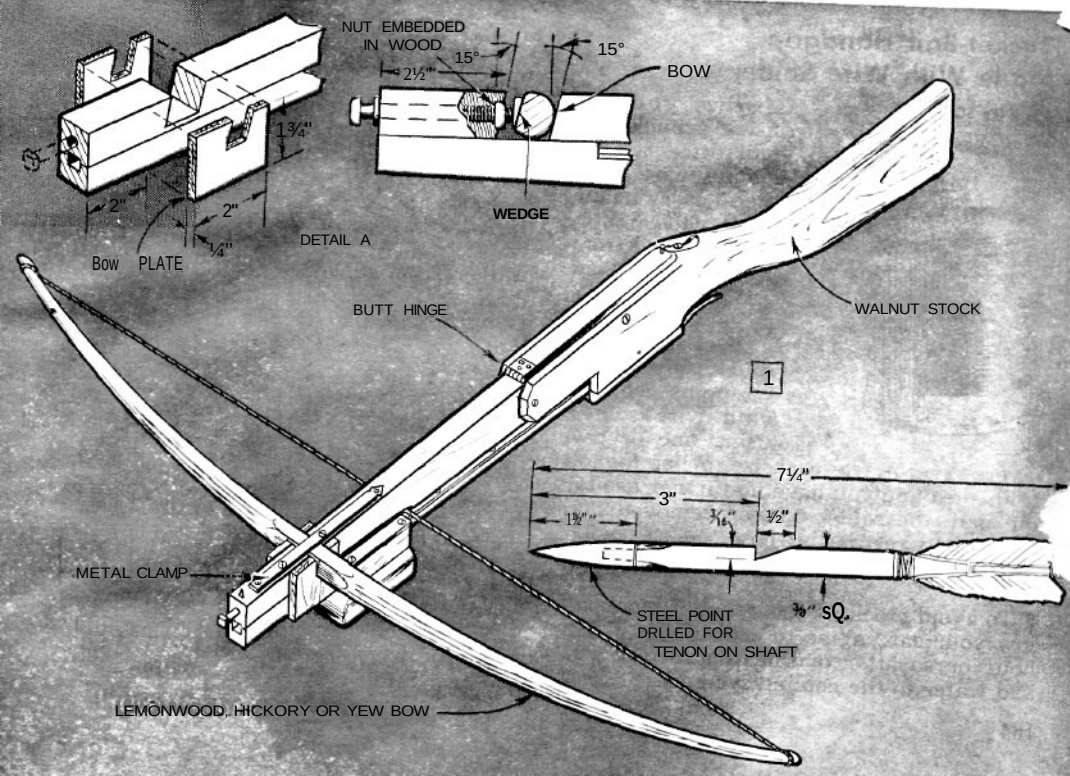


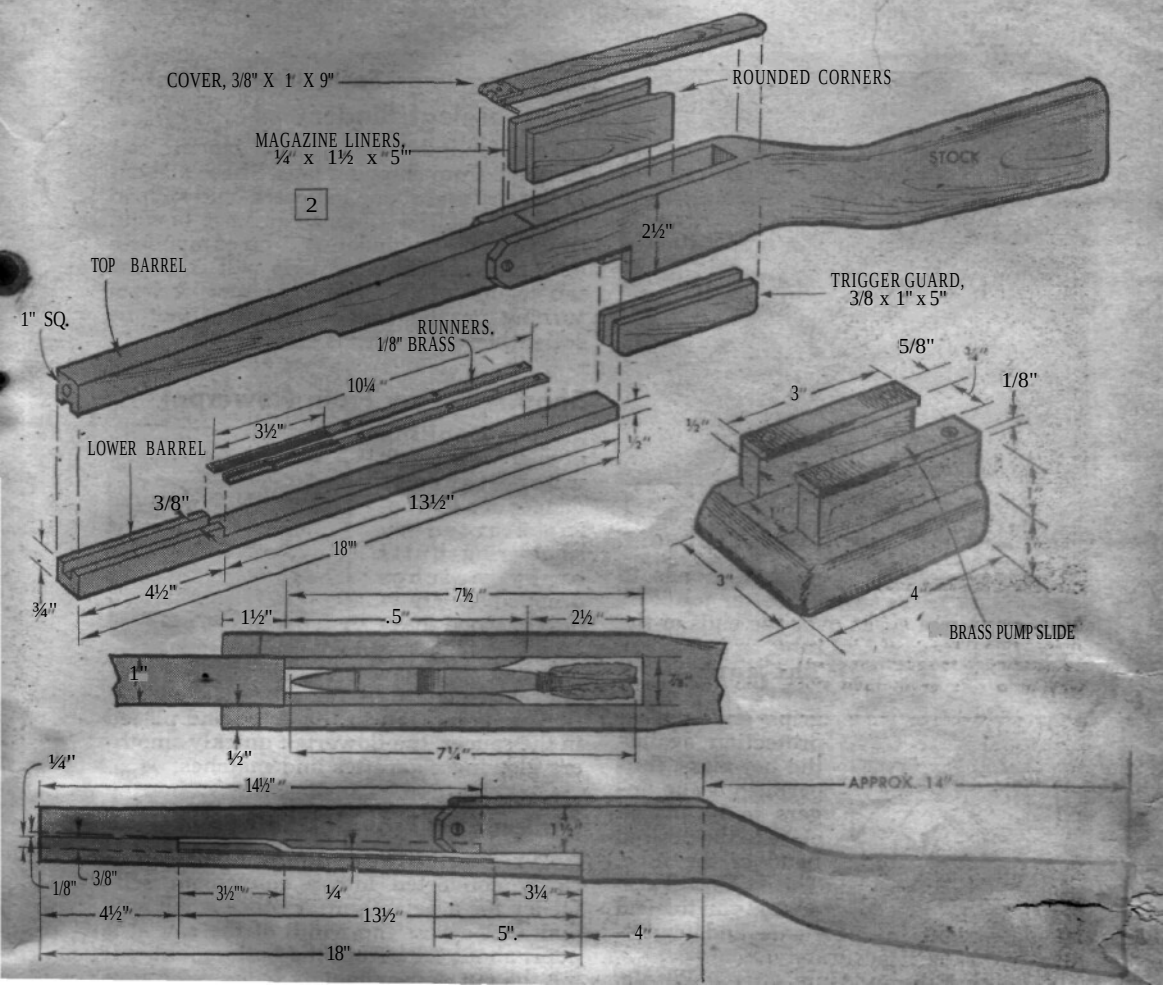
Above, this repeating crossbow is loaded just like a bolt-action rifle, five quarrels being placed in the box magazine at one loading. Below, note the trim lines of the finished job. If desired, you can install either open or peep sights on the barrel

depth in both halves. Then parts of both halves are cut away so that when assembled there will be an offset slot for the bowstring as in the lower detail in Fig. 2. Brass runners, fitted with 3½-in. brass strips soldered edgewise to them, are screwed to the lower barrel as in the center left-hand detail in Fig. 2. Care must be taken to space the runner strips so that the inner edges are exactly flush with the inner edges of the magazine liners. After making a trial assembly, it may be necessary to file the slanting ends of the 3½-in. strips or the underside of the upper barrel to permit free passage of the bowstring through the offset slot. The purpose of the offset in the slot is to force the bowstring upward sufficiently to release it from the notch in the quarrel, permitting the latter to enter the bore in free flight.

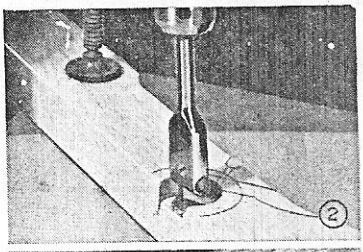
In making the stock, it's a good idea to copy a rifle or shotgun stock that fits you and has a grip and tang shaped to your liking. Bandsaw the wood to the rough outline of the stock selected, then finish to contour with wood rasps and sandpaper. Care must be used in cutting and finishing the magazine slot in the stock, as the magazine liners must be spaced accurately so that the quarrels drop freely into firing position, Fig. 3. The inner rear corners of the liners are rounded to a smooth curve. To assure free movement of the quarrel in firing position, it may also be necessary to round the inner corners of the brass runners. The pump slide, Fig. 2, engages the bowstring as in Fig. 1 when in the forward position. Overhanging brass strips, which are screwed to the guide blocks, Fig. 2, ride on the brass runners. In cocking, the slide is drawn back as far as it will go and the forward end is pulled

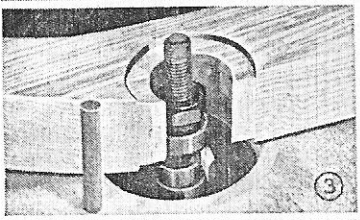


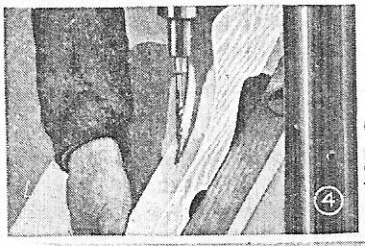

NUT EMBEDDED IN WOOD
15°
15°
2½"
BOW
WEDGE
1¾"
2"
2"
¼"
Bow PLATE
DETAIL A
BUTT HINGE
WALNUT STOCK
1
7¼"
3"
1½"
3/16"
½"
3/8" SQ.
STEEL POINT DRLLED FOR TENON ON SHAFT
METAL CLAMP
LEMONWOOD, HICKORY OR YEW BOW


COVER, 3/8" X 1" X 9"
ROUNDED CORNERS
MAGAZINE LINERS, ¼" x 1½" x 5"
STOCK
2
2½"
TOP BARREL
1" SQ.
TRIGGER GUARD, 3/8 x 1" x 5"
RUNNERS, 1/8" BRASS
10¼"
3½"
LOWER BARREL
3/8"
13½"
18"
4½"
¾"
½"
5/8"
1/8"
3"
1½"
4
BRASS PUMP SLIDE
7½"
1½"
.5"
2½"
1"
½"
7¼"
¼"
14½"
APPROX. 14"
1½"
1/8"
3/8"
3½"
¼"
3¼"
4½"
13½"
5".
4"
18"

SHOOT THESE



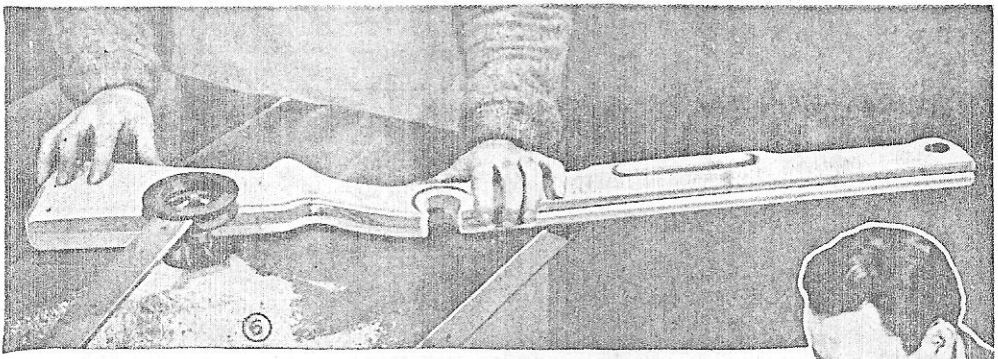




IF YOU can't hit the bull's-eye with a regular archer's bow and arrow, try one of these modern crossbows and you'll find yourself hitting the "gold" almost every time from distances up to 60 yds. They are good for hunting, too; a 160-lb. steel bow will stop anything short of an elephant. Two models are described in this story, both very similar in construction except that one has a wood bow and the other a steel bow. Comparative data is given in table of Fig. 5.

Stock for wood bow: The stock of the wood bow can be made from white pine. Its shape is very much like a modern rifle as can be seen in Fig. 8. Start the job by making a full-size drawing of the stock including the full detail at the trigger as shown in Fig. 9. Transfer the stock outline to 1 1/16-in. white pine and saw it out. Drill the hole for the string release, using an expansive bit as in Fig. 2. Recesses on either side of the hole are run in with a straight shaper cutter, Fig. 3, the guide collar rubbing the hole. Lacking shaper equipment, the recesses can be cut with a router bit in a drill press. Fig. 4 shows the mortise for the

Data	Wood Bow	Steel Bow
Weight of crossbow	3 lbs.	4¼ lbs.
Drawing weight	48 lbs.	110 lbs.
Maximum range	160 yds.	250 yds.
Effective target range	About 40 yds.	About 60 yds.
Penetration in white pine	⅞"	1¼"
Length of stock	37"	28½"
Length of bow	54"	23"
Size of arrow	5/16" X 23½"	5/16" X 13½"

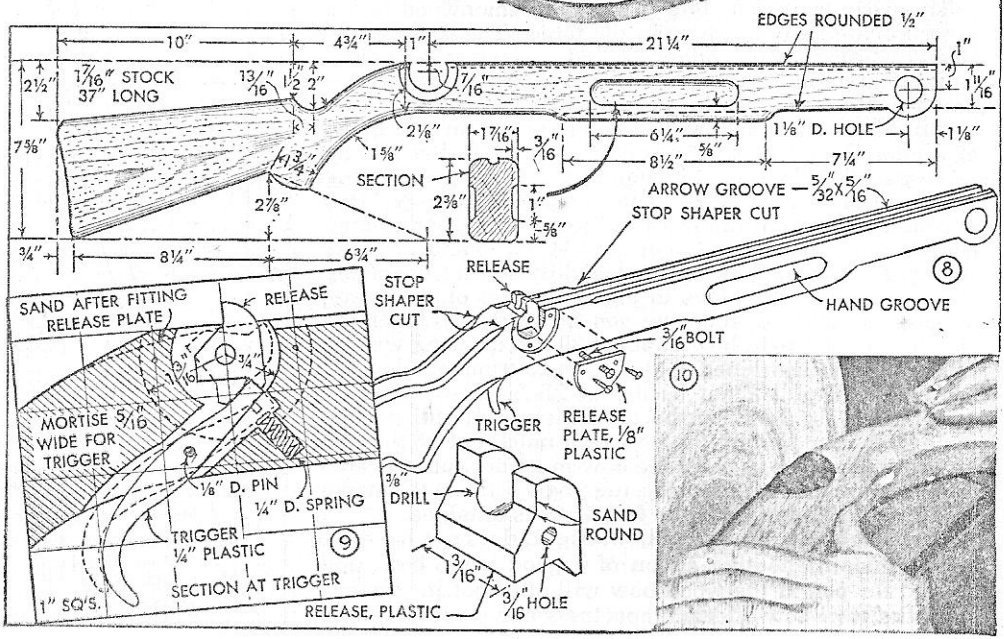


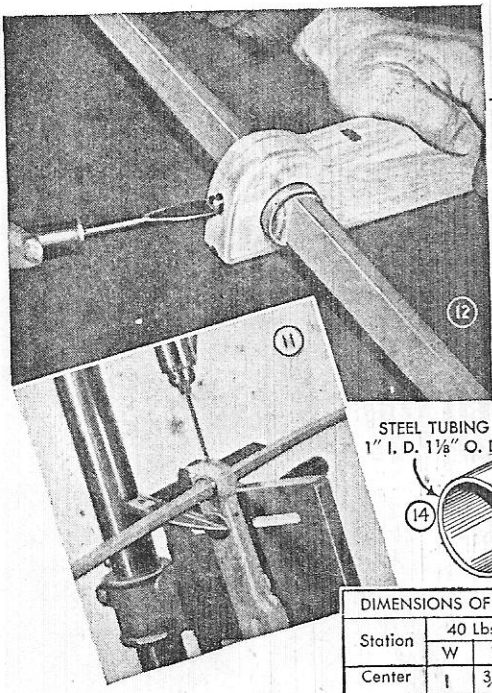
Modern CROSSBOWS

trigger being cut. Run in the arrow and hand grooves, using suitable shaper cutters. Then, shape all the edges ½ in. round, stopping about 1 in. from the release hole as indicated in Figs. 6 and 8.

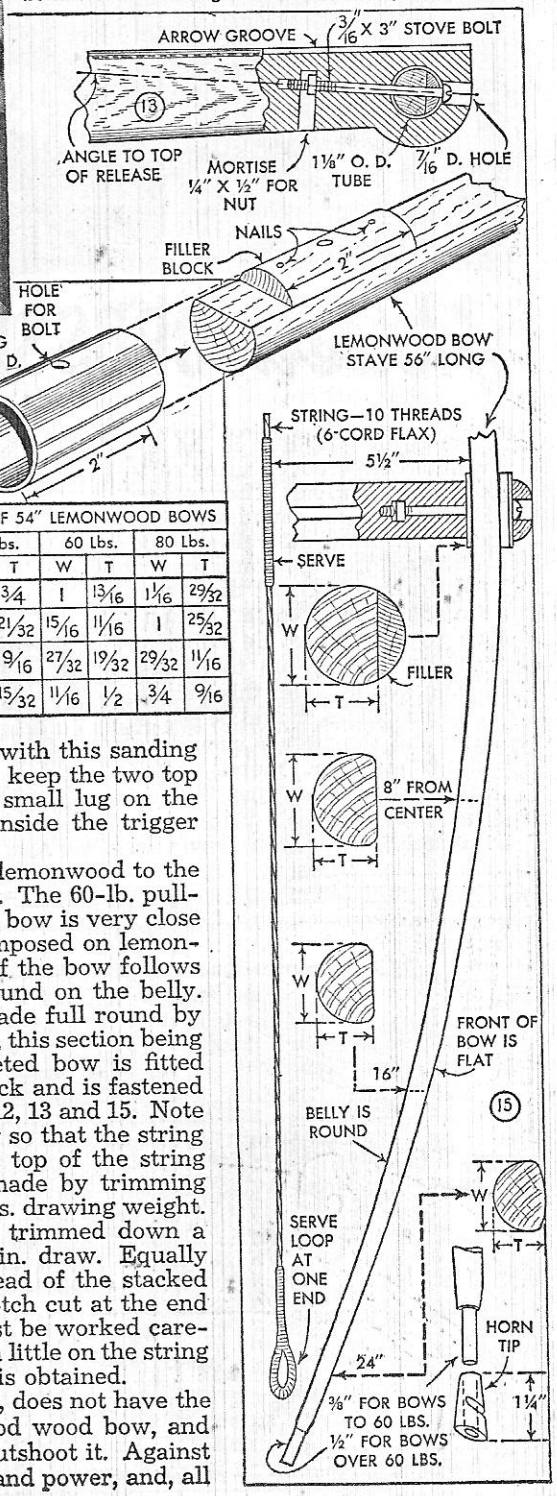
All working parts of the action are made from plastic. Dimensions given will provide sufficient strength for bows up to 60 lbs. drawing weight. Over this weight, the release plates should be 3/16-in. plastic and the trigger should be made from 3/16-in. metal. After fitting the release plates, the top of the stock is sanded down to about the dotted line shown in

Cocking lever is required when bow pulls over 100 pounds. Bows that pull less than this weight can be set by hand





Wood bow is 54 inches long, made from lemonwood. Approximate section for 40, 60 and 80-lb. bows are given in table below. Bow is strengthened at center by steel sleeve

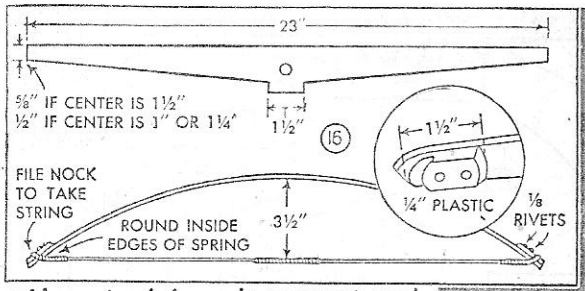


DIMENSIONS OF 54" LEMONWOOD BOWS						
Station	40 Lbs.		60 Lbs.		80 Lbs.	
	W	T	W	T	W	T
Center	1	3/4	1	13/16	1 1/16	29/32
8-Inch	15/16	21/32	15/16	11/16	1	25/32
16-Inch	13/16	9/16	27/32	19/32	29/32	11/16
24-Inch	5/8	15/32	11/16	1/2	3/4	9/16

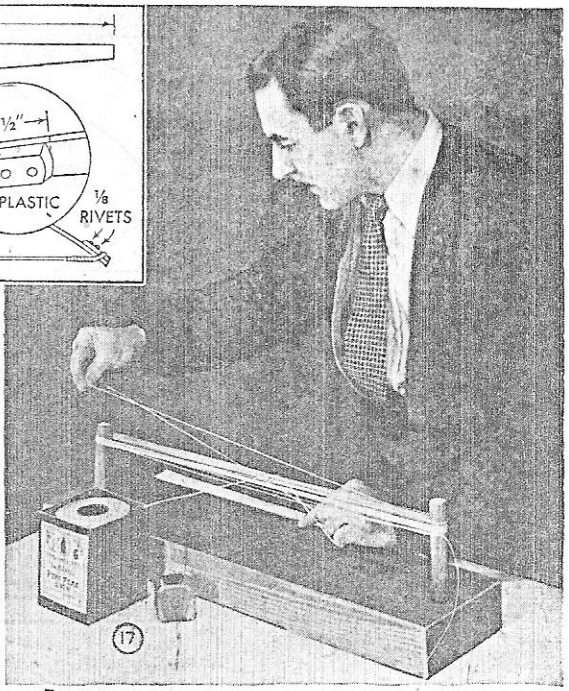
Fig. 9. Fig. 10 shows the operation. The sharp edges are then faired into the shaper cuts. Be careful in fitting the release plates so that screws will not interfere with this sanding and rounding operation, in other words, keep the two top screws low. The plastic trigger has a small lug on the underside near the upper end to fit inside the trigger spring, as can be seen in Fig. 9.

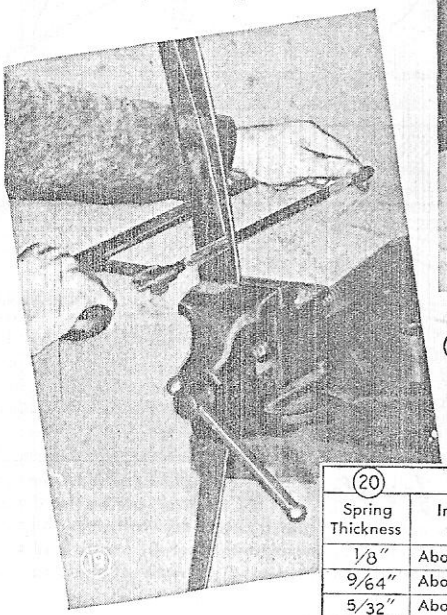
The wood bow: The bow is made of lemonwood to the approximate sections given in the table. The 60-lb. pulling weight is recommended. The 80-lb. bow is very close to the maximum stress which can be imposed on lemonwood in this length of bow. Shaping of the bow follows standard practice, flat on the front, round on the belly. A section 2 in. long at the center is made full round by adding a filler block, as shown in Fig. 14, this section being enclosed in a steel tube. The completed bow is fitted through the hole at the front of the stock and is fastened with a 3/16-in. bolt as shown in Figs. 11, 12, 13 and 15. Note in Fig. 13, that the bow is tilted slightly so that the string when pulled back comes to about the top of the string release. If desired, the bow can be made by trimming down a regular 6-ft. bow of about 30 lbs. drawing weight. When this is shortened and the ends trimmed down a little, it will pull about 60 lbs. at 21-in. draw. Equally practical, a flat bow can be used instead of the stacked type shown, mounting the bow in a notch cut at the end of the stock. In any case, the bow must be worked carefully and broken in gradually, tugging a little on the string and then releasing until the full draw is obtained.

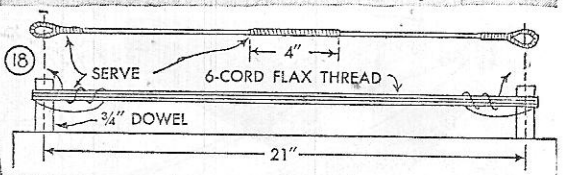
The steel bow: The steel bow, Fig. 1, does not have the silky, smooth shooting action of a good wood bow, and pound for pound the wood bow will outshoot it. Against this, the steel bow offers compactness and power, and, all



The steel bow is compact and powerful. Metal is obtained from a light automobile spring, which is sawed with high-speed steel hacksaw blade to the shape shown above





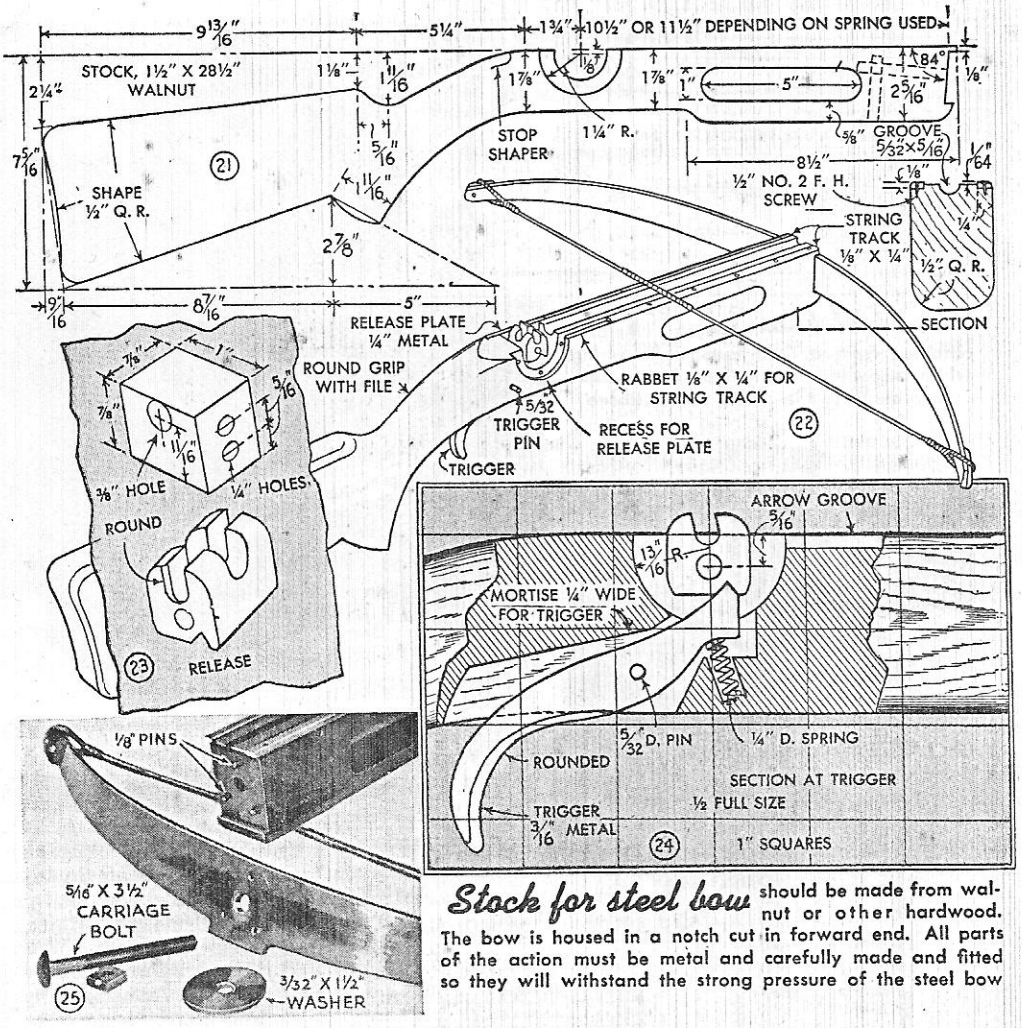


(20) 23-IN. SPRING-STEEL BOWS

Spring Thickness	Initial Set	Brace	Spring to Release	Pull and Threads to Hold		
				1" Wide	1¼" Wide	1½" Wide
⅛"	About 2¼"	3½"	11½"	42 lbs./12	52 lbs./12	63 lbs./12
9/64"	About 2¼"	3½"	11½"	60 lbs./12	75 lbs./16	90 lbs./18
5/32"	About 2¼"	3½"	11½"	83 lbs./16	104 lbs./20	126 lbs./24
3/16"	About 2¼"	3½"	11½"	142 lbs./28	179 lbs./36	216 lbs./42
7/32"	About 2"	3"	10½"	188 lbs./38	236 lbs./48	285 lbs./56
¼"	About 2"	3"	10½"	289 lbs./56	363 lbs./70	438 lbs./82

things considered, makes much the better crossbow. The spring stock can be obtained from a light automobile leaf spring. It will cost you two high-speed steel hacksaw blades to saw it to shape, Fig. 19. If the spring is a little wider than needed, it is a good idea to leave the extra metal intact at the center, as shown in Fig. 16. The bow tips are cut from sheet plastic, riveted in place and filed to take the string. The steel bow will have an initial fixed set of about 2-in. deflection, and should be braced at 3½-in. deflection as shown in Fig. 16. The table, Fig 20, shows approximately what leaf-spring steel will pull in pounds at 11½-in. draw. A 100 to 160-lb. bow is recommended. Extremely heavy bows over 300 lbs. drawing weight make nice exhibition pieces for flight or penetration shooting, but are no fun to shoot as you seldom retrieve the arrow intact if at all. It is practical, however, to make two or three bows of different weights, all interchangeable on the same stock.

Bow strings: Bow strings for wood bows can be purchased or made from 6-cord flax thread. This kind of thread is used in stitching machines by shoemakers. Twelve threads will hold wood bows to 80 lbs., the loop at the end being made by turning the whole string back on itself. The string for a 23-in. steel bow is made on a simple wooden form, as shown in Figs. 17 and 18. In this case, the string is divided into equal parts to make the loops. Both loops and a distance of 4 in. at center are wrapped, and the completed string is waxed with beeswax. The string can be shortened by giving it several twists before fitting to the bow. The triangular-boxed figures in table

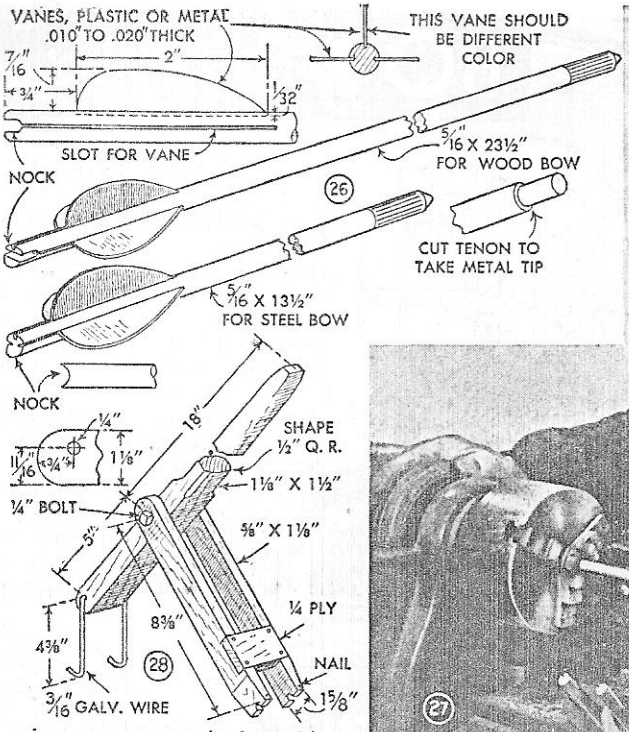


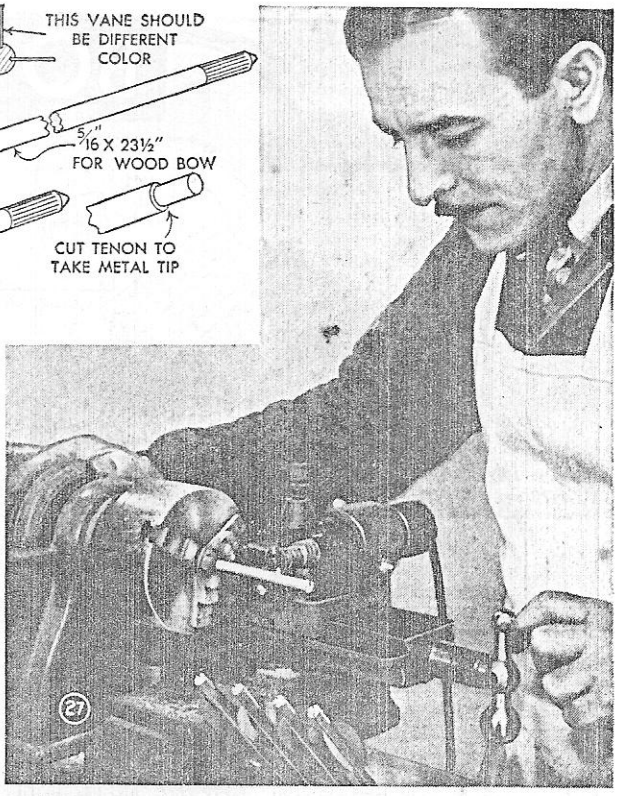
Stock for steel bow should be made from walnut or other hardwood. The bow is housed in a notch cut in forward end. All parts of the action must be metal and carefully made and fitted so they will withstand the strong pressure of the steel bow

Fig. 20 are the number of threads of 6-cord flax required to hold a bow of the drawing weight indicated. Stepping on the center of the bow while the ends are supported on wood blocks will bend the bow enough to permit slipping the string in place.

Stock for steel bow: Because of the heavier drawing weight, the stock for a steel bow must be made from walnut or other hard, strong wood. The stock should be laid out full-size, Figs. 21 and 24, then transferred to wood, cut out, and then machined in much the same manner as the wood-bow stock already described. An addition is the metal track on each side of forearm, Fig. 22. This originally was to protect the wood from the rubbing action of a metal bow string. The metal string (6-strand, 19-wire flexible cable 5/32-in. dia.) did not stand up under actual shooting and was discarded for the flax thread. The track, however, is worthwhile protection even with the flax string, although not essential. All parts of the action are metal, steel for the release, Fig. 23, and trigger, and aluminum or brass for release plates and string track. The bow is housed in a notch cut in the end of the stock, and is held by means of three locating pins and a bolt, as shown in Fig. 25. The carriage bolt is ground round under the head, which is sawed to form a screwdriver slot. The release pin is ¼-in. diameter, slotted on one end for a screwdriver and threaded on other end to fit a tapped hole in the release plate. All metal parts are of ample strength for bows up to 400 lbs. drawing weight. Follow the release and trigger design closely; these parts are nicely balanced to provide positive holding while retaining a light trigger pull.

Arrows: Arrows for both bows are 5/16-in. birch dowel. Vanes are plastic, celluloid or metal, glued in grooves cut in the shaft.





Arrows **are made from 5/16-inch birch dowel. The vanes are cut from celluloid and are fitted in the grooves cut in the shaft**

Fig. 27 shows one way of cutting the grooves, the shaft being held in the lathe, positioned by the indexing head, while a rotary hand tool mounted in a slide rest does the cutting. Vanes are mounted at right angles, Fig. 26, instead of the usual triangular pattern used for long bow arrows. This method of mounting provides perfect ruddering for smooth, straight flight and, at the same time, fits the mechanical construction of the crossbow.

Cocking lever: Bows up to about 100 lbs. drawing weight can be set by hand; over this weight it is necessary to use a cocking lever. Fig. 28 shows the construction and dimensions of a cocking lever for 11½-in. draw. The galvanized-wire hook which slips under the bow will automatically assume a bent position the first time it is used. Photo Fig. 7 shows the manner of using the lever. If the release is set slightly forward, the trigger will cock automatically when the string engages the rear prong of the release.

Shooting: After cocking the bow, the cross bow is shot very much like a shotgun, sighting down the arrow to the target. A little practice will enable you to judge the range and drop of an arrow very nicely. When hunting, the bow can be carried cocked but without arrow. When not in use, the steel bow is left braced, but the wood bow is unstrung. Needless to say, any bow over 100 lbs. packs a terrific drive, and the utmost caution should be exercised in its use. Never fit an arrow in place until you are ready to shoot, and don't point the gun in any other direction than toward the target when the arrow is in place.

Three Simple Ways You Can Preserve Linseed-Oil Putty

To assure a supply of soft putty whenever needed, pack it in a jar having a tight-fitting lid. Level off the putty and cover it with raw linseed oil to a depth of ¼ in. Do not use boiled oil. Before use, pour off the oil and take out the required amount of putty and repack the remainder. If the putty is too soft when removed, work in a little whiting. To do this, cut the putty in small pieces, sprinkle on the whiting and knead the mixture to the desired consistency. If you just want to keep putty soft overnight in hot weather, place it in a jar and cover it with water. You can keep putty for a few weeks by wrapping it in waxed paper before putting it in water.

COVER STORY

Hunter's Crossbow

This old-time weapon has the hitting power and accuracy of a modern rifle.

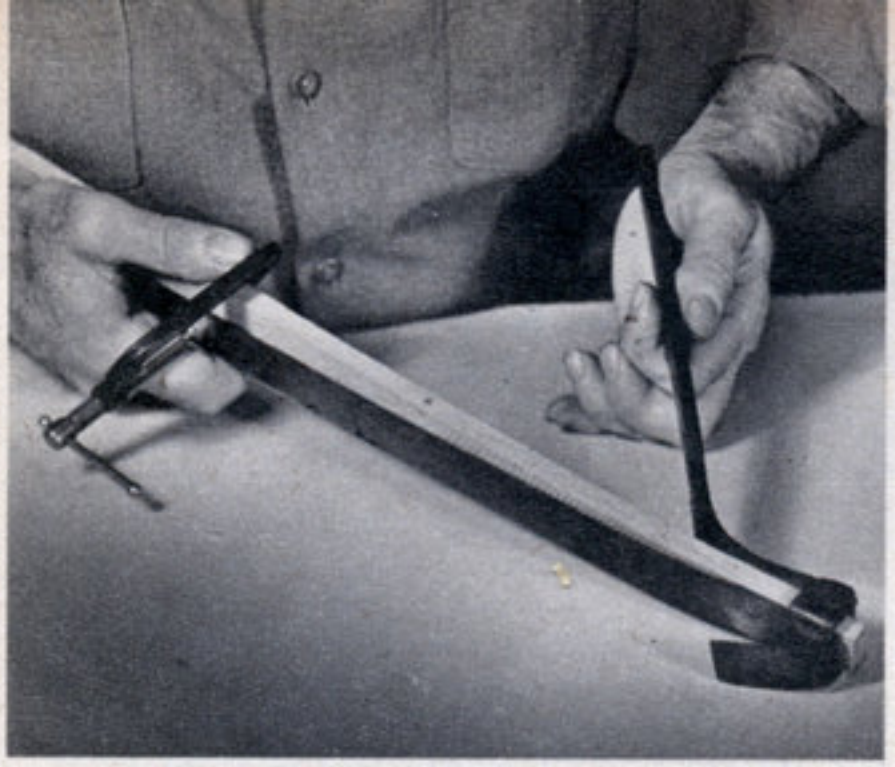
By E. Milton Grassell

THIS crossbow, with all the romance and charm of a medieval weapon, is so powerful and accurate that it is used extensively for hunting and precision target shooting. It's a deadly weapon, not a toy, exceptionally fine for hunting rabbits, pheasants, squirrels, and even capable of killing big game like deer, elk, antelope, and cougar when used by one skilled in its handling. Therefore it is most imperative that the crossbow be handled carefully. Never hold it in a position where it might endanger anyone if fired accidently, and always reckon with the area beyond the target or game in the event you should miss hitting the object aimed at.

A similar crossbow would cost from $50 up commercially, but the total cost, if you make it, should not exceed $7.50, providing there are a few scrap hardwood pieces, a dab of lacquer, welding rod and some other common materials around your workshop.

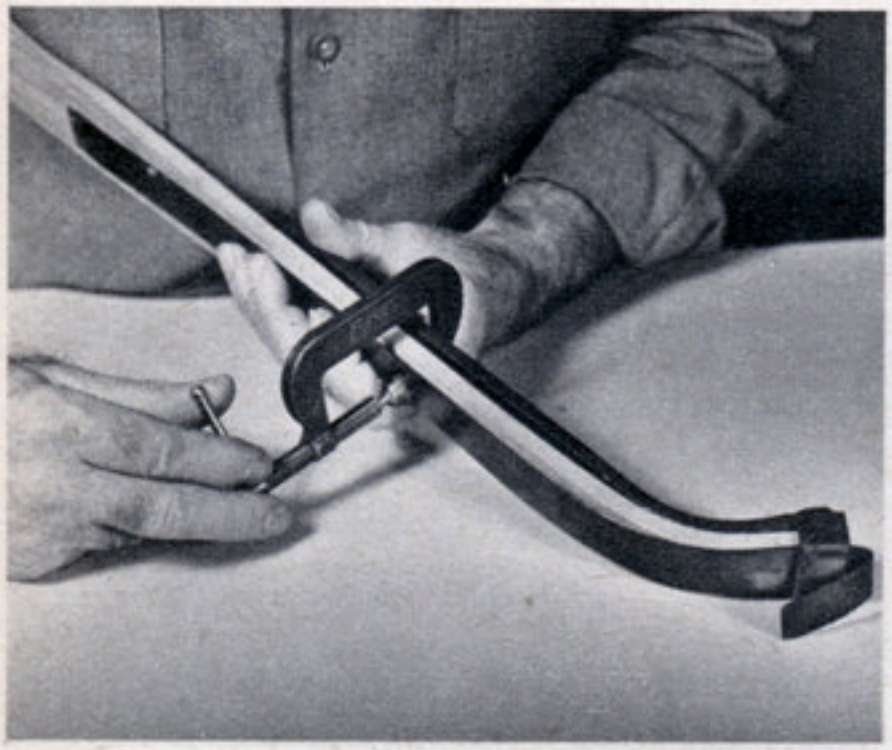
Sold on making one? Okay, here's how Mr. Chester Stevenson of Eugene, Ore., makes his most popularly demanded crossbow, and

Photos by Frances R. Schultz

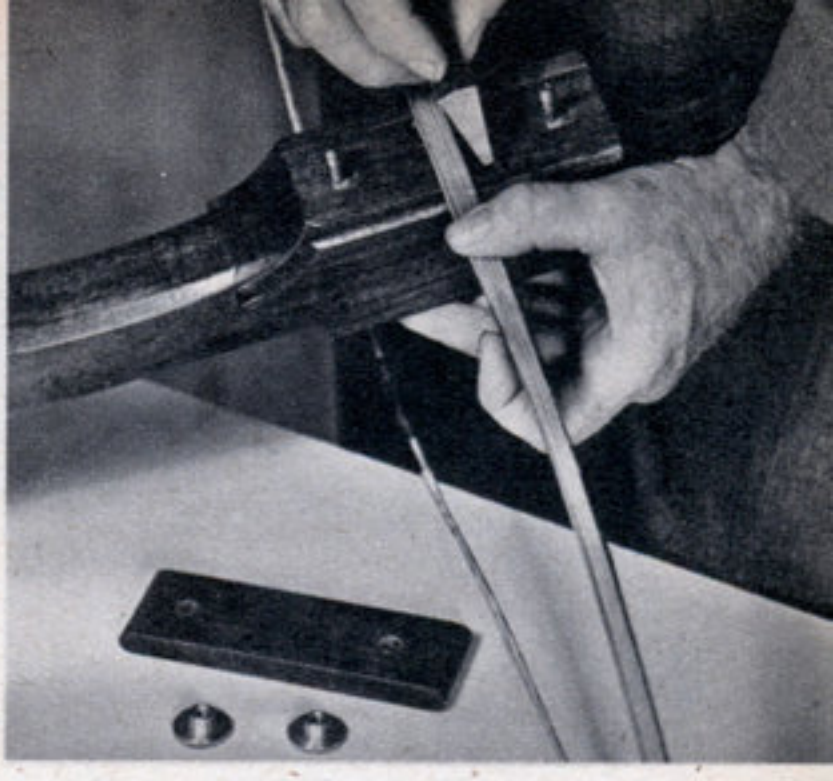


1. After steaming for about 15 minutes, the bow wood is placed in the bending jig which is held against the wood by means of an ordinary C-clamp.

2. The sheet metal strip of the jig keeps the bow wood from splintering while the reverse bend is made in the tips. Remove clamp when wood cools.



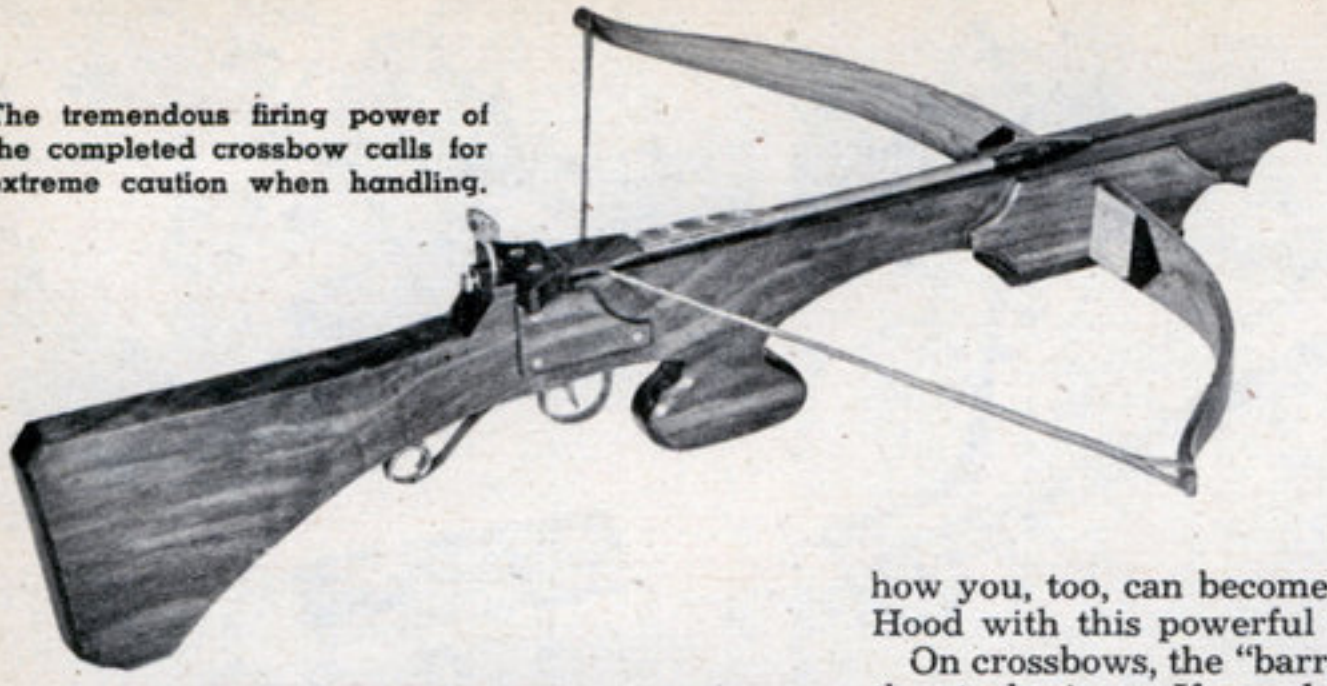
3. When gluing the Fiberglas to the back of the bow, use one-inch rubber strips cut from an old inner tube as clamps to hold materials together.



4. Weakest part of the crossbow is at the slot for the bow. To prevent horizontal play, a wedge-shaped block is slipped into slot behind the bow.

5. The bow lock plate takes up any possible vertical play once the lock nuts have been tightened. Ordinary wing-type nuts can be used if desired.

6. A precision peep sight for target shooting can be made (see drawing) using only three drills, a hacksaw, and a file. It has two-way adjustments.



The tremendous firing power of the completed crossbow calls for extreme caution when handling.

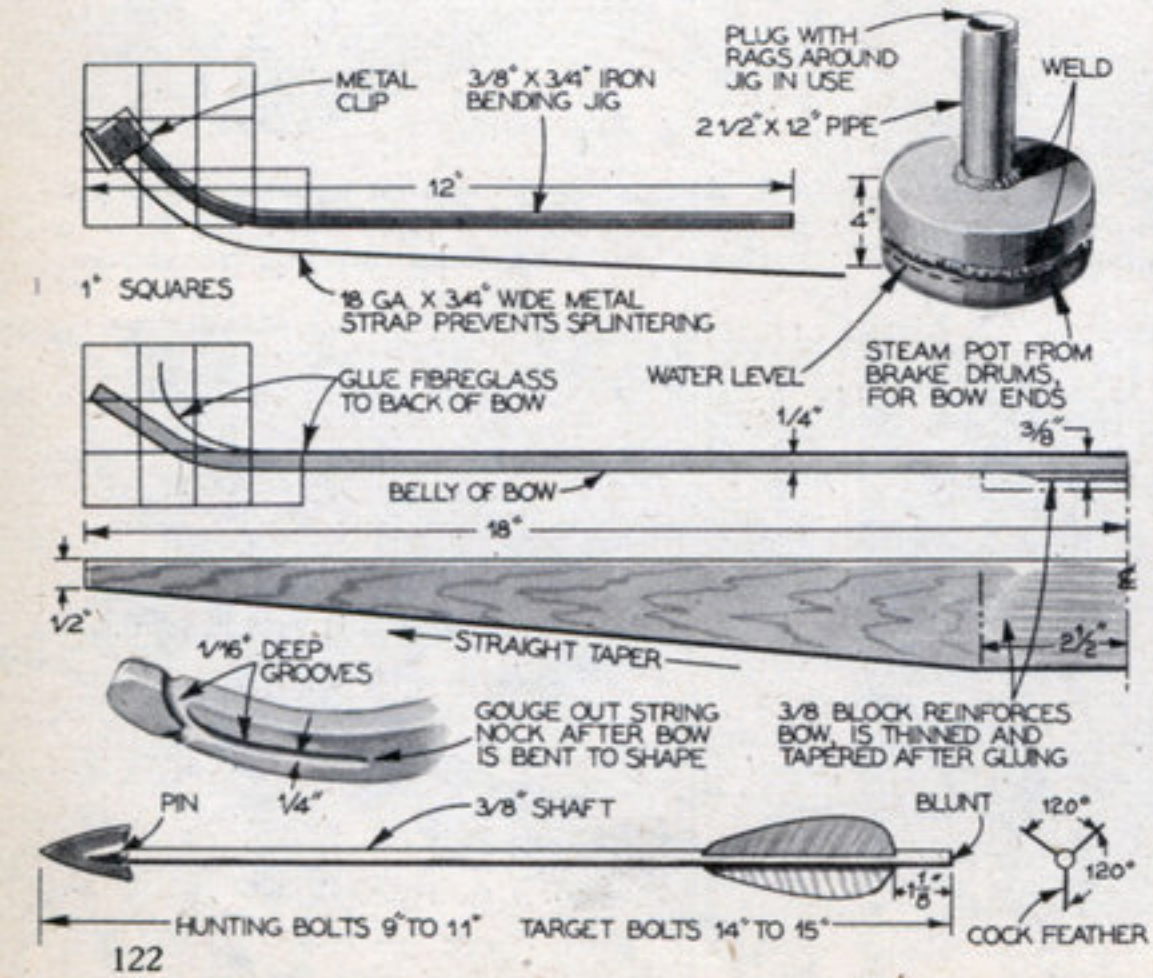
The proper method of cocking the crossbow with a bolt in firing position. As shown here, practice cocking without a bolt until you acquire skill.

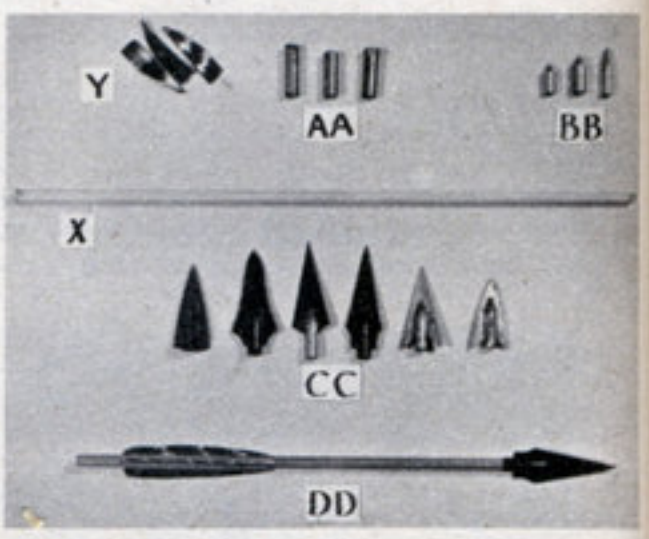
how you, too, can become a jet-age Robin Hood with this powerful weapon.

On crossbows, the "barrel" is included in the stock piece. If you don't have a hardwood board about 1½x8x36-in., glue scrap pieces together. This works just as well. In fact, the whole design can be modified, providing the draw (14-in. from the back of the bow to the trigger release latch) and the trigger unit are not altered. Follow the drawings and you'll have no trouble making any parts of the crossbow.

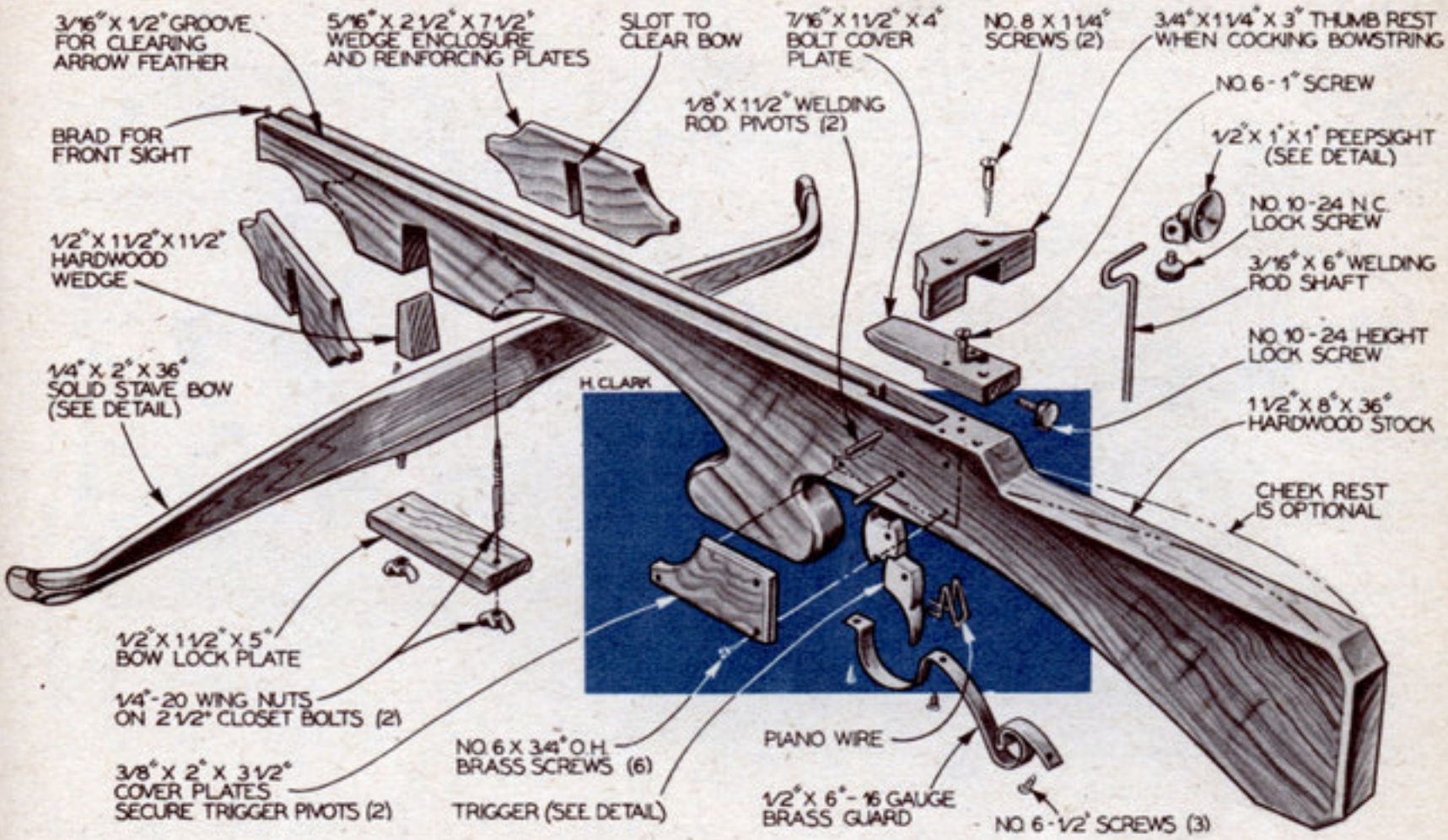
After cutting the general contour, a recess is chiseled in the stock for the trigger assembly. Between this and the end of the barrel, make a kerf (a bolt groove) approximately $\frac{3}{16}$x½-in. deep down the center. Sandpaper is used to make the ⅛-in. chamfer on both edges of the bolt groove.

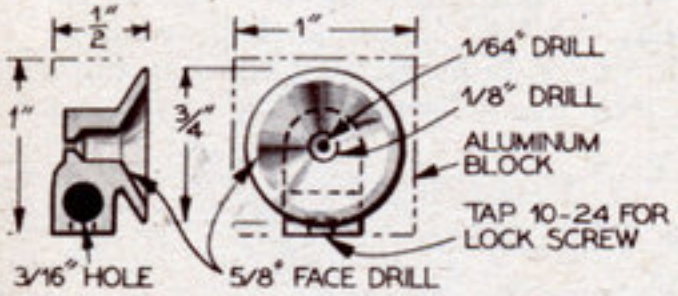
The unique trigger, modified by Mr. Stevenson, will fire the bolt with approximately the same finger pressure used to shoot an ordi- [*Continued on page* 196]



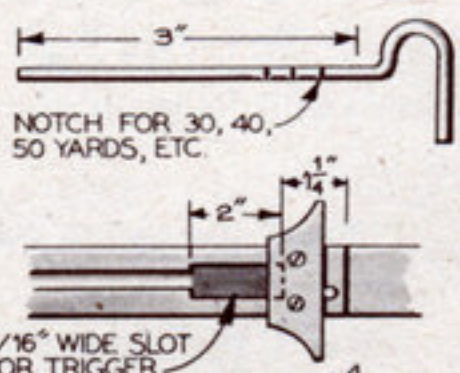


Making bolts is largely a matter of assembling stock items obtained from archery supply houses. Shown here are: AA—blunt points for small game, BB—target points, CC—big game points, X—shaft, Y—trimmed feathers, and DD—a fully assembled hunting bolt.

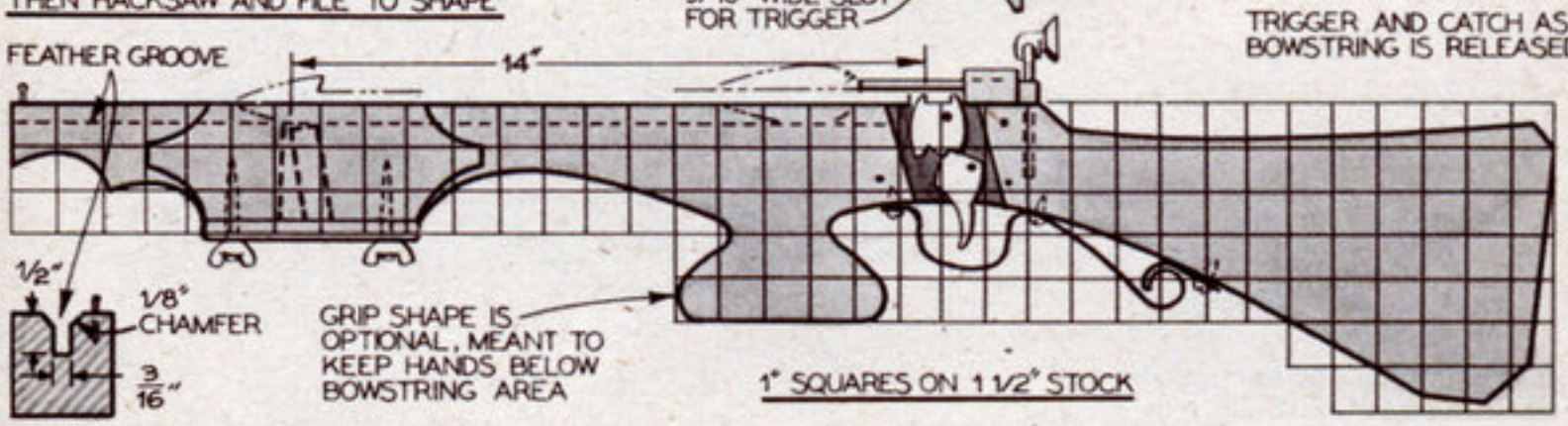




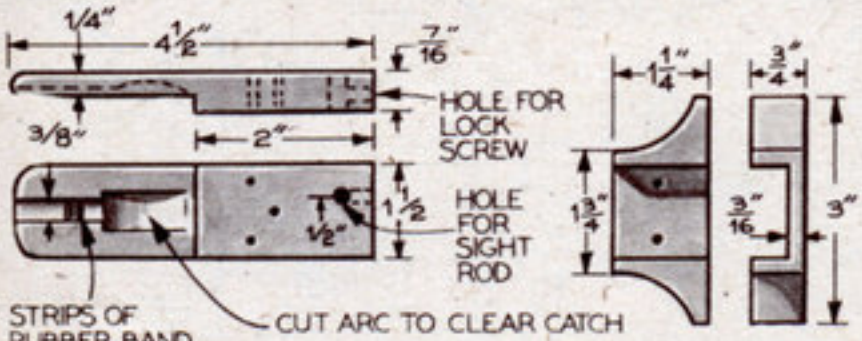
MAKE PEEPSIGHT WITH THREE DRILLS, THEN HACKSAW AND FILE TO SHAPE



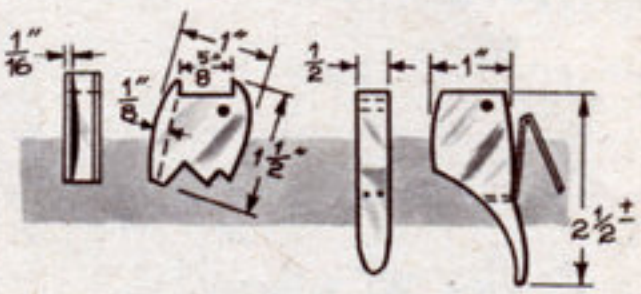
TRIGGER AND CATCH AS BOWSTRING IS RELEASED



1" SQUARES ON 1 1/2" STOCK



COVER PLATE AND THUMB REST



BOWSTRING CATCH AND TRIGGER FROM METAL OR FIBER SHEET

Hunter's Crossbow

[*Continued from page 122*]

nary rifle, when the release latch is cocked with a 75-pound pressure.

The trigger guard, made from No. 16 gauge brass, ½x6-in., is bent and fastened with three No. 6 half-inch roundhead brass screws.

When hunting, you will probably aim along the bolt, but sights are preferable for target shooting. The peep sight shown in the photos, made from ½x1x1-in. brass scrap, is extremely precise, yet it can be made with three drills (1/64, ⅛, and 5/16-in.), a hacksaw and a file. It has both vertical and horizontal adjustments which are held with lock screws (see drawing).

The bow attachment assembly is the weakest part of the stock assembly. Therefore, two ⅜-in. thick strips are used to reinforce this area. You can machine the required combination screw-bolts, and the fancy knurled lock nuts, but it's simpler to buy two closet screws from the neighborhood plumber.

There are two other parts to this unit—a wedge-shaped block, and the bow lock plate, used to hold the bow securely in place.

The bow has two unusual features: (1) the ¼x2x36-in. solid stave (either yew wood or osage orange), and the Fiberglas, when cut according to plan, requires no tillering, and (2) the reverse curve gives added speed. That's the reason this crossbow has jet-like power.

Don't let the steaming and reverse curve bending worry you. It's really simple, as the photos show. You can make a steam pot from old brake drums and a piece of pipe, as shown in drawing. The strap metal bending jig is also easy to make.

Take the measurement of the finished bow from nock to nock and order a bow string from an archery supply firm. Today, archery supply houses also sell arrow shafts, piles (points), ground feathers, and other accessories that practically reduce bolt making to an assembling and finishing job.

Order several 5/16-in. straight 30-in. shafts. Since bolts are shorter than long bow arrows, these can be cut so as to make two bolts from each shaft.

If you purchase slip-over type points, no tenon is necessary on the shaft. This further simplifies bolt making.

Before fletching the shaft, finish it with dipping or brushing lacquer. Never use varnish on target bolts. Friction causes the shaft to heat when it penetrates straw targets and the varnish blisters.

Either right or left wing turkey feathers can be used, providing they are the same on any one arrow. The feathers can be trimmed with scissors. Place them in a fletching jig (these sell from $1.50 up with directions included) and glue them on the shaft with household cement. When fletching shafts with broadhead points, be sure the cock feather and the vertical surface of the broadhead are in the same plane. (See drawing.)

The nock, customarily found on arrows, is not used on bolts. Nothing is done to the rear of the shaft. Before you load the crossbow with a bolt, try cocking it a few times, as shown in photo, until you have developed a real feel for the job. •

BILL OF MATERIALS

1	1½"x8"x36"	hardwood stock (including barrel)
1	½"x1"x1½"	aluminum, fiber, or bronze release latch
1	½"x1"x2½"	aluminum, fiber, or bronze trigger release and 8" piece of .030 piano wire for trigger spring
2	3/16"x1½"	mild steel welding rod used as pins for trigger assembly
2	2½" long	closet screws and caps from plumbing shop
2	¼-20 N.C. lock nuts	can knurl your own lock nuts or use wing nuts
1	½"x1½"x5"	hardwood bow lock plate
1	½"x1½"x1½"	hardwood wedge
2	5/16"x2½"x7½"	wedge enclosures and barrel reinforcement
2	⅜"x2"x3½"	cover plates and six No. 6¾" brass screws
1	16 ga. ½"x14½"	brass strip trigger guard
1	small brad	round head for front sight
1	7/16"x1½"x4"	bolt cover plate, and one No. 6-1 flathead screw
1	¾"x1¼"x2"	thumb rest (for cocking crossbow), and two No. 8-1¼" brass screws
1	3/16"x6"	brass welding rod for shaft for adjustable peep sight
1	½"x1"x1"	brass for peep sight
1	No. 10-24	lockscrew for peep sight wind gauge
1	No. 10-24	lockscrew for vertical adjustment on sights
The Bow:		
1	brake drum and 2½" pipe, 12" long	steam pot
2	⅜"x¾"x12" strap iron; 16 ga. sheet metal, 18" long	bending jig
1	2"x36"	Fiberglas, 2 or 3-ply
1	⅜"x2"x6"	backing block to bring bow to size when it fits in slot in stock
1	¼"x2"x36"	yew or osage orange wood for bow
	1" strips from innertubing	for clamps
The Bolts:		
4 or 5	5/16"x30"	Port Orford Cedar bolt shafts
	as needed	turkey feathers
1		fletching jig

BULLET SHOOTING CROS
-GENERAL IN

FIRST OF ALL, WHY A BULLET SHOOTING CROSSBOW? CHEAP SHOOTING NO CHASING EXPENSIVE ARROWS OR LOSING THEM! AND THE DRAW WEIGHT UNLIKE POUCH AND SLOTTED BARREL, BULLET CROSSBOWS IN HISTORY, THIS SOMEWHAT INACCURATE AND THE SLOTTED, ROUND BARREL BOW CREATED T WORKS REALLY GREAT! THE FIRST NEW DESIGN IN 500 YEARS! A SLIDIN ENERGY TO THE BALL BULLET. FRICTION IS LOW AND THE POWER IS HIGH ARE EASY TO FIND AT YOUR LOCAL HOME CENTERS AND HOBBY SHOPS.

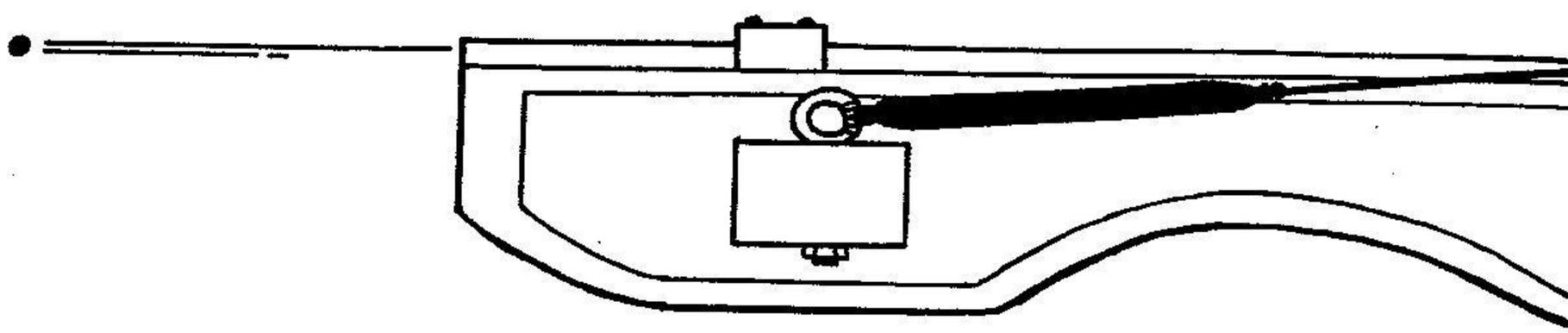
THE BOW USES 1/4" RUBBER BAND POWER. SOME WWII BOWS (ARROW WILL GIVE YOU ABOUT 70 POUNDS DRAW WEIGHT. ENOUGH FOR BACKYARD PLIN REQUIRED A COME-ALONG (WINCH) TO COCK IT AND IT SENT A 3/8" STEE OUT AND SMASHED A HOLE THROUGH AND SPLIT THE BOARD. IT TURN

RUBBER POWER IS REQUIRED BECAUSE IT SUPPLIES TREMENDOUS ENERGY STOPPING OF THE BOWSTRING AND THRUSTER. THIS GRADUAL ACCELERATION POWER STROKE BEING ABOUT 2 TO 3 TIMES LONGER IN LENGTH THAN IN A WOULD PROVIDE, WITHOUT DAMAGE TO THE BALL, STRING OR THRUSTER THE SHOOTING ACTION IS INSTANTANEOUS. VELOCITY IS FANTASTIC AND ONLY 2 30° UPWARD AIM ANGLE! OK! LETS GET GOING!

BEGIN BY CUTTING OUT THE RIGHT AND LEFT SIDE PIECES FROM YOUR 3/ OUT THE NUT AND LEVER PIN SHAFT HOLES. USE A DRILL PRESS OR A SQU FORGET! GET YOUR PIECE NUMBERS FROM PRINT 2, FRONT VIEW.) THEN YO CLAMP GLUE ON SECTIONS 2+3 IN THEIR PROPER PLACES. THIS WILL GIVE Y AFTER THE GLUE IS SET AND DRY, CLAMP GLUE SIDE 4 IN PLACE. ROUGH HEX BOLTS THREADED ON ENDS ONLY, FOR PINS. THEN MAKE THE BOW P POINT YOU'LL PROBABLY DO A LITTLE TEST SHOOTING, BUT REMEMBER TO A MORE STYLISH LOOK AND LIGHTNESS. BOW STOCK IS MEDIEVAL DESIGNE CROSSBOWS. SOME SHOOTERS USED TO PLACE BUTT RIGHT UNDER THEIR RIGHT EY

NOTE THE INSTRUCTIONS FOR ENLARGING THE PLAN ON PRINT 2. YOU DON'T E AND 3/4"THICK AND PLACE THE NUT HOLE 22" DOWN FROM THE NOSE USING A SQUARE LIKE BOW AND EYEBALL TRIM IT LATER. EASY AS PIE! FRONT ED IS 1" FROM TOP OF STOCK, NOT TOP OF RAIL!

THE MAIN THING IS TO STUDY THE PLANS AND VISUALIZE WHAT HAPPENS WHE THE PLANS. AND ALWAYS WEAR YOUR SHOOTING GLASSES! WITH ANY ARCHE STEPS HAVE BEEN TAKEN TO PROTECT THIS DESIGN CONCEPT AS WELL



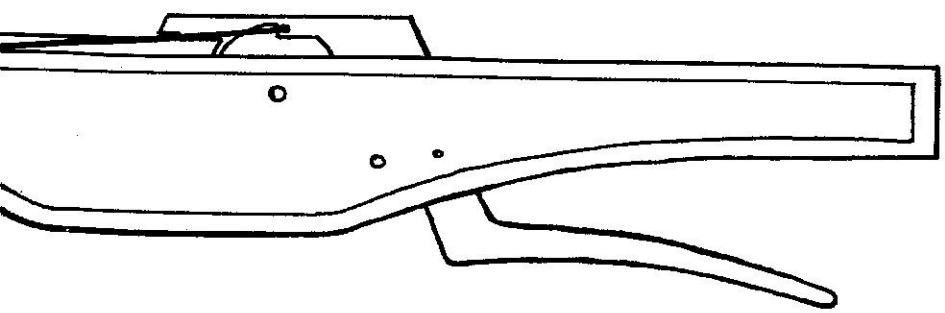
OSSBOW • .38 CAL. BALL.
INSTRUCTIONS-

NG FUN WITH A WEAPON THAT APPROACHES A FIREARM IN PERFORMANCE!
GHT CAN BE SET AT ANY POUNDAGE YOU WANT, BY USING RUBBER POWER!
THIS ONE IS EASY TO MAKE IN YOUR HOME WORKSHOP. THE OLD POUCH BOW WAS
D TOO MUCH FRICTION ON THE BULLET TRAVELING THROUGH IT. THIS ONE
DING BULLET THRUSTER GLIDES DOWN ITS GROOVE AND SUPPLIES THE FOWARD
IGH. ACCURACY IS EXCELLENT. ITS NOT ONLY SIMPLE TO MAKE BUT THE SUPPLIES

OW) ALSO USED THIS POWER SOURCE. 20 BANDS ON EACH SIDE OF THE BOW
LINKING. MORE THAN ENOUGH! I'VE TESTED MINE AT 50 BANDS PER SIDE, WHICH
TEEL BALL THROUGH A 1 1/4" PINE PLANK AT 50'!! A .375 LEAD BALL FLATTENED
RNED THE BOARD TO KINDLING. (STEEL SEEMS TO BE MUCH NEATER.)
GY IN A GRADUAL MANNER AND ALSO HAS A SHOCK ABSORBING ACTION ON THE SUDDEN
ION, INSTEAD OF SUDDEN, AS WITH A STEEL BOW) IS COMPENSATED FOR BY THE
A STEEL BOW. HENCE, THE BALL GETS UP TO THE SAME SPEED A STEEL BOW
TER, THAT WOULD OCCUR IN STEEL BOWS. AS FAR AS THE HUMAN EYE GOES,
25 BANDS PER SIDE WILL SEND A BULLET OUT OF SIGHT WHILE STILL CLIMBING A

8/4" THICK POPLAR. PIECES #1 AND 4. CLAMP TOGETHER (DON'T GLUE!) AND DRILL
SQUARE WITH A HAND DRILL TO INSURE THE HOLES RUN PERPENDICULAR. (DON'T
YOU CUT OUT #2+3 WITH CENTER AREA REMOVED. LAY OUT THE RIGHT SIDE AND
E YOU YOUR STOCK, WITH CENTER HOLLOW, MINUS THE LEFT SIDE, PIECE 4.
H STOCK IS DONE! NOW YOU MAKE YOUR NUT AND LEVER AND INSTALL. USE 3/8"
W AND THRUSTER, STRING, ETC. AS PER PLANS AND YOUR IN BUSINESS! AT THIS
TO TRIM AND TAPER THE STOCK + LEVER AND ROUND THE EDGES OF THE BOW FOR
NED. RIFLE DESIGN CAME LATER TO CONTROL RECOIL. THERE IS NO RECOIL IN
EYE! SUGGEST YOU PLACE THE TAPERED BUTT AT SIDE OF HEAD, EYE HEIGHT.
T EVEN HAVE TO DO THIS. JUST TAKE 4 LENGTHS OF 36" LONG POPLAR BY 3 1/2" WIDE
ING THE ACTUAL SIZE PATTERN, TRACED ON TRACING PAPER. THEN CONSTRUCT
EDGE OF BOW HOLE IS 4 1/4" FROM NOSE OF STOCK. TOP EDGE OF BOW HOLE

WHEN THE NUT IS RELEASED. WHEN THIS HAPPENS, YOU'LL FIND YOU DON'T EVEN NEED
HERY EQUIPMENT! SHOOT SAFE! ENJOY!
LL AS ANY POSSIBLE MODIFICATIONS OF IT.

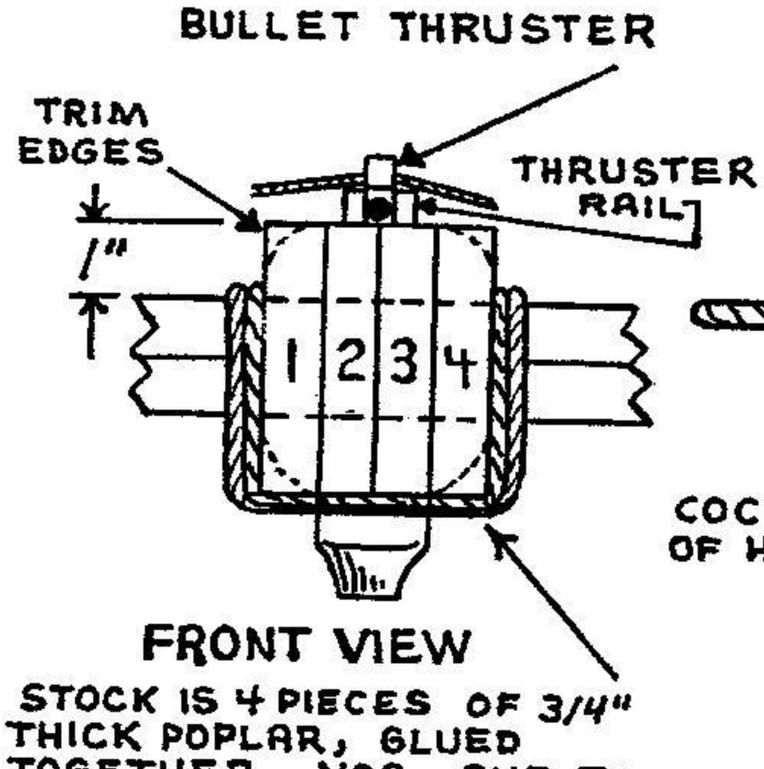


BULLET SHOOTING • FLOATING THRUSTER CROSSBOW. .38 CAL. RUBBER POWERED • AMMO 3/8" STEEL BALL, .375 LEAD BULLET • 70 TO 300 LB. PLUS WEIGHT. SHOCK FREE RELEASE ACTION.

PHOTO ENLARGE THIS PLAN PAGE TO 36" LONG FOR THE CROSSBOW STOCK OR GRID IT UP BY USING A 1" SQ. GRID FOR YOUR PATTERN DRAWING AND A 1/4" SQ. GRID DRAWN ON THIS PLAN, OR ON CLEAR ACETATE, LAID OVER THIS PLAN.

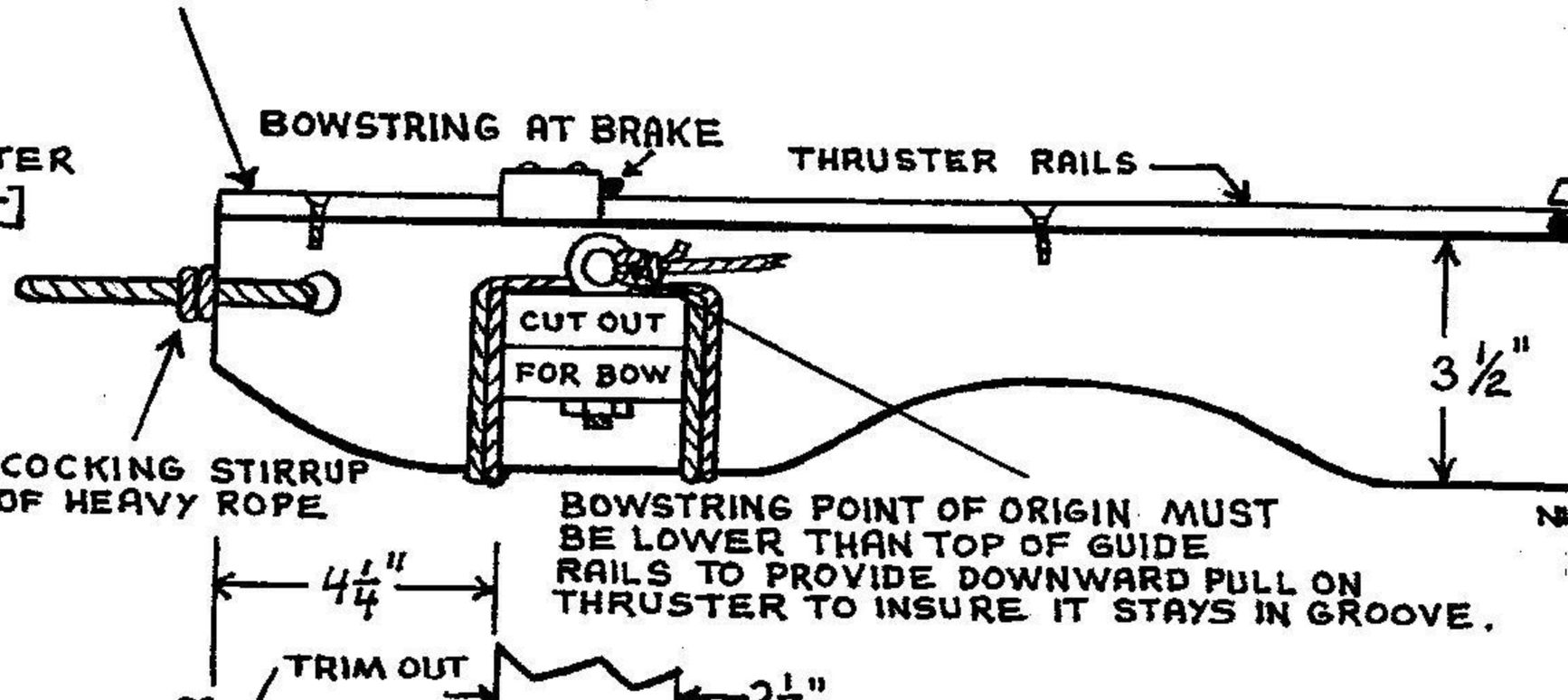
IN THIS NEW
NUT AND A G
VELOCITY.
LOCK IN. IN
CONTACT TH
BARREL ARE
THRUSTER H
IN THE GROO
RELEASED, THE BOWSTRING PROPELS THE CAPT
OF THE GUIDE RAILS. IT IS HELD SLIGHTLY ABOV
STOPPED WHEN THE STRING HITS THE THRUSTER
STRING DAMAGE. A STRING AND THRUSTER B
THIS NEW CONCEPT CROSSBOW HAS BEEN DESIGN
IT PROVIDES A SHOCK ABSORBING ACTION FOR TH
ACTION. USE RUBBER POWER ONLY. LOW POW
WIDER AT STRING CONTACT POINTS FOR HIGH PO

THRUSTER RAILS ARE 21" LONG. 3/8" HIGH AND 1/4" WIDE. TWO RAILS WITH A 3/8" SPACE BETWEEN. THIS SPACE IS YOUR THRUSTER GROOVE. THRUSTER RIDES DOWN THIS GROOVE. MOUNT WITH FLAT WOOD SCREWS. USE READY CUT SPRUCE FROM HOBBY SHOP, OR CUT OWN.



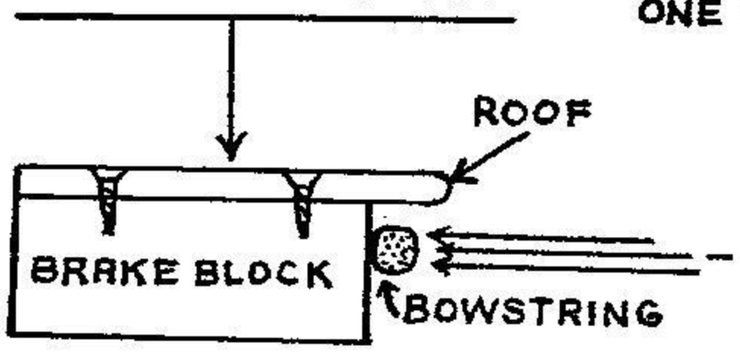
FRONT VIEW

STOCK IS 4 PIECES OF 3/4" THICK POPLAR, GLUED TOGETHER. NOS. ONE TO FOUR. PIECES 2 AND 3 HAVE CENTER AREA CUT OUT.

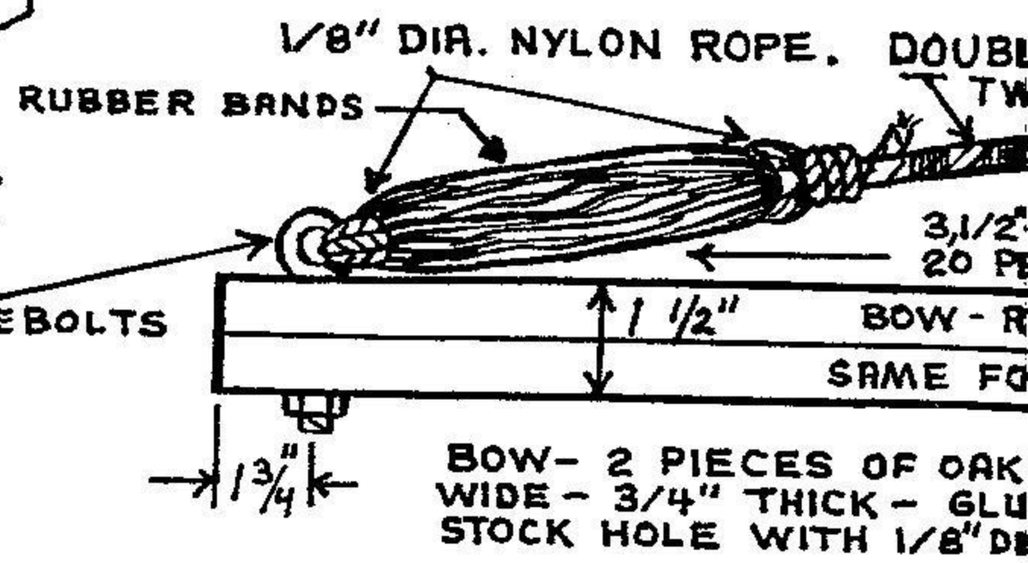


THRUSTER BRAKE BLOCKS. ONE SIDE SHOWN. POPLAR. 3/4" HIGH. 1 1/4" WIDE. 2" LONG. MOUNT-2 WOOD SCREWS. ONE ON EACH SIDE. WIDER, FOR HIGH POWER.

FOR HIGH POWER-ADD A BRAKE ROOF TO PREVENT STRING FROM JUMPING OVER THE THRUSTER BRAKE.

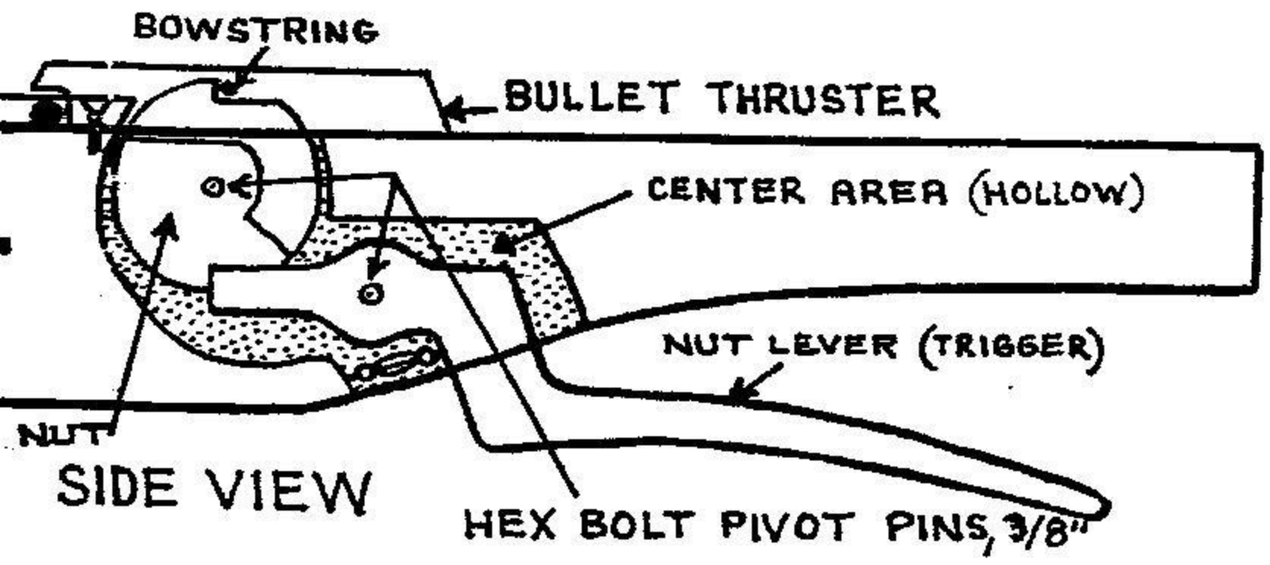


ROUNDING OFF INSIDE CORNERS OF BRAKE BLOCK REDUCES STRING WEAR AT THAT POINT.

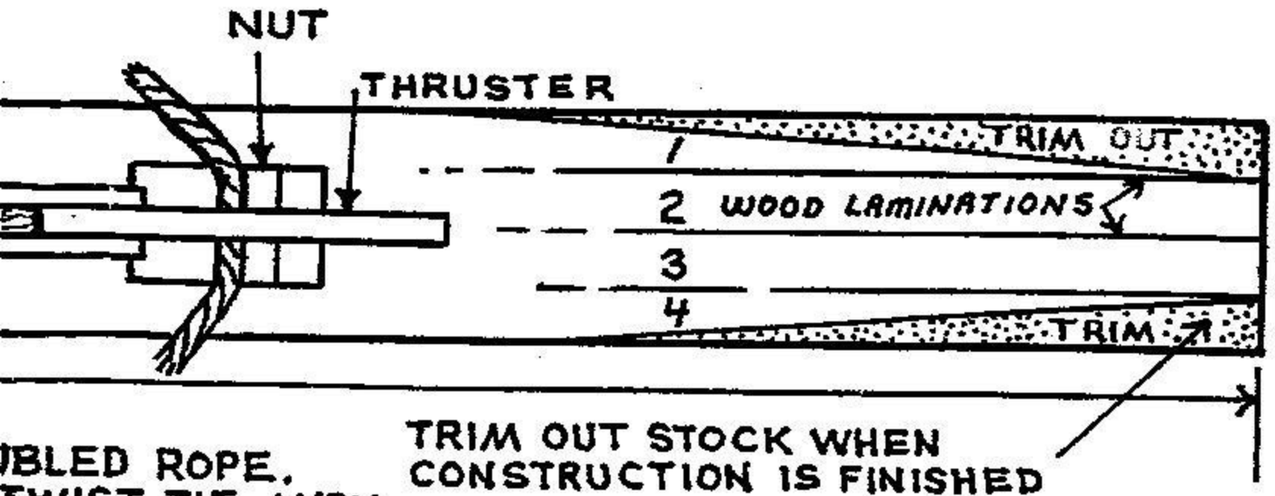


EW CONCEPT CROSSBOW, A "FLOATING" BULLET THRUSTER RIDES THROUGH A GROOVE IN THE RELEASE
GROOVE MADE WITH TWO SPRUCE STRIPS, AND PROPELS A BALL WITH TREMENDOUS FORCE AND
THE BALL IS LOCKED IN A GROOVE ON THREE SIDES AND THE THRUSTER PROVIDES THE TOP SIDE
N EFFECT, THE BALL RIDES DOWN A LOW FRICTION SQUARE BARREL. A ROUND BARREL WOULD
THE BALL ON ITS FULL CIRCUMFERENCE PRODUCING GREATER FRICTION. THREE SIDES OF THIS
RE STATIONARY WHILE THE TOP SIDE IS THE MOVING THRUSTER. THE BOWSTRING FLOATS IN THE
HOLE, (GOES THROUGH IT) AND THE DOWNWARD PULL OF THE STRING HOLDS THE THRUSTER DOWN
OOVE. THE RELEASE NUT HOLDS BACK THE BOWSTRING WHEN COCKED. WHEN THE NUT IS
PTIVE THRUSTER AND BALL DOWN THE GROOVE. NOTE THE BOWSTRING DOES NOT TOUCH THE TOP
DVE BY THE STRING HOLE HEIGHT OF THE THRUSTER. THE BULLET THRUSTERS FOWARD TRAVEL IS
ER BRAKE BLOCKS. WIDE SURFACE OF BLOCKS AND SHOCK ABSORBING RUBBER POWER PREVENTS
BRAKE ARE NECESSARY TO PREVENT SPRING BACK THAT MIGHT DAMAGE RAILS OR THRUSTER.
SNED FOR RUBBER POWER. RUBBER POWER MAKES FOR SMOOTH, SHOCK FREE OPERATION.
THE TREMENDOUS ACCELERATION OF THE BALL AND THRUSTER AS WELL AS ITS SUDDEN BRAKING
WER TO HIGH POWER THROUGH AMOUNT OF RUBBER. MAKE THE THRUSTER BRAKE BLOCKS
POWER. 150 LBS. PLUS. SEE DOTTED LINES IN TOP VIEW.

SUPPLY LIST: HOME CENTER, TWO, 6' LENGTHS OF POPLAR, 3 1/2" WIDE, 3/4 THICK. ALSO, ONE 6' OAK LENGTH, 2 1/2" WIDE, 3/4" THICK. 3/8" HEX BOLTS, LARGE EYE BOLTS. (3/8" SHAFT) ELMERS GLUE. TOOLS.



SIDE VIEW



HOBBY SHOP SUPPLY LIST: 3 OR 4 PIECES OF MODEL AIRCRAFT BIRCH PLYWOOD, 3/16" THICK. A COUPLE OF SPRUCE STRIPS, 3' LONG, 1/4" X 3/8". USE 3/16" PLYWOOD IN NUT SO YOUR WIDTHS AND GROOVE WILL WORK OUT WITH 3 STEPS ON PRINT 3. AND YOU CAN DO THE JOB WITH A HAND SAW ON 3/16" WOOD. NO EXPENSIVE BAND SAW REQUIRED.

OBTAIN
RUBBER BANDS AT OFFICE SUPPLY OR HOBBY SHOP.

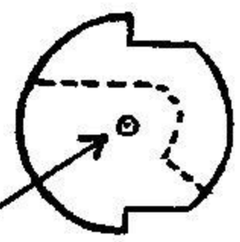
NOTE... SEE ACTUAL SIZE PATTERNS ON PAGE 3 FOR DIMENSIONS OF PARTS ALONG WITH DIMENSIONS LISTED HERE.

BLED ROPE.
TWIST, TIE, WAX.

RUBBER BANDS. 1/4" WIDTH.
2"-4,1/2" LONG. 20 TO 50 PER SIDE.
PER SIDE GIVES ABOUT 70 LBS. DRAW WEIGHT.
- RT. SIDE, FRONT.
FOR LEFT SIDE.

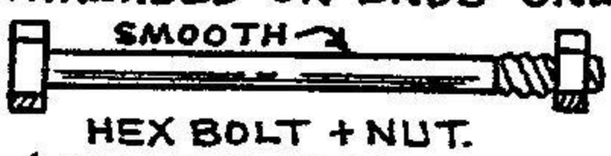
BOWSTRING MUST BE TIGHT, IN UNCOCKED POSITION. AT LEAST 25 LBS. TENSION. USE ABOUT 12" OF BOWSTRING BETWEEN RUBBERS.

AK - 30" LONG - 21/2"
LUE TOGETHER. TIE IN
"DIA. NYLON ROPE.

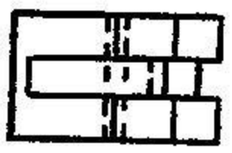


NUT
3 VIEWS
SEE ACTUAL SIZE ON PRINT 3.

USE 3/8" HEX BOLTS + NUTS AS NUT AND NUT LEVER PINS. THREADED ON ENDS ONLY.



HEX BOLT + NUT.
(USE WASHERS AS WELL.)

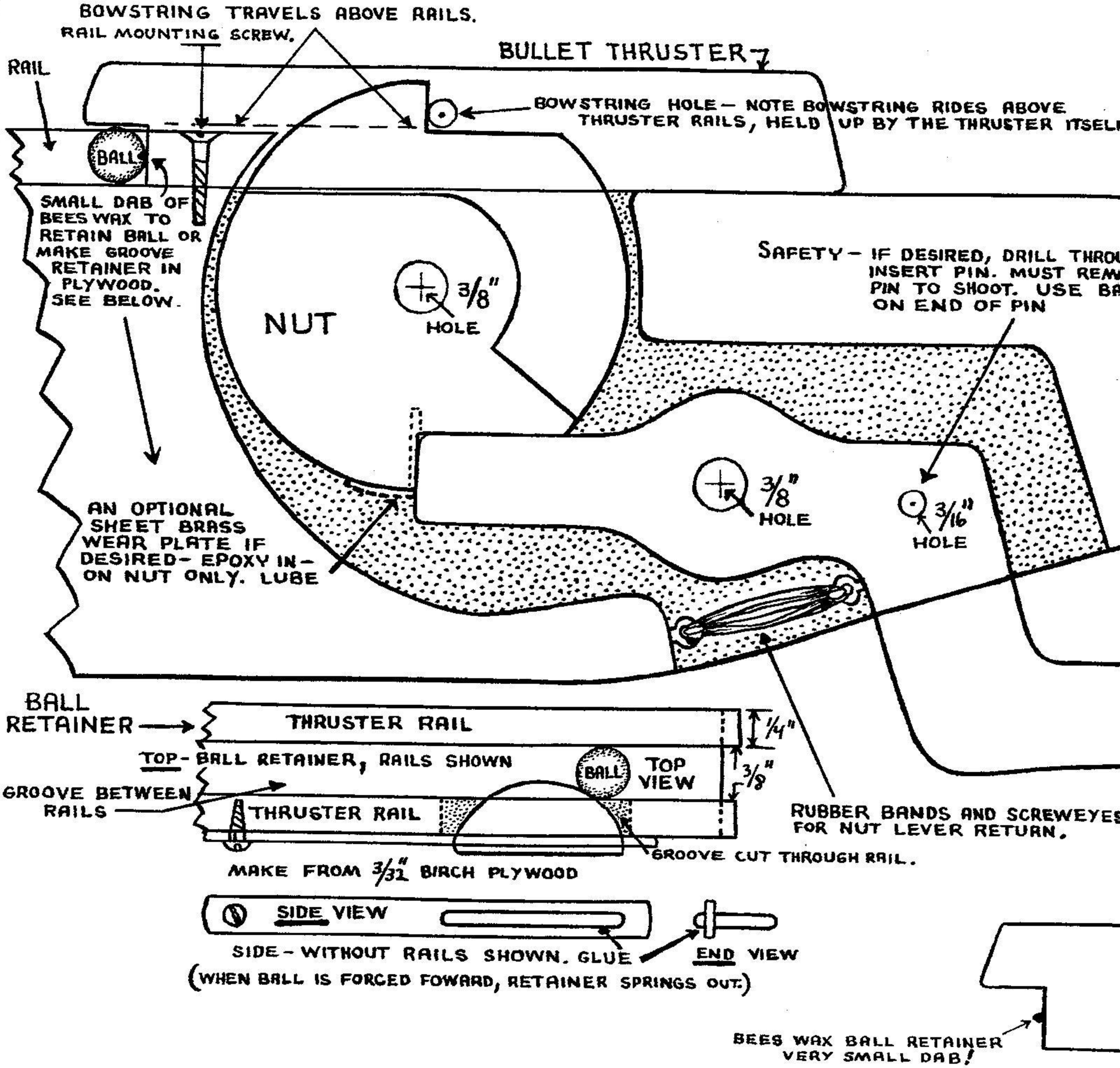


ACTUAL SIZE PATTERN OF CROSSBOW LOCK

ONCE YOU GRID UP YOUR SIDE VIEW STOCK DRAWING, YOU CAN USE THIS PATTERN TO ACCURATELY PRODUCE YOUR LOCK PARTS AND DRILLED HOLES.

NOTE...
EVEN IF YOU CAN'T VI
VIEW DRAWING OF PRI
THE 3 EASY STEPS FO

OBTAIN PLYWOODS AT YOUR H
MODEL AIRCRAFT SECTION. US
WHITE GLUE.



ISUALIZE NUT FROM 3
NT #2, JUST FOLLOW
OR A PERFECT PART

HOBBY SHOPS
SE ELMERS

F.

UGH.
OVE
ALL KNOB

ES.

STEP #1 NUT

ACTUAL SIZE PATTERN. CUT OUT 6 OF THESE IN — 3/16" BIRCH PLYWOOD. GLUE 3 TOGETHER FOR ONE SIDE. THEN GLUE 3 TOGETHER FOR OTHER SIDE.

NUT ⊕ 3/8" HOLE

DRILL AFTER FINAL ASSEMBLY.

STEP #2 NUT

ACTUAL SIZE PATTERN. CUT 2 OF THESE AND GLUE TOGETHER. THEN GLUE ALL 3 PIECES TOGETHER, WITH THIS ONE IN THE CENTER — SEE STEP 3 BELOW. USE 3/16" PLYWOOD.

AS RELEASED NUT TURNS — THIS TURNING SURFACE SUPPORTS THRUSTER AS IT PASSES THROUGH NUT.

NUT CENTER ⊕ 3/8" HOLE

STEP #3 NUT

NUT — FINAL ASSEMBLY ⊕ 3/8" HOLE

GLUE LINE-UP PATTERN

USE THIS TO LINE UP 3 SECTIONS YOU MADE, FOR GLUE ASSEMBLY — THEN DRILL HOLE.

NOTE:
TOTAL WIDTH OF NUT IS 1 1/2"
WITH 3/8" CENTER SLOT

ACTUAL SIZE OF NUT LEVER — MAKE 8 FROM YOUR 3/16" AIRCRAFT BIRCH PLYWOOD AND GLUE TOGETHER. TAPER WIDTH OF HANDLE AS SHOWN IN MAIN PRINT, FRONT VIEW. THEN DRILL HOLE.

⊙ 3/16" STRING HOLE

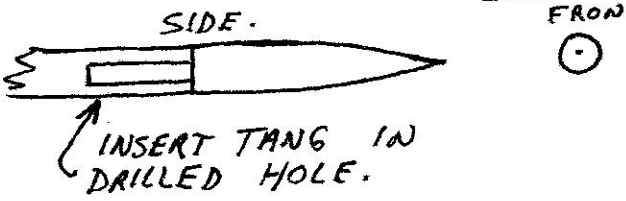
ACTUAL SIZE BULLET THRUSTER PATTERN. CUT OUT TWO IN 3/16" BIRCH AIRCRAFT PLYWOOD
GLUE TOGETHER AND DRILL HOLE.
LUBE THE BOTTOM WITH GREASE + GRAPHITE
LUBE RAIL GROOVE AS WELL. REGULAR AUTO LUBE OIL WORKS BEST

ADD. NOTES

(1) PAINT WITH OIL BASED ENAMELS. (BLACK IS NICE)

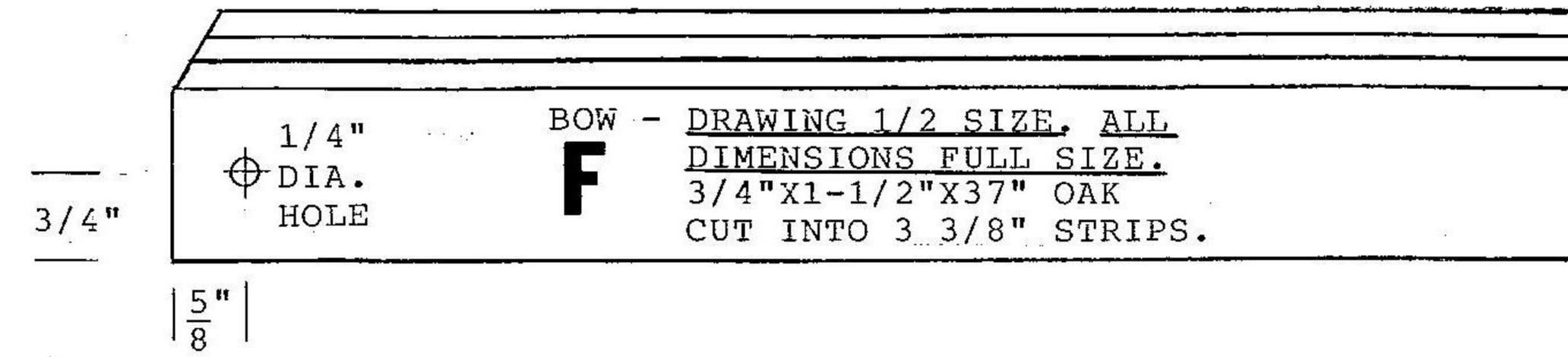
(2) SOAK ALL ROPE WORK, (EXCEPT BOW STRING AT THRUSTER) WITH WHITE GLUE. (ELMERS) LET DRY. THIS GIVES A WOOD HARDNESS TO THE ROPE WORK AND ADDS STRENGTH.

(3) BOW WILL ALSO SHOOT HEAVY METAL BODKIN TIPPED FEATHERLESS BOLTS. 8" BIRCH SHAFTS— 5/16" DIA. SHAFTS GUIDE HEAVY TIPPED BOLTS IN SAME MANNER AS A STICK ON A SKY-ROCKET. FEATHERS NOT NEEDED, BROADHEAD POINTS WILL FLY OFF COURSE. MUST BE BODKIN TIPPED.



THESE BOLTS WILL SURPASS PENETRATION OF .38 CAL. PISTOL ROUNDS, WHEN MADE WITH HARDENED STEEL, USING HIGH POWER RUBBER.

PAGE
1A



BOW - **F**

DRAWING 1/2 SIZE. ALL DIMENSIONS FULL SIZE.
3/4"X1-1/2"X37" OAK
CUT INTO 3 3/8" STRIPS.

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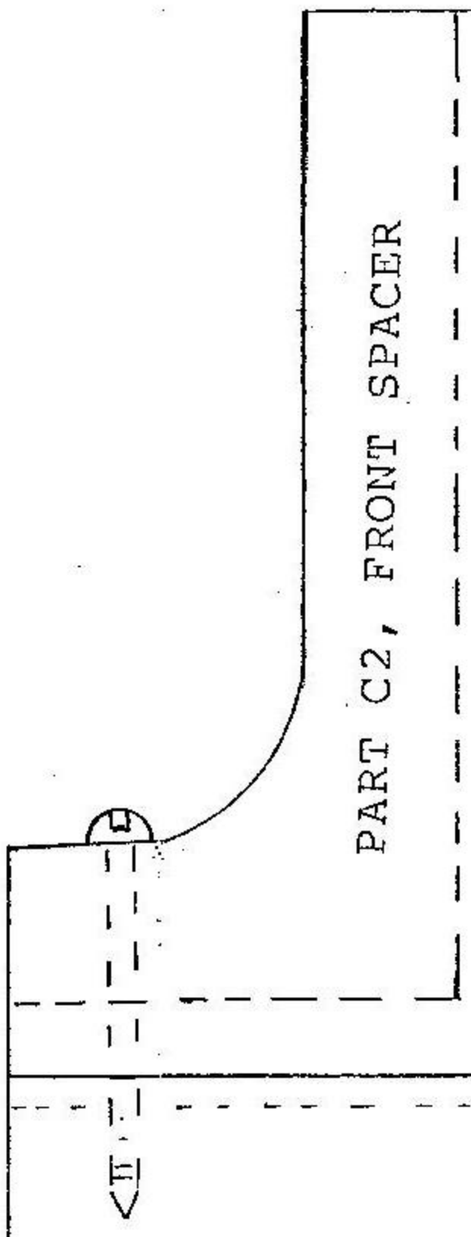
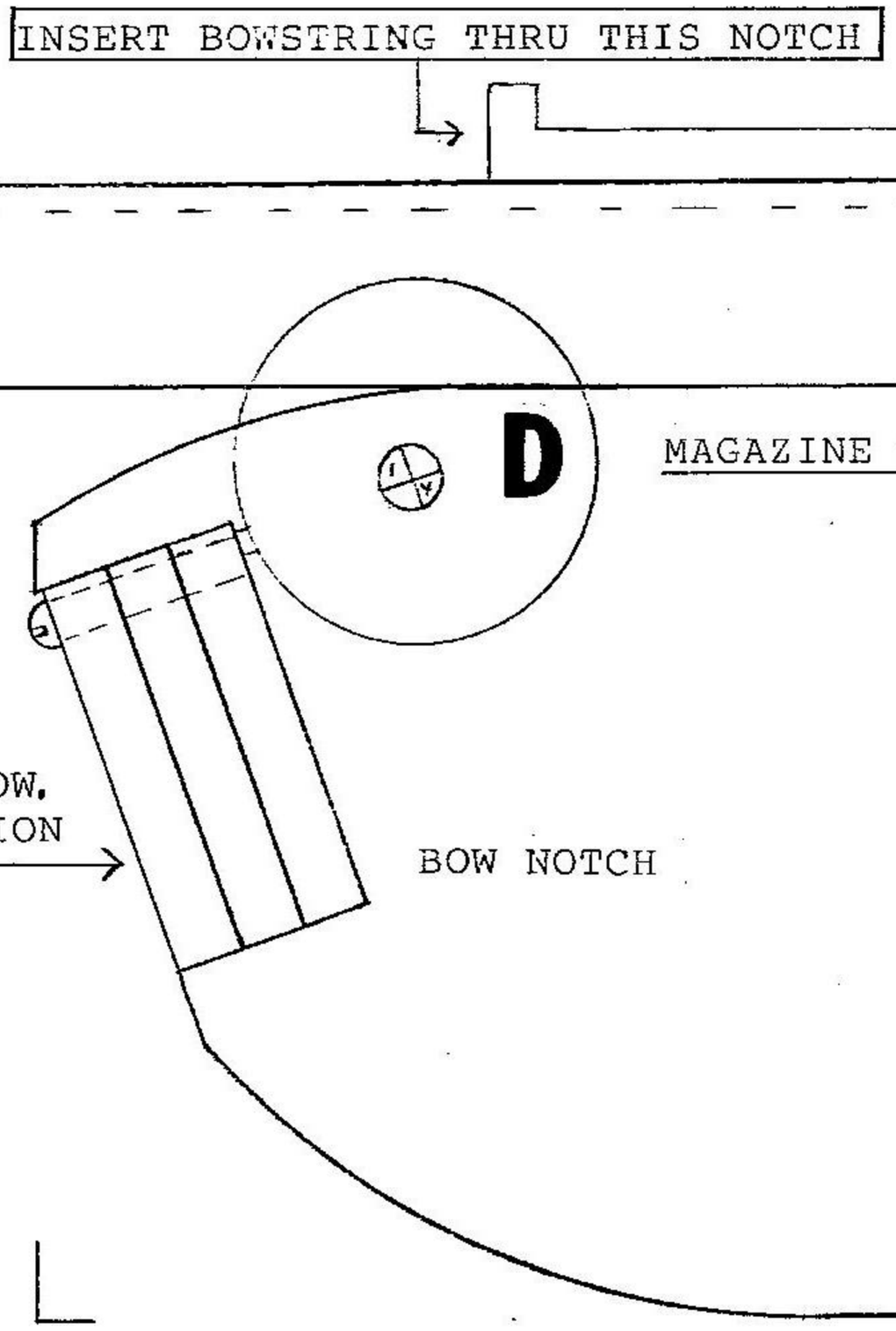
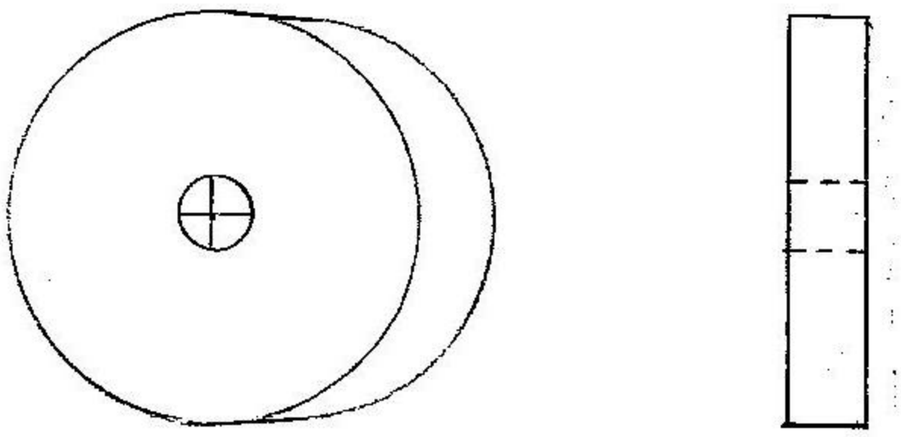




PART "D" SIDE VIEW - END VIEW



TWO 5/32" DIA. HOLES
1/8" EDGE DISTANCE

3/4"

C

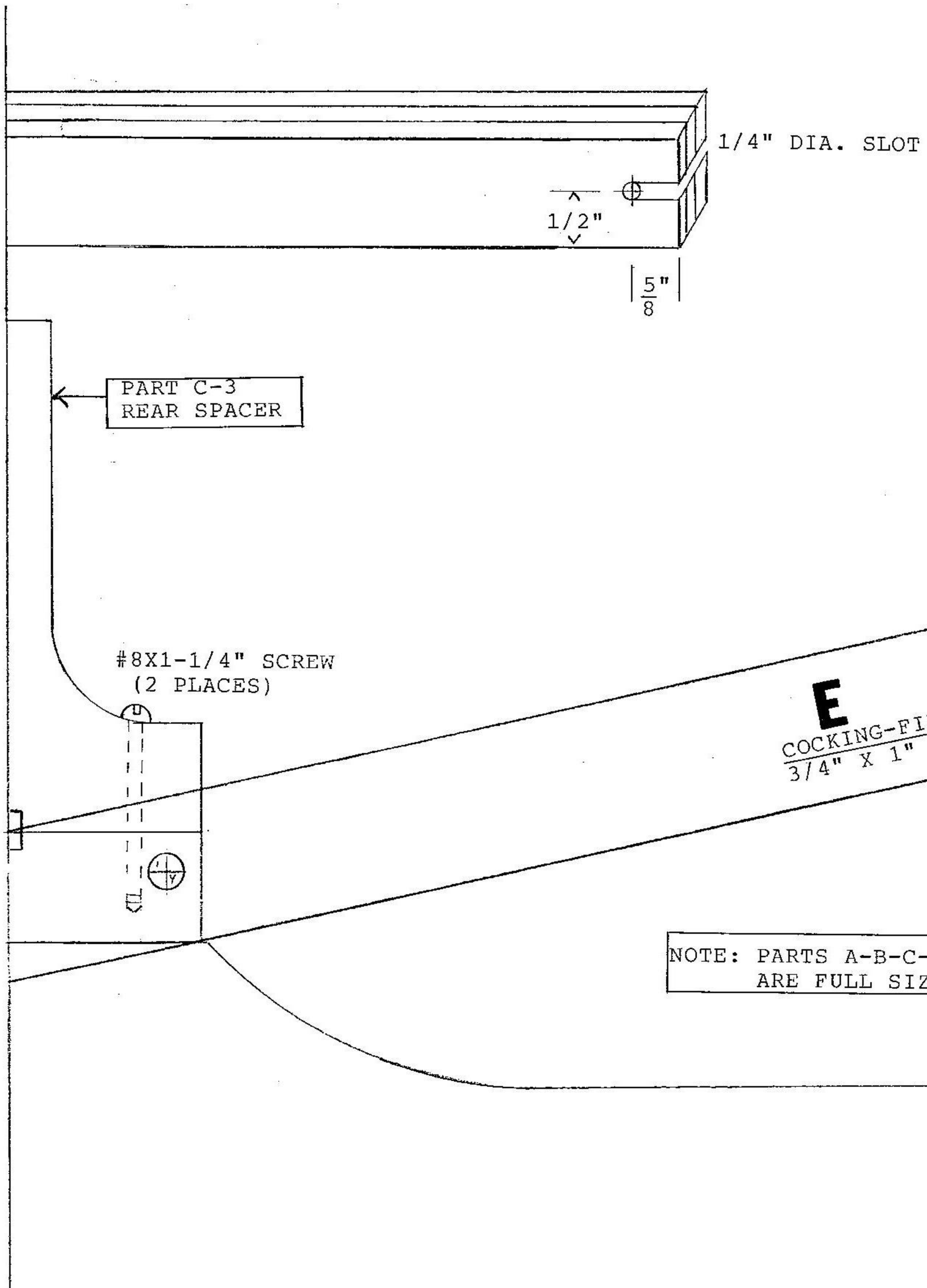
ARROW MAGAZINE PART C1, 3 PIECES
1/4" X 3-1/2" X 17-1/2" SEE PAGE
TWO FOR PARTS C2 AND C3

BOWSTRING
(CROSS SECTION)

B ARROW GUIDE 3/4" X 1-1/2 X 17-1/2"

A

GUN STOCK 1-1/2" X 3-1/2" X 28"
ALL CURVES 6" RADIUS.


1/4" DIA. SLOT
1/2"
5/8"
PART C-3
REAR SPACER
#8X1-1/4" SCREW
(2 PLACES)
E
COCKING-FIRING LEVERS 2 PIEC
3/4" X 1" X 13-1/4"
NOTE: PARTS A-B-C-D-E
ARE FULL SIZE.
CUT ON THIS LINE
AND JOIN WITH PAGE 1-A
(TAPE OR GLUE)

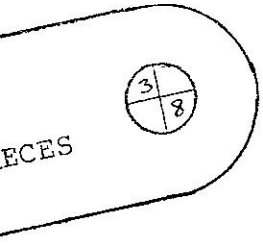
BILL OF MATERIALS

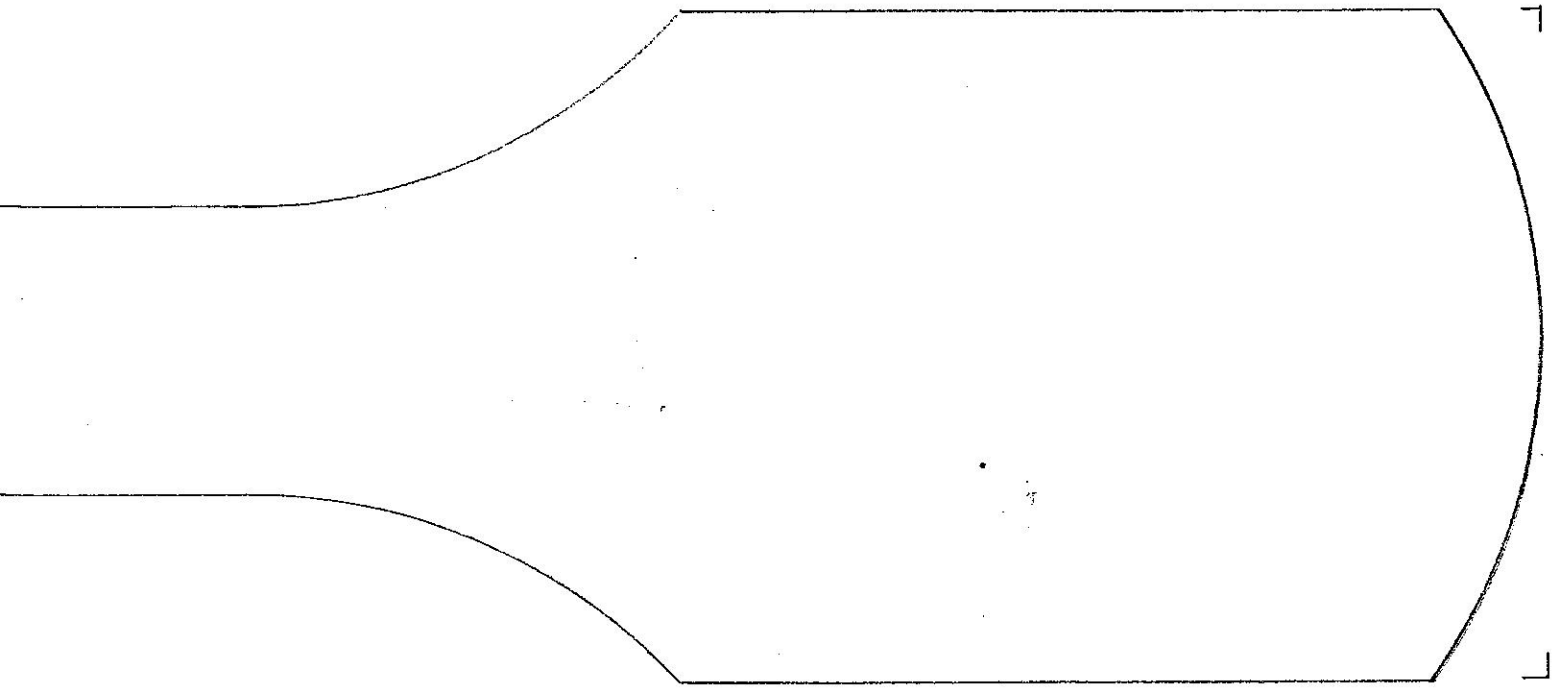
THE TYPE OR KIND OF WOOD YOU USE DEPENDS ON YOUR BUDGET, WHAT YOU HAVE ON HAND OR HOW YOU WANT THE GUN TO LOOK WHEN FINISHED.

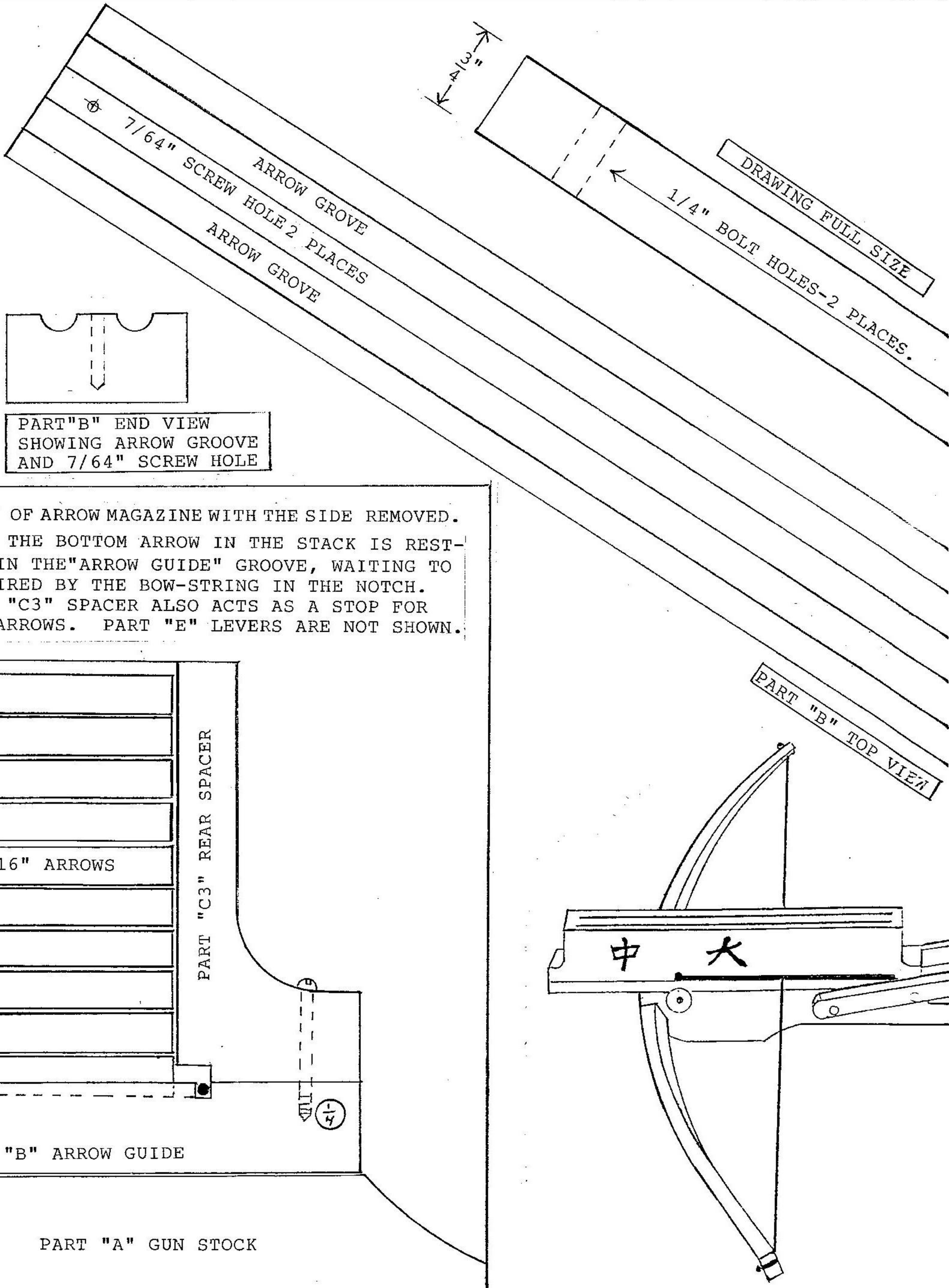
A. 2X4X28"
B. 3/4X1-1/2X17-1/2
C. 3PIECES 1/4" PLYWOOD. 3-1/2X17-1/2(C1)
   2 " 3/8" " . 1-1/2X3-1/4 (C2)
   2 " 3/8" " . 1-1/2X3-1/2 (C3)
D. 2 PIECES 1/4" PLYWOOD 1-3/8" WITH A 1/4" HOLE IN THE CENTER.
E. 2 PIECES 3/4X1X13-1/4
F. 1 PIECE OAK 3/4X1-1/2X37".
G. BOWSTRING, PLEASE SEE CONSTRUCTION DET.
H. ARROWS 24 PIECES 5/16X14" DOWEL WOOD.

HARDWARE

2 1/4X3-1/2 BOLTS.
4 1/4" WASHERS.
2 1/4" LOCKNUTS.
2 #8 2" WOOD OR SHEET METAL SCREWS
2 #8 1-1/4" " " "





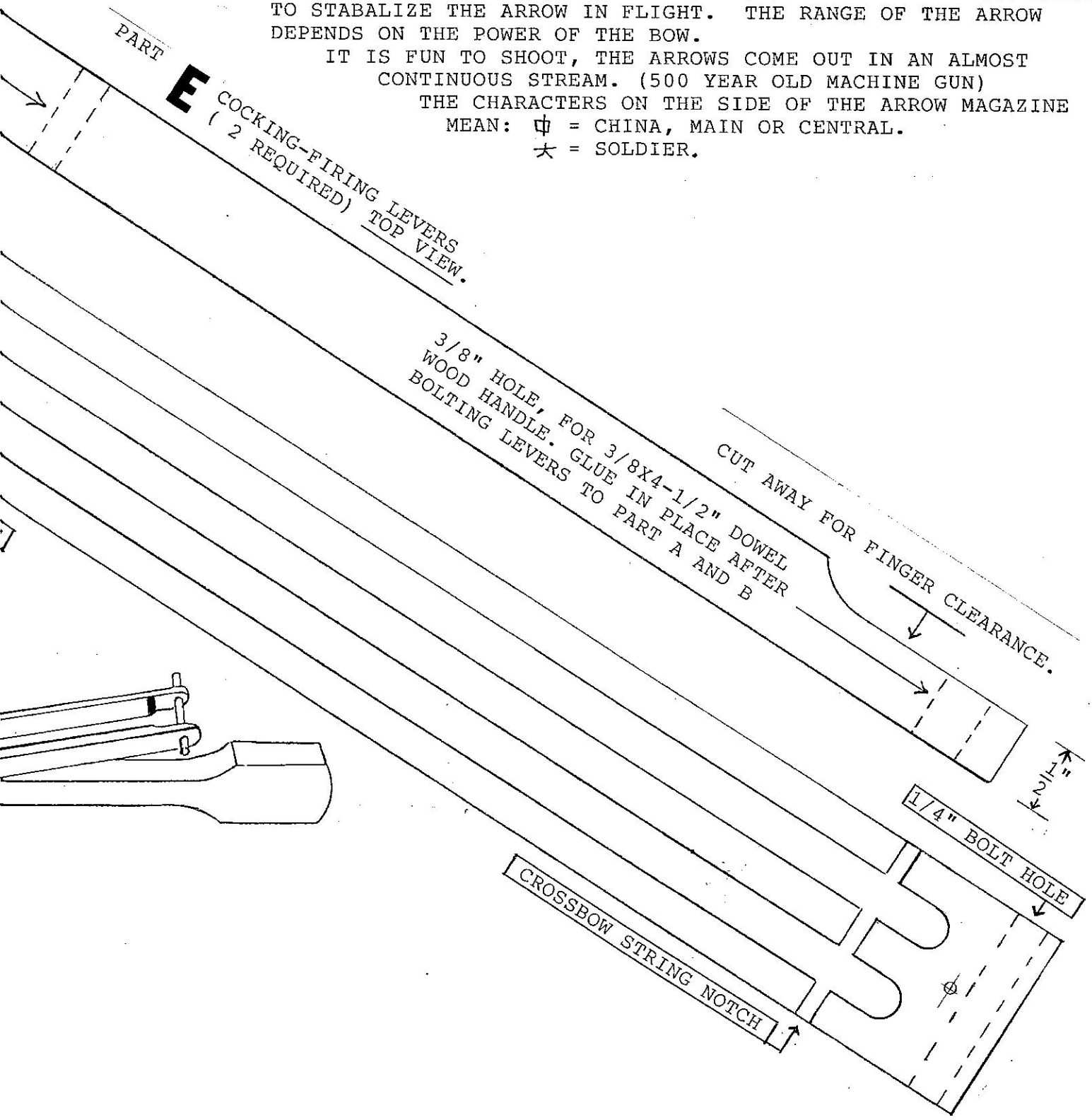

4 1/3"
ARROW GROVE
7/64" SCREW HOLE 2 PLACES
ARROW GROVE
DRAWING FULL SIZE
1/4" BOLT HOLES-2 PLACES.
PART "B" END VIEW SHOWING ARROW GROOVE AND 7/64" SCREW HOLE
VIEW OF ARROW MAGAZINE WITH THE SIDE REMOVED.
NOTE THE BOTTOM ARROW IN THE STACK IS RESTING IN THE"ARROW GUIDE" GROOVE, WAITING TO BE FIRED BY THE BOW-STRING IN THE NOTCH.
PART "C3" SPACER ALSO ACTS AS A STOP FOR THE ARROWS. PART "E" LEVERS ARE NOT SHOWN.
PART "B" TOP VIEW
5/16" ARROWS
PART "C3" REAR SPACER
1/4
PART "B" ARROW GUIDE
PART "A" GUN STOCK
中
大

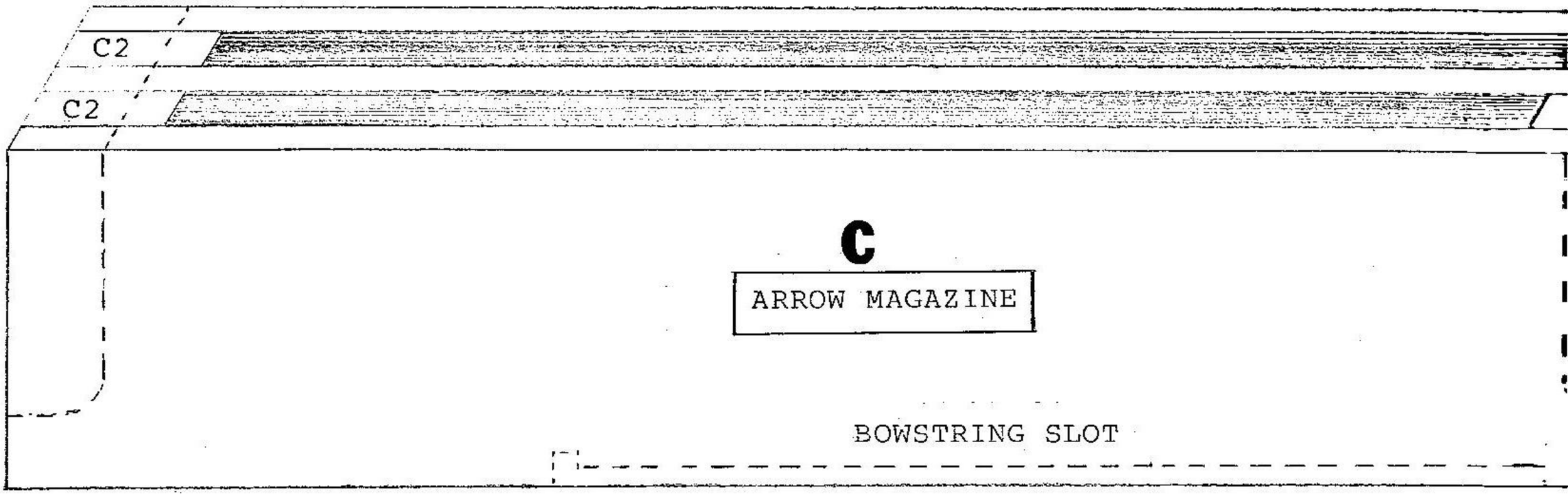
CHINESE REPEATING CROSSBOW HISTORY

THE REPEATING CROSSBOW IS SO OLD IT IS IMPOSSIBLE TO KNOW IT'S TRUE AGE, BUT TO THIS DAY IT IS CARRIED IN REMOTE AREAS OF ASIA. IT IS REPORTED TO HAVE BEEN USED DURING THE CHINA-JAPAN WAR OF 1894-95. THE UNUSUAL FEATURE OF THIS CROSSBOW IS THE REPEATING ACTION. SIMPLE, YET VERY EFFECTIVE, IT IS POSSIBLE TO FIRE 24 ARROWS IN 10-12 SECONDS; THUS, 100 BOWMEN CAN DISCHARGE 2400 ARROWS IN A FEW SECONDS. VERY EFFECTIVE FOR SLOWING THE CHARGE OF AN ENEMY IN THE OPEN. THE LIGHT ARROWS HAD LITTLE PENETRATING POWER; SO, THE TIP WAS TREATED WITH POISON, MAKING A SCRATCH FATAL. IT IS NOT PRACTICAL TO ADD FEATHERS TO THE ARROW SHAFT; SO, A HEAVY STEEL HEAD HELPS TO STABALIZE THE ARROW IN FLIGHT. THE RANGE OF THE ARROW DEPENDS ON THE POWER OF THE BOW.

IT IS FUN TO SHOOT, THE ARROWS COME OUT IN AN ALMOST CONTINUOUS STREAM. (500 YEAR OLD MACHINE GUN)

THE CHARACTERS ON THE SIDE OF THE ARROW MAGAZINE MEAN: 中 = CHINA, MAIN OR CENTRAL.
大 = SOLDIER.





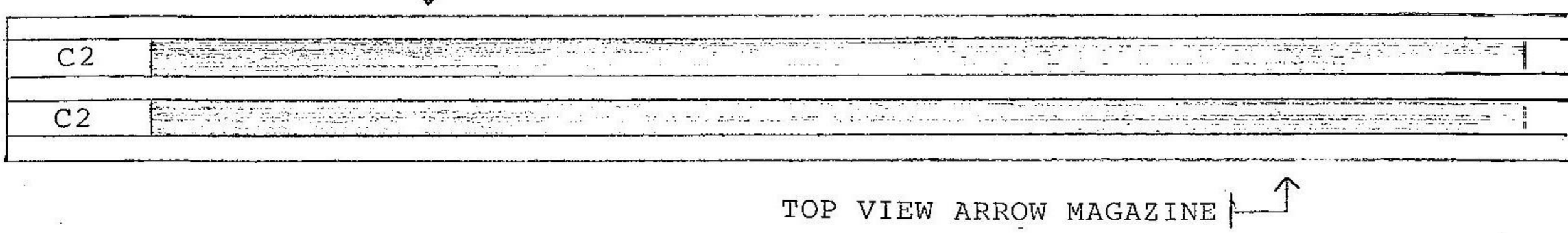
C

ARROW MAGAZINE

BOWSTRING SLOT

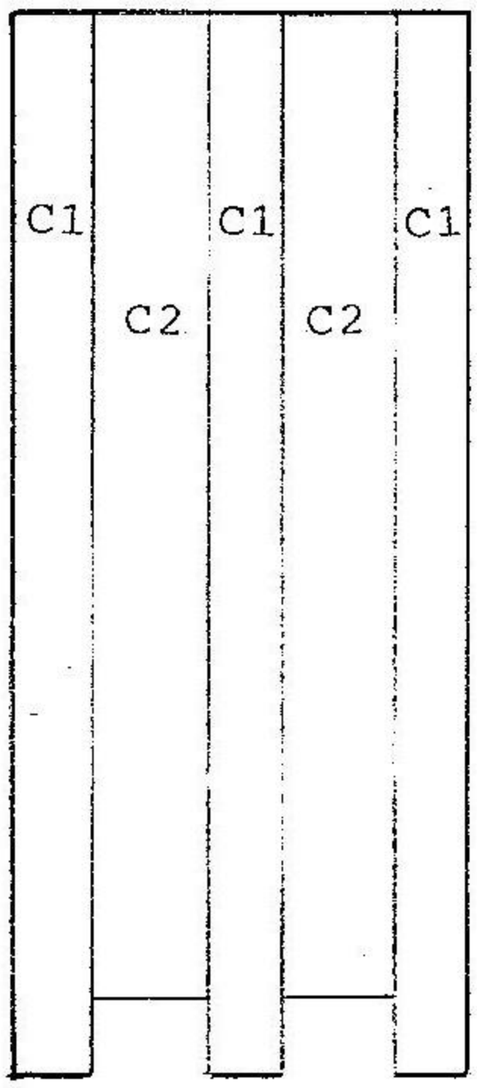
DRAWING 1/2 SCALE

GLUE PARTS C1,C2 AND C3 TOGETHER
THEN CUT ON DOTTED LINES.

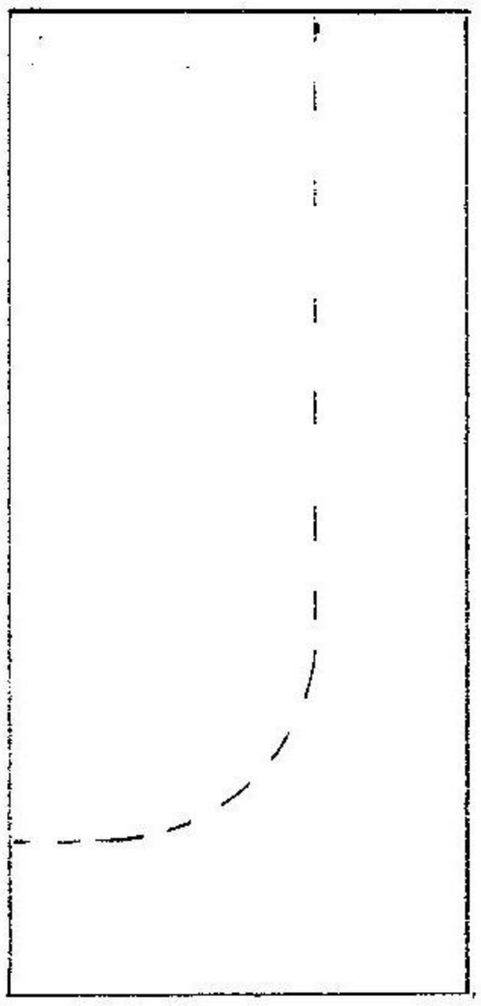


TOP VIEW ARROW MAGAZINE

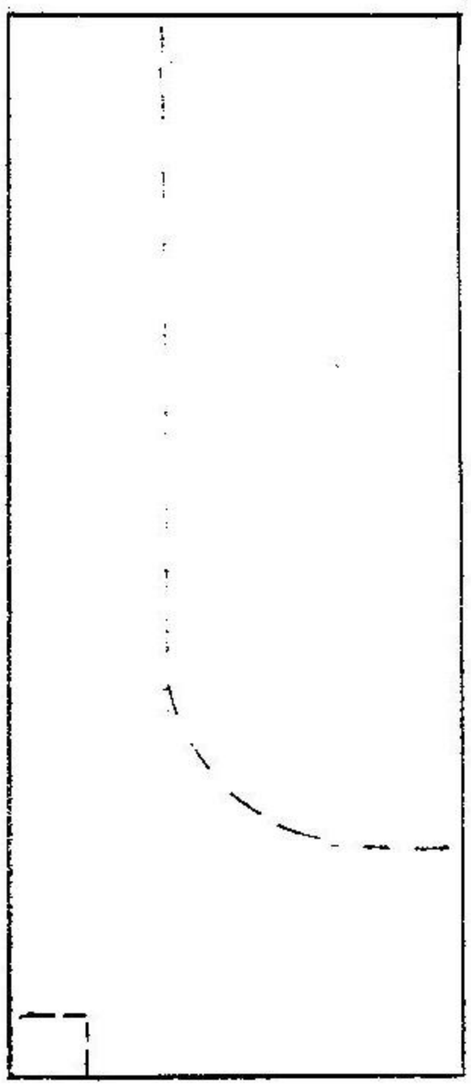
ARROW MAGAZINE
FRONT VIEW



PART C2
FRONT SPACER
(2 REQUIRED)
3/8" PLYWOOD
1-1/2"x 3-1/4"

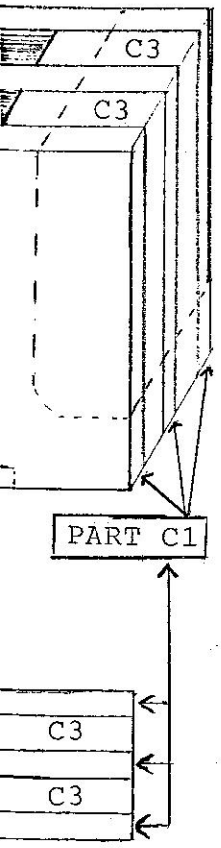


PART C3
REAR SPACER
(2 REQUIRED)
3/8 PLYWOOD
1-1/2" X 3-1/2"

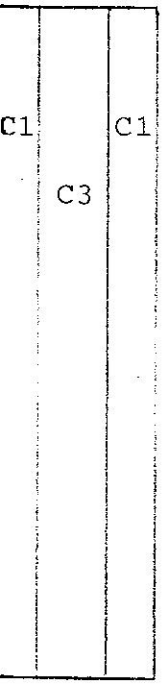


ARROW MA
REAR VIE

DOTTED LINES SHOW WHERE PARTS WILL BE CUT AFTER C1,C2 & C3 ARE GLUED TOG



AGAZINE
IEW



GETHER.

CONSTRUCTION DETAILS

PART A GUN STOCK CUT FROM 2X4 (1-1/2 X 3-1/2) OR 2 PIECES 1X4 (3/4 X 3-1/2) GLUED TOGETHER. SEE FULL SIZE SIDE VIEW DRAWING ON PAGE ONE.

PART B ARROW GUIDE 3/4X1-1/2X17-1/2. SEE FULL SIZE SIDE VIEW, PAGE ONE AND TOP AND END VIEWS ELSEWHERE. THE TWO 5/16 WIDE BY 1/8" DEEP GROOVES STABILIZE THE ARROW DURING LAUNCHING, AND POSITIONS THE BOWSTRING ON THE ARROW TIP. DRAW THE GROOVE LINES AND USE A WOOD GOUGE AND CUT TO THE 1/8" DEPTH. IF YOU HAVE A DRILL PRESS, CHUCK UP A 5/16" DRILL BIT, SET TO HIGH SPEED, CLAMP A FENCE TO THE DRILL PRESS TABLE AND SLIDE THE PART (FROM LEFT TO RIGHT) TO CUT THE GROOVE. LOWER THE DRILL BIT A LITTLE WITH EACH PASS TO THE 1/8" DEPTH.

PART C ARROW MAGAZINE THIS UNIT IS EASY TO MAKE USING 1/4" AND 3/8" PLYWOOD. SEE FULL SIZE DRAWINGS ON PAGE 1FOR PART C1 (3 PIECES REQUIRED) 1/4"X3-1/2X17-1/2" DON'T CUT THE CURVES ON THE ENDS UNTIL PARTS C1, C2 AND C3 ARE GLUED IN PLACE. THEN ALL 5 PIECES MAY BE CUT AT THE SAME TIME. CUT THE BOWSTRING SLOT AT THIS TIME. NOTE PART C2 IS 1/4" SHORTER THAN C3 (SEE FRONT VIEW OF ARROW MAGAZINE) THIS ALLOWS THE ARROW TO EXIT THE MAGAZINE WHEN THE BOW STRING IS RELEASED. EACH ARROW COMPARTMENT IN THE MAGAZINE IS 3/8"X14-1/2" THIS ALLOWS CLEARANCE FOR THE 5/16"X14" ARROW. EACH COMPARTMENT WILL HOLD 12 ARROWS WHEN THE BOWSTRING IS IN THE FIRING NOTCH. THE MAGAZINE IS ATTACHED TO THE ARROW GUIDE PART B, WITH TWO #8X1-1/2" WOOD SCREWS, ONE AT EACH END.

D MAGAZINE GUIDE 1/4"X1-3/8" WITH A 1/4" HOLE IN THE CENTER OF THE PART. (2 REQ.) ONE ON EACH SIDE OF THE GUN STOCK. THIS PART WILL KEEP THE ARROW MAGAZINE FROM SLIDING OFF THE GUN STOCK WHEN IT MOVES FORWARD TO ENGAGE THE BOWSTRING AND BACK TO THE FIRING POSITION. DRILL A 1/4" HOLE THRU THE GUN STOCK, AS SHOWN ON PAGE ONE, INSERT A 1/4" DOWEL, AND GLUE ONE PART IN PLACE ON EACH SIDE. THE TWO WOOD SCREWS HOLDING THE BOW IN THE BOW NOTCH SHOULD ENGAGE THE DOWEL. THIS ADDS SOME HOLDING POWER TO THE SCREWS.

PART E, COCKING-FIRING LEVERS TWO PIECES 3/4"X1"X13-1/2" FULL SIZE DRAWINGS ON PAGE ONE. ALSO SEE TOP VIEW LOCATED ELSEWHERE IN PLANS. THESE LEVERS ARE BOLTED TO THE GUN STOCK AND ARROW MAGAZINE WITH THE TWO 1/4" BOLTS. TIGHTEN BOTH NUTS JUST ENOUGH TO ALLOW MAGAZINE TO SLIDE BACK AND FORTH WITHOUT BINDING, THEN GLUE IN PLACE THE 3/8" DOWEL HANDLE. TO OPERATE THE CROSSBOW PUSH FORWARD ON THE HANDLE UNTIL THE BOWSTRING DROPS INTO THE NOTCH ON THE ARROW GUIDE. PULL BACK AND THE LEVERS WILL FORCE THE STRING OUT OF THE NOTCH AND FIRE THE ARROWS.

PART F, THE BOW. THE HARDER THE WOOD THE STRONGER THE BOW WILL BE. I USED OAK. START WITH ONE PIECE 3/4"X1-1/2"X37". CUT INTO THREE PIECES 3/8"(approx.) BY 1-1/2"X37". THIS WILL ALLOW THE BOW TO BEND WITHOUT BREAKING. SEE 1/2 SIZE DRAWINGS FOR MORE DETAILS.

PART G, BOW STRING. I TRIED TO MAKE MY OWN, BUT COULDN'T FIND ANYTHING THAT WOULD NOT BREAK OR STRETCH. SO I GAVE UP AND BOUGHT A 35" COMPOUND BOWSTRING FROM A LOCAL ARCHERY SHOP. (ABOUT $5.00) IT HAS AN EYE IN EACH END, 18 STRANDS OF DACRON AND WORKS VERY WELL. TO STRING THE BOW, PUSH THE BOWSTRING EYE THRU THE 1/4" HOLE IN THE END OF THE BOW. INSERT A 2 INCH PIECE OF 1/4" DOWEL INTO THE EYE SO THE STRING WILL NOT PULL BACK THRU THE HOLE. INSERT THE OTHER END THRU THE NOTCH IN THE FORWARD END OF THE ARROW MAGAZINE BOW SLOT. BEND THE BOW WITH CARE, DONT PUT TOO MUCH STRAIN ON THE TWO SCREWS HOLDING THE BOW IN THE NOTCH AT THE FORWARD END OF THE GUN STOCK. WITH ANOTHER 1/4" X 2" DOWEL IN THE BOWSTRING EYE SLIP THE STRING INTO THE SLOT ON THE END OF THE BOW. I USUALLY UNHOOK THE BOWSTRING WHEN NOT IN USE, TO KEEP THE SPRING IN THE BOW.

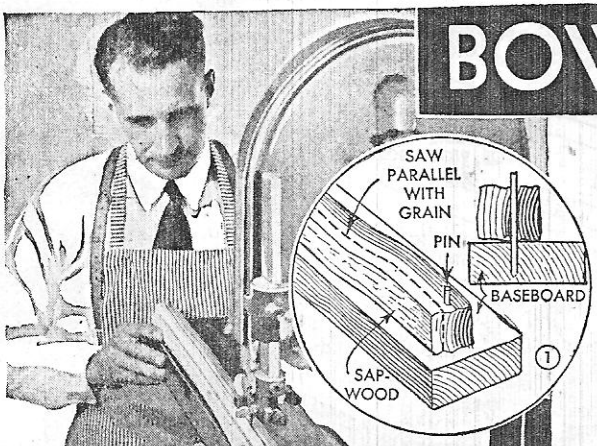
PART H, ARROWS. 5/16" X 14" DOWEL OR TARGET ARROWS MAY BE PURCHASED FROM YOUR LOCAL ARCHERY SHOP, AND CUT OFF TO 14" LENGTH. TO MAKE YOUR OWN, DRILL A 1/8" HOLE 2" DEEP INTO THE END OF THE DOWEL AND INSERT AN APPROPRIATE SIZE NAIL. YOU CAN LEAVE THE HEAD ON THE NAIL OR CUT OFF AND FILE TO A POINT. USE CAUTION WHEN FIRING THIS WEAPON, IT IS NOT A TOY!!

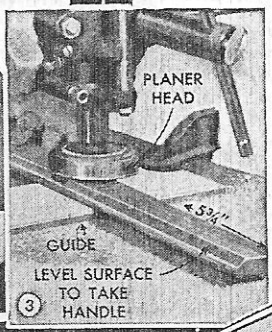
BOWS to Bring

By Sam Brown

HUNTING game with bow and arrow packs a real wallop. There's a thrill in seeing an arrow go winging toward its mark. Even a close miss is fun. So many sportsmen have adopted this sport that some states have exclusive bow-and-arrow hunting reserves where firearms are prohibited.

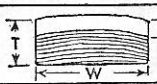
A bow for hunting should be as short as practical, ranging in length from 4 ft. 8 in. to 5 ft. 6 in. It should be a plain bow, able to stand a lot of knocking around.





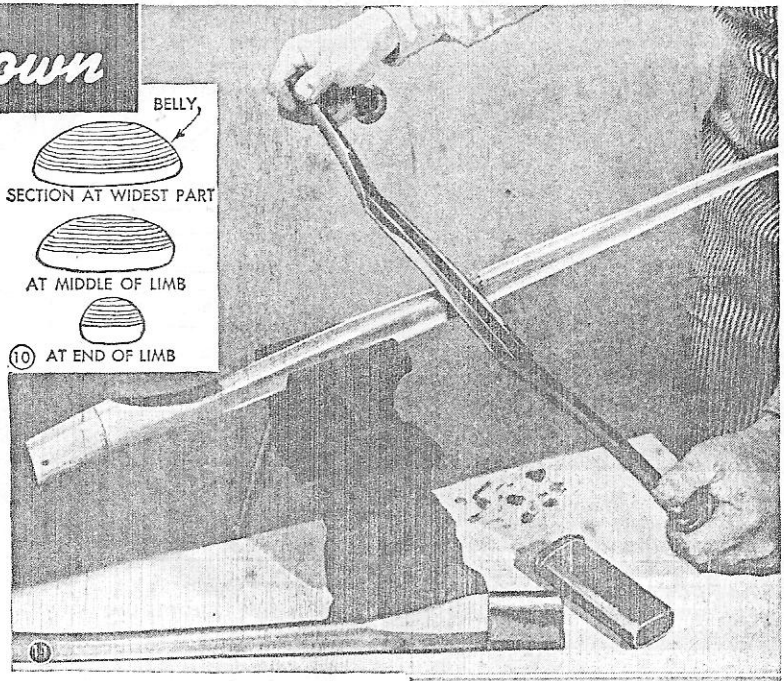
2

NET SIZES FOR 40 TO 50-LB. BOWS

4 

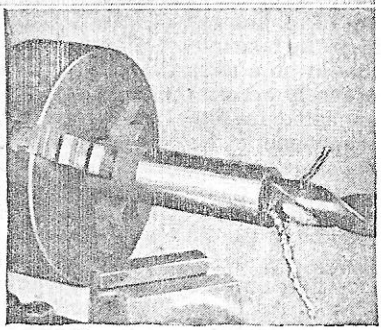
WOOD	T	W	SAP
OSAGE ORANGE	11/16"	1 5/16"	3/16"
YEW	3/4"	1 7/16"	1/4"
BOAM	3/4"	1 1/2"	5/16"
LEMON-WOOD	11/16"	1 1/4"	NONE

'em Down

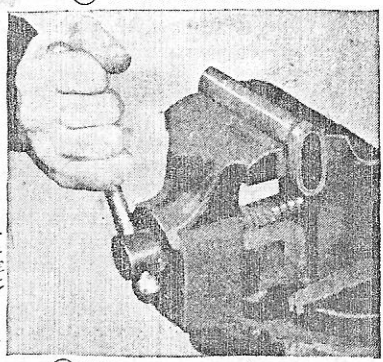


The drawing weight need not be excessive; you can bring down the toughest game in the country, including moose, bear and wild boar, with a 45 to 50-lb. bow and a steel broadhead arrow. Most hunters prefer a flat or semiflat bow. The demountable type of semiflat bow described here is popular because of ease of transportation, and the knockdown handle in no way affects smooth, fast shooting. If this is your first bow, by all means make it of lemonwood, as this compact and nearly grainless wood permits mechanical shaping without any regard to grain structure. If you want the best, however, use osage orange or boam. Yew is good, too, although a little too soft for rough usage. All bow woods except lemonwood require careful following of the grain.

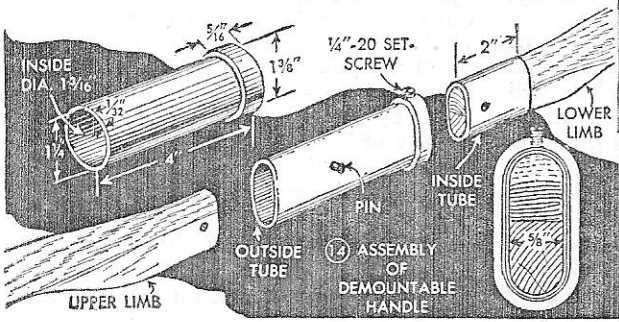
Start by roughing out the back of the bow. Osage orange is perfect in this respect; just peel off the bark, and the remaining layer of sapwood, about 3/16 in. thick, is just right. Yew and boam have more sapwood and will require trimming down. This can be done best on a band saw as in Figs. 1 and 2, mounting the stave on a guide board and then saw-



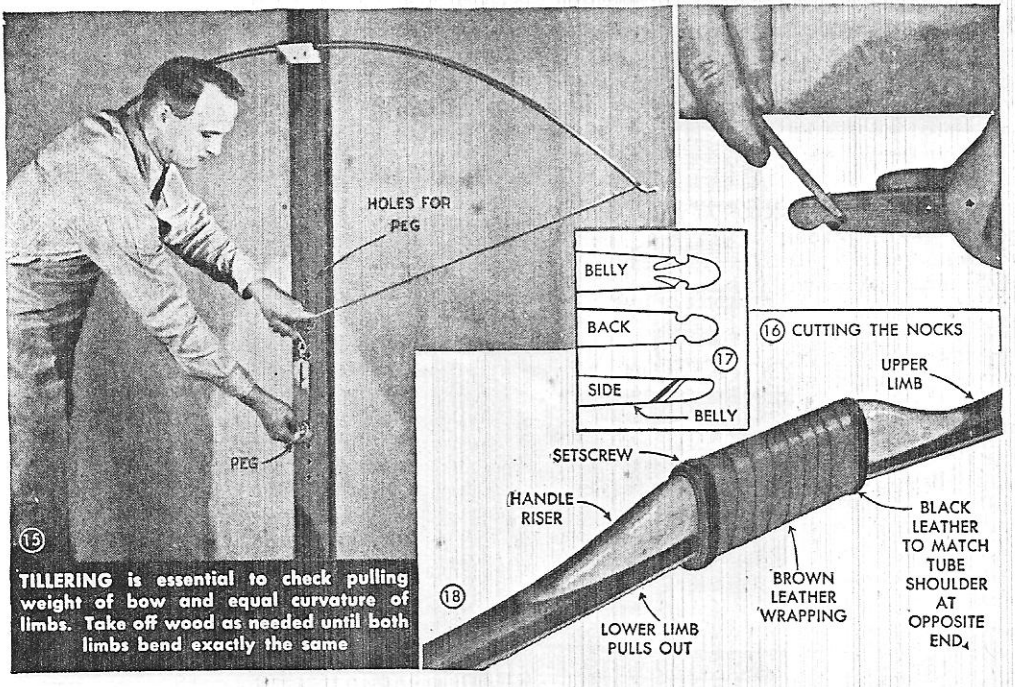
⑫ BORING THE HANDLE TUBE



⑬ VISE PRESSURE GIVES OVAL SHAPE



THE HUNTING BOW should be as short as practical, with pulling weight of 40-60 lbs. Style shown is semi-flat with demountable handle for ease in transportation



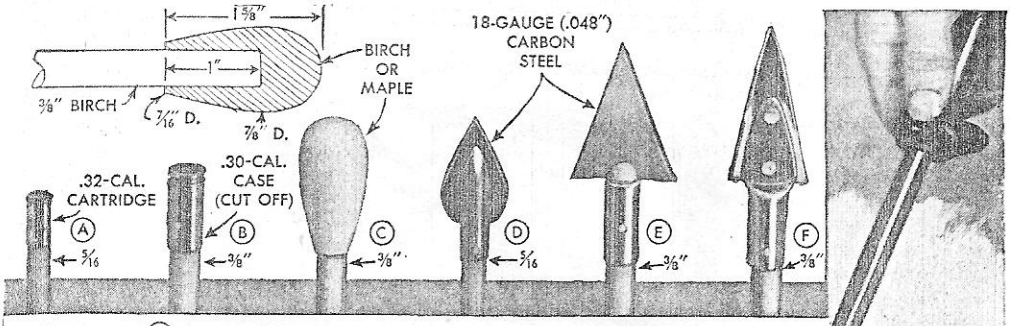
ing on a line the required distance away from the heartwood. Pins holding the stave should be a snug drive fit in holes drilled squarely across the chord of the grain, as indicated in Fig. 1. If there is too much heartwood, it can be trimmed down with the same setup. Where there is just a little extra wood on the heart side, a planer head in the drill press will remove it in a jiffy, Fig. 3. In the absence of power tools, the staves can be trimmed with a drawknife. The first stage of cutting gives you a flat stick about ¾ by 1½ in. with a thin layer of white sapwood on the back as shown in Fig. 5. Here you can see why it is easy to work with lemonwood; you have no sapwood to worry about, and the compact grain permits ripping and jointing to straight lines. All the other woods will be crooked, the back of the bow following every dip and curve in the grain. After band-sawing, smooth up the back of the bow with drawknife and scraper, following the grain. Fig. 4 shows table of net sizes for bows of different woods.

On the back of the stave, draw the outline shown in Fig. 5, band-saw to shape and taper the belly side as in Fig. 6. You will cut across the grain to some extent in both operations, but it is only on the back of bow that you positively must follow the grain. Glue the handle riser in place, Fig. 8, and then band-saw it both ways to the shape shown in Fig. 7. Both limbs of the bow are treated in the same way except that the upper limb should be 2 in. longer than the lower one, as in Fig. 9.

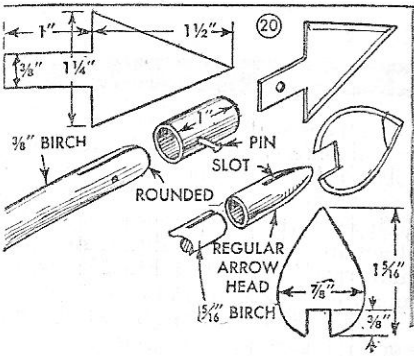
The demountable feature is accomplished by fitting the limbs of the bow inside a metal tube. You can buy telescoping tubes for this purpose, or you can make your own. Fig. 14 shows the general nature of the assembly. The short inside tube is pinned to the lower limb and the long outer tube is pinned solidly to the upper limb, the lower limb being a slide fit inside the outer tube, where it is held rigidly by means of a setscrew. Making your own telescoping tube is just a matter of turning and boring, Fig. 12, and then squeezing the assembled tubes in a vise as in Fig. 13, to get the required oval section. It is advisable to heat the work, otherwise the steel may crack at the shoulder portion. The original fit of the round tubes should not be too snug.

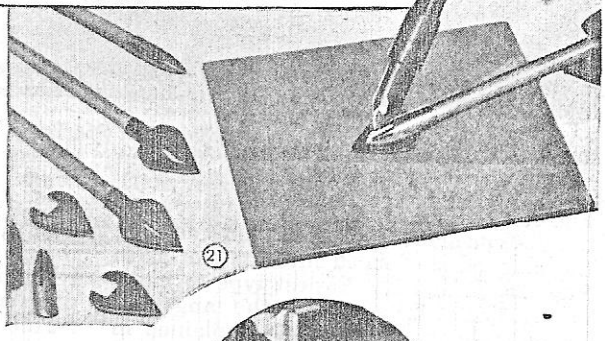
Figs. 10 and 11 show the final stage of shaping the bow, rounding off the belly with a drawknife or coarse and fine rasps. Osage orange may be so knotty as to require entire shaping by filing. Whenever you run into a knot, leave a little extra wood to compensate for the natural weakness caused by the defect. Finish off the limbs by scraping with a hook scraper or a piece of broken glass.

As you work down the belly side, tiller the bow frequently as shown in Fig. 15, checking its drawing weight, and more important, the bend of the limbs. Some workers tiller against a wall and use a grid of pencil lines to check for equal bending.



(19) VARIOUS STYLES OF BLUNT AND BROADHEAD HUNTING ARROWS





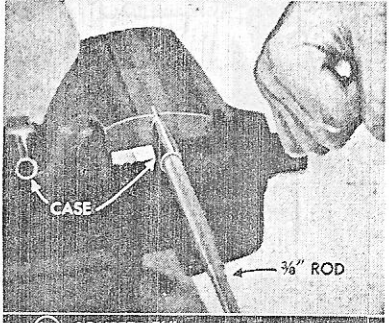
HUNTING ARROWS in blunt and broadhead styles are shown on this page. Steel for heads can be obtained from old power hacksaw blades

However, good results can be obtained by eye inspection alone, and by noting if the string tends to pull off to one side as you pull it back. The bow should be rigid through the handle, and almost rigid the full length of the handle riser. Starting at the end of the handle riser, the limbs should bend in a graceful arc. Go slow at this stage; it is very easy to remove too much wood and ruin the bow. If you get a little under the poundage you want, cut an inch off both limbs and try it again. Get the pull about 5 lbs. more than you want; it will let down about that much after you have used it a few hours. If the bow is much too heavy throughout, make a fast dip immediately beyond the handle riser to get a thinner section, and then taper gradually to the tips. Nocks should be of the plain type cut into the wood as in Figs. 16 and 17. Fig. 18 shows the finished bow at the handle.

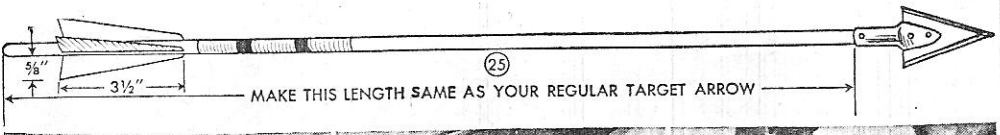
There are two kinds of hunting arrows: blunts and broadheads. The blunt points, details A, B and C of Fig. 19, can be made from cartridge cases or turned from wood. These heads have tremendous hitting power. They will bowl over a rabbit or knock a squirrel out of a tree. The need for the blunt point is obvious; you can imagine what happens to a sharp steel broadhead when you wham it into a tree trunk, or worse, a high tree limb.

Steel broadheads are needed for both small and big game. With sharp-cutting edges, even a 40-lb.

(23) CUT SLEEVES FROM 30-CAL. CASES



(24) SQUEEZE 3/8" FLAT AT SMALL END



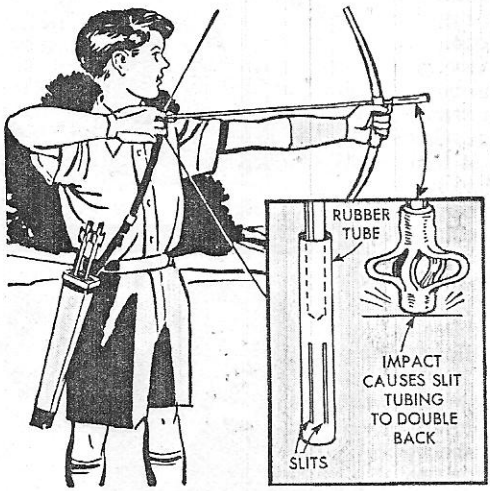

(26) GRIND FLATTENED END TO SHAPE


(27) CLEAN OUT WITH HACK-SAW CUT

(28) RIVET THE STEEL HEAD IN PLACE

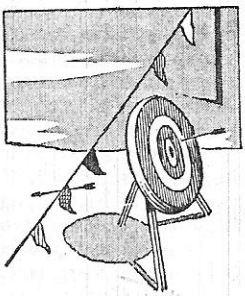
bow will send one of these shafts right through a two-point buck. The smallest practical head is the lancet shown at D, Fig. 19. This is made by slotting a regular bullet-type arrow head, and then soldering the notched steel head into the slot as in Figs. 20, 21 and 22. Easiest type to make in any size of broadhead is the tang-and-sleeve style shown at E and explained in Fig. 20. The step-by-step operation in making a broadhead, style F, is shown in Figs. 23 to 28. If you use .30-cal. ball cartridge cases, it will be necessary to have a tang on the broadhead for needed strength. With a sleeve of thicker copper or steel tubing, the split ends of tube alone will hold the head, which can be made a simple, triangular shape without tang. Old power hacksaw blades furnish good steel for heads. All of the styles shown can be purchased readymade if desired. Fletching of shafts follows standard practice except that the feathers are preferably of the low, long triangular style as shown in Fig. 25. Complete construction kits including heads, cut feathers and birch shafts can be purchased at a nominal cost and provide an ideal method of working. The diameter of shafts will depend somewhat on the pull of your bow. If the pull is 40 lbs. or under, 5/16 or 11/32-in. shafts are plenty heavy. Bows pulling over 45 lbs., especally when big broadheads are used, must have 3/8-in. shafts to stand up under the terrific impact.

Slit Tubing Over Point of Arrow Lessens Danger to Others



To shorten the range of arrows and minimize the danger to others, one parent puts a protective head on the arrows of his son's archery set. The head consists of a length of rubber tubing with 5 slits about 1 in. long. These heads are slipped over the points and serve to break the impact when the arrow hits an object.

Colored Pennants Help Locate Lost Archery Arrows



As an aid in noting the path of archery arrows that miss the target, one instructor attaches pennants of different colored cloth to a string, which is then stretched between stakes placed to one side and slightly behind the target. By noting the color of the pennant in the path of the arrow, an archer can follow the line of flight easily.

DISCLAIMER

AN OPEN STATEMENT TO OUR CUSTOMERS

While it is legal to own information regarding the construction of the majority of our plans it is illegal to make most of them without certain permits from the Federal Government. Please be aware that to construct the illegal to own devices is a violation of federal codes and you are subject to legal repurcussions, fines, and restraint if caught with them. The ball is in your court, it is up to you how you play it. We sell these plans with the intention that they are for entertainment purposese only, or just to say you have it. We do not promote the illegal construction of any weapons or parts thereof, we just provide interesting reading that is feasible to the point of reasonable construction if the owner of the plan decides to do so.

Reading

Another aspect of these plans is that all of them have varying degrees of dangerousness and lethality. By no means are they toys to be played with. The chance of premature detonation or backblast or flak,ricochets are all real possibilities. You can get hurt by being careless. Should you ever decide to make these then please always make several and test them without warheads and at a safe distance from yourself. Never try something out immediately in your hands.

These plans are by no means equal to military counterparts in distance, power or lethality. But they are dangerous when constructed. The plans are designed to be reasonable facsimiles of well known devices. The reason for varying them is that should you decide to make them you can do so with little expense and with common tools. To make equal counterparts to military weapons would cause the maker to invest in enormous amounts of machinery and have several degrees in engineering. These are for laymen.

Many of these plans are under copyright and we reserve all rights thereof. One's not under copyright will be soon.

In closing we urge you to not defy the law or your own conscience in making any of these. Don't take any risks with the law or your life. We do not admit to making any of these devices ourselves as that would set us up for felony charges ourselves. Let's just say that usually when people buy from us we have a re-order within two to three months. Since we photocopy our plans we do not offer any refund, only exchanges for poor copies (legibility of print). The aforementioned must be approved by us in writing by us before any return for any reason.

Thanks for buying our plans and we hope you enjoy them and we hope to hear again from you soon. We appreciate seeing photos of your completed models if and when you do make them. Thanks again.

EXPLODING ARROWS AND CROSSBOW BOLTS $15.00

These arrows are extremely simple to construct but must be made of original aluminum arrows in one case and only the screw in head type on another. These do not have a very large capacity for explosive but will stun or possibly kill someone who is within 5 feet of impact. These are great for demolishing vehicles or starting a blaze. Please be careful as these have no safety and if dropped, will detonate immediately.

1: Obtain a hollow aluminum arrow that has not got a screw in adapter on the end. Remove the tip or arrowhead. If it has an adapter, saw it off behind it.

2: Fill the cavity up to within one inch of the end with black-powder or any explosive you may have.

3: Now get a common .22 cal. blank and insert the flanged end of it into the cavity of the arrow. If it just falls in you will need to back it out to the end of the arrow and cover it with glue to not only hold it in place but also to keep it from falling into the cavity again. It is now ready to fire after drying. It must hit head on your target to crush the primer and explode.

4: To make the warhead model You will need any kind of arrow that has a screw in adapter on the end. Next obtain a blunt tip for the arrow.

5: You will now need a small vial. It does not have to be tapered but it does need to be less than 4 inches long and 2 inches in diameter. It must also be watertight and dry. It also has to be sealable. It can be metal but plastic works as well. Metal is usually too heavy.

6: After getting your explosive container (vial) drill a small hole in one of the flat tneds of it the same diameter as the blunt arrow tip. The hole should be as close to the center as possible.

7: Insert the tip into the hole down to the top of the threads and glue it in place securely.

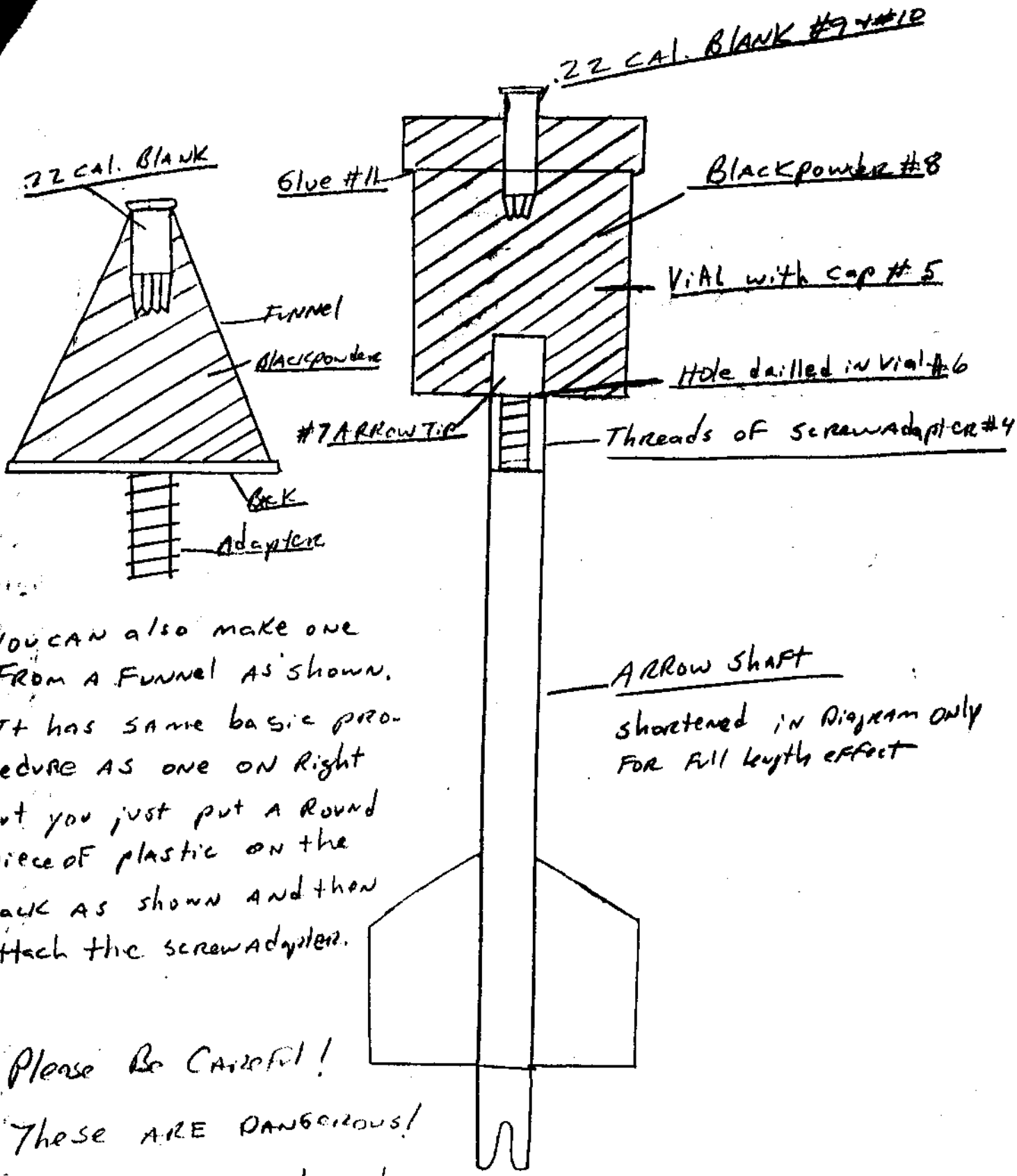
8: Now fill the vial with your explosive or blackpowder.

9: Before attaching the seal end to thevial you need to make a detonator in it. Get a .22 cal. blank and drill a hole in the end of the cap the same diameter as the blank.

10: Insert the blank into the hole with the crimped end towards the explosive and glue the blank inplace. Leave the blank half in and half out as a more direct hit is necessary with this model.

11: After completeing this attach the end to the vial andsecurely glue it in place. Make sure you cover it completely to create a watertight ~~seal~~. seal.

Now that it is complete you need to use it. Make sure to go someplace that is remote as these are illegal. Do not use these in hunting. How could you explain a deer dressed out completely from a single arrow shot? Don't drop it. Blackpowder is unstable and is known to explode unexpectedly. You need to arch your shots HEAVILY. These are morethan twice the weight of a normal arrow and drop drastically. You don't want to fire it at your feet. If it is at all possible you need to test your first few by remote control to make sure you've done it right. PLEASE BE VERY CAREFUL.



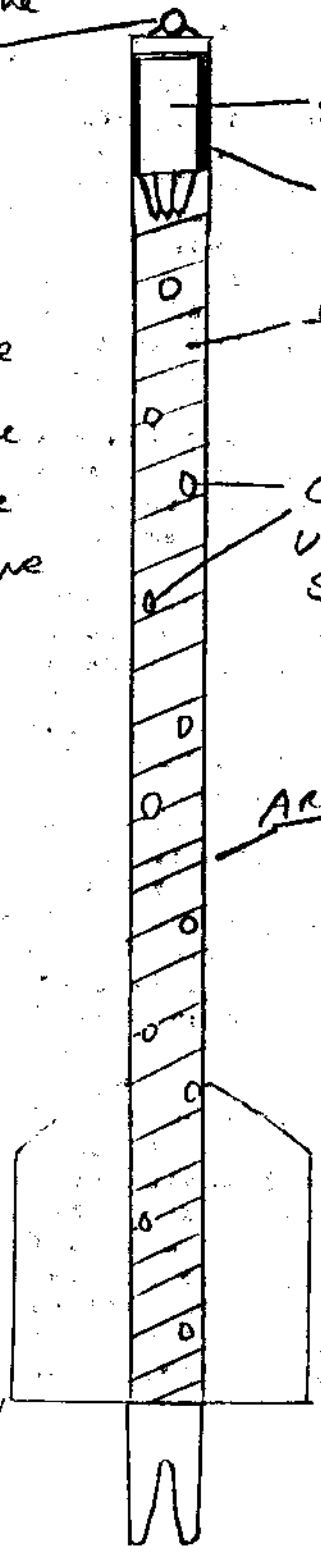
You can also make one from a funnel as shown. It has same basic procedure as one on Right But you just put a Round piece of plastic on the back as shown and then attach the screwadapter.

Please Be Careful!

These ARE DANGEROUS!

Do not Drop them!

IF you have trouble with detonation, Resort to gluing a B-B on the end of the BLANK



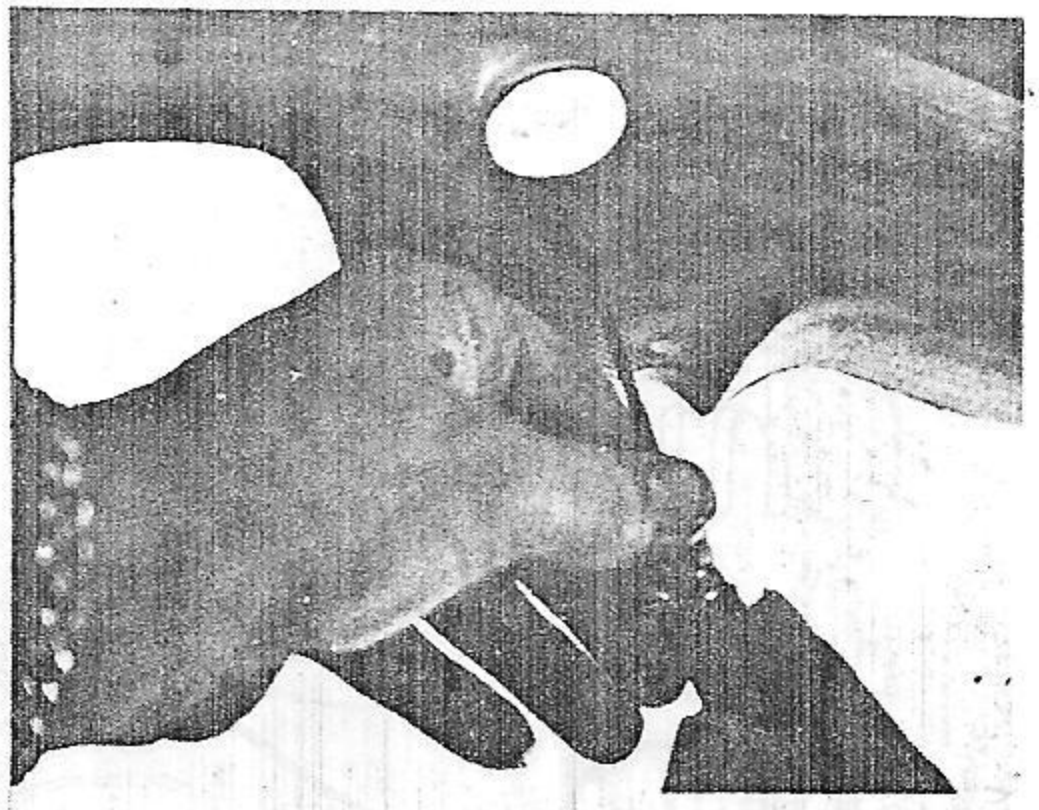
USE THEM FOR SHORT RANGE SHRAPNEL EFFECT

FOR INCENDIARY TYPE you need to seal the REAR end with glue AND FILL with GASOLINE AND then FINISH out LIKE REGULAR model.

These are also good to carry A POISON IF you need it.

Please Be CAREFUL! These are dangerous! Do not Drop them!

Chips from the work shop



ROBIN ALLEN-SINCLAIR

Pride in Workmanship
means
Pride of Ownership

As George Stevens says—"More Tournaments are won in the WORK SHOP than on the shooting line."

—*from Robert Gannons COMPLETE BOOK OF ARCHERY*

MANY CROSSBOWMEN are as intrigued by the designing and making of this fascinating weapon as by its actual use. And, its use is greatly enhanced by the fact that they have made it themselves. So hopefully this chapter will be of assistance to the builder and, perhaps, the designer.

We recommend, however, that for a FIRST Crossbow the builder stay exactly with a set of plans. We have found too often, that a change to what may look advisable upsets some other unconsidered feature.

SO, STAY WITH THE PLANS FOR YOUR FIRST CROSSBOW.

The stock is very little of a problem to anyone with reasonable tool experience. Making a bow, however, is apt to *be a problem* and we would recommend consideration, before you start. What do you want the bow for? What type of bow,material, etc. If you are familiar with archery, we had better point out that due to the Crossbow's short draw, double the handbow's power should be your estimate.

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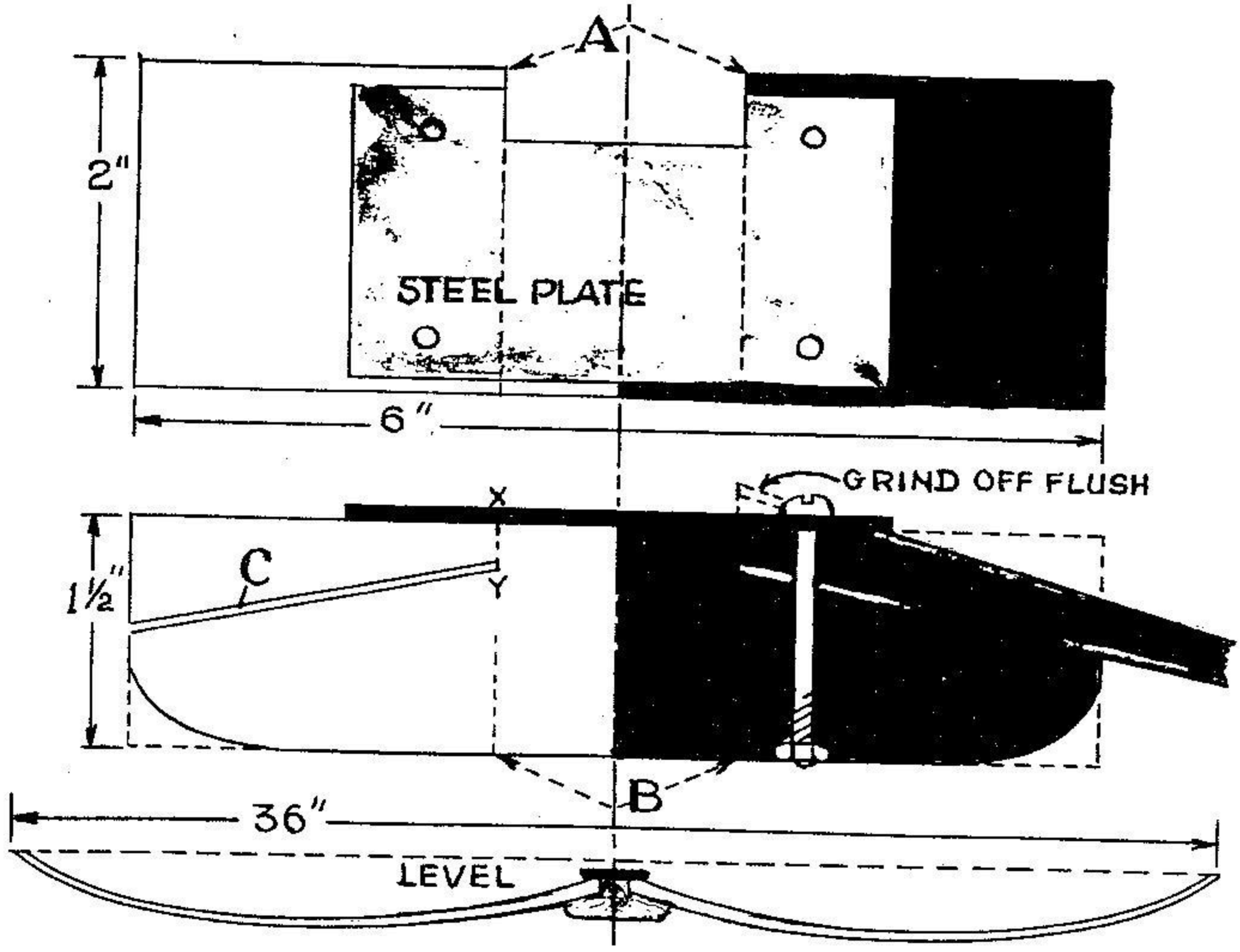
SO, STAY WITH THE PLANS FOR YOUR FIRST CROSSBOW.

The stock is very little of a problem to anyone with reasonable tool experience. Making a bow, however, is apt to *be a problem* and we would recommend consideration, before you start. What do you want the bow for? What type of bow,material, etc. If you are familiar with archery, we had better point out that due to the Crossbow's short draw, double the handbow's power should be your estimate.

The Target or Tournament bow usually draws between fifty and seventy pounds. Since it is drawn by hand, the exertion will affect the shooter in the prolonged use at Tournaments. But with light, small diameter arrows, no great thrust is required. The Hunting bow should definitely top 100 pounds. Thiis is no great item, as only infrequent shooting is apt to occur. On the larger game such as moose about 150 pounds draw is desirable. See the Chapter on Hunting.

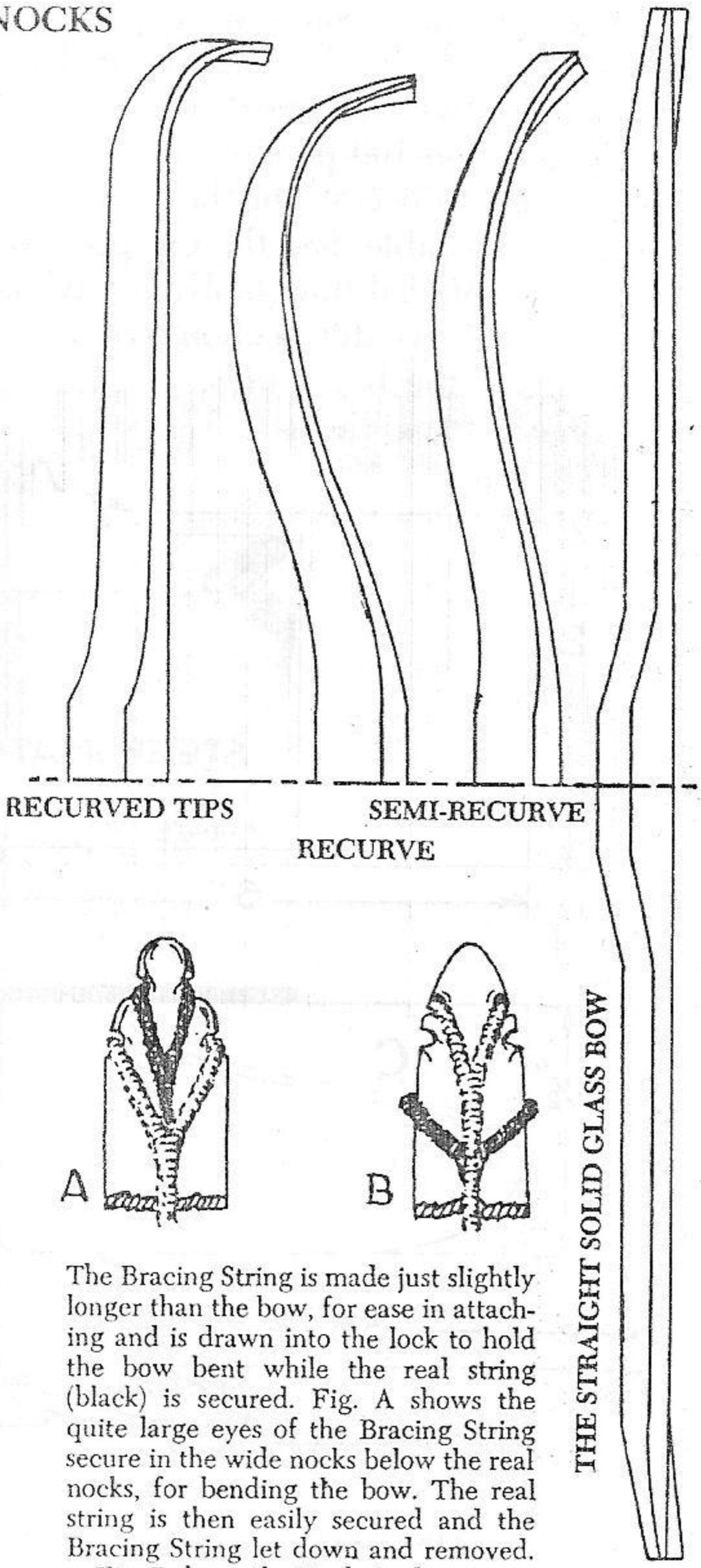
Commercial bow limbs are available* and with that in mind we will dimension a center section (riser) for your stock mounting and the attaching of the bow limbs.



True up a block of good hard wood such as maple 1 1/2" thick by 6" long by 2" wide, or the width of the bow limbs. "A" Dado out the width of the stock, 1/2" deep. Then saw cut in at approximately 15 degrees as shown at "C". X-Y should be about 2/3 of the thickness of the bow limb butt. Epoxy the bow limbs in place and grind off the projecting corners level with the maple block. Drill and bolt the metal plate on as shown. Laying it out on paper first will help in establishing angles, etc.

TYPES OF BOW LIMBS AND STRING NOCKS

John Fortman Jr. of Pilot Grove, Mo., demonstrates the use of a Bracing String in stringing his Crossbow. (See drawing at right.)



The Bracing String is made just slightly longer than the bow, for ease in attaching and is drawn into the lock to hold the bow bent while the real string (black) is secured. Fig. A shows the quite large eyes of the Bracing String secure in the wide nocks below the real nocks, for bending the bow. The real string is then easily secured and the Bracing String let down and removed.

Fig. B shows the Nocks in the reverse position to Fig. A and the Real String is first slipped over one end and then the other of the bow tips. The Bracing String is then inserted in the outer eyes for bending the bow and the Real String worked out into its nocks.

In Stringing ANY Bow, Both Limbs Must be Bent EQUALLY and from as near the TIPS as Possible.

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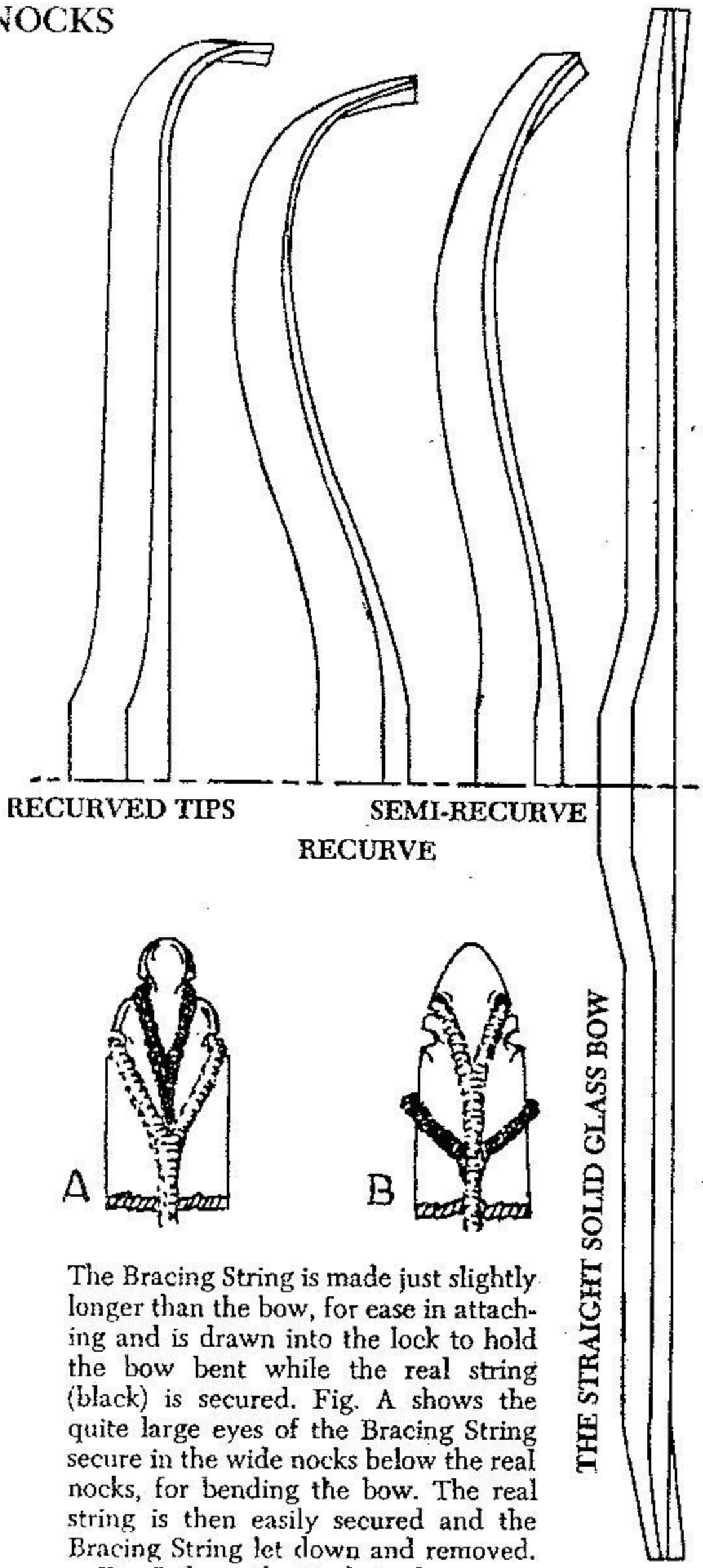

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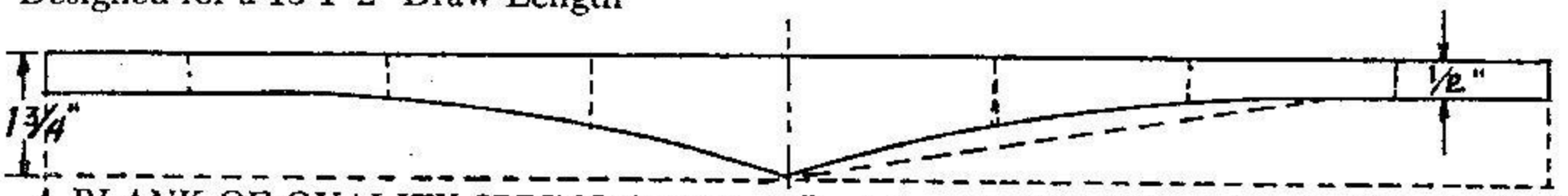
In Stringing ANY Bow, Both Limbs Must be Bent [illegible] and from as near the TIPS as Possible.

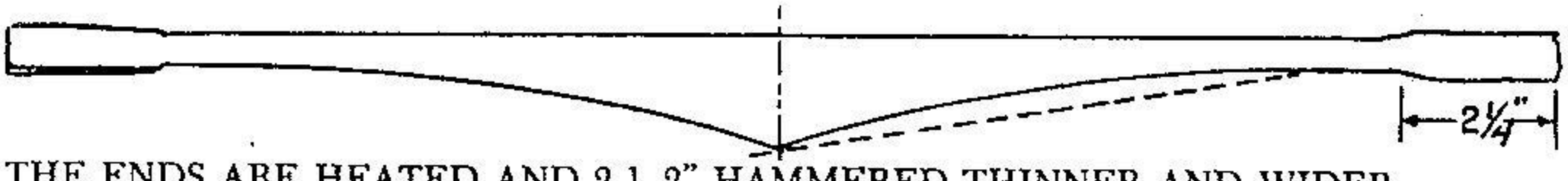
THE MODERN STEEL BOW

Designed for a 13-1 2" Draw Length



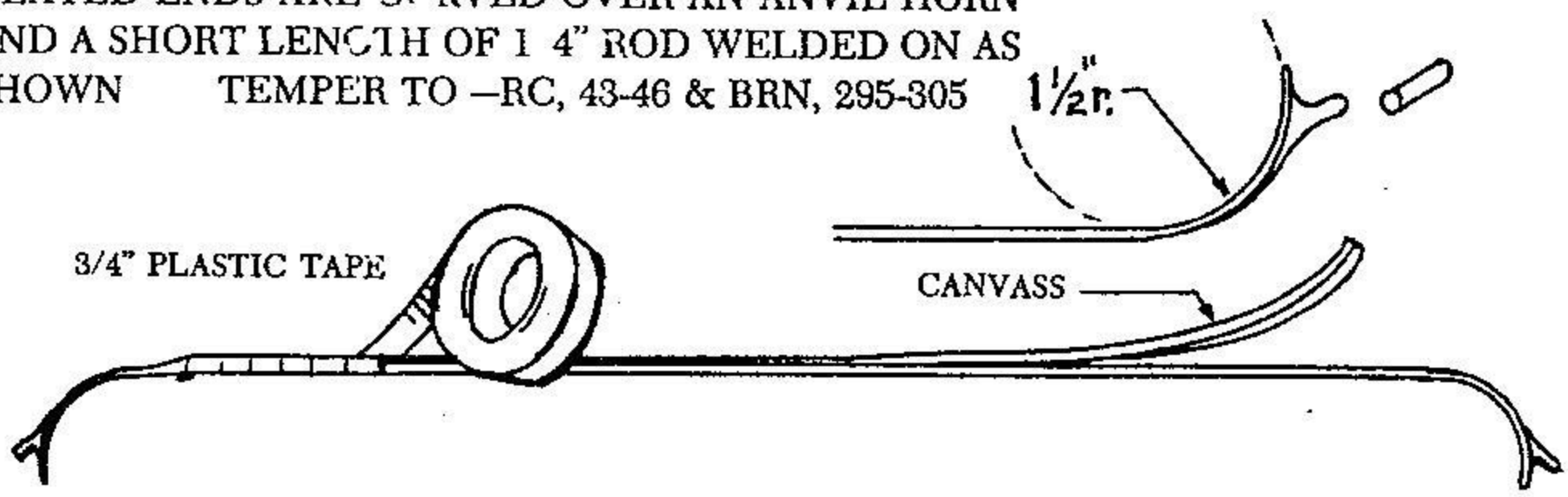
A BLANK OF QUALITY SPRING STEEL 30" x 1-3 4" IS CUT TO THE SHAPE SHOWN

Thickness .157" for 100 lb. Bow Thickness .187" for 140 lb. Bow



THE ENDS ARE HEATED AND 2-1 2" HAMMERED THINNER AND WIDER

HEATED ENDS ARE CURVED OVER AN ANVIL HORN AND A SHORT LENGTH OF 1 4" ROD WELDED ON AS SHOWN TEMPER TO –RC, 43-46 & BRN, 295-305



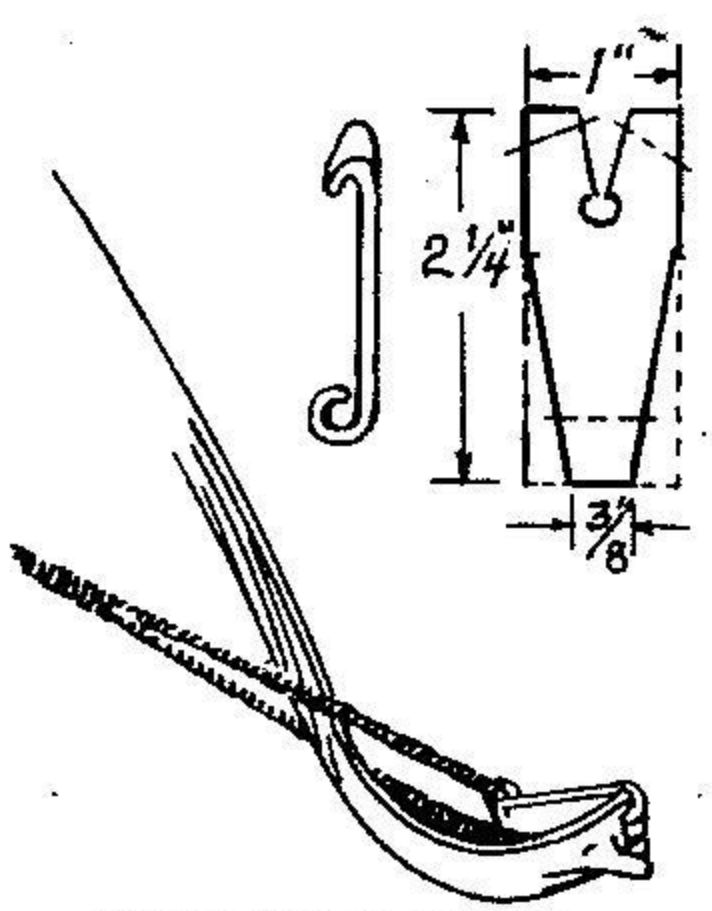
HEAVY 10 oz. CANVASS IS CUT TO SHAPE AND TAPED TO THE COMPRESSION SIDE

THE STEEL BLANK may be cut with a hi-speed hack saw blade, or, if a good torch man is available, with a torch. In either case, the edges are ground smooth and both limbs matched exactly. When this is done, grind all edges rounded to prevent small fractures from starting. In hammering out and bending the tips, do not use white heat. The 1 1/2" radius given does not need to be exact, but both tips MUST be the same.

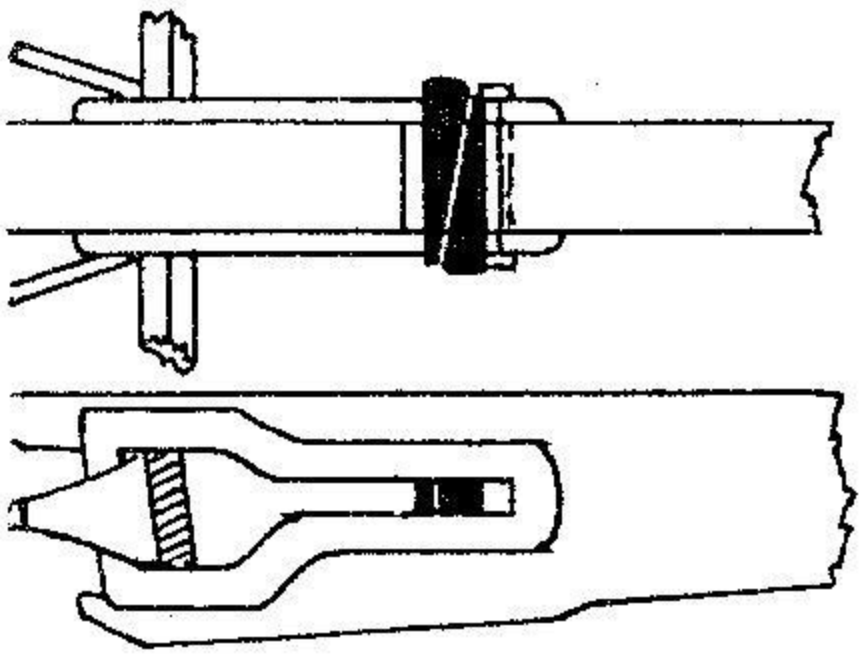
The short length of 1/4" rod should be well filled around its base and ground out smooth for string contact. Again, see that both are the same.

Using the bow as a template, trace to within 3" of the tips on 10 oz. canvass. Cut just slightly narrower than the bow and apply STRETCHED to bow with a *thin layer* of Elmers glue, taping it down with 3/4" plastic tape, angled to overlap about one half its own width as shown.

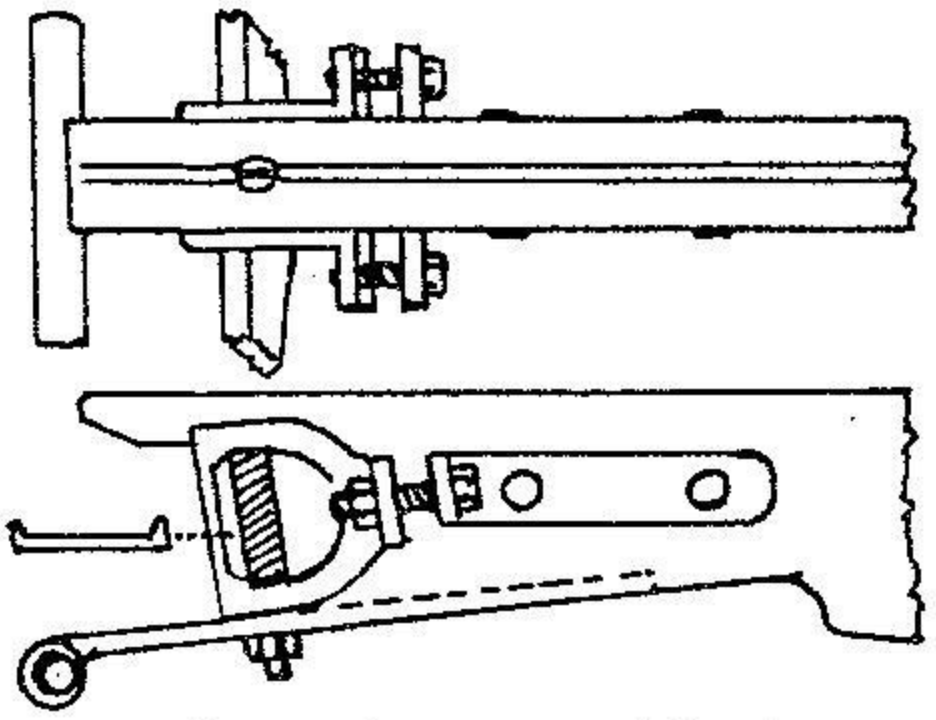
THE STRING for bracing this bow is made 1/4" longer than the REAL string with 4" eyes, into which the metal clips shown at left are hooked. (See page 152 on using a Bracing String.)



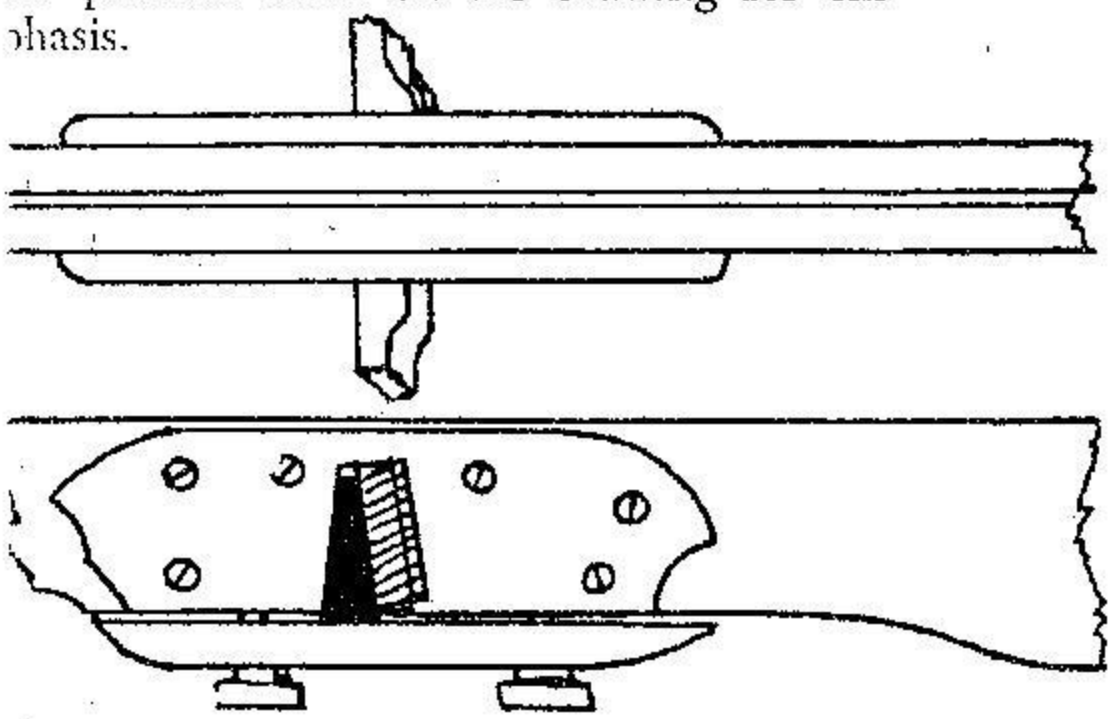
HOOKS FOR BRACING STRING



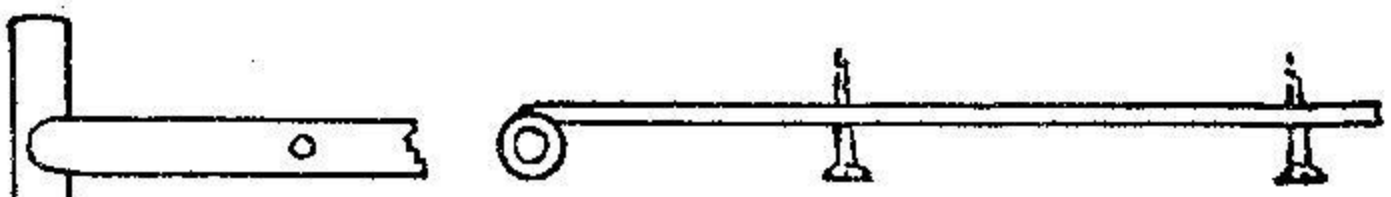
Military (Medieval) bowmount. The side brackets are heavy, nicely shaped wrought-iron. An equestrian type stirrup also provides a tie-strap to hold the brackets from spreading, which in turn, securely fastens the stirrup. The wedges that draw up the assembly are painted black on the drawing for emphasis.



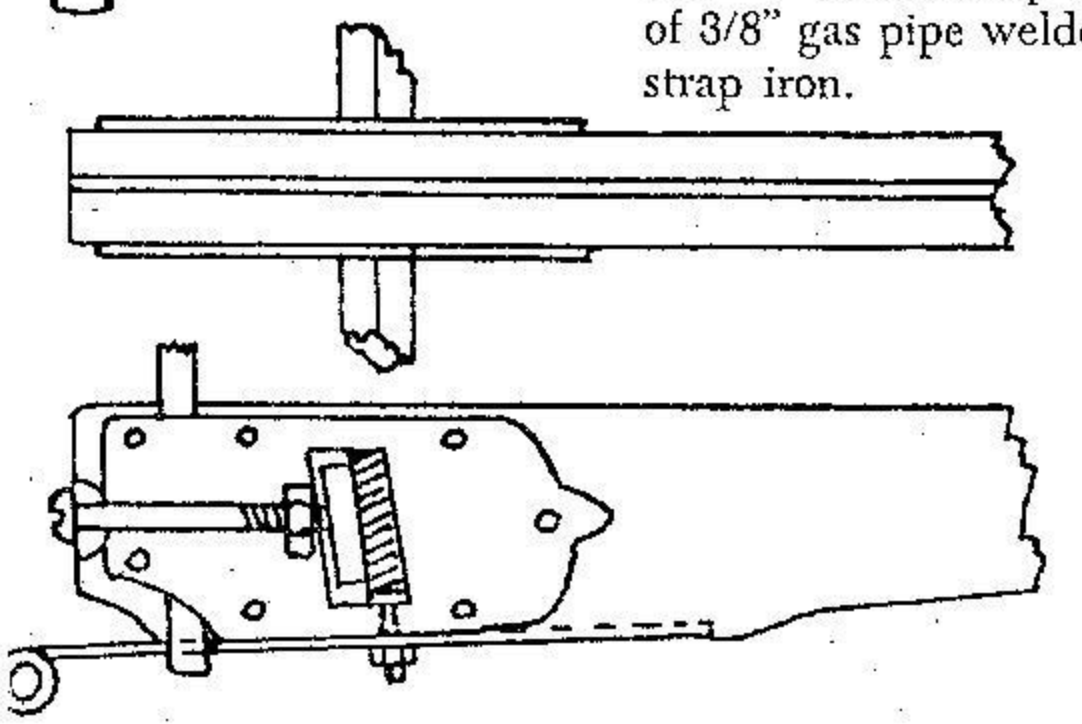
A somewhat similar system of brackets is used on our heavy Hunting bows. The brackets, however, are drawn tight with bolts as shown. A separate tie-strap holds the brackets from spreading. And a "T" iron stirrup accommodates both of the shooter's feet, allowing a more centered draw on the bow string.



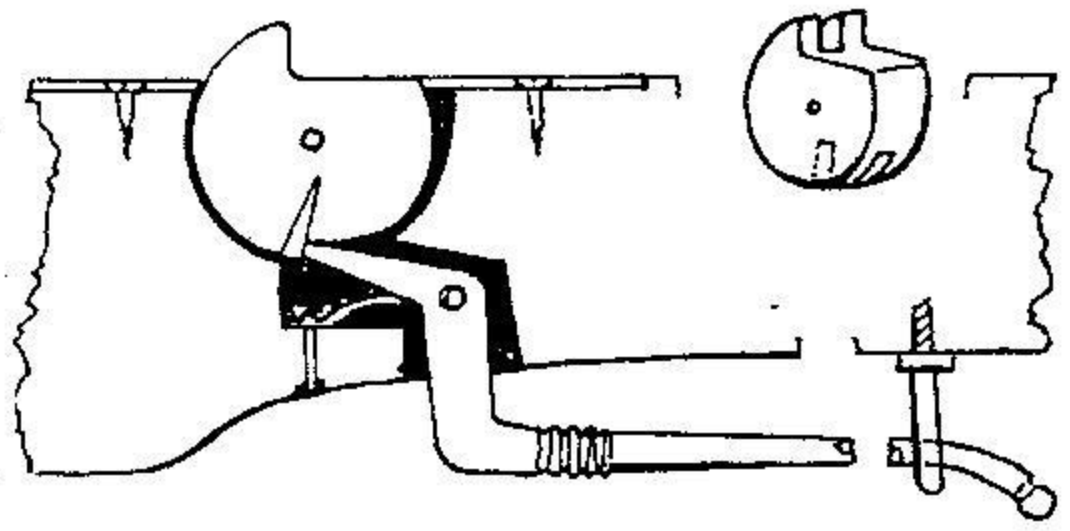
Variations of the Bailey bowmount are quite popular. The mortice for the bow is reenforced by side plates. Since often of wood, we would recommend plywood. The bow is tightened from underneath with thumb screws or wing-nuts to pull a stout block up against a fitted wedge as shown. The side plates cover the wedge. The wedge bow tightener dates from early Chinese to the present.



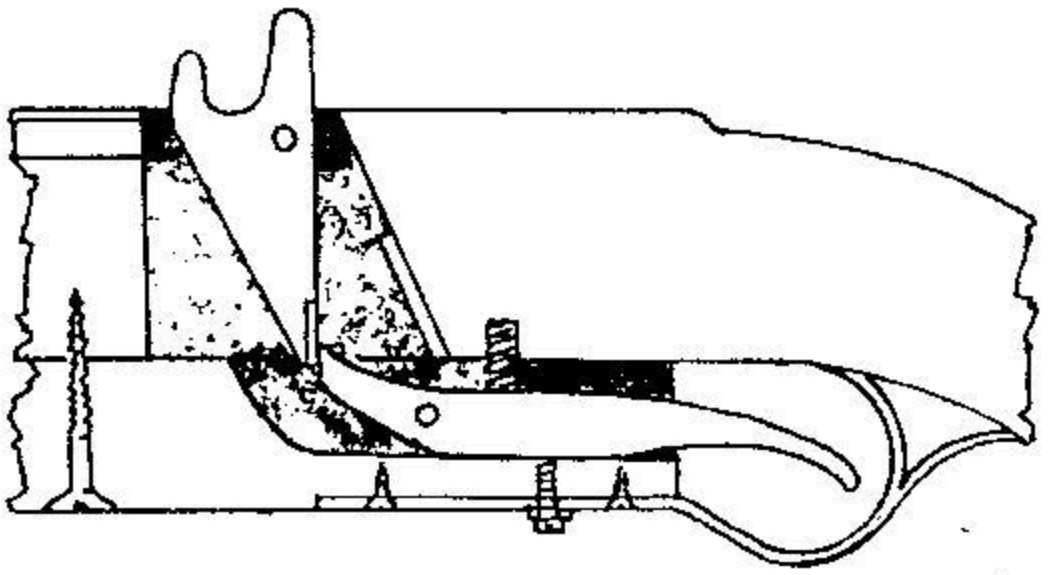
The "T" iron stirrup is made from a three and one-half inch piece of 3/8" gas pipe welded across the end of a length of 3/16" x 3/4" strap iron.



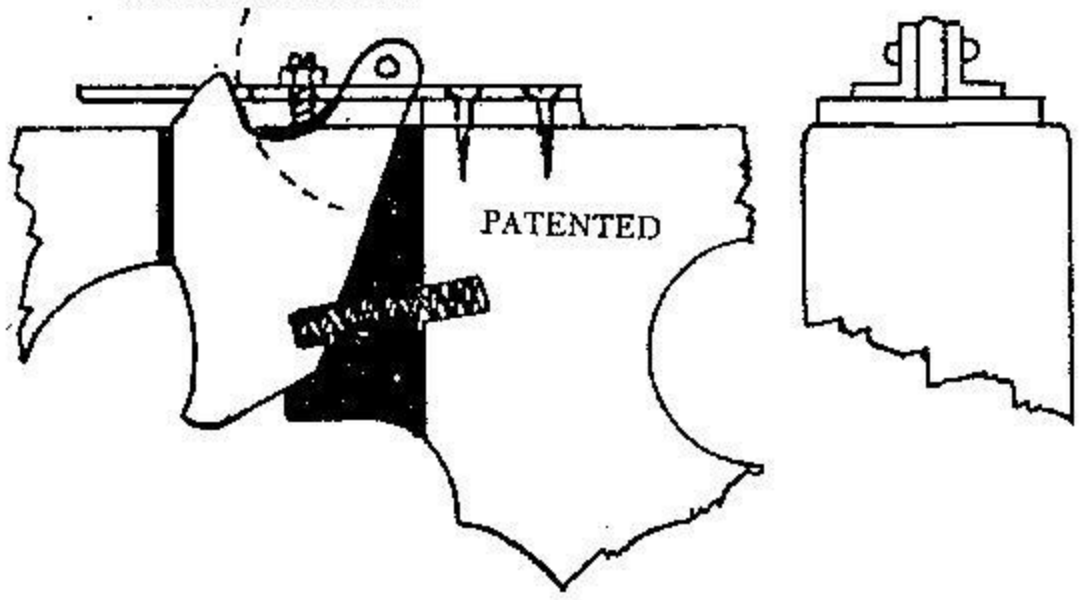
Another good Target bow mount is shown with bolt tighteners. Particularly if the bow is glass, it must be protected from the bolts by aluminum or solid blocks as shown. The metal side plates shown are not necessary unless very heavy bows are used, in which case the plates should be riveted to each other to prevent any chance of the stock splitting. A front sight post is indicated.



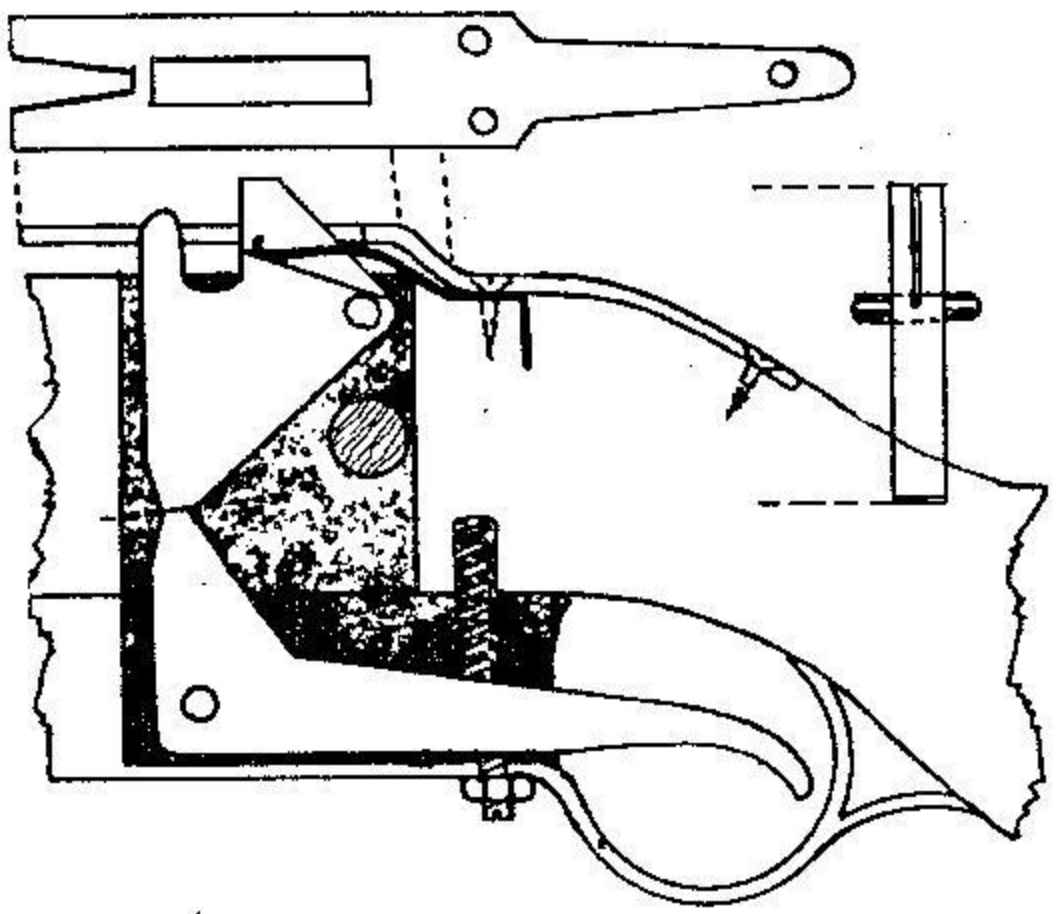
THE SPOOL LOCK, illustrated above, seems to have been universally used on the heavy Medieval bows. Due to the great strain, no pivot pin was used. The spool fitted snugly into its mortice and was released by a long tripping-bar for leverage. The spools were made from the hard base of stag antlers or Ivory with an inserted wedge of steel for sear contact.



WITH THE MUCH LIGHTER BOWS in use today, many ingenious locks have been developed. The placement of pivot pins to take advantage of leverage give easier release. A smooth trigger and string release are highly desirable, but for safety they should not be too easy, or of a hair-trigger type.



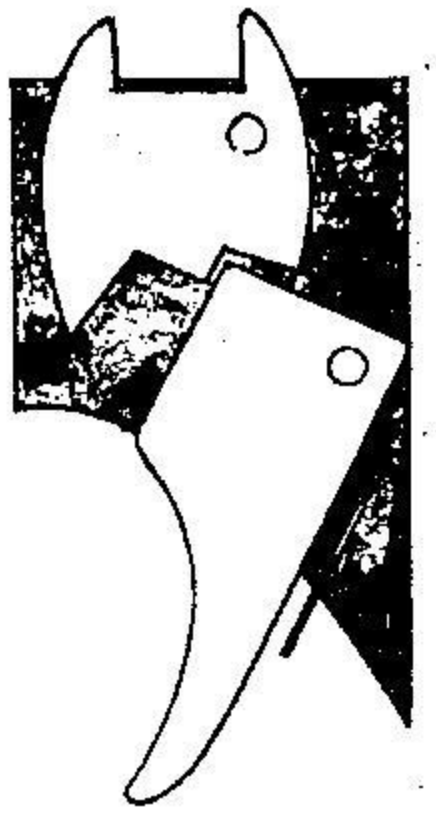
A ONE PIECE LOCK (patented). While not yet proven out with the heavy bows, it has been thoroughly tested on Target weapons, and has been found a smooth easy performer. Since no working parts are needed except for its pivot, it can be made from a light metal such as aluminum. Its successful operation depends on the pivot being above the latch, and the detent slanting forward at about an angle equal to a perpendicular to its radius from the pivot.

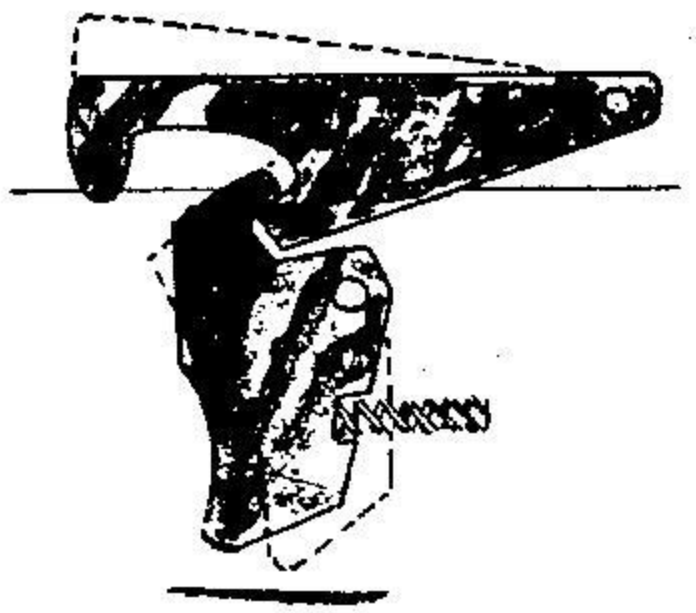


A HEAVY DUTY LOCK made from 1/4" steel this one finger lock has given over twenty years of trouble free operation. The tripping-bar type trigger gives additional leverage for easy operation with heavy bows. The Crossbow lock is actuated by the full power of the bow, not a light 3 lb. spring as in a gun. Locks must be designed with that in mind--SAFETY FIRST.

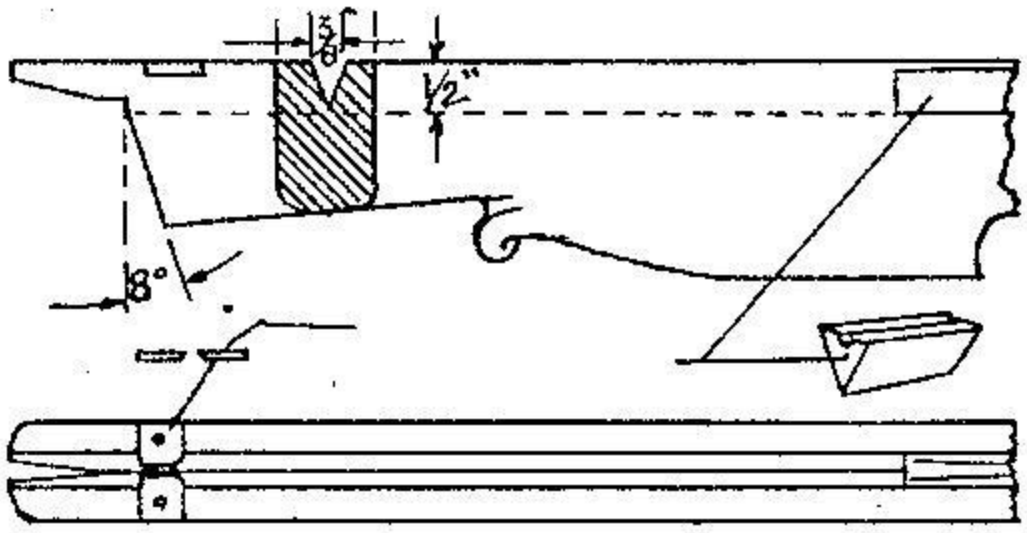
THE HARRY L. BAILEY LOCK.

An early target bow lock, versions of which are often in use today. It was a two fingered latch to allow the arrow butt to contact the string. Usually today it is used with a cover to keep the string from jumping. The sear contacts in this type of lock should be case hardened.

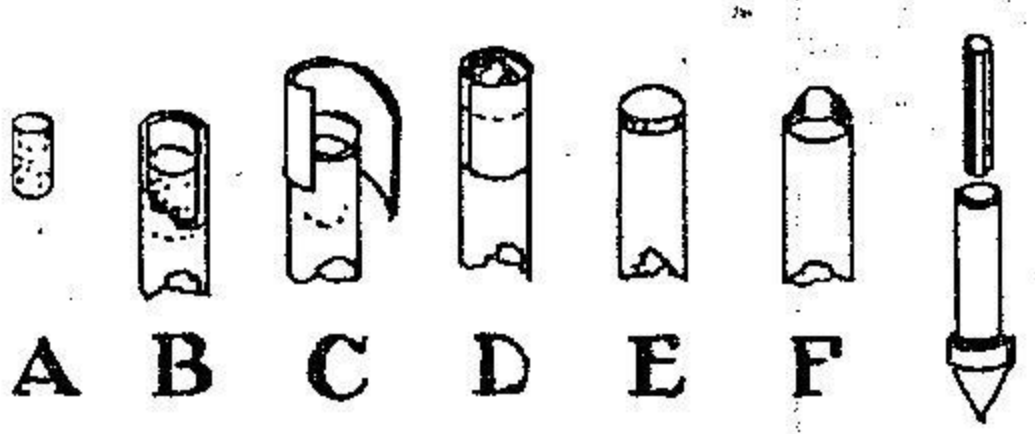




AN OVERHEAD LOCK design. The string is drawn with the jaw open, which is closed down over the string by the shooter's thumb.

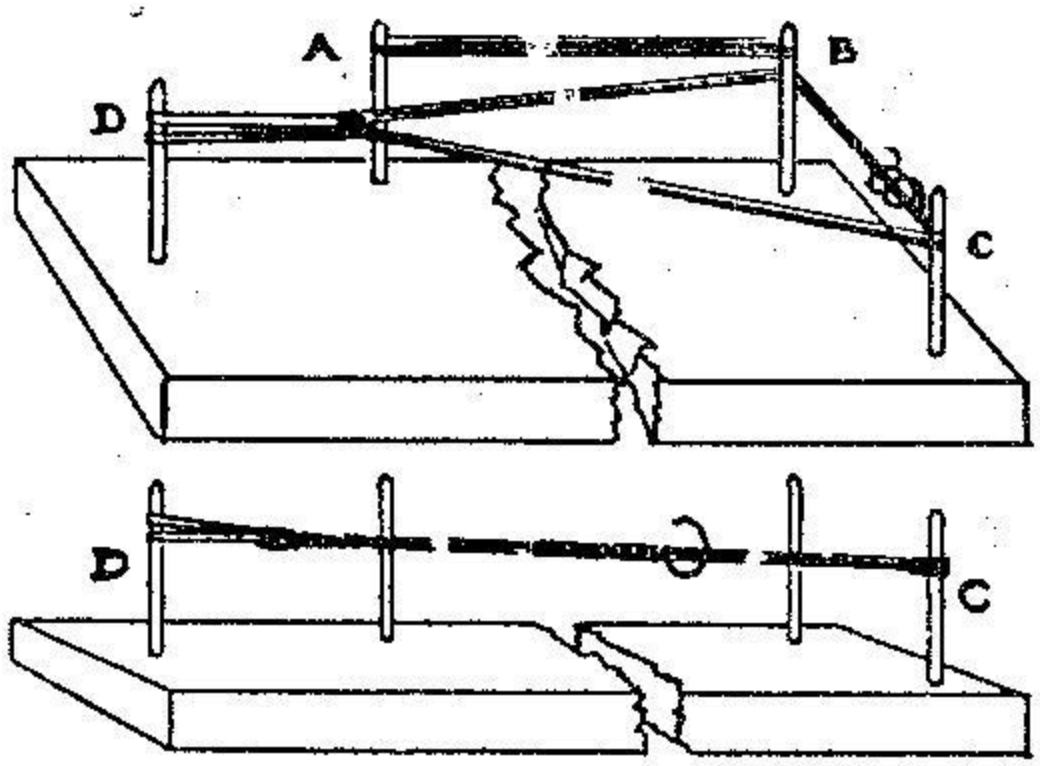


PLANS on "How-to-Make," all emphasize the rigidity of the barrel portion, even to heavily laminated fore-stocks and the necessity of a *perfectly straight* arrow groove. The drawing at left, illustrates the essentials of the author's two-point suspension groove. The V filler-block A is slightly grooved to take the arrow butt and is set in the feather V slot about 1/16" below the barrel surface. The forward arrow rest squares may be made of 1/16" plastic, morticed flush. These and the butt block A are carefully adjusted to place the arrow center at string height. (Preferred contact is below the arrow center.) The forward positioning plates are adjusted to hold the arrow tip *slightly* elevated—*only enough so the eye can detect it.*

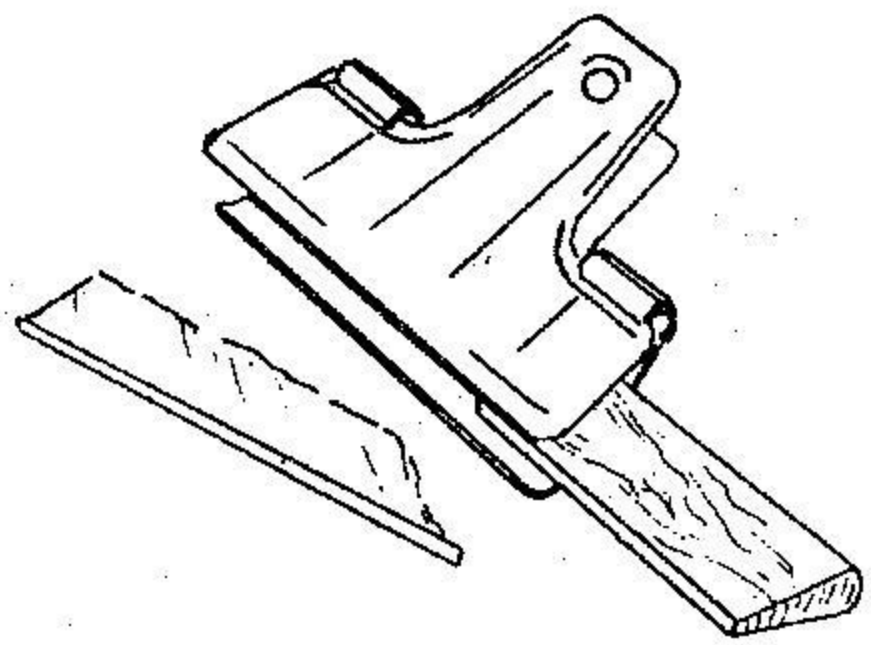


Since his Bolts are essentially half-length longbow arrows, material, jigs and other equipment are readily available to the Crossbowman. The arrow butt, still referred to as the "nock" is not, however, a commercial item. The author is showing his solution to this important problem.

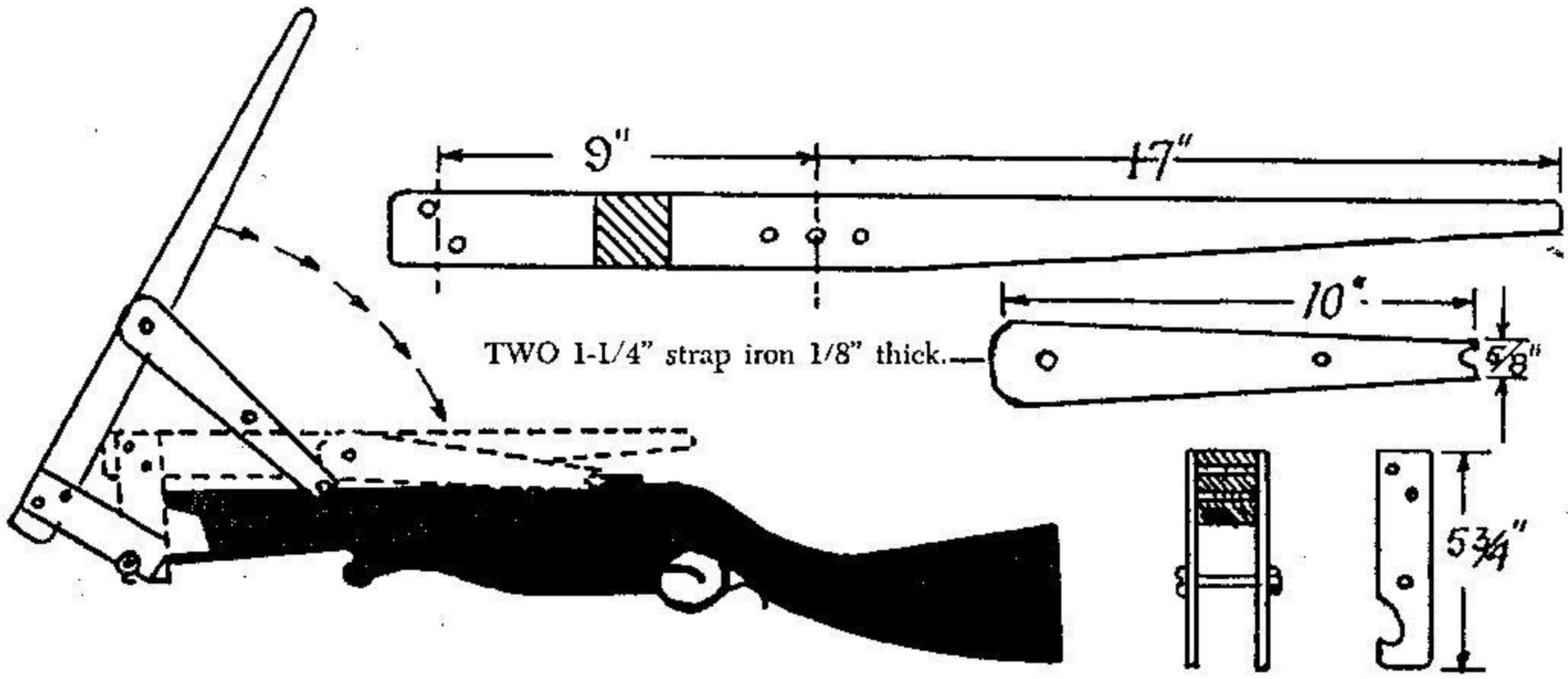
A light Port Orford cedar shaft is turned down to just fit the aluminum or glass shafting and cut into 1/2" lengths as at A. This is inserted into the shaft to about a full 1/8" below the end as at B. Three-quarter inch masking tape is then circled carefully around the end to project 1/4" above, Fig. C. This is filled with slow drying Epoxy glue (Fig. D) and allowed to set vertically. When thoroughly hardened, the tape is removed and the Epoxy ground down to a flat surface as at E. If one wishes, opposing sides are champhered to form a vertical (with the cock feather) butt, or nocking surface, as at F. Another suggestion is to fill the hollow end of the insert points with either lead or epoxy in a length of metal rod for better arrow balance.



A simple string-board (6" x 40") may be drilled to take four 20d nails, the ends of which are well rounded and polished. Insert the nails from the bottom of the board. B and C are across one end. A and B are along one side, the distance between A-B is your string length. Then, centered on B and C, a little farther out than A, place D. This latter point is to stretch your string for serving. The use of a heavy rubber band will give you enough tension. After the string strands are coiled on A-B for length, they are transferred over B and C, and stretched tight to D for serving what will be the string's "Eye," between B and C. This serving will then be centered around B and stretched to D and the serving continued around BOTH for a short distatnce forming the eye. Now reverse the ends of the string and repeat the serving. The string is then stretched by its eyes and a center section served. You should use only paraffin on the center serving.

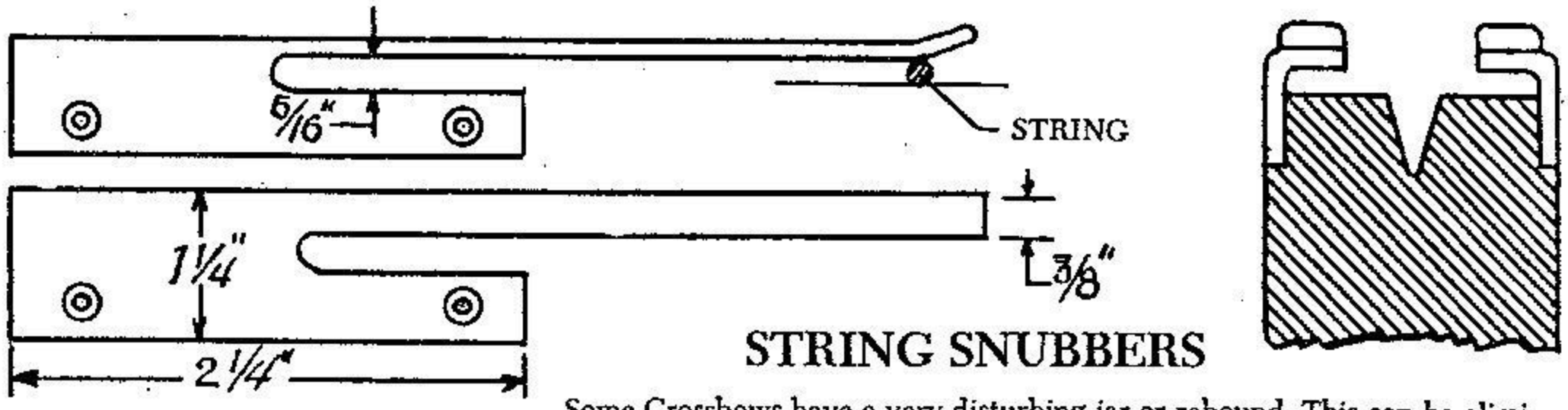


The commercial "ground base" feather can be improved considerably for gluing by inserting a length in one of the larger paper clips and carefully grinding down the vane against a sander. It is well to insert a bevelled length of wood. as shown, in one side of the clip against which the curled side of the feather rests. to hold it perpendicular.



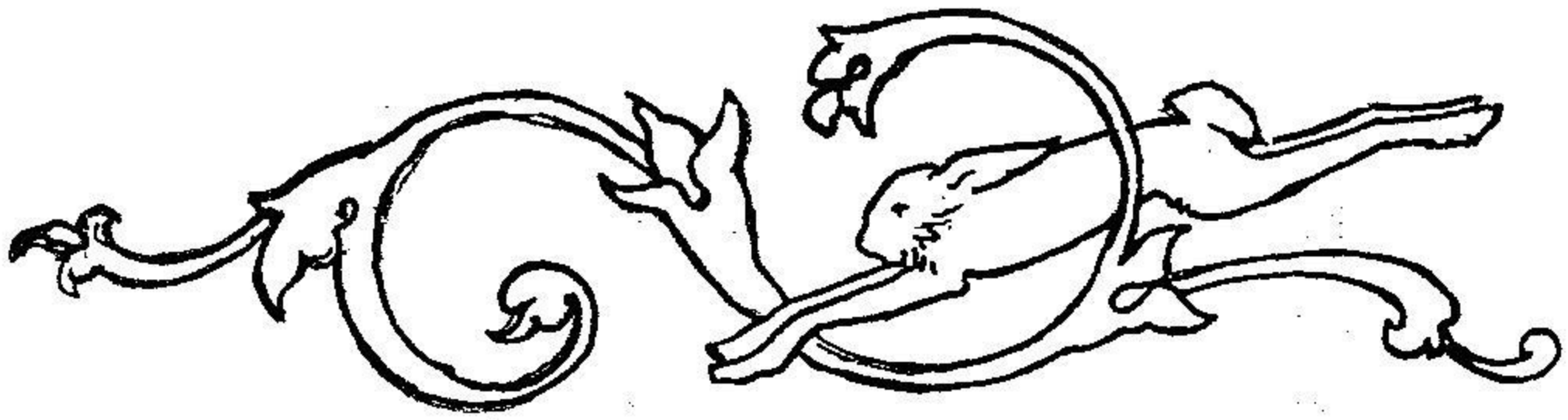
COCKING LEVER (The Modern Goat's Foot)

The overall dimensions given are those used for the author's Hunting Crossbow. The lever is hooked over the "T" stirrup crossbar. In making one for *your* stock it will be necessary to cut some thin lath and mark all the dimensions to be sure of a working fit. See photo of use on page 113.

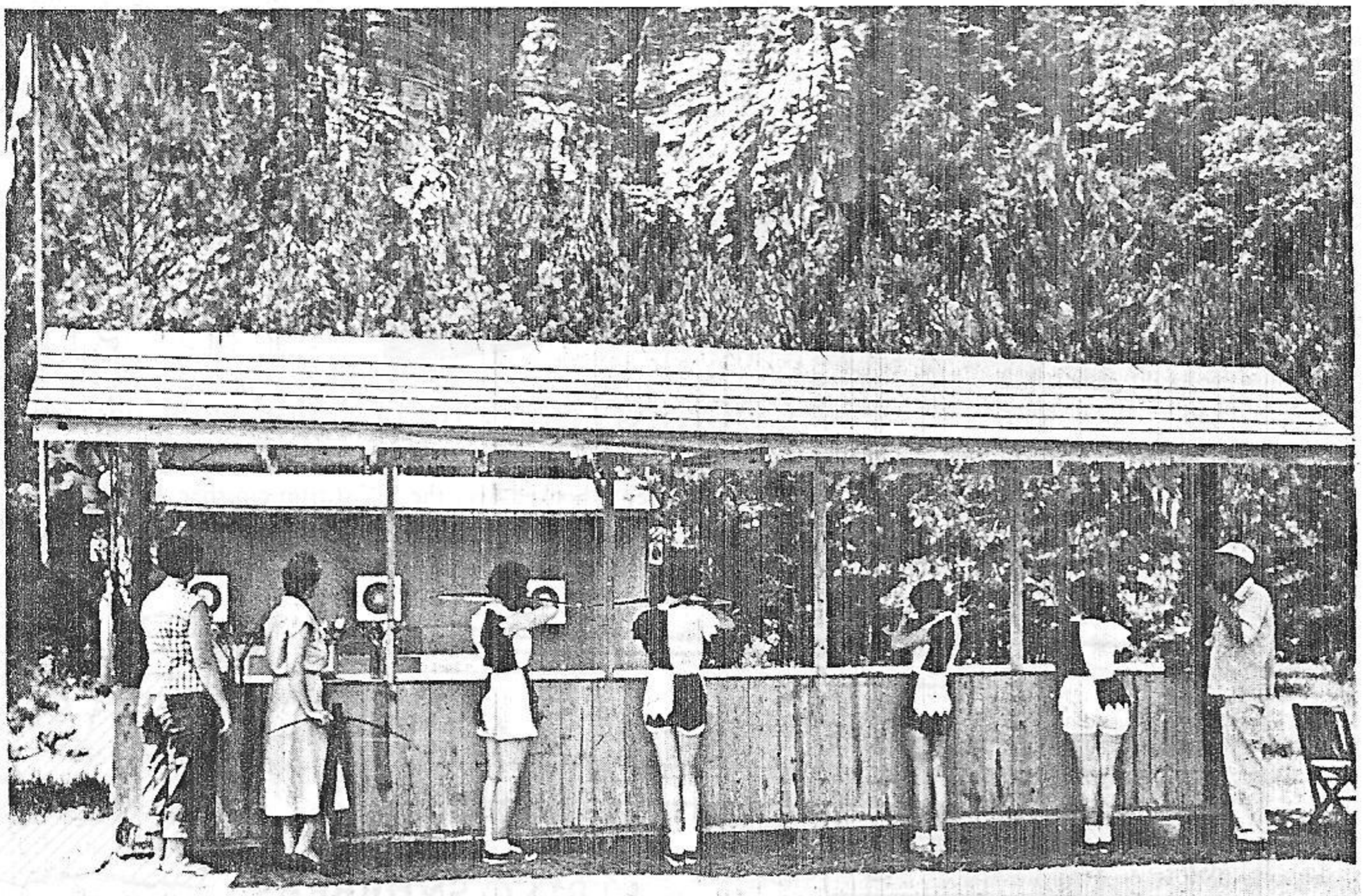


STRING SNUBBERS

Some Crossbows have a very disturbing jar or rebound. This can be eliminated by a slight squeeze on the string on its travel forward from brace. Make two from 1/8" x 1" x 5" long steel as shown. Mortice in flush on stock and check for arrow vane interference. See cross section drawing.

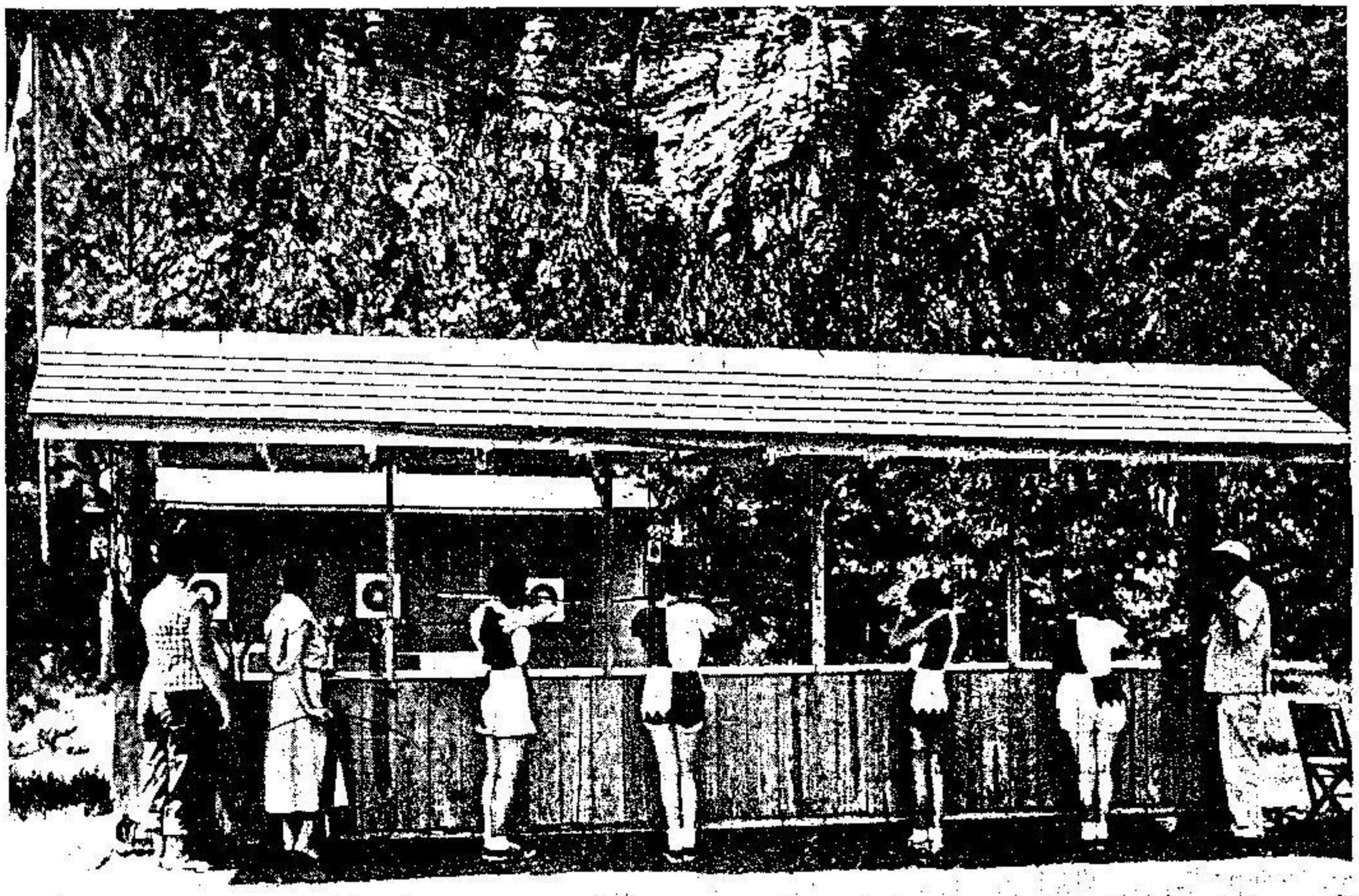


A Suggested Type of Simple Carving



SAFETY! We have never had an accident, let's see that we never do.

Originally erected as a "Begimner's Stand" to familiarize new shooters with the weapon, before allowing them out on the Field Targets. Within 30-60 days, equipped with moving targets and the Repeater Bows, it was a fast moving Gallery. But it still served as training for the novice. Floodlighted, it was very popular at night. Incidently, a stretched wire with pool-hall tally buttons proved ideal to record the number of loads a shooter used when very busy.



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YOUR TARGET BACKSTOP

For full enjoyment of your weapon, you should not only have a good place to shoot, but a good backstop. This can be a decorative asset to any residence with a little designing, as with the ACA type illustrated.

Nothing discourages the archer quicker than hours spent hunting for passed arrows and the expense of broken and damaged equipment. The baled hay so often used by Longbowmen lets too many of the short bolts "bury up" and the bale must eventually be torn apart to recover hidden bolts. The hay also requires some type of cover against the weather.

The round tied grass or straw target bosses are available at nearly all sport stores. (*With over 20 years experience with tournaments, we suggest the Saunders Tournament Indian Grass Matt. Especially if small diameter Tournament arrows are used.*) While Crossbowmen use the 24" or 60 cm. faces for most shooting, a larger Boss should be used, especially if no auxiliary backstop is provided. A recommended backstop is a 4' x 4' square of 3/8" or 1/2" rough plywood, faced with 1/2" outdoor Celotex to ease the jar—particularly if aluminum arrows are used.

The range should be accurately measured and small markers placed at 10 yard intervals (below the lawn mower). Fifty yards will do for average practice where space is limited

The hunting or "broadhead" arrow tips present a practice problem. The best backstop is an earth bank, if free from stones. If the heads are not pinned on the shafts, we have found that about five or six layers of heavy, corrugated cardboard make a good backstop. If they are tied together loosely, the arrow shaft can be worked free of its point and then the points are retrieved from the cardboard. While it lasts, this paper boxing makes one of the best arrow stoppers.

SCORE—The color rings of the Archery target score: Gold-9, Red-7, Blue-5, Black-3, White-1. An arrow cutting the dark line between colors scores the higher point.

Since Archery has turned to the 10 ring, or centimeter target, there is little doubt but that the Crossbow will follow, using the 60 cm. colored face.

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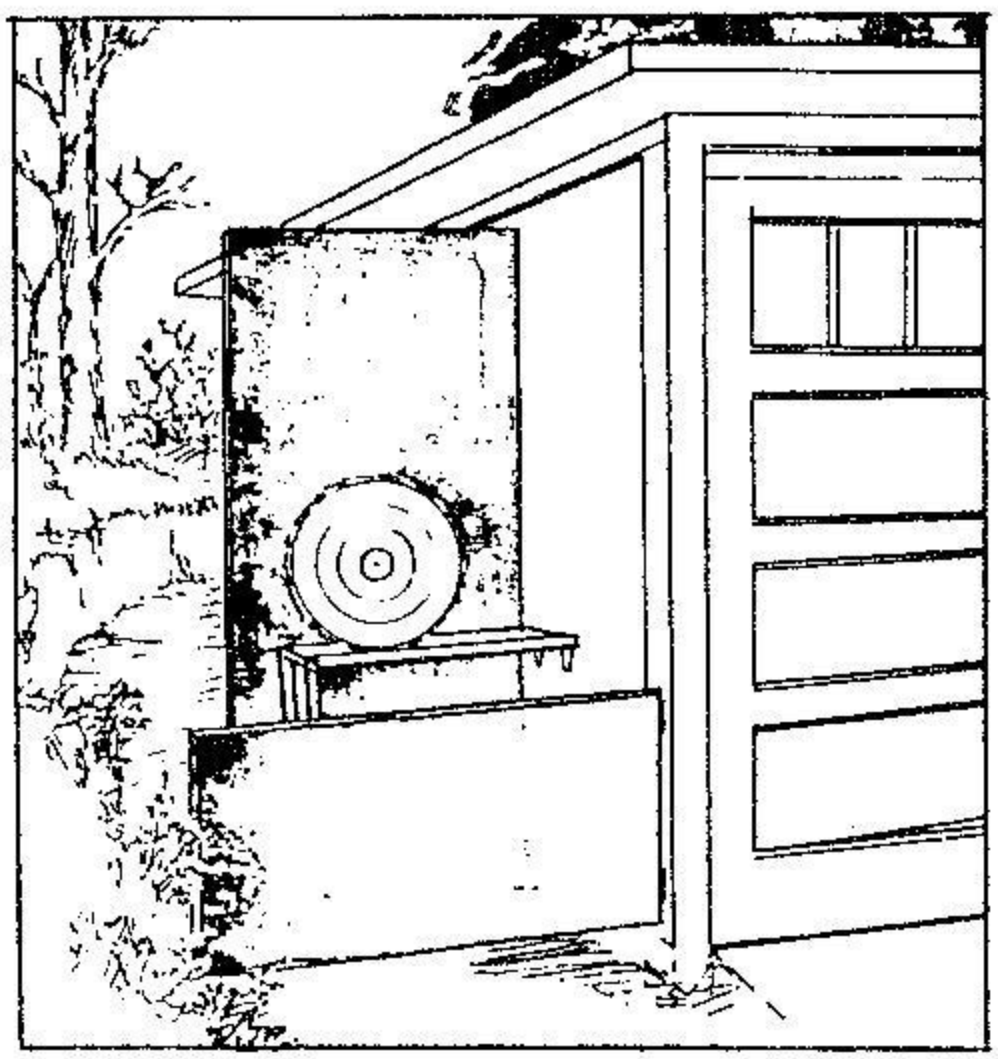
Many Crossbowmen (and Longbowmen) take advantage of their garage driveway to get in a little shooting. Of course, this requires moving both cars and setting up a tripod for the target. But it does not provide auxillary arrow stoppage. Illustrated is the author's "step out and shoot" driveway backstop.

No Workshop facilities are required, just a hand drill and screwdriver. Materials are one sheet each of sub-flooring plywood and 1/2" outdoor Celotex (4' x 8'). Have the lumber dealer cut a 6" strip off one side (waste), as the full 4' hanging is pretty heavy. Also cut 2' off the end for the forward baffle. This is to prevent any low shots from skimming under the backstop. A 12" x 40" pine board for the "table" and 5 solid 3" strap hinges, plus two smaller hinges to secure the table. Two 1" strips are run off the 40" board for legs (See sketch of table). And you are ready to go to work. All wood,especially the edges should be well painted. Hang the forward baffle first, the table to come just off the end when the baffle is back against the building. With the table raised, see that you hang the backboard flush with with the table when extended. The backboard is secured to the table for stability with an ordinary pad-lock hasp, its staple screwed to the table top. We assume that you will keep the target matt handy just inside the garage door. A couple of screen door hooks will hold the panels snug against the wall.



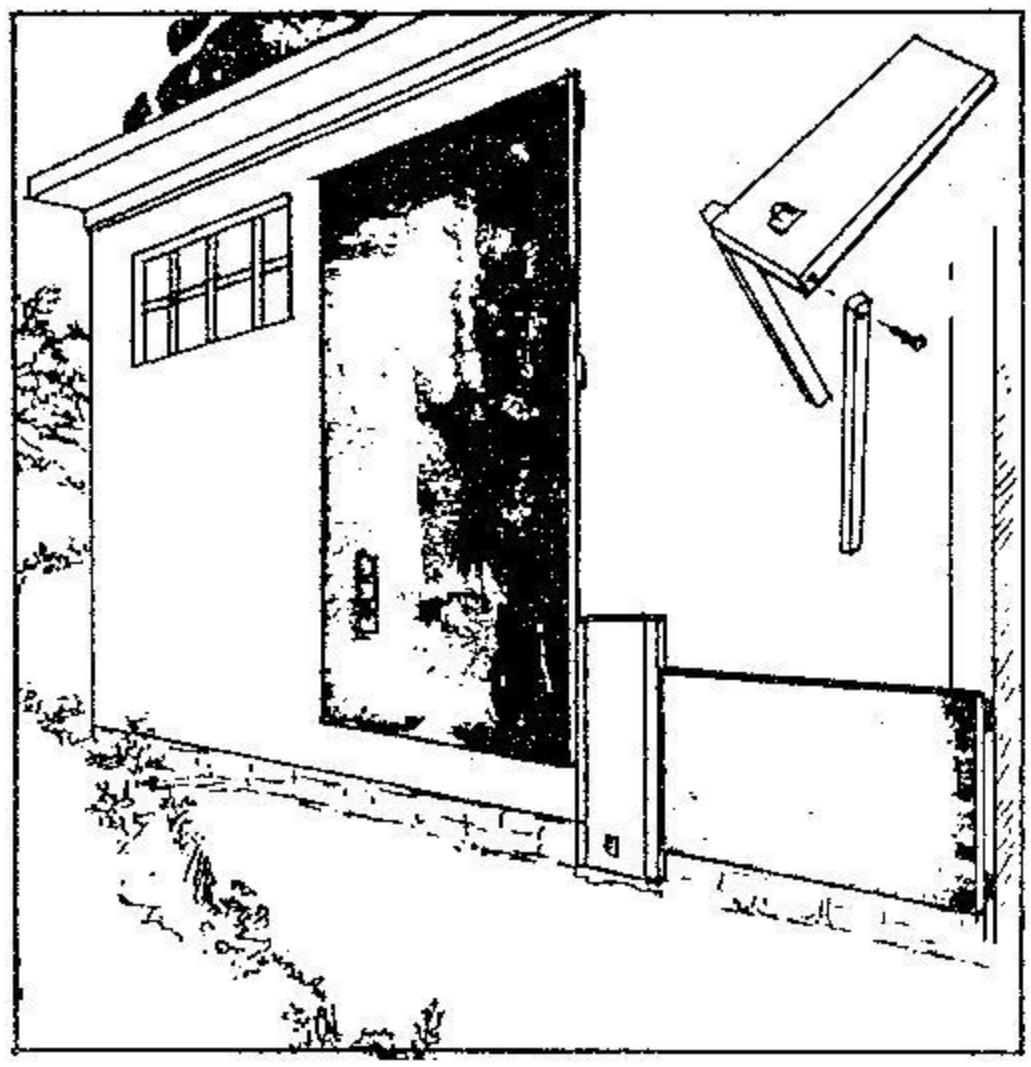


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Fig. 17 - Two Modern Oriental CO2 Rifles

Top specimen is a Howa bolt-action CO2 rifle from Japan. Howa mainly has produced absolutely top grade production firearms under their own name and the names of several American firearm producers. Their air rifle shows the same attention to quality and solid construction.

Bottom specimen is a "Mountain Rancher's Rifle" from the Philippines. This CO2 rifle is made with a .50" caliber brass barrel with inserts for .177", .22", and .38" caliber projectiles.
Note the laminated stock of semi-futuristic design (some of our other similar specimens have stocks with thumbholes and saddle-like dual cheekpieces and ornate carvings - they look like something out of science-fiction!). Note the spinning reel under the forearm! This is used to retrieve frog and fish spears, and arrows fired from the .38" barrel. The .50" caliber barrel is used to fire cattle/big game tranquilizer dart/syringes and, hold your hat, TNT explosive torpedoes! (I put a whole chapter on Philippine airguns into our Blue Book of Airguns).

Fig.17A - Airgun Torpedoes!

These devices, beautifully lathe-turned from brass, are "torpedoes", designed to be charged with shaped-charges of high explosives, such as TNT, and then fired from Philippine .38" and .50" (9 & 12.5 mm) caliber CO2 rifles, such as the specimen to the left. When he left several different versions of these rifles at our office, the factory representative presented us with these specimens. He also had some, which he took with him for trials with a relative in Southern California, that were already charged. When we asked him how he brought them, when he flew in, he replied: "In my vest pocket"!. Talk about airport security!

There are both .38" and .50" caliber torpedoes here, some with round heads for surface detonation, others with pointed heads for deep detonation. He indicated that they use them for killing animals up to the size of water buffaloes. But, he added, the problem is that they may blow away "one-quarter" of the water buffalo"!

Beeman collection.

Photos 16 and 17 are items in the Beeman Collection, photographed by Ulrich Eichstädt.

Technological developments are moving faster than political changes. Break Free's new Linear Bow utilizes powerful rubber tubing for propulsion, rather than a prod. But is it a crossbow?

Technological developments are moving faster than political changes. Break Free's new Linear Bow utilizes powerful rubber tubing for propulsion, rather than a prod. But is it a crossbow?

DART CATAPULT

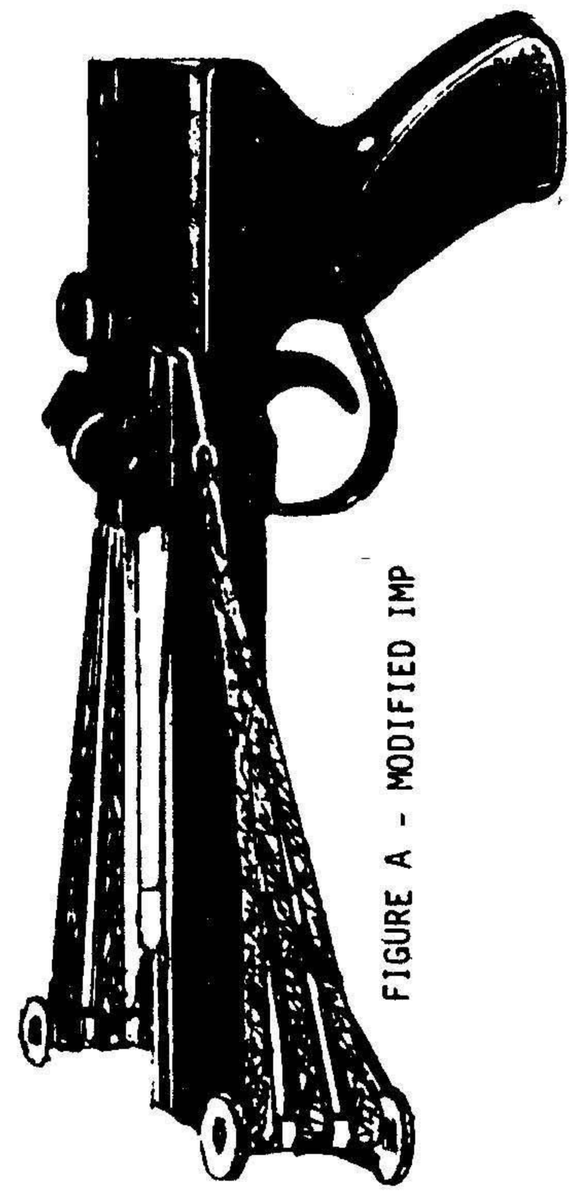


FIGURE A - MODIFIED IMP

The Dart Catapult was conceived by the Allied Special Services during World War II. The weapon was intended for clandestine use and was produced in several models. The larger rifle sized units featured a folding stock mechanism based on the German MP-40 SMG stock.

The dart catapult concept is a compromise between the easily constructed but inefficient rubber powered speargun and the power and accuracy of the bulky traditional crossbow. The use of a triangular baseplate in place of the original prod (bow) will reduce the overall width by 1/3 to 1/2. The easily replaced rubbers eliminate the need for building and maintaining a complex and expensive recurve bow.

Figure A shows an IMP Crossbow Pistol that has been modified to accept rubbers and a triangular baseplate. (see IMP article page 95, this issue.)

Figure B is a set of full size plans for a home built dart catapult. The frame design and scale are based on the IMP, but the measurements are easily modified for building larger versions. The frame is fabricated from aluminum or brass flat stock.

The rubber power unit may be made up from surgical tubing, slingshot replacement rubbers or jumbo rubber

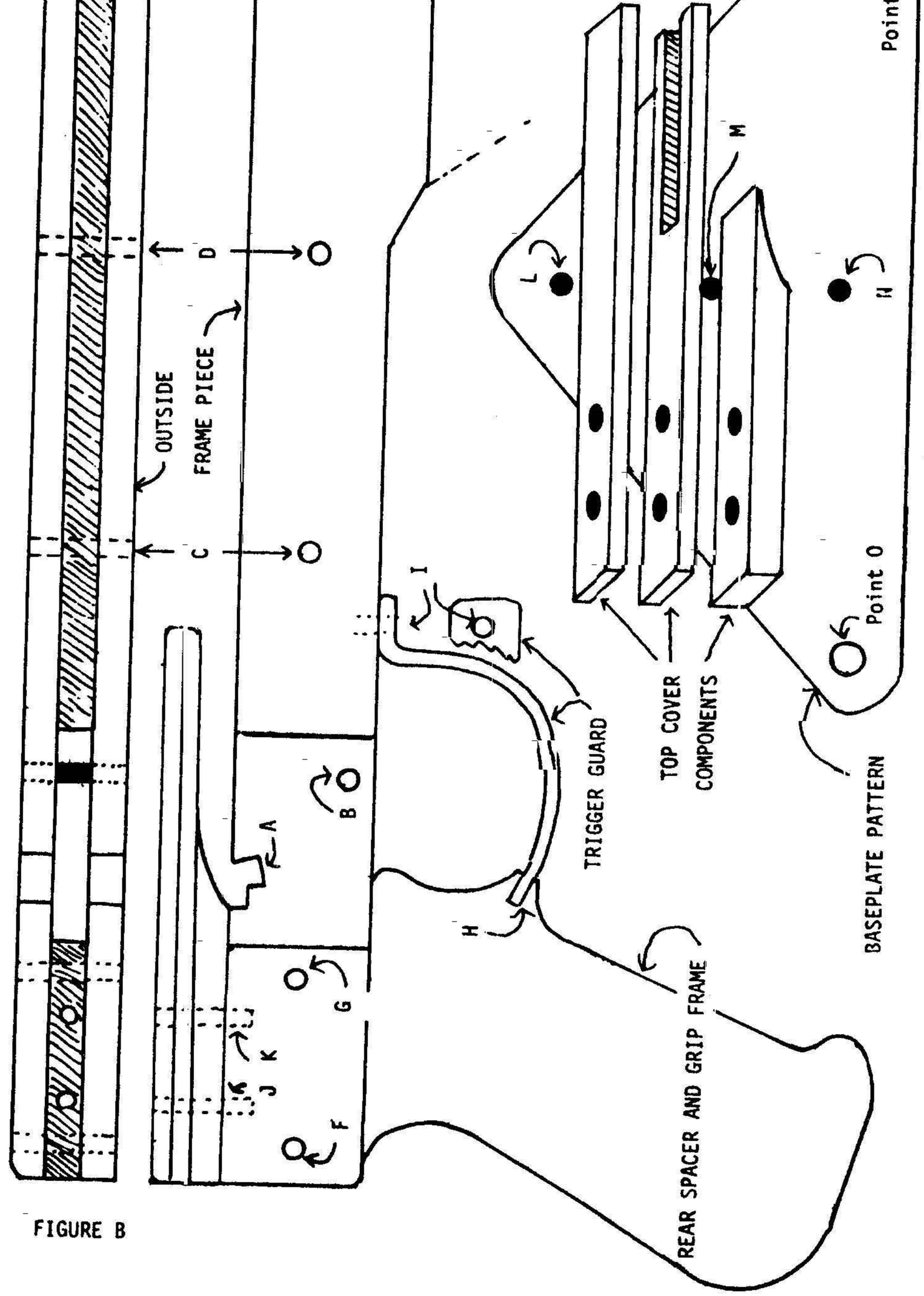


FIGURE B

hands.

STEP 1

Cut the two outside frame pieces from ¼" flat stock. Carefully align edges and clamp together for steps 2 and 3.

STEP 2

Cut the cocking notch in the frame pieces at A. Increase the angle of the undercut for rugged field use. Decrease angle to near verticle for a target type "hair trigger."

STEP 3

The front spacer is cut from ¼" stock and is positioned between frame halves until all three bottom and front edges are aligned. (There should now be a ¼" x ¼" channel along the top edge of the frame.) Clamp pieces together and drill 1/8" diameter holes through all three pieces at points B-E. Hole B is for a press fit trigger pin so a slightly undersized drill may be used if available. Holes C-E may be threaded for machine screws or 1/8" bolts and nuts may be used to fasten the three pieces together.

STEP 4

Cut the trigger pin from 1/8" diameter drill rod. The trigger is made from ¼" flat stock. Cut two shims from an old credit card or similar plastic sheet. Use a sanding block to reduce trigger width until the trigger and two shims are a wobble free fit in the frame. Align with hole B and tap pin in place. If the pin is not a secure fit, a drop of Loctite at each end will hold it in place.

STEP 5

Build the rear spacer/grip frame from ¼" metal sheet. If the gun will receive light duty only, ¼" plywood or other non metal materials may be used. Custom grips can be used or this frame's shape may be altered to accept spare pistol grips on hand. Use a saw or file to cut slot H in grip frame before installing grips.

STEP 6

The trigger guard is cut from 1/8" stock and is ¼" wide. Bend to the shape indicated and trim off the excess length. Insert the rear of guard into slot H. Drill 1/8" hole at point I and screw guard to frame.

STEP 7

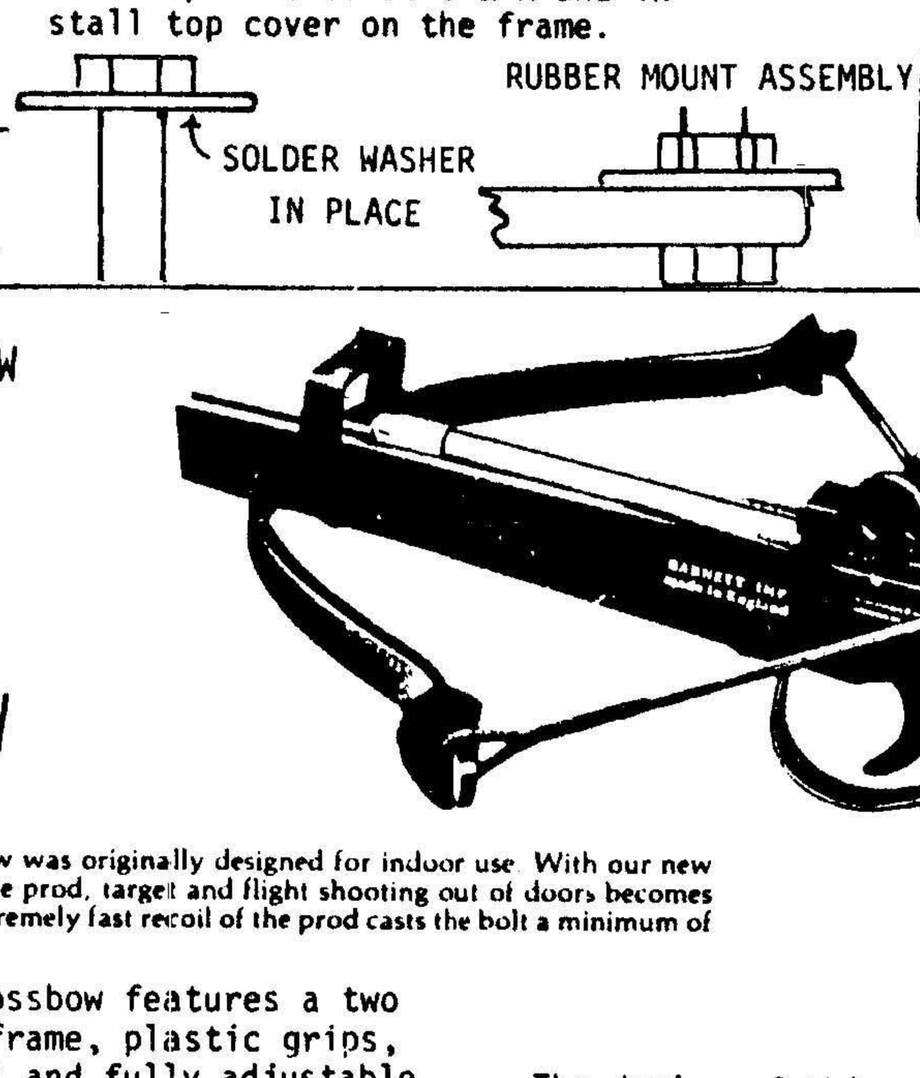
Construct top cover from individual pieces and assemble as shown. Note arrow stop slot on underside. Drill 1/8" holes at J & K and install top cover on the frame.

STEP 8

The 3"x6" triangular base plate should be cut from 3/16" (minimum) brass. Thickness should be at least ¼" if aluminum is used. Drill 1/8" holes L, M, and N in the plate. Use the base plate as a template to mark the bottom of the center piece (front spacer) on the frame. Edge of base plate should be flush with front of frame. Thread holes and coat screws with Loctite before installing plate to frame. If you are using bolts and nuts for assembly, the bolts must be inserted from the top down into the arrow track. The front spacer (bottom of the track) should be counter drilled to allow the bolt heads to fit flush and not obstruct the track.

STEP 9

Drill a ¼" hole at each end of the base plate (points O). Install the two ¼"x2" bolts with 1" OD washers and jam nuts as shown. These are the mount points for the rubber power units.



PRODUCT REVIEW

'IMP' PISTOL CROSSBOW

This compact little crossbow was originally designed for indoor use. With our new 30 lb draw weight glass-fibre prod, target and flight shooting out of doors becomes an exciting venture. The extremely fast recoil of the prod casts the bolt a minimum of 50 yards.

The IMP Pistol Crossbow features a two piece cast aluminum frame, plastic grips, fiberglass prod (bow) and fully adjustable rear sights. The aluminum trigger should be shimmed on both sides with nylon washers to eliminate wobble.

The crossbow is 10½" long and 5½" tall. The prod measures 12" across when strung and in the uncocked position. The child size grips should be lengthened about 1" by taping or gluing a wood or plastic block to the bottom. There is no provision for a safety so bolts (arrows) should not be inserted until you are ready to fire. The two bolts provided are brittle plastic and should be replaced with ones made of fiberglass or aluminum.

The design of this crossbow is the basis for the dart catapult project on page 92 and may be used instead of beginning from scratch.

The IMP Crossbow sells for about $30 and is available from one of the sources listed below. Order both catalogs as they contain info on several crossbows, books, crossbow components, replacement bolts,etc.

Crossbowman (USA), Box 2159, Petaluma, CAL 94952. Catalog 25¢.

B.&P. Barnett (Canada), 93 Ashbury Ave., London, Ont. N6E 1T3, Tel.(519) 681-6482. Catalog 50¢.

Ralph Payne-Gallwey 'The Crossbow'

Longman's, Green & Co. London, 1903

CHAPTER XLIX

THE CHINESE REPEATING CROSSBOW

HERE we have surely the most curious of all the weapons I have described.

Though the antiquity of the repeating crossbow is so great that the date of its introduction is beyond conjecture, it is to this day carried by Chinese soldiers in the more remote districts of their empire.

In the recent war between China and Japan, 1894-95, the repeating crossbow was frequently seen among troops who came from the interior of the first-named country.

The interesting and unique feature of this crossbow is its repeating action, which though so crudely simple acts perfectly and enables the crossbowman to discharge ten arrows in fifteen seconds.

When bows, and crossbows which shot one bolt at a time, were the usual missive weapons of the Chinese, it is probable that the repeating crossbow was very effective for stopping the rush of an enemy in the open, or for defending fortified positions.

For example, one hundred men with repeating crossbows could send a thousand arrows into their opponents' ranks in a quarter of a minute.

On the other hand, one hundred men with bows, or with ordinary crossbows that shot only one arrow at a discharge, would not be able to loose more than about two hundred arrows in fifteen seconds.

The effect of a continuous stream of a thousand arrows flying into a crowd of assailants-in so short a space as fifteen seconds-would, of course, be infinitely greater than that of only two hundred in the same time, especially as the arrows of barbaric nations were often smeared with poison.

The small and light arrow of the comparatively weak Chinese crossbow here described had little penetrative power. For this reason the head of the arrow was sometimes dipped in poison, in order that a slight wound might prove fatal.

The impetus of the heavy bolt of the mediaeval European crossbow which had a thick steel bow, was sufficient to destroy life without the aid of such a cruel accessory as poison.

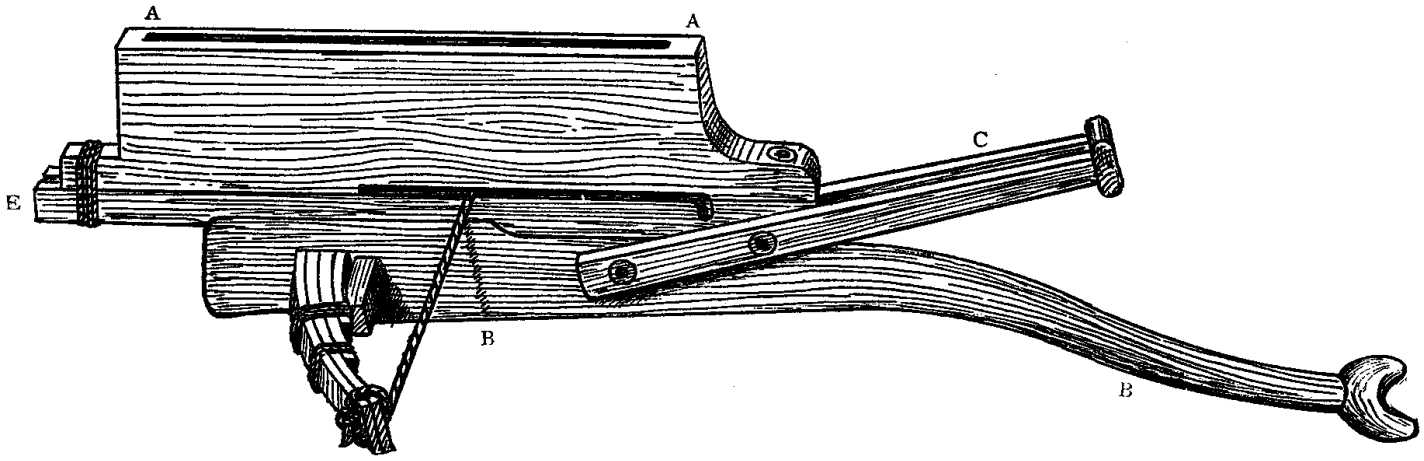


FIG. 171.—SIDE VIEW OF THE CHINESE REPEATING CROSSBOW.

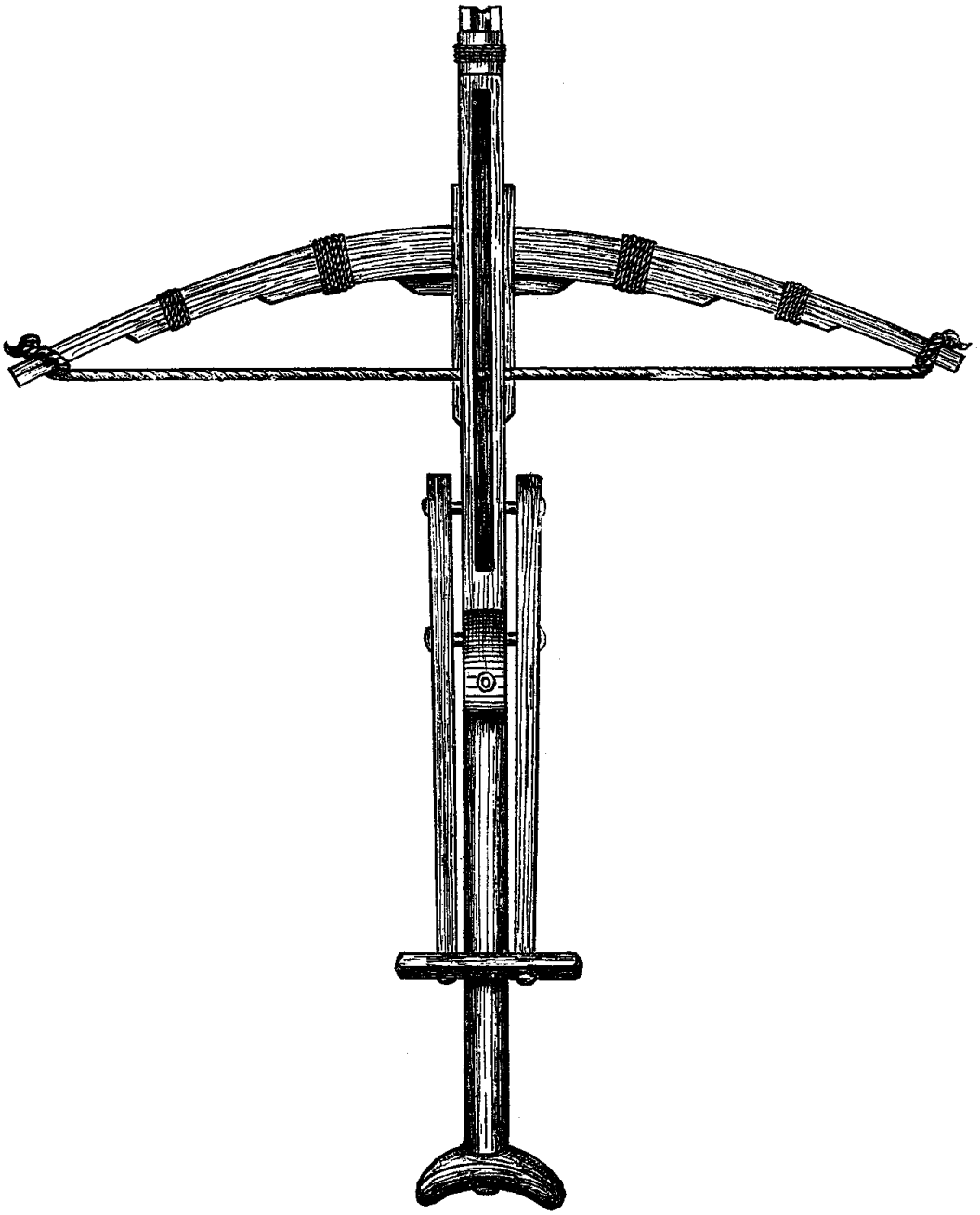


FIG. 172.—SURFACE VIEW OF THE CHINESE REPEATING CROSSBOW, SHOWING THE OPENING AT THE TOP OF ITS MAGAZINE.

THE CONSTRUCTION OF THE CHINESE REPEATING CROSSBOW, Figs. 171, 172

A, A.	The magazine in which the ten or twelve small arrows are laid (one on the other) when the weapon is made ready for use.
B, B.	The stock in which the bamboo bow is fixed.
C.	The lever that works the crossbow. The lever is hinged to the stock of the crossbow and its magazine by metal pins, fig. 174.
E.	The piece of wood along the upper surface of which a groove is cut. for an arrow to rest in, and that also has a notch in it to hold the bowstring.

This piece is attached to the magazine and forms the lower part of it.

HOW TO WORK THE CROSSBOW, FIG. 174

By pushing forward the magazine by means of the lever, the bow-string is automatically caught in the notch above the trigger, A, fig. 174.

At the moment when the bow-string is thus secured, an arrow falls from the magazine into the groove cut out in front of the notch. An arrow cannot drop from the magazine into the groove till the bow-string is in the notch, fig. 175.

The trigger consists of a little piece of hard wood. When the lever is fully pulled back the trigger pushes the stretched bow-string upwards out of the notch that holds it, B, fig. 174. The trigger works in an upright slot. It has its upper end enlarged to prevent it from dropping out of the slot in which it moves up or down, fig. 173,

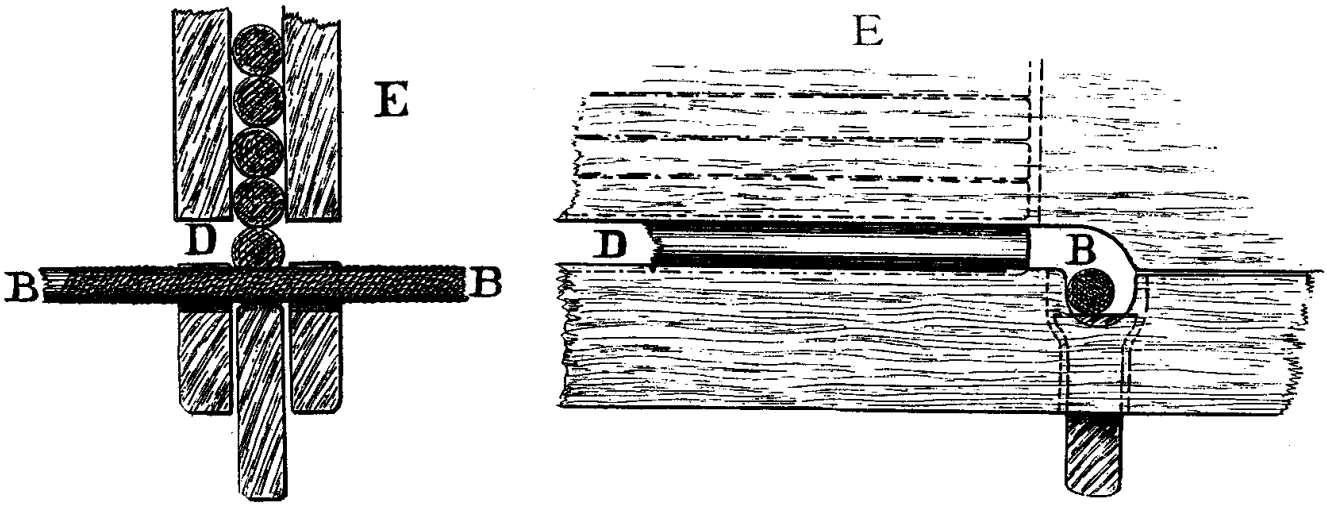


FIG. 173.—THE ACTION OF THE TRIGGER OF THE CHINESE REPEATING CROSSBOW.

B, The bow-string in the notch above the trigger ; D, An arrow in the groove in front of the bow-string ; E, The magazine which contains the supply of arrows.

FIG. 174 -THE ACTION OF THE TRIGGER OF THE CHINESE REPEATING CROSSBOW.

A. The magazine, full of arrows, pushed forward by the lever. The bow-string is caught in the notch above the trigger.

B. The crossbow just before it is discharged. The trigger, as its lowest extremity is pressed against the surface of the stock by the action of the lever lifts the bow-string out of the notch.

B, fig. 174. The lever is here pulled back, with the result that the bow is bent and the bow-string stretched. By pulling back the lever a little farther than shown in this sketch, the projecting end of the trigger will be pressed against the surface of the stock of the crossbow. This causes the upper end of the trigger to lift the bow-string out of the notch and set it free. The arrow is then discharged and the crossbow returns to the position shown in fig. 171, and is ready for the next shot.
From this description, it will be understood how simple and rapid is the action of the crossbow. All that need be done to shoot off the arrows contained in its magazine, is to work the lever to and fro as slowly or as quickly as desired.
It is even possible to discharge a dozen arrows in fifteen seconds.

By a slight alteration in the construction of the crossbow it was sometimes made to shoot two arrows, instead of one, every time its bow recoiled.
In such a case, the magazine and stock were about ¾ in. wider than in the weapon just described. The magazine had a thin partition down its centre which divided it into two compartments. On each side of the central partition a dozen arrows were laid, one over the other. The bow-string passed over two parallel grooves instead of over a single one, each groove being, of course, exactly beneath a compartment in the magazine. As the lever was worked, two arrows dropped from the magazine and remained side-by-side, one in each groove, both arrows being propelled together when the bow-string was released.
By means of this arrangement one hundred men could discharge two thousand arrows in fifteen seconds, or double the number which one hundred men could shoot off in the same time with the ordinary repeating crossbow.

The effective range of these Chinese weapons was about 80 yards; their extreme range from 180 to 200 yards. The bamboo arrows, though short and light, were well made and had steel heads that were heavy in proportion to the length of their shafts. They had no feathers, so that their freedom of movement might not be impeded as they dropped one by one from the magazine when the crossbow was being used.
For the same reason, the width of the magazine-inside-was slightly in excess of the diameter of the arrow. The length of the arrow was from 12 in. to 16 in., according to the size of the crossbow; its diameter 5/16 in. to 3/8 in.
The bow was made either of one stout piece of male bamboo, about 3 ft. 6 in. long, or of several flat strips lashed together.
In the latter case, the bow-string passed through a hole in each end of the bow, fig. 174. The bow-string consisted of animal sinew twisted into a cord of suitable strength.

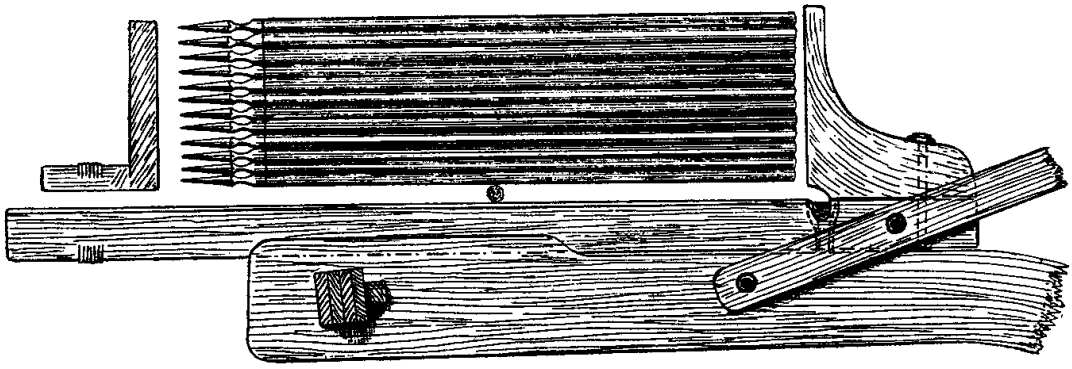
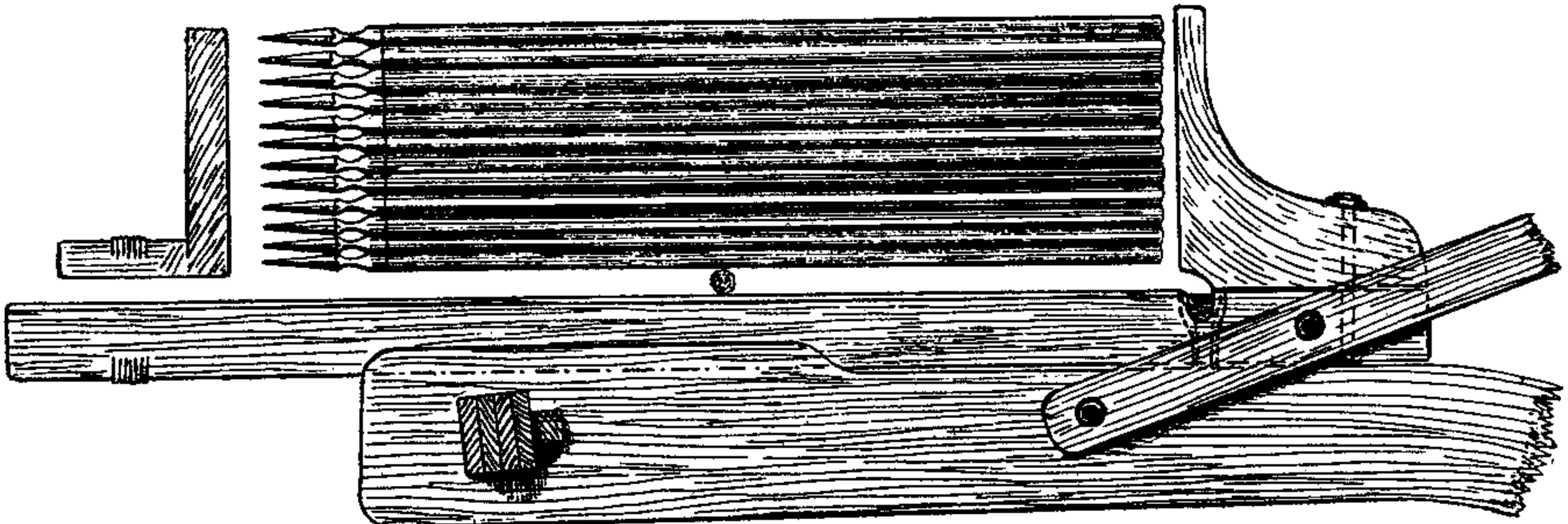


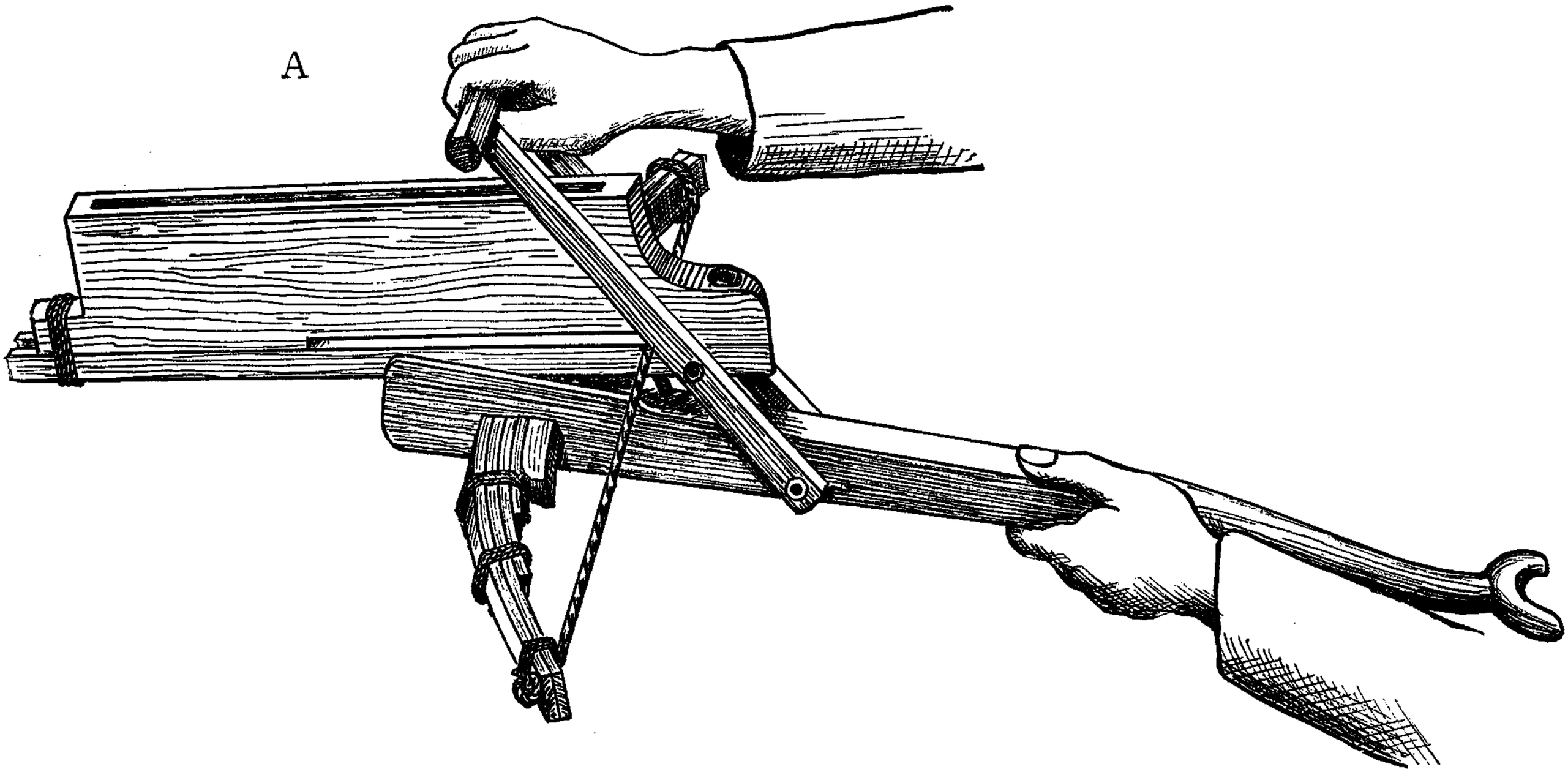
FIG. 175.-THE MAGAZINE OF THE CHINESE REPEATING CROSSBOW WITH ITS SIDES REMOVED.

It will be seen that an arrow cannot drop down from the magazine into the groove along which the bow-string travels till the latter is in the notch above the trigger, as shown in A, fig. 174.

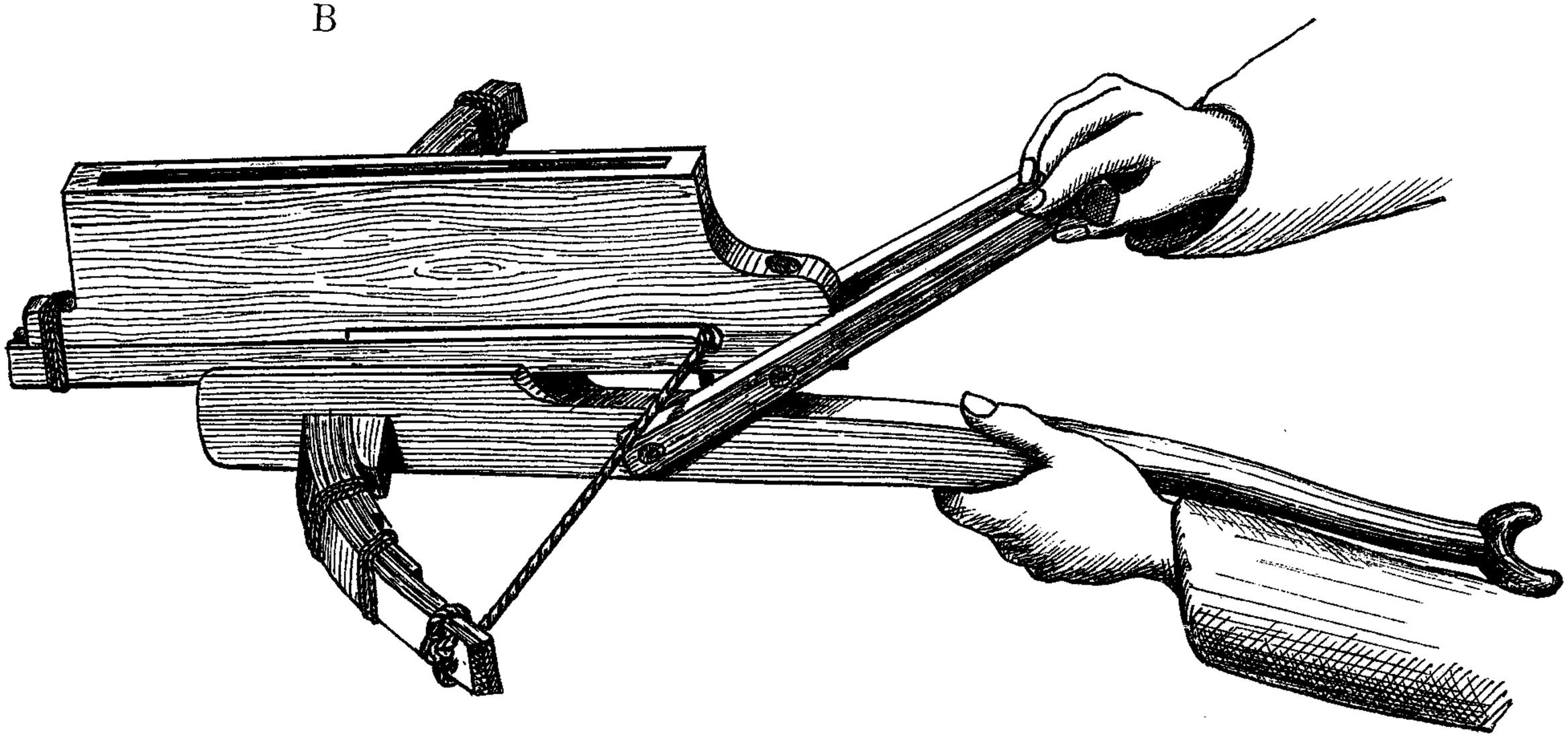
Last up-dated 09 October, 2000



A



B



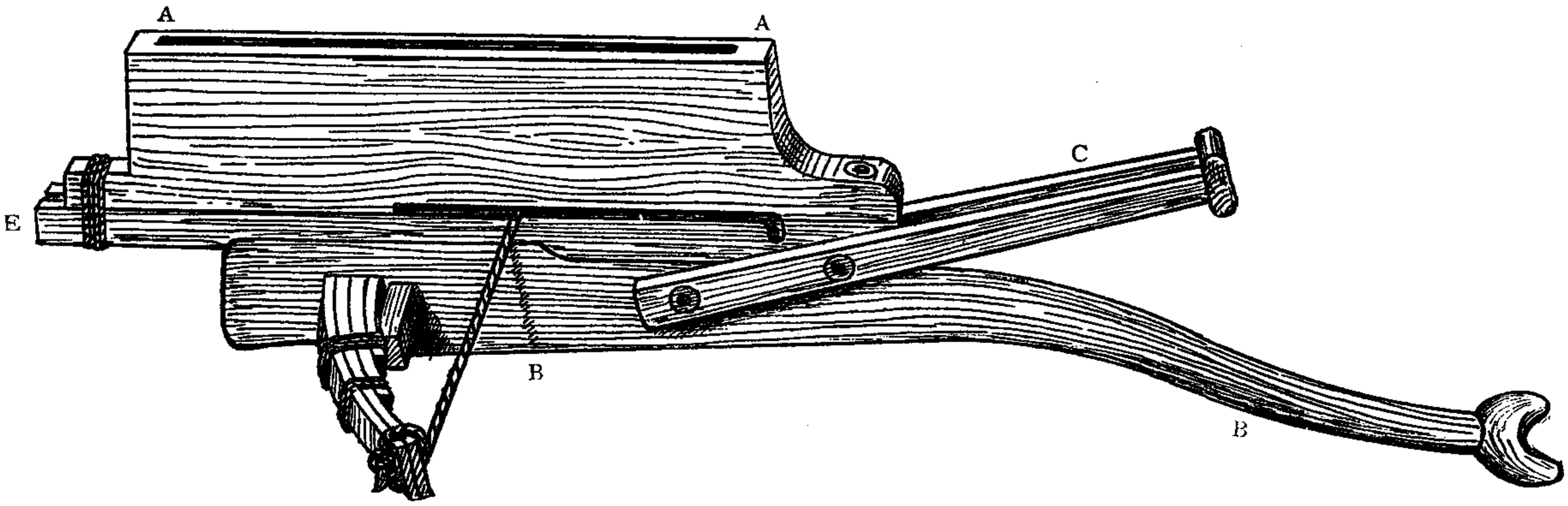


FIG. 171.—SIDE VIEW OF THE CHINESE REPEATING CROSSBOW.

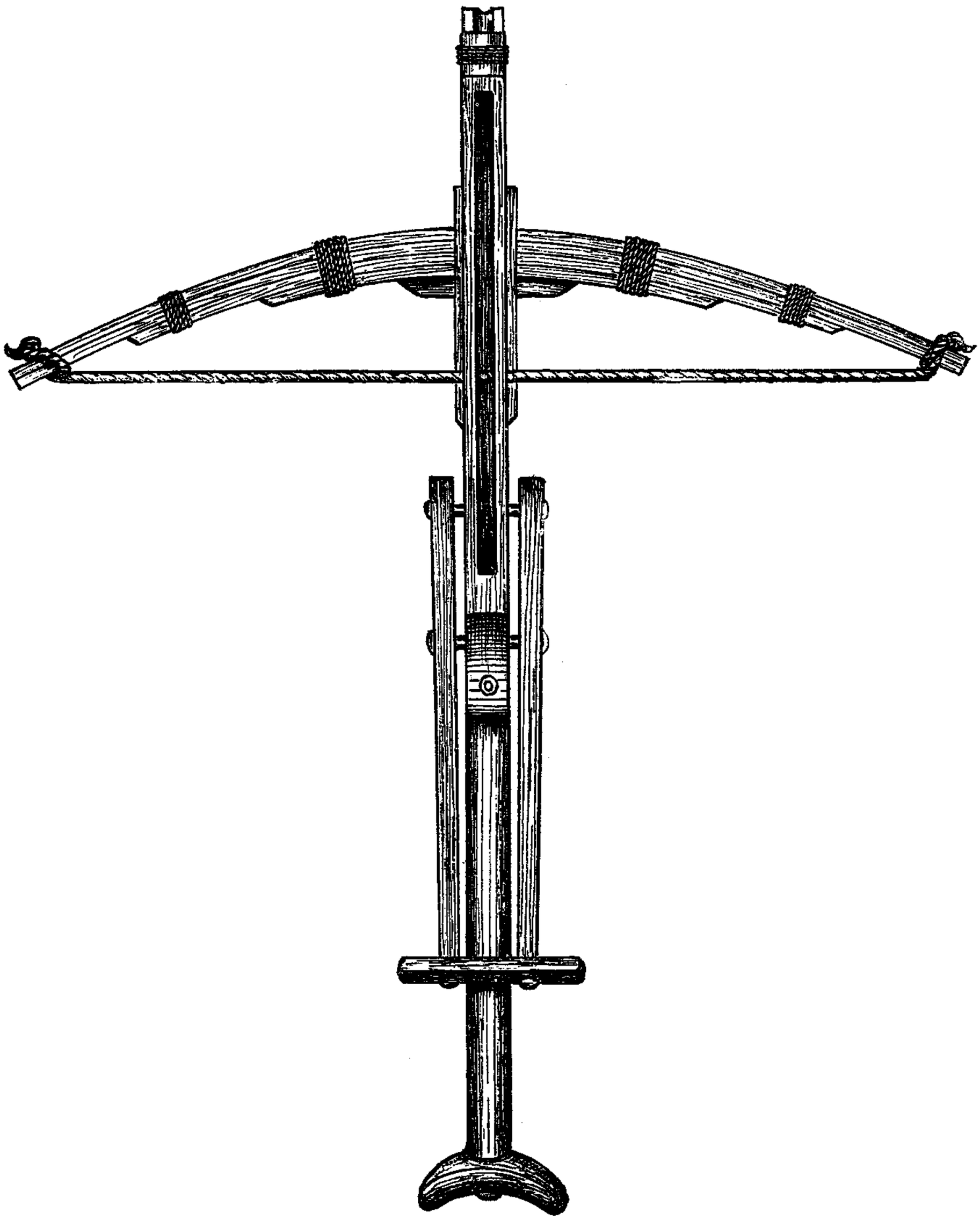


FIG. 172.—SURFACE VIEW OF THE CHINESE REPEATING CROSSBOW, SHOWING THE OPENING AT THE TOP OF ITS MAGAZINE.

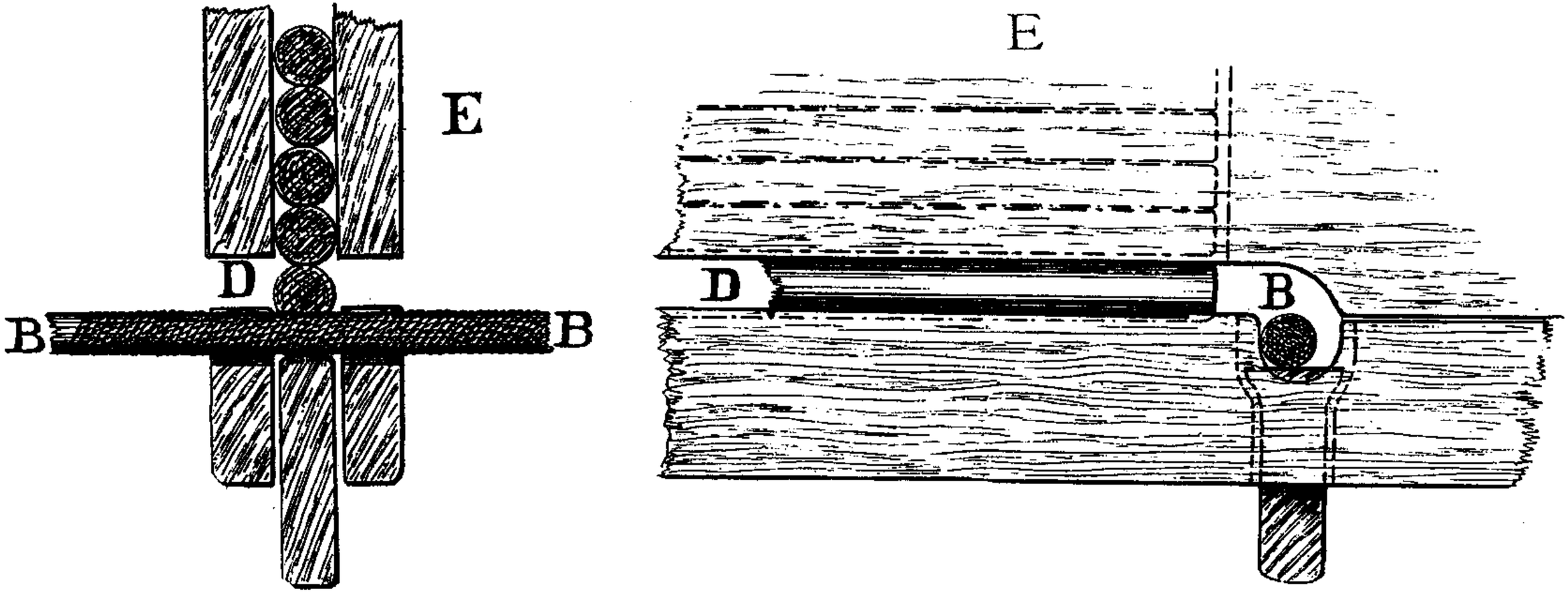
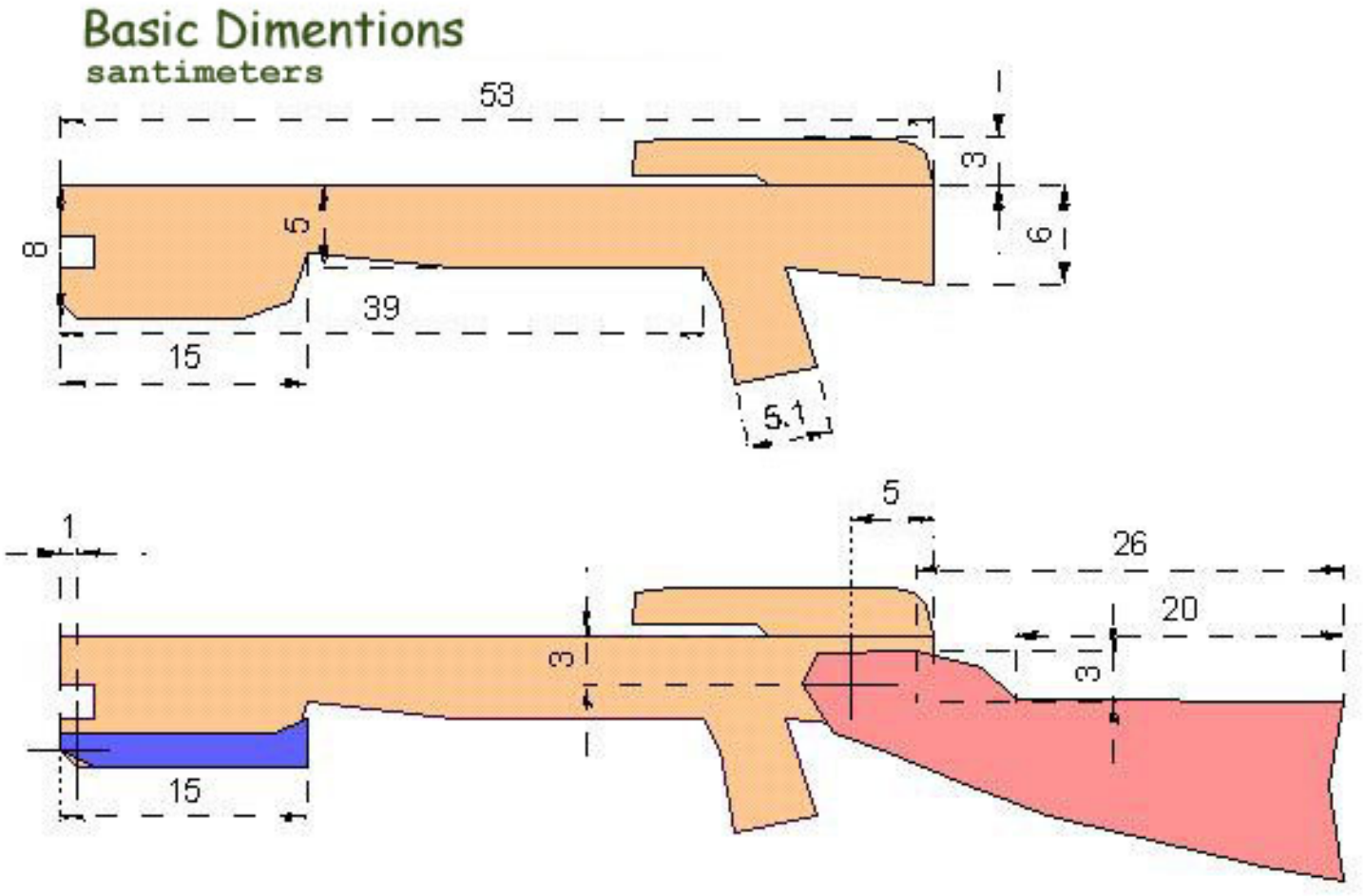


FIG. 173.—THE ACTION OF THE TRIGGER OF THE CHINESE REPEATING CROSSBOW.

B, The bow-string in the notch above the trigger ; D, An arrow in the groove in front of the bow-string ; E, The magazine which contains the supply of arrows.

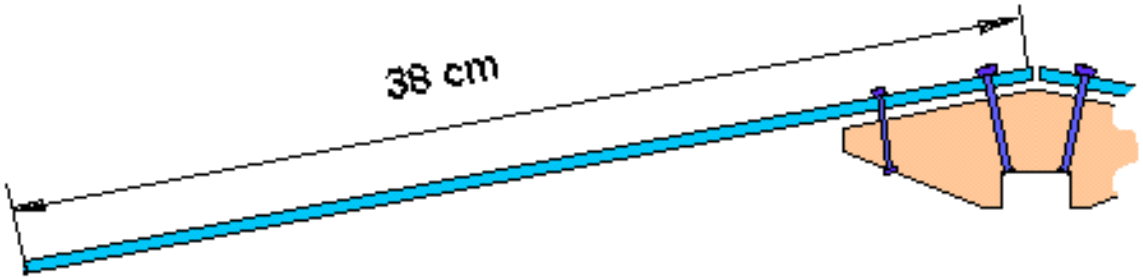
Part One - Basic Dimentions.



Matereal used for stock is the birch.

Part Two - The Prod.

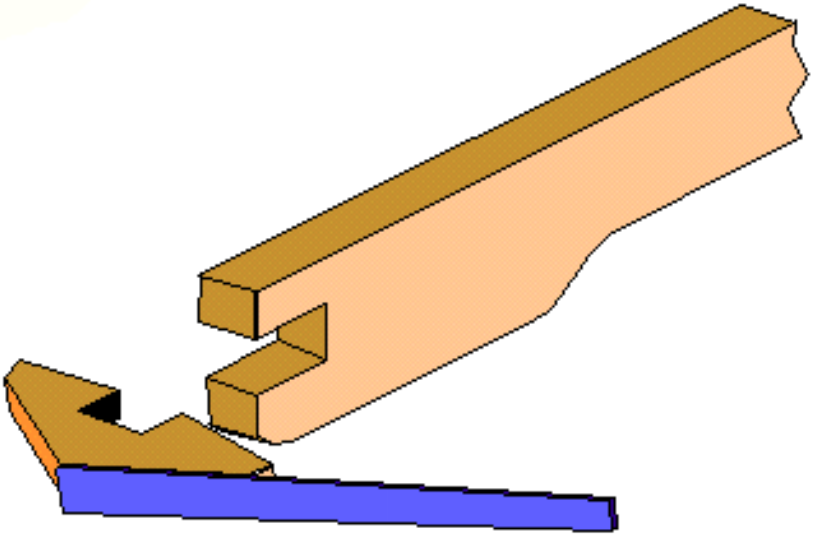
Well, not much to say about it. They say, best matereal is the fiberglass, but I have not found a suitable peace of it. So, the first bow was made from some unknown plastic, found in the garage. It was 65 cm long and has about 37 kg draw weight. All was OK for some weeks, but then it got a terrible string follow. My current prod is made next way: I took an old slalom ski, sawed a back part of it, then sawed it lengthwise. Thus I got limbs and mounted them on central section with long bolts. So I got a prod wich is some longer than normal, but it works good, and does not have any string follow. It's draw weight is about 43 kg.



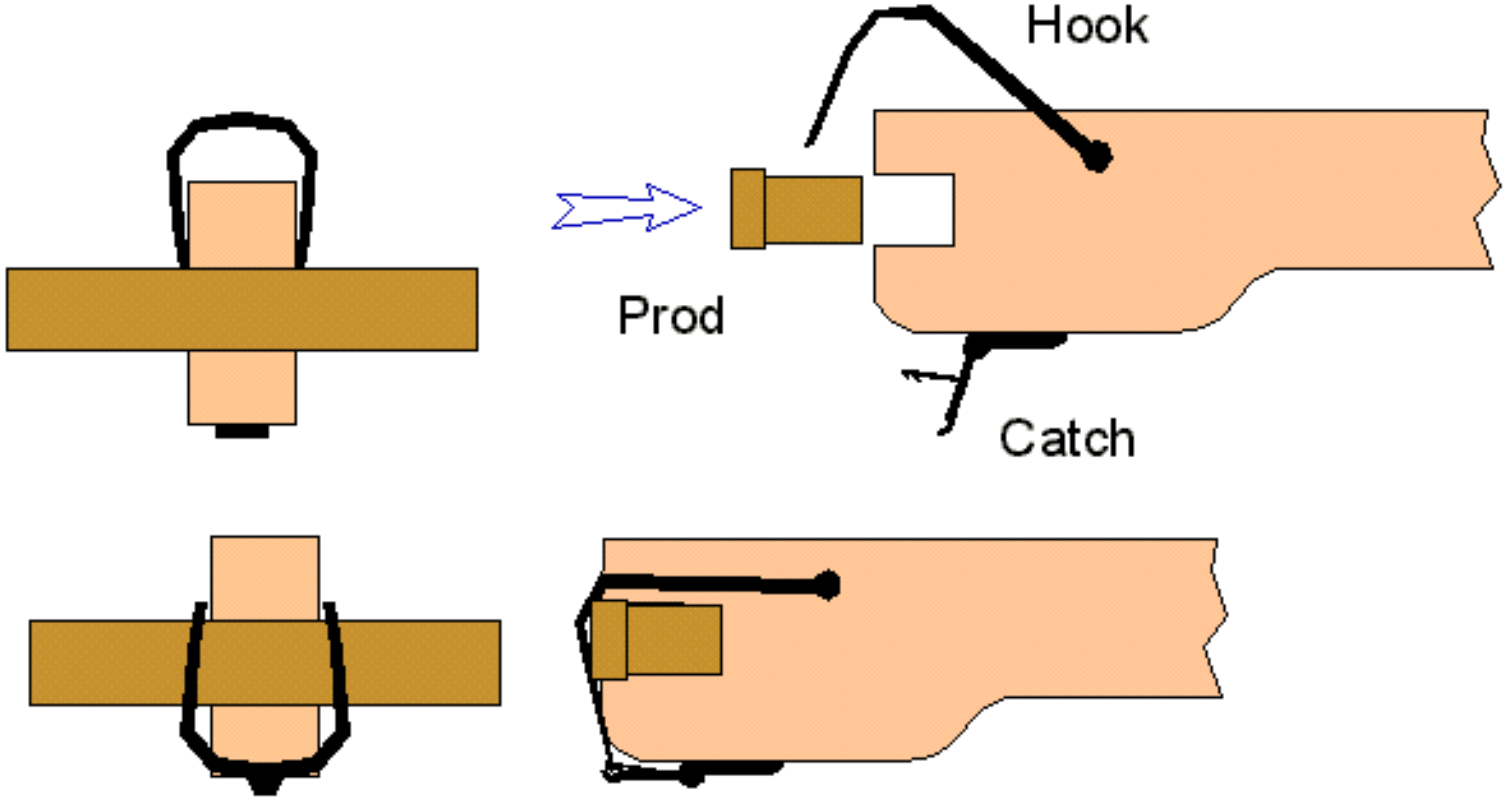
Part Three - Bow Irons and assembling.

Of coarse, I wanted to make a prod removable. So, I took a catch from old-fashioned ski bindings and used a resilient hook When the catch is locking on the hook, the hook is folding and clasping the prod to the stock. Notches on the stock an on the prod get into each other and the prod is reliable fasten at place.

Here is the general sheme of what it looks like

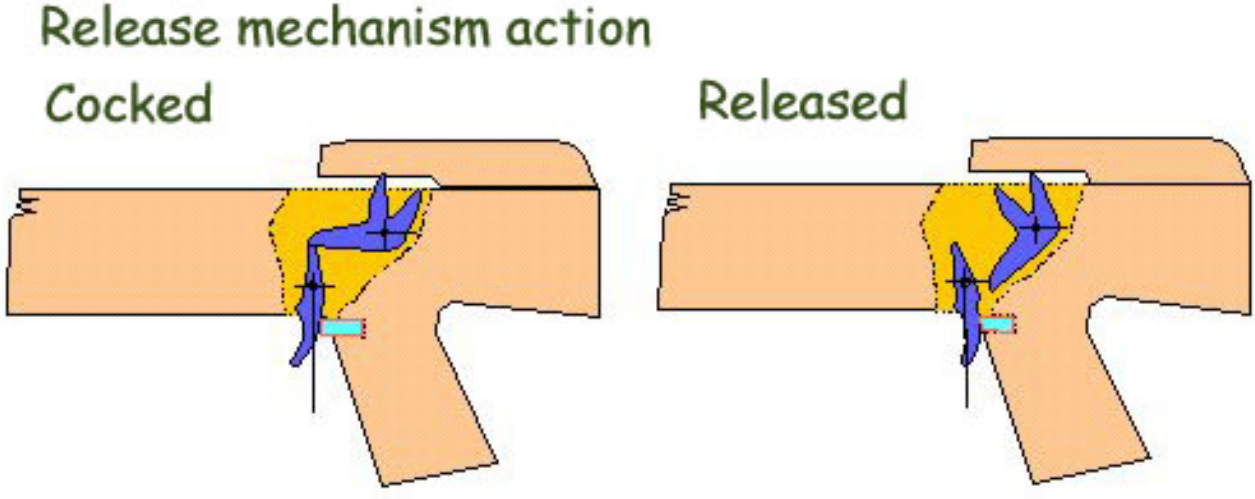


And here is a more detailed drawing

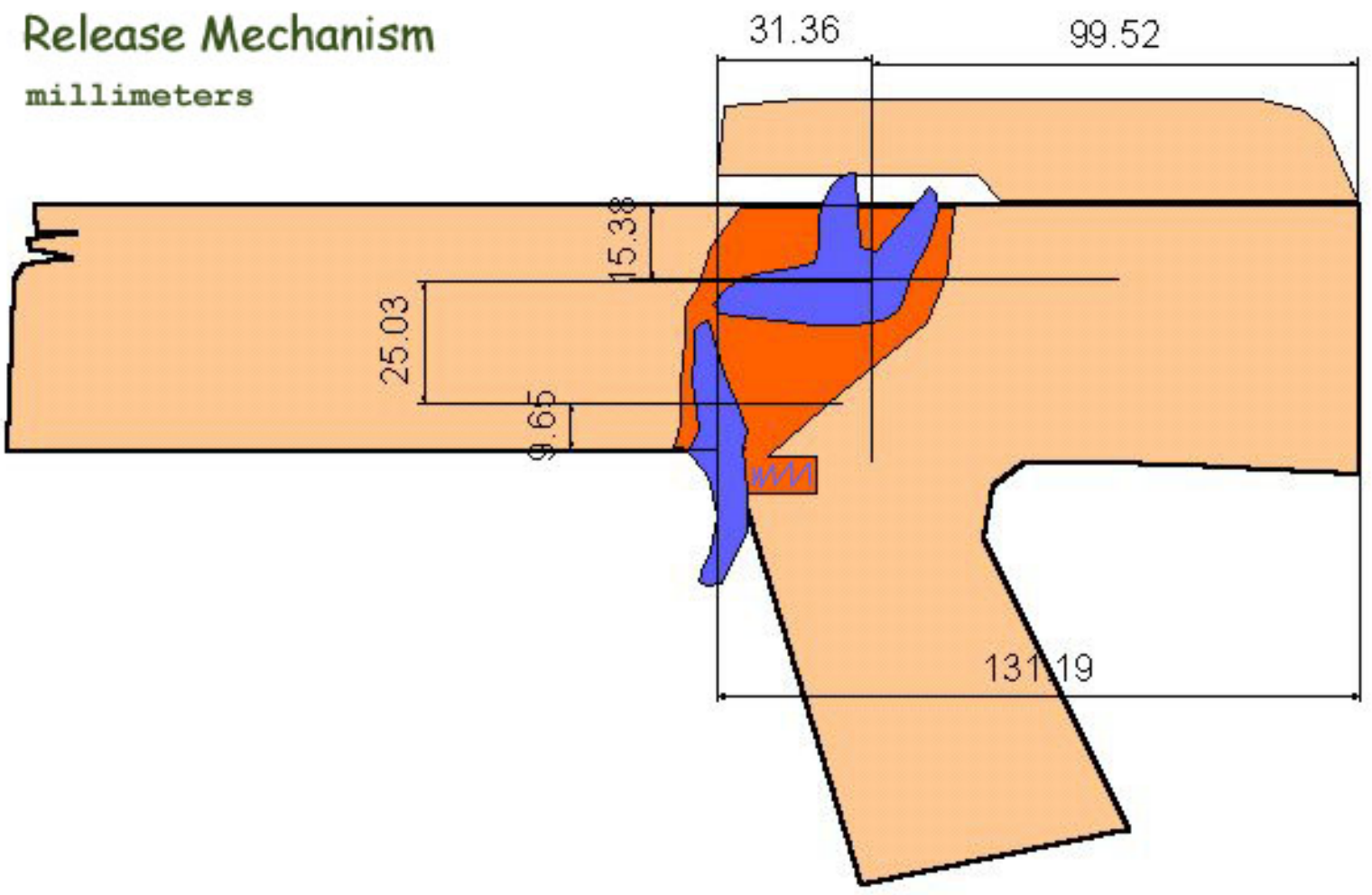


Part Four - release mechanism.

I made the most simple mechanism, containing only two steel details, excepting a spring.



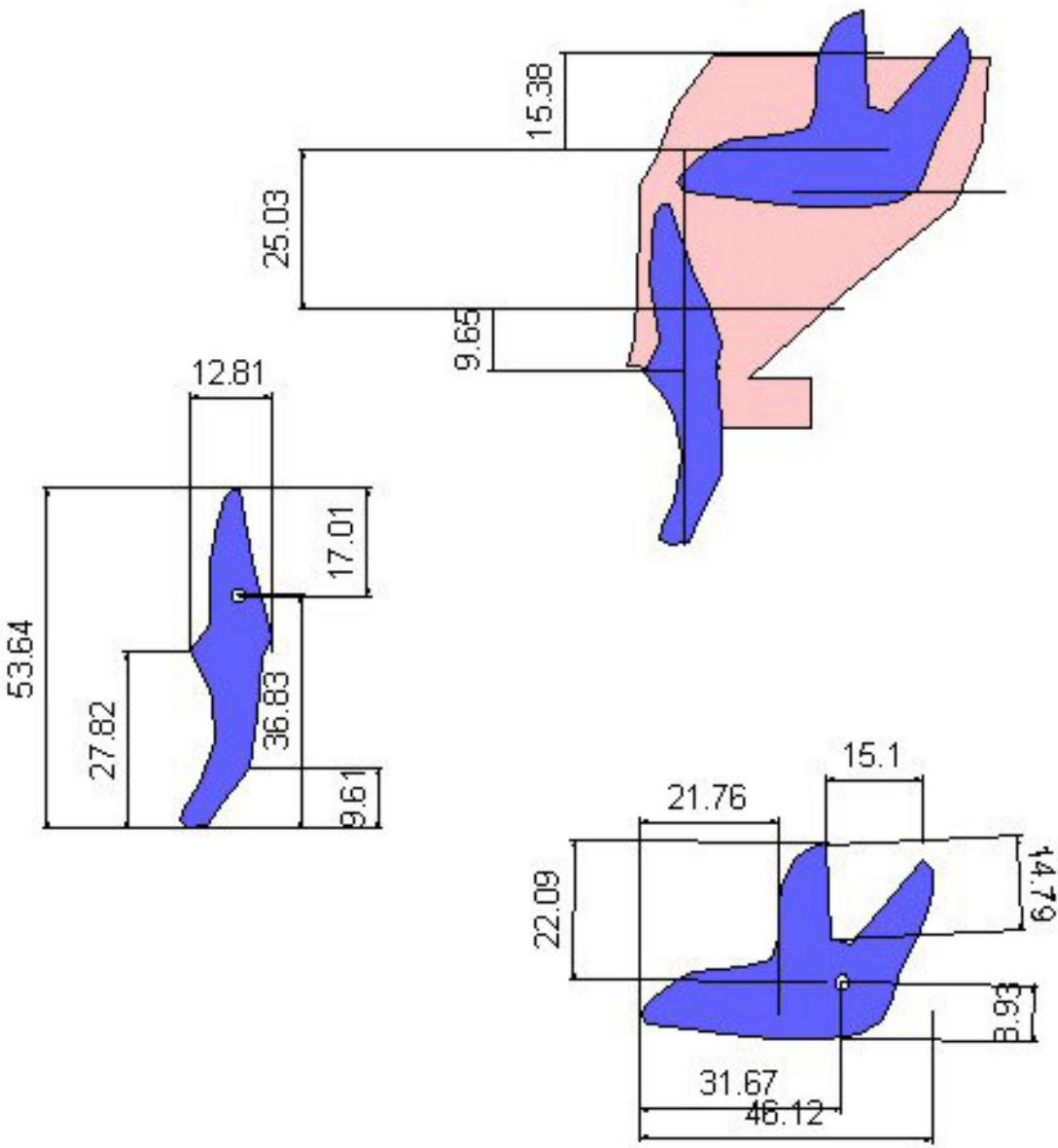
I hope pictures show, how does it work.



Here are release mechanism dimentions

Release mechanism dimentions

millimeters



Inexpensive 2x4 Combat Crossbow Plans

By Wulfric Alemaker

NOTE: Plans do not include bowstring, you must make or procure a 32" string.

First off, I can't claim credit for the 2x4 design. It was introduced into the Northern Region of the East Kingdom by Baron Mutsura Ishikage no Ishido, and it gave Combat Archery in this region a real boost by allowing new archers to try it out without a spending a lot of cash. The design of His Excellency's bow utilized a rotating nut and had longer limbs consisting of 3 fiberglass posts stacked vertically, and a handgrip but no buttstock. I decided to eliminate the nut in favor of a cheaper, simpler-to-build trigger mechanism. My bow uses a rising pin trigger, which I believe is feature found on period Pictish bows. When cocked, the string rests behind 2 steel fence staples and on top of the rising pin. When the tickler is squeezed upward, the pin pushes the string up until it slips over the rounded top of the staples and sends the bolt on it's way. I wanted more power (grunt, grunt), so I added a fourth fiberglass post and shortened the limbs/draw length, which coincidentally gave the bow a narrower profile for working through a shieldwall. I also added a buttstock to steady it while aiming. My bow draws a little under 600 inch-pounds so it can use any bolt allowed on the field but works best with fiberglass-shafted or siloflex bolts. I have been told that some kingdoms have a minimum bolt length, if you live in one you may need to adjust your dimensions. Plenty of modifications and refinements to this design are possible, feel free to experiment.

These things won't win any beauty contests, but they are an effective munitions-grade weapon and a great way to get started. All the materials can be purchased at hardware or farm supply stores, and damaged components are easily replaced. The limbs and trigger pieces are all made from 3/8" fiberglass fence posts. The usual precautions about working with fiberglass apply (i.e. don't breathe the dust, don't get it on your skin or in your eyes.) Having seen fiberglass bows experience catastrophic failure, I don't consider this design unsafe; since when fiberglass breaks it usually just folds in half with splintered ends and doesn't go flying apart like wood does. Plus, there are three other posts to support one if it goes. I've only had one post fail in the 3 years I've been using the bow. After a battle I noticed that it had started to split apart, so I replaced it in about 5 minutes in camp. After a while the posts start to take a "set" so it wouldn't hurt to replace them every year.

Tools needed:

Drill & bits: 3/32", 3/8" (drill press makes life easier)

Hammer

Hand saw or bandsaw

Hacksaw

Wood rasp, coarse file, Surfoam cutter, or dremel for wood shaping

3/8" Round file

Screwdriver

Sandpaper or power sander

Measuring tape or ruler

Vise

1/2" chisel

Propane torch or stove burner

Heat resistant gloves

Materials needed:

1 - nice straight 2x4 cut to length of stock (mine is 28")

4 - 3/8" dia. 48" long white fiberglass fence posts

2 - 12" lengths of wood approx. 3" x 1/2" for side rails. (I used some baseboard molding)

2 - Fence staples for barbed wire

2 - Copper pipe caps for 1" pipe

1 - Strip of barrel plastic 7" x 1-1/2"

1 6-penny finish nail for pivot

2 dimes or pennies

2 wood screws 1" long

Dozen 1-1/2" finish nails or 1" wood screws

Short piece of sinew/dacron twine/wire, etc to lash the rising pin to the tickler

Strapping tape or duct tape

If you want to make an optional stirrup, you'll need material for that, too. I just brace the buttstock against my belly armor when cocking, so I don't have to look down from combat. That's how archers get dead.

Procedure:

Decide which edge of the 2x4 will be the top of the bow (the track) and make sure it is reasonably smooth and straight. Measure back from the front of the bow 14 ½". Drill a 3/8" hole dead center in the track at this point, as perfectly perpendicular as you can. A drill press really helps here. Drill at least 3 inches deep. This is the hole for the rising-pin.

Mark the position of the staples so their back edges are just forward of the pin, one on either side 1" apart. Position them so that when the pin rises upward it will push the string up over the staples. Drill pilot holes and hammer the staples into the stock until the tops are 5/8" above the track. Make sure the backs of the staples are in alignment with each other and perpendicular to the stock, and they are even in height. If one is taller or more forward than the other the string may not slip off both at the same time, resulting in a misfire or hangfire. Make sure you sand or file the tops and backs of the staples smooth so they don't abrade the string.

Next mark the position of the 4 holes for the limbs. Make sure you leave at least 1/4" of wood between them. Drill them through the stock, as perpendicular as possible. IMPORTANT! Bevel the edges of the holes so there isn't a sharp edge to focus stress on the limbs.

Now take your saw and cut out the bottom of the stock as indicated in the diagram, starting about 11"

back from the front. It narrows to about 2" at the grip. Round off the corners of the grip area top & bottom until your hand can comfortably grip the stock.

Take your hacksaw and cut three of the fiberglass fence posts at 31" and the fourth at 33-1/2". These will become the limbs of your prod. I have found the best way is to cut most of the way through, then finish the cut from the other side so they don't split. Bevel the ends slightly to keep them from splitting in use.

Take your dimes and drill a 3/32" hole through the center of each (or use a whitney punch). Set aside.

One of the leftover pieces of post will become your pin. Cut it about 1/4" longer than the distance from the top of the staples to the bottom of the pin hole in the stock. Slightly bevel the top of the pin. Drill a 3/32" hole through the pin near the bottom and round that end. Insert the pin in it's hole in the stock.

Take another cut-off piece and make it about 6" long. This is now your tickler. With the top of the pin even with the top of the staples, hold your tickler at right angles to the bottom of the pin and mark where it intersects the forearm of the stock. This will be the elevation of the tickler bar at full squeeze. Now place your 3/8" drill bit in that position and drill straight into the stock (i.e. parallel to the track) about 1-1/2".

Round one end of the tickler and stuff it into the hole you just drilled. Mark the location for the pivot point on the side of the stock and drill all the way through the stock and the tickler. Now remove the tickler and lay it on the side of the stock in the same relative position. Use your 6-penny finish nail to temporarily hold the tickler to the side of the stock. Now push the pin down so it's top is flush with the track. This is where it will be in the cocked position. Line up the tickler with the bottom of the pin and trace it's position on the side of the stock with a pencil. This will show you the angle that you need to drill the stock to meet the previous hole at the pivot point. Remove the tickler and drill out the hole. Drill about 1/4" past the intersection of the holes. Now chisel out the wood between both holes so that you have a 3/8" pocket in your stock that will allow your tickler to move up and down between cock position and fire. (Optional Northern Army Thug method - cut with the side of your drill bit and just hog through the soft pine.) Rasp or file it smooth so the tickler moves freely up and down (see cut-away diagram). When you're satisfied, permanently pin the tickler in the pocket with the pivot nail, using the drilled dimes as washers on either side of the stock. Cut the point of the nail off close to the dime and gently peen the end of it like a rivet. The pivot nail is now secure. Drill a 3/32" hole in the tickler directly below the hole in the pin and lash the two pieces together. Your trigger mechanism is now functional.

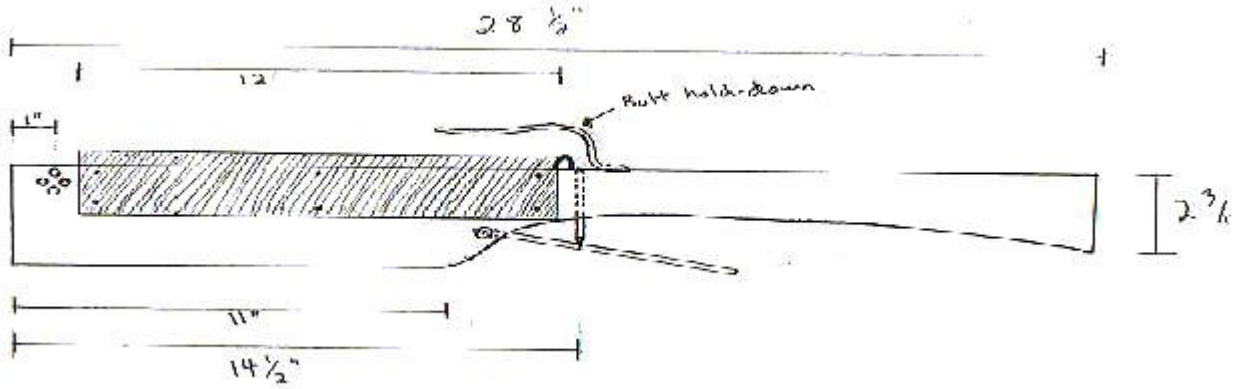
Nail or screw the side rails to the stock with your dozen 1-1/2" finish nails or small wood screws. The top of the side rails should be 1/2" above the track. Sand the tops very smooth and round the edges since this is where your string will ride. Bevel the outside corners closest to the staples as shown to allow the string to transition freely from the staples to the top of the side rails without snagging.

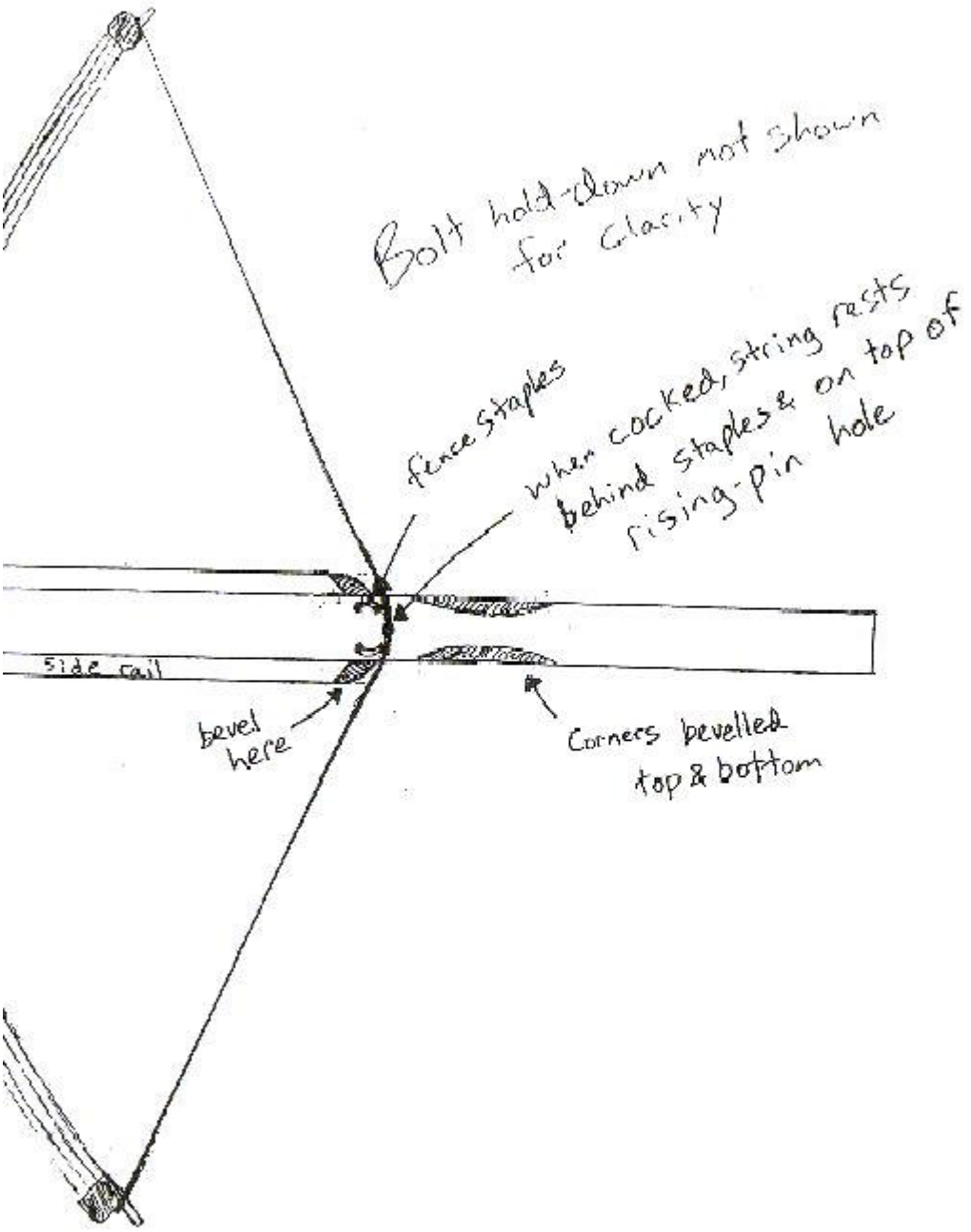
Make your bolt hold down by heating the strip of barrel plastic and bending it to shape. You want it to flare up a little at the tip for ease of loading the bolts. Screw it to the stock with 2 screws behind the trigger mechanism.

Drill a 3/8" hole through the pipe caps near the sides and deburr the holes. Now insert the prod posts into the stock and center them. The longest post goes in the rearmost hole. Wrap tape around the posts as indicated in the diagram. The pipe caps should be a snug, but not tight, fit when you press them on. The string will hold them in place.

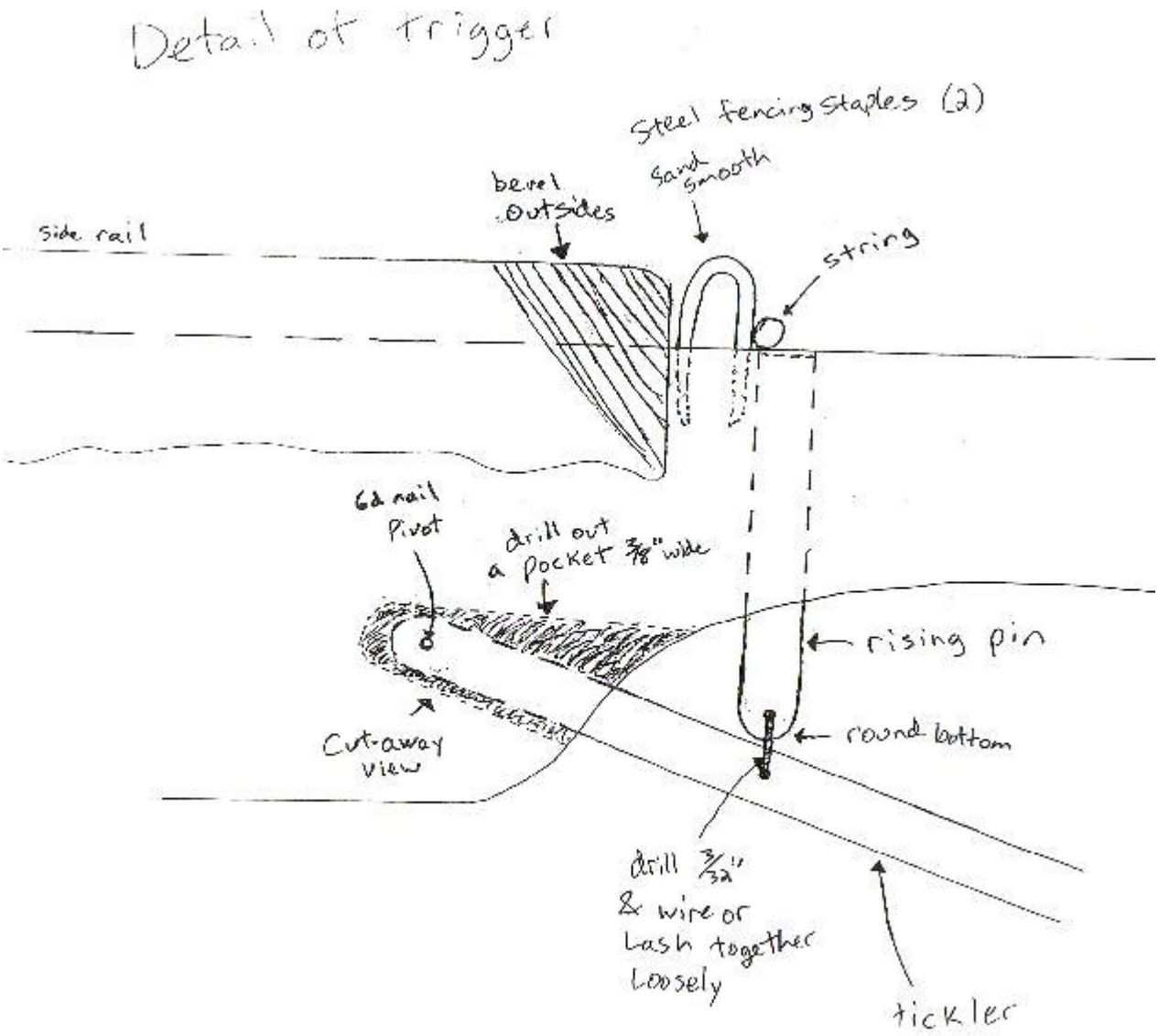
Finally, make or procure a string 32" long. If it's a little too long, give it a few twists to shorten the overall length. If it's a little too short, file a little off the length of your limbs. Get someone to help you string the bow. Carefully draw it back halfway a few times to make sure everything is behaving. Expect some creaking noises as the posts slide against each other a little bit. Cock it, load & fire. If you are using a stirrup, be careful not to depress the tickler with your leg when cocking. Inspect the bow carefully for any signs of stress or cracking each time for the first few shots.

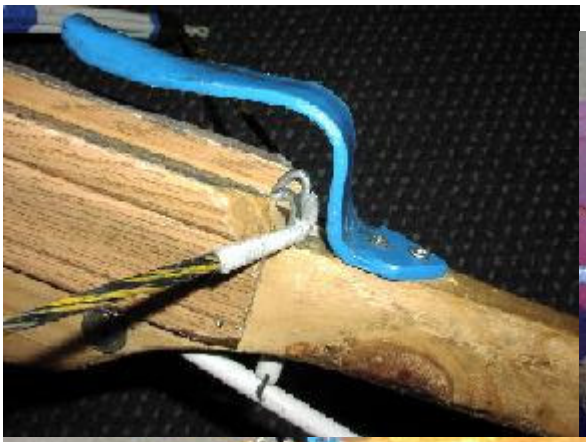
To avoid accidental discharges, you can keep your fingers wrapped around the grip and your knuckles will prevent the tickler from moving upward and tripping the trigger. However, a good bump to the string may still result in discharge so as with any projectile weapon, be aware of where it's pointed at all times.





└ rearmost fence post protrudes through offset hole drilled in copper pipe cap


Detail of trigger
Steel fencing staples (2)
bevel outsides
sand smooth
side rail
string
6d nail
Pivot
drill out
a pocket 3/16" wide
rising pin
round bottom
Cut-away
view
drill 3/32"
& wire or
Lash together
Loosely
tickler

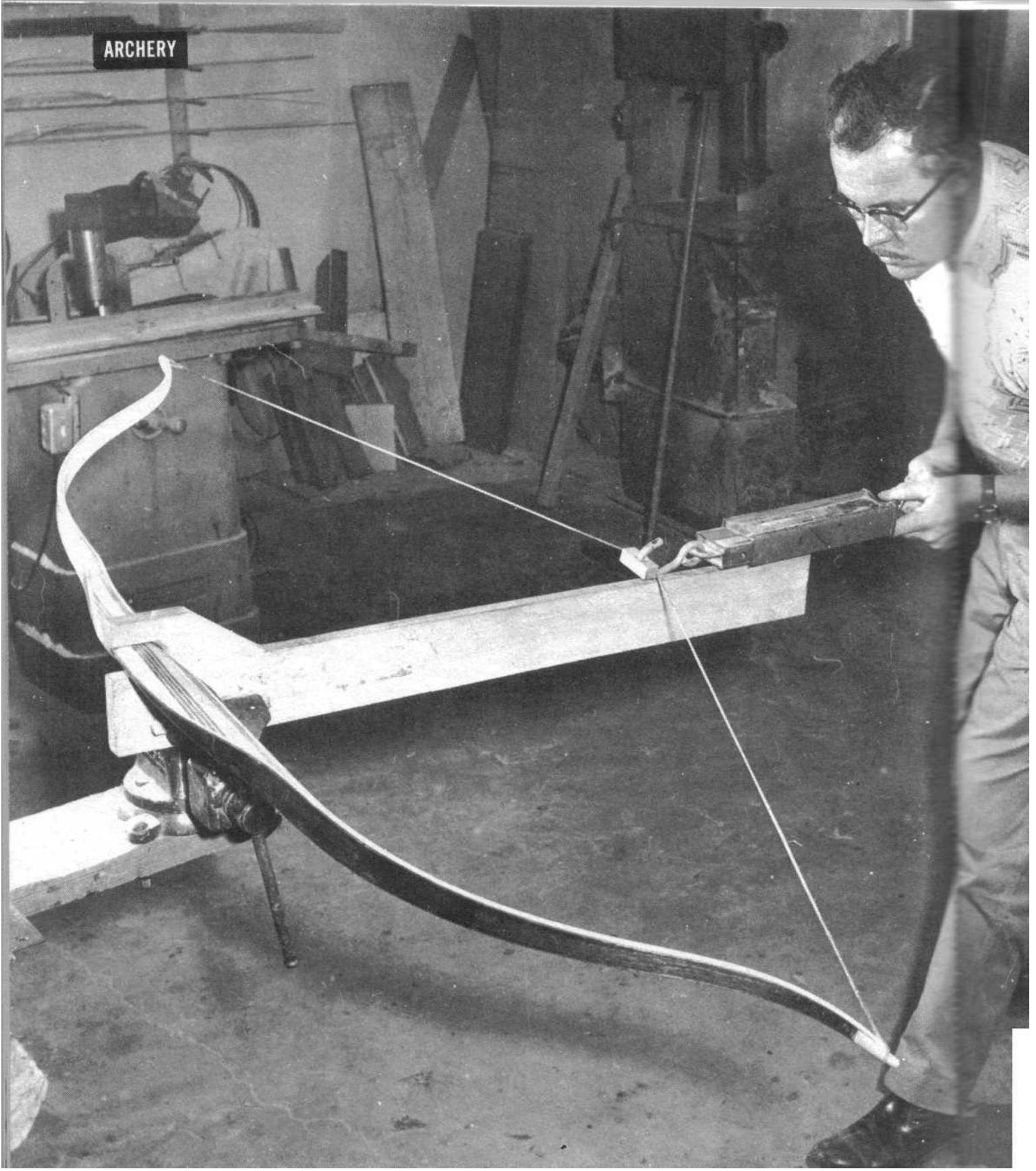


Happy Hunting!

Wulfric Alemaker

East Kingdom

Thanks to Wulfric Alemaker for writing up these instructions for us.



Tom Jennings of S. & J. Archery checks the weight oi a finished laminated recurve bow with spring scale and graduated base board. Glass and core lamination thicknesses largely determine weight of each bow.

How to Make a Recurve Bow

The knowledge gained through the experience of making your own bow makes this more than just a prideful accomplishment.

SOONER or later the enthusiastic archer gets a yen to make his own bow. His reasons may be economical or experimental, but whatever they are, his skill as a craftsman should be equal to his enthusiasm or his venture into bow-making could prove dismal and costly. It's one thing to get a slat or stave of lemonwood and whittle out a simple bow that will perform to a fair degree of satisfaction, but the beginner who attempts to make a laminated recurve bow is tackling the most difficult project in the critical field of bow-making. There are so many variables and pitfalls in the construction of a laminated bow that to turn out a successful job on the first try is an achievement in itself. Yet, the thrill of accomplishment and the knowledge gained through this experience make it a worthwhile venture, even if it takes two tries to succeed.

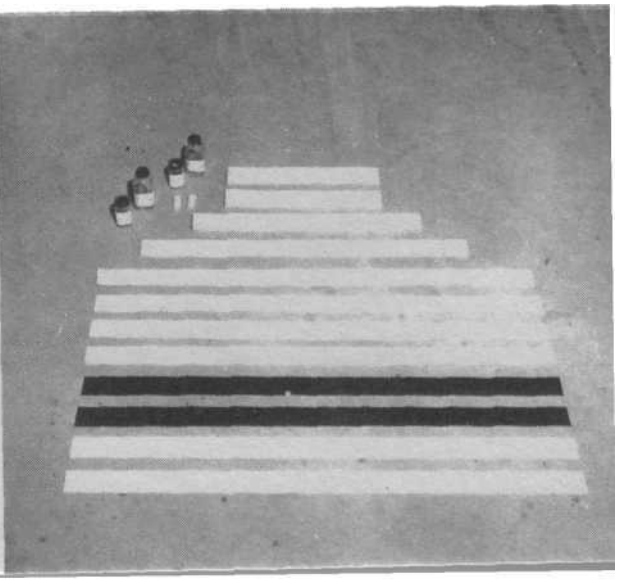
Today's modern bow is made up of laminations of wood and Fiberglas, the wood serving as a neutral core or spacer between two laminations of Fiberglas. Actually it is the Fiberglas that does the work of the bow, carrying 88 percent of the load while the wood core carries only 12 percent. As you increase the spacing between the two Fiberglas laminations by using a thicker core, you automatically increase the strength of the bow by the square. Thus, if you double the thickness of the core, you increase the weight of the bow four times. Since the thickness of the laminations is measured in thousandths of an jnch, it is easy to see how just a few thousandths of an inch more thickness in the core can make a bow too heavy for your use.

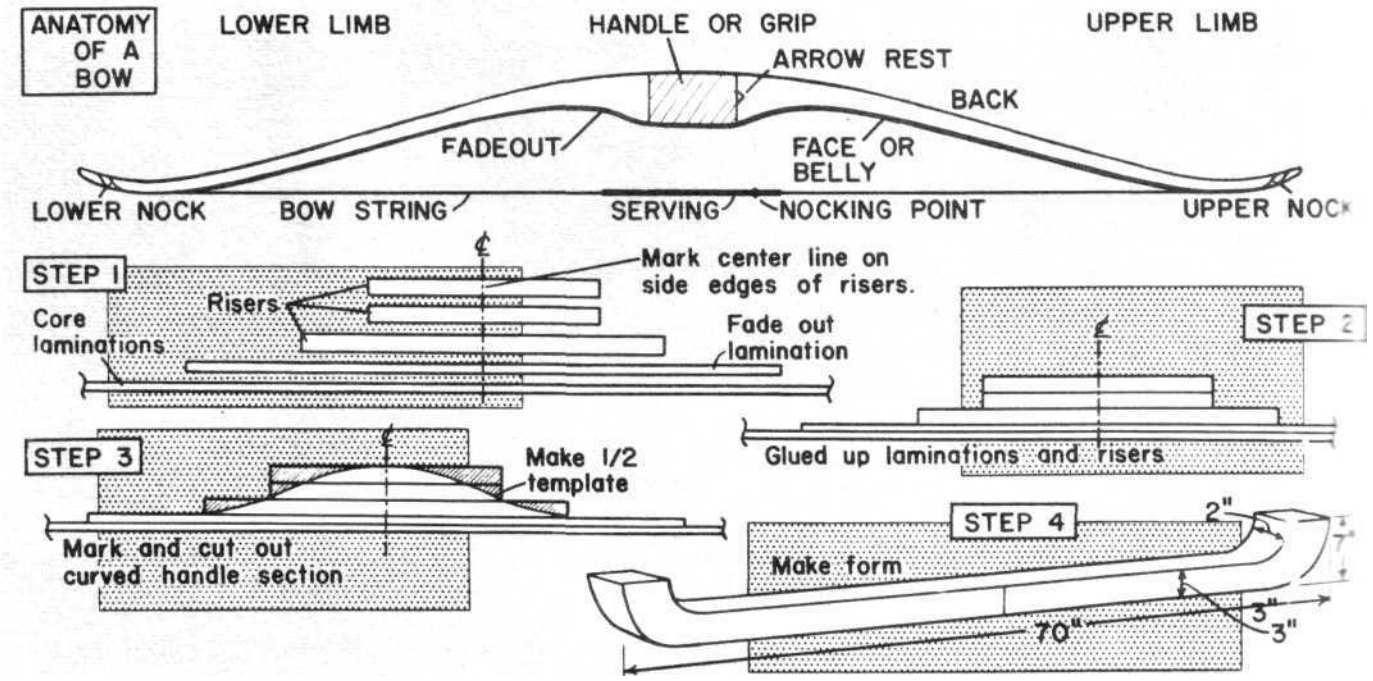
There are several woods that are suitable for bow-making, among them hickory, Osage orange, yew and lemonwood. However, maple is the most common core wood used in glass-faced and backed bows because it is a consistently hard dense wood, very straight-grained, and readily available in good clear grades. The beginner is wise to use maple rather than some of the other woods which are tricky to handle because of knots and twisty grain patterns.

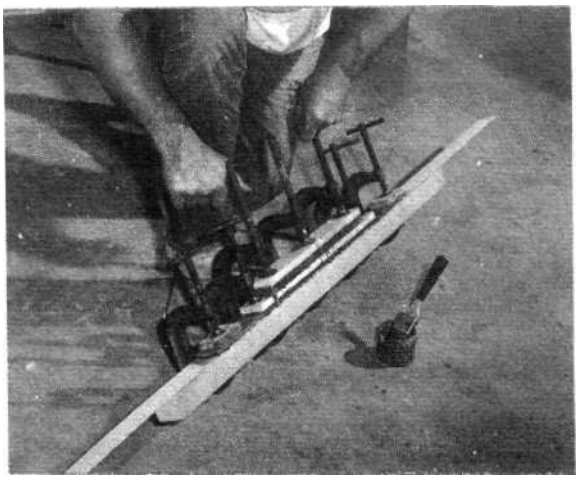
To make things easier for the beginner, there is a bow kit available that con-

Core laminations are cut from same block of hard maple in order to insure matched limbs.

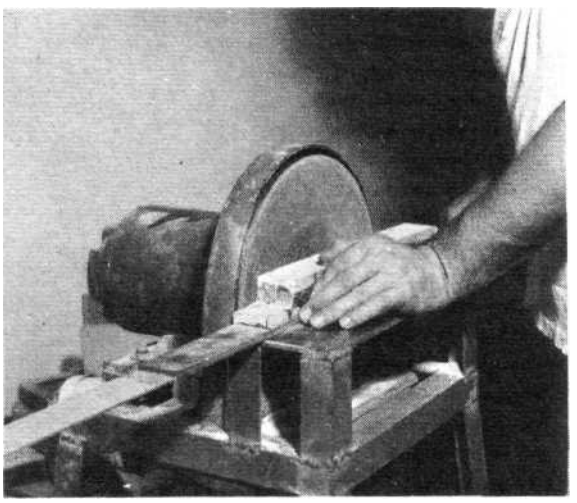
Kit contains all materials needed for making laminated recurve bow in weight desired.







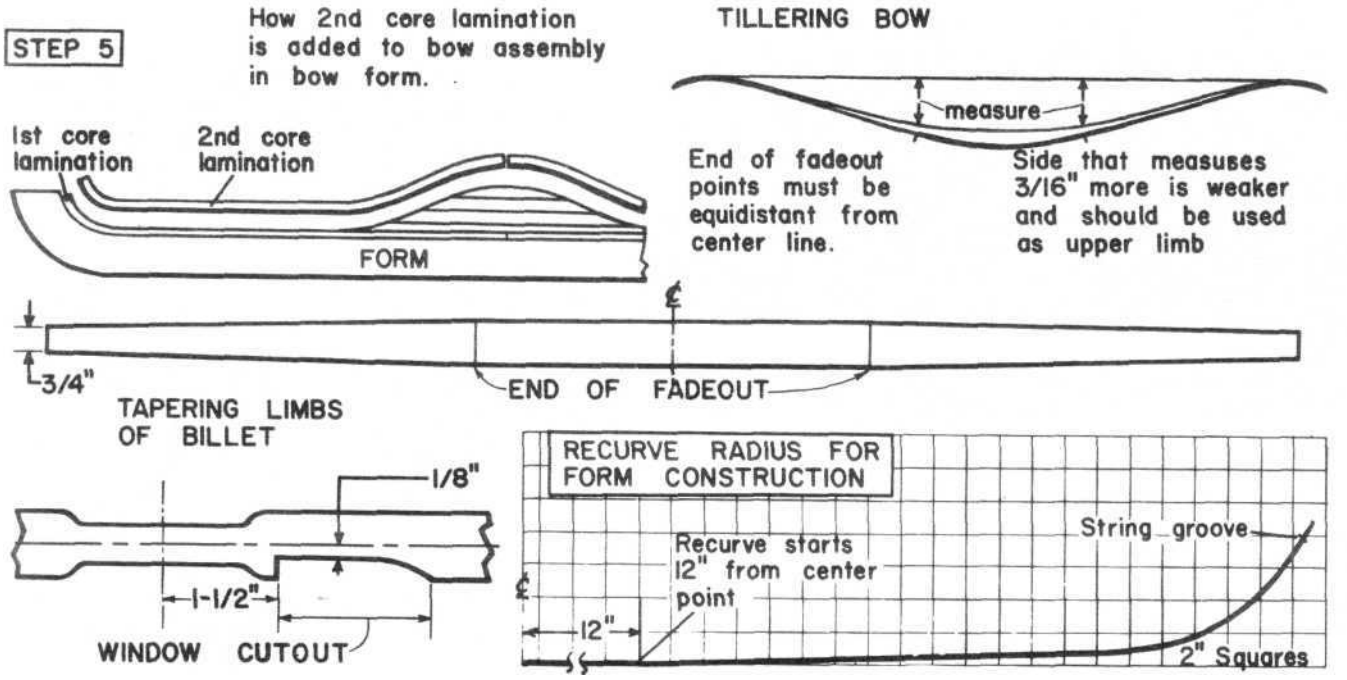
Glue up risen and base core laminations; damp unit to straight bar to insure good glue lines.



After glue has dried, clean off edges of bow assembly and lay out curve it is to be cut down to.

tains all the necessary woods, Fiberglas and glues to make a custom, 5-foot 6-inch recurve bow. The wood sections and Fiberglas strips are of uniform thickness and the wood is cut from matched sections of hard maple wood of the finest quality. The kit, which sells for $24.95, is put out by S. & J. Archery, 10945 Burbank Blvd., North Hollywood, Calif., makers of custom Smithwick bows, and provides all the necessary materials to make a custom bow, as shown in the photos in this chapter.

Before making a bow, however, it is a good idea to acquaint yourself with the anatomy of a bow and the terms used to denote its various parts. As shown in the diagram on this page, the bow, when held vertically, has an upper and lower limb, each extending from the central handle or grip. The smooth ledge cut into the upper part of the grip on the side where the arrow will travel is called the arrow rest or plate. The side of the bow facing away from the archer is called the back, while the side facing the archer is called the belly or face. The belly portions on either end of the handle that taper inward toward the limbs are called the fadeouts or dips. At the end of each limb is a string groove which is called the nock, known respectively as the upper and lower nock. The bowstring has a reinforced center section called the serving; the little ball of string located opposite the arrow plate and used

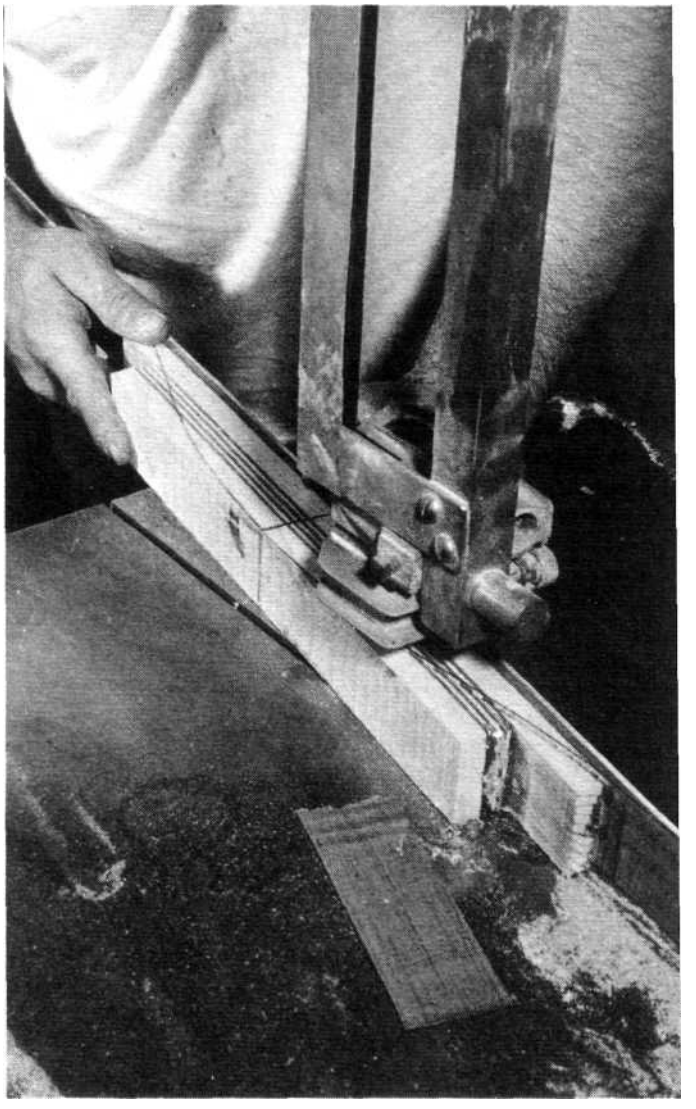


to take the guesswork out of nocking the arrow is called the nocking point.

To make the custom bow shown in the photos, you will need the following materials, all of which are supplied in the bow kit mentioned above, and can be purchased as a unit or as separate items:

2 strips Fiberglas (1¾x36) .....for belly of bow
2 strips Fiberglas (1¾x36) .....for back of bow
4 lengths Canadian hard maple lamination (1¾x36) .....for core of bow
1 length maple lamination (1¾x28x¼) ....base lamination to be faded into core
1 maple block (1¾x18x½) .... for riser, or center section of bow
2 maple blocks (1¾x14x½) .....for top of riser
2 maple blocks (1½x¾x¼) ....for string groove reinforcement
1 bottle M-74 plastic glue ....for cementing glass to wood
1 bottle C-31 plastic hardener .....used on glass only
1 bottle Urac No. 185 .....for cementing wood to wood
1 bottle Urac hardener ....for all wood-to-wood surfaces

The thicknesses of the glass and core laminations determine to a large extent the weight of the finished bow and should be carefully selected with that in mind. It is practically impossible to draw up a formula that will give you the correct thicknesses for any specific weight bow because of the many other factors that can affect your bow weight. For instance, your bow weight will be affected also by the length of the bow, the design and amount of recurve, its width and taper, and the type wood used in the core. A long center-section riser



Use a bond saw or jig saw to cut out this curve, taking care not to cut into fade-out lamination.

will shorten the working limbs and increase the weight of the bow, while a shorter grip section will allow you longer working limbs and thus lighten the bow. It takes very little to add or subtract 10 pounds from the weight of a bow and, for this reason, anyone building a laminated bow of his own design can never be sure what weight it will be until he can actually test the bow.

Bow makers make many bows and do a considerable amount of experimenting before they establish a standard of operation for any one bow, and because this has been done with the Smithwick Custom Bow, it is possible to order a bow kit for the weight bow you wish to make. The kit will then have laminations of the correct thickness to give you the right basis from which to start. Even then, the success of your ultimate weight goal will depend on how skillfully you shape and taper the limbs. Once the billet or roughed-out bow is completed, you cannot add any more weight to it. You can only take weight off.

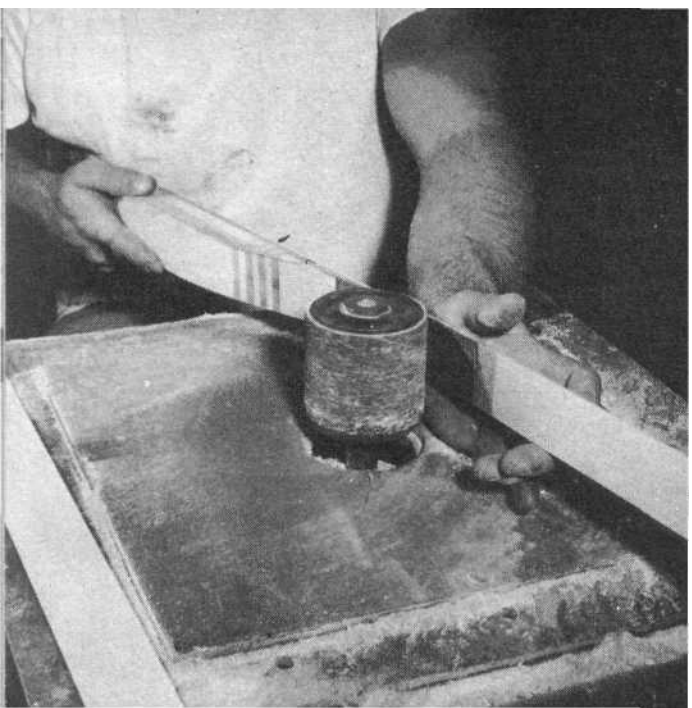
As a general rule, the following lamination thickness specifications will, if applied to the bow design shown, produce a bow that will correspond closely to the desired weight you wish to achieve: for a 50 lb. bow: .175-inch core, .050-inch back glass and .060-inch belly glass; for a 40 lb. bow: .175-inch core, .042-inch back glass and .048-inch belly glass; for a 25-30 lb. bow: .160-inch core, .040-inch back glass and .045-inch belly glass.

The lighter 25-30 lb. bow is usually a lady's bow and requires additional changes in the tapering of the billet to bring the weight down without reducing the thickness of the limbs too much. This is because there is a ratio between the thickness and the width of the limbs where the bow gives the best performance.

With all your materials laid out, you are now ready for the first step in making your bow. This step consists of gluing the riser blocks to the core laminations. However, before applying any glue, it is a good idea to assemble the component parts dry and familiarize yourself with the position each piece occupies so that there will be no mistakes when the glue is applied. Once the glue has been applied, you must join and clamp the pieces together without delay in order to get a perfect bond. To make sure that the pieces are positioned properly, mark the center line across the side edge of each piece. When all units are assembled, the center lines should coincide to form a straight line across the edge of the risers.

In this first step, you glue together only the three riser blocks, the fade-out lamination, and one pair of core laminations. The pair of core laminatioris are laid end to end under the riser blocks to form a continuous 6-foot long core as shown in the diagram. This core comes in two sections; in order to assure perfectly matched upper and lower limbs, two 36-inch lengths of core lamination are cut from the same 36-

Taper fadeout into base lamination. Extreme care must be taken to avoid gouging base lamination.



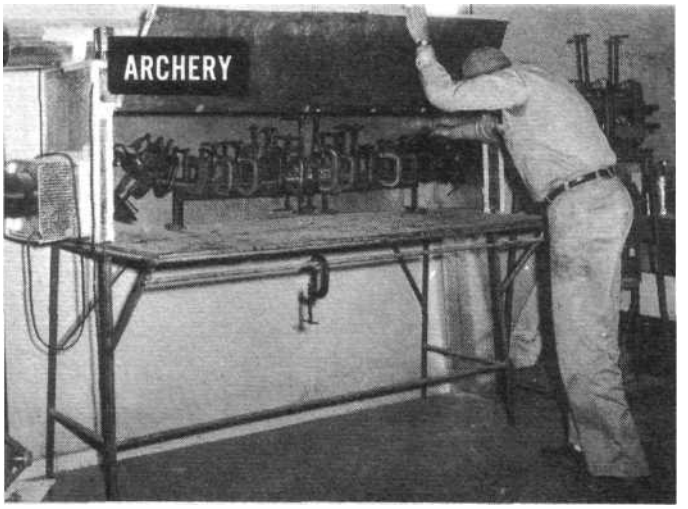
End of fadeout blends into base lamination. When done right, there won't be any detectable ridge.

Glue second pair of core laminations, Fiberglas facings to bow assembly and secure to bow form.

inch long block of hard maple. The two pieces, coming from the same section of wood, are as closely matched in grain and wood characteristics as is possible to achieve. This is true also of the second pair of core laminations which are glued to the assembly in another operation.

The wood portions can be cemented together with any good wood glue, such as urea-base glues or Elmer's Glue. The glue supplied with the kit is Urac No. 185, which is used with a Urac hardener. Apply the glue evenly with a 1-1/2-in. brush to both surfaces being joined and clamp the assembly firmly between blocks and a straight bar of wood or metal. The straight bar is important for insuring good glue lines. Use enough clamps to distribute the pressure evenly along the entire area being

Inner-tube strips or tape can be used to secure assembly to bow form to establish recurve shape.



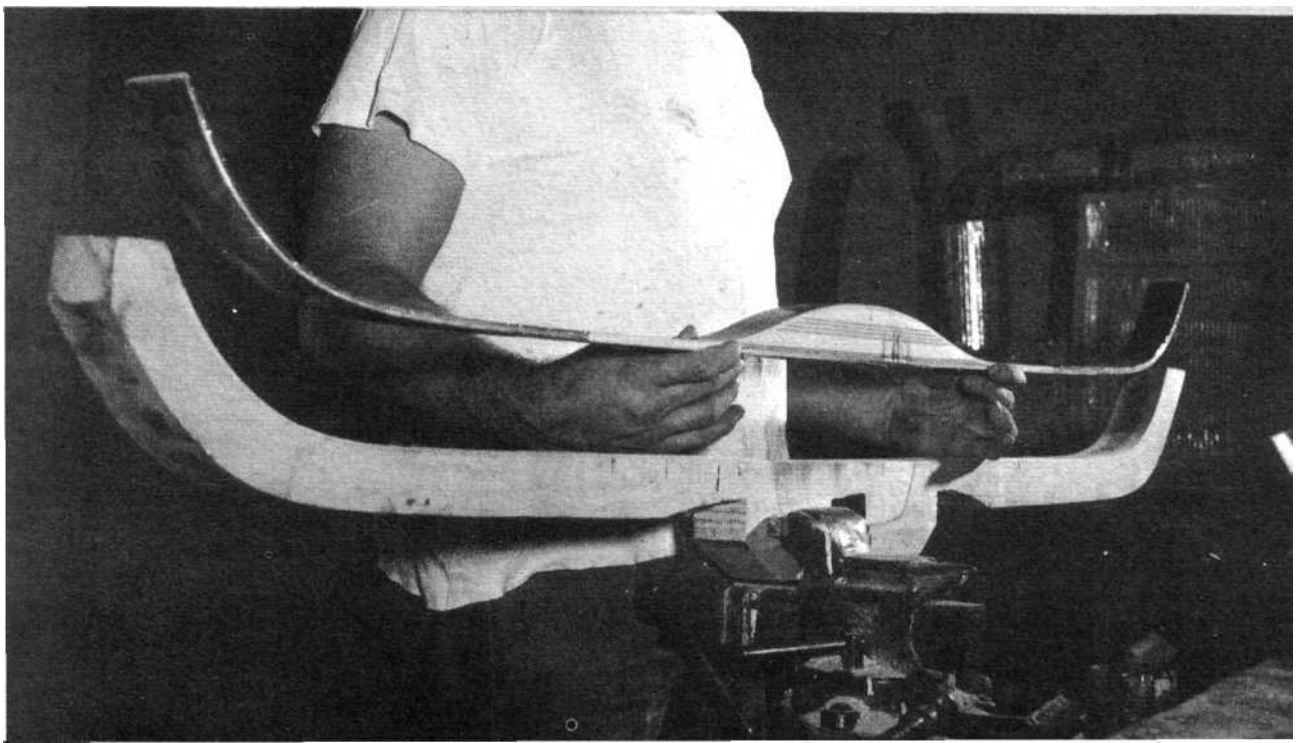
Glued bow assembly is clamped to steel form and dried in heating chamber in professional set-up.

Howard Hill dries his bows with heat of a blow torch directed into improvised drying chamber.

glued. Allow 24 hours drying time, the first six hours at at least 100 degrees Fahrenheit. A closed car in the summer sun will usually get at least this hot. Another trick is to wrap the glued assembly in a sheet of canvas that has been treated for water-proofing and let this lie in the direct sun. The heat will build up in the canvas wrapping to a very high degree. Howard Hill improvises a drying chamber by wrapping a length of 10-inch stovepipe with asbestos, closing it off at both ends, but leaving a small enough opening at one end through which to direct the heat of a blowtorch.

While the assembly is drying, make a wooden form for shaping the billet. This form should be bandsawed out of a 2-inch thick solid wood block that is seven inches wide and 70 inches long. In the absence of solid wood, plywood can be used by laminating two lengths of 3/4-in. and one length of 1/2-in. plywood together to build up the 2-inch thickness required. Cut the form out to the shape shown in the diagram, making sure that both ends of the form cut out are identical in shape. The best way to assure this is to make a template, from heavy cardboard or thin sheet metal, of one half of the desired shape, then trace this onto the form block, first on one end of the block and then, flopped, on the other end of the block. The form, when cut out, should be perfectly square to insure a firm even base for clamping the glued laminations. After cutting out the recurve contour, draw a line on the form parallel to

After drying by heat at recommended temperature, bindings are taken off and billet is removed from form. Billet will have taken recurve shape. Clean and square up both sides of the billet by sanding.



this shape and spaced three inches from it and cut away the excess wood along this line. The precision and evenness with which you make this form will determine the quality of your finished bow to a great degree.

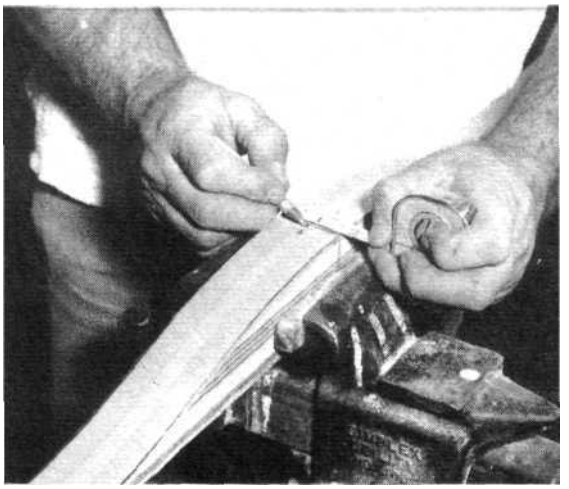
After the bow assembly has dried, clean the excess glue off both sides of the riser section and then lay out the curve it is to be cut down to as shown in diagram (Step No. 3). Since both sides of the riser section fadeouts are the same shape and equally distant from the center line, a half template can be used in both positions to trace the curve onto the riser section. The fadeout *must* be a very gradual curve into the base or core lamination. This is essential to the final tiller of the bow.

Use a band saw or jig saw to cut out this curve but do not cut into the fade-out lamination. The gradation of the fadeout is too critical an operation to be done with a saw. It should be done by careful sanding, preferably using a drum sander, until the fadeout gradually blends into the core lamination. Be very careful not to cut *into* the core lamination or leave even the slightest ridge at the end of the fadeout. Cutting into the core lamination will weaken the bow at that point, while leaving a ridge will stiffen the limb, add to the bow's weight, and interfere with the bow's performance.

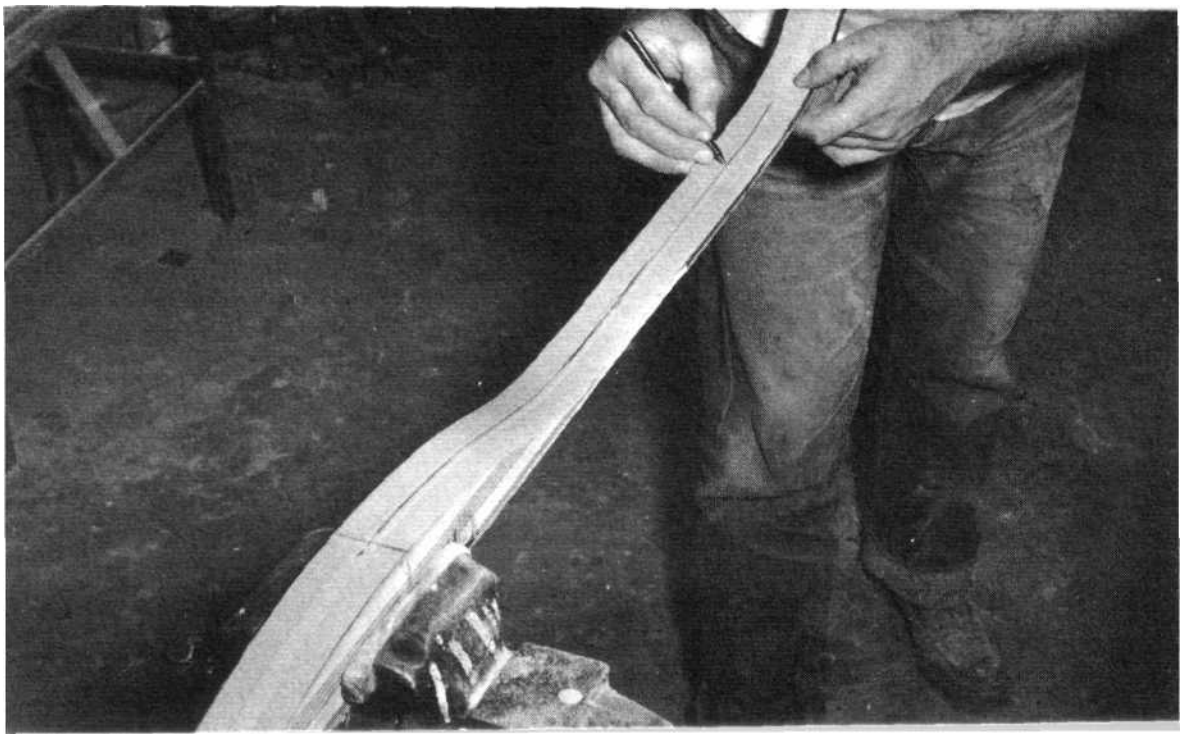
The next step is to glue the second pair of core laminations to the bow assembly. This operation is performed in the bow form in order to establish the recurve shape. The

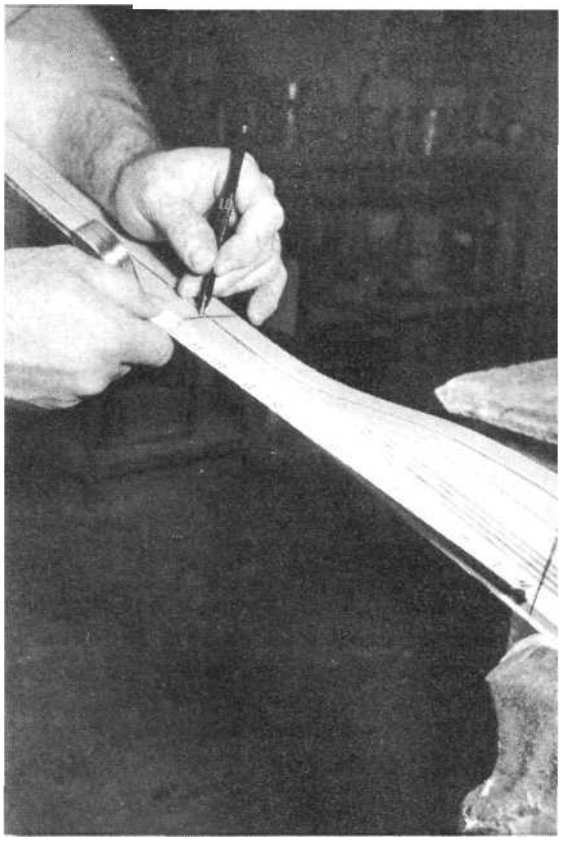
Cover outer Fiberglas surfaces with masking tape for protection and to facilitate marking layout

Using a flexible tape measure or rule, establish the center of the bow, taking care to be precise

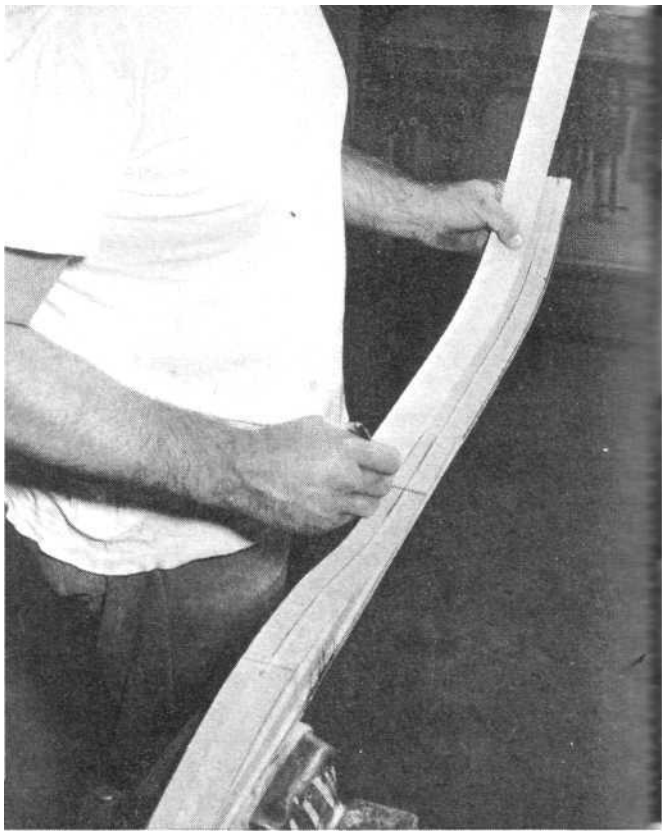


Now draw two center lines on the bow. one crosswise and the other lengthwise. All measurements should be very carefully made as even a slight error will be reflected in the accuracy of the finished bow.





Measure exact distance from, center to end of either fadeout. Mark off equal distance other limb.

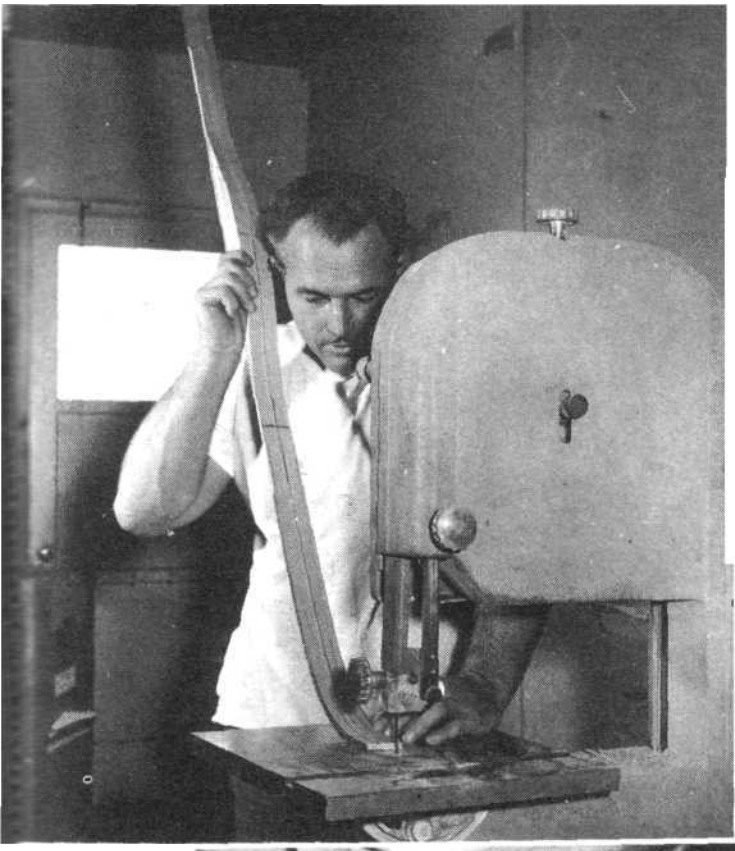


Mark off bow tips for required width, then lay out limb tapers from end of fadeout to bow tip.

best way to do this is to set the two strips end to end and secure them together temporarily with masking tape across their outer surfaces. Then apply glue to the inner surfaces of both strips and the back surface of the bow assembly. Now join the laminations together, centering the taped joint with the center line on the riser section and lining it up with the center line on the bow form. Do this in the form, using a C-clamp on the center line to clamp the assembly to the form. Then, starting at the center point and using loops cut from an old inner tube, numerous clamps or masking tape, secure the laminations firmly to the form. To facilitate removal of the billet from the form, wax paper should be placed between the form and the laminations. Also, because the rubber loops and tape, when tightly wound around the assembly, exert most of the pressure on the edges of the laminations and very little in the middle, a spacer strip, consisting of "a strip of wood 1/16 in. thick and 1/8 inch narrower than the laminations, should be laid along the top of the billet and centered to leave a 1/16-in. margin along each side before the tape or rubber loops are wound around the assembly. This spacer strip will equalize the pressure exerted over the entire surface and insure a good glue line. No glue is applied to this spacer strip.

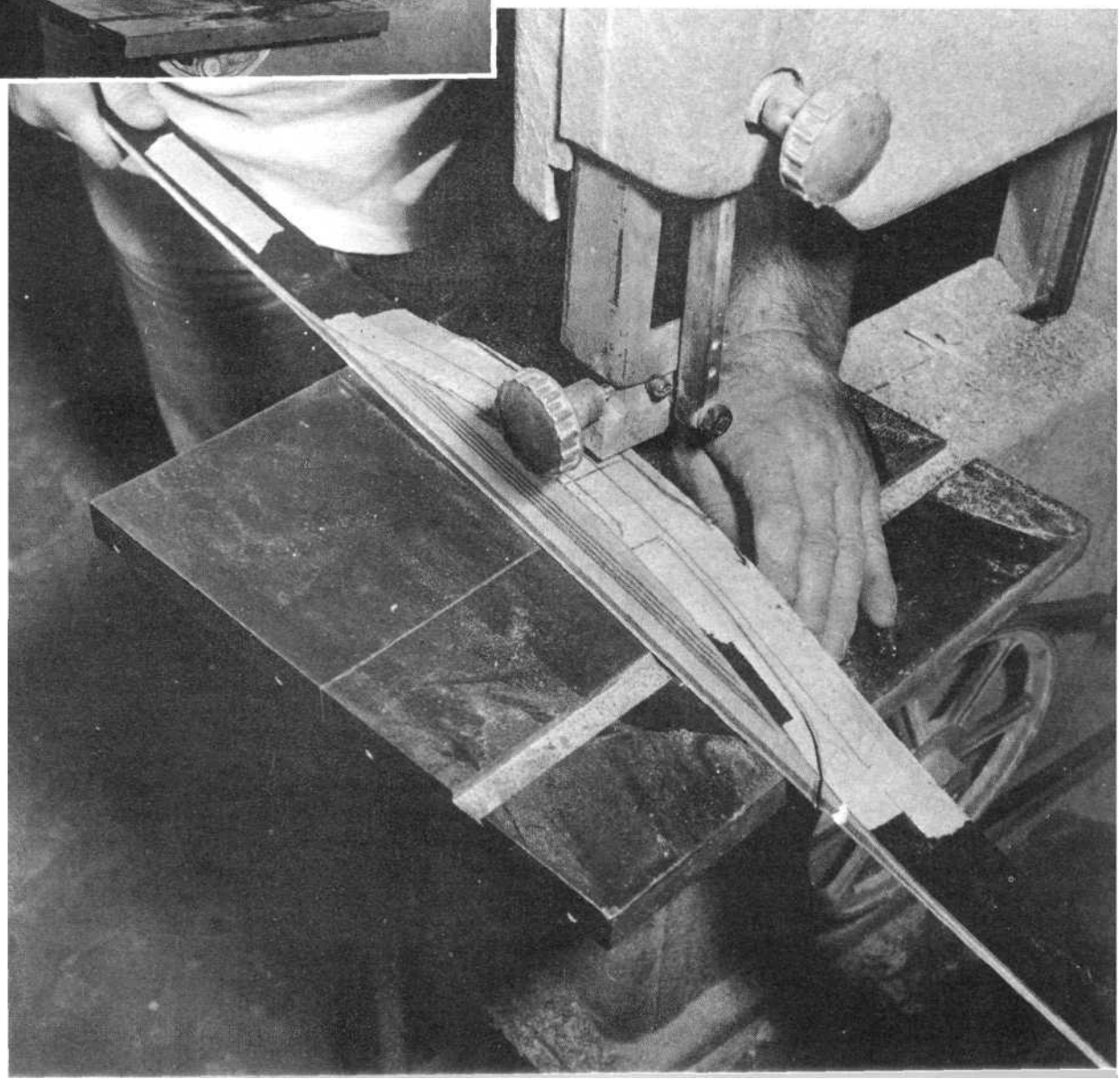
As you work your way toward the bow tips, the laminations will be forced down into the form and will take the shape of the curve cut into the form. Do this along both ends, securing the entire length, then set the form into a hot place to dry. Because extreme heat may melt natural rubber, loops preferably should be cut from one of the synthetic-type tubes which are more heat resistant. Dry the billet at no less than 100 degrees F. When the glue dries, the laminations will retain the shape of the form. Clean off the excess glue from the sides of the core and, with No. 1/2 grit sandpaper, clean off any wax that might have transferred to the core from the wax paper.

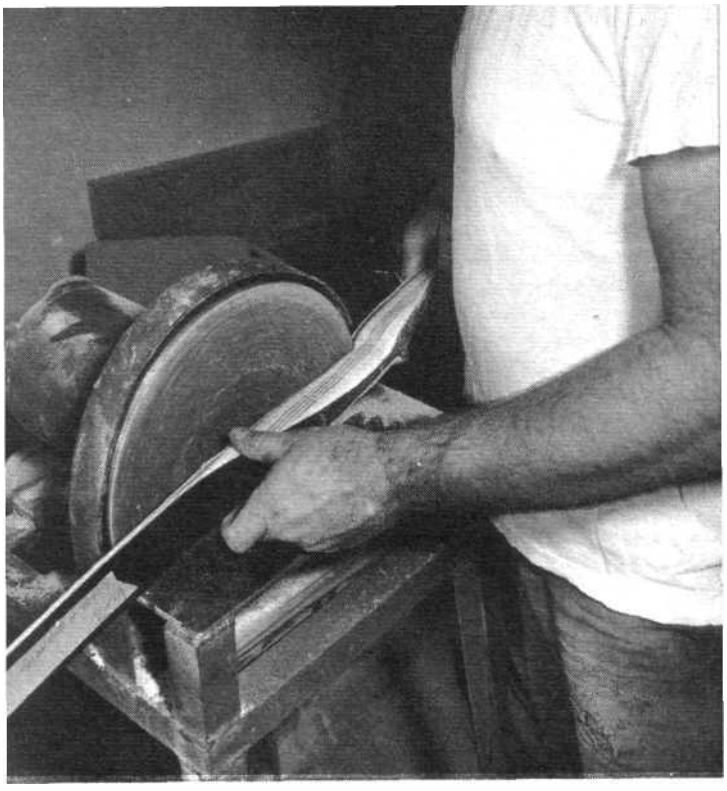
The next step is to apply the Fiberglas to the bow assembly. The Fiberglas is obtained in two thicknesses, the heavier strips being used on the belly of the bow and the lighter ones on the back. Rough the sides of the glass to be glued (either side can be



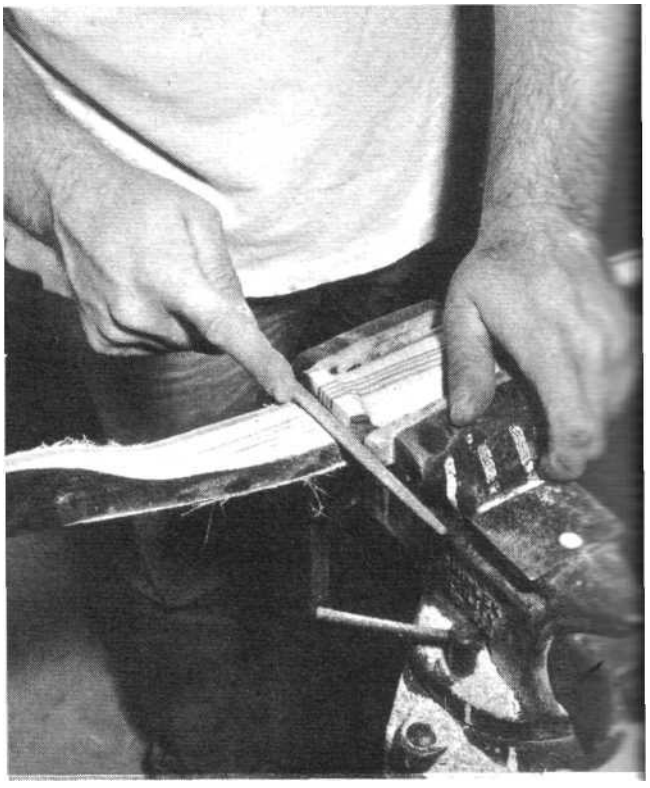
Cut away the excess limb. Clean and iace the edges up to the layout lines, rounding Fiberglas slightly with a mill file.

Having determined which is to be the upper limb and which the lower, lay out the handle and sight window and cut to shape.





Following the photos on these pages, rough shape the bow handle, on a disc sander if you have one.



Curve top surface of the arrow rest slightly so that shaft does not rest on too broad a surface.

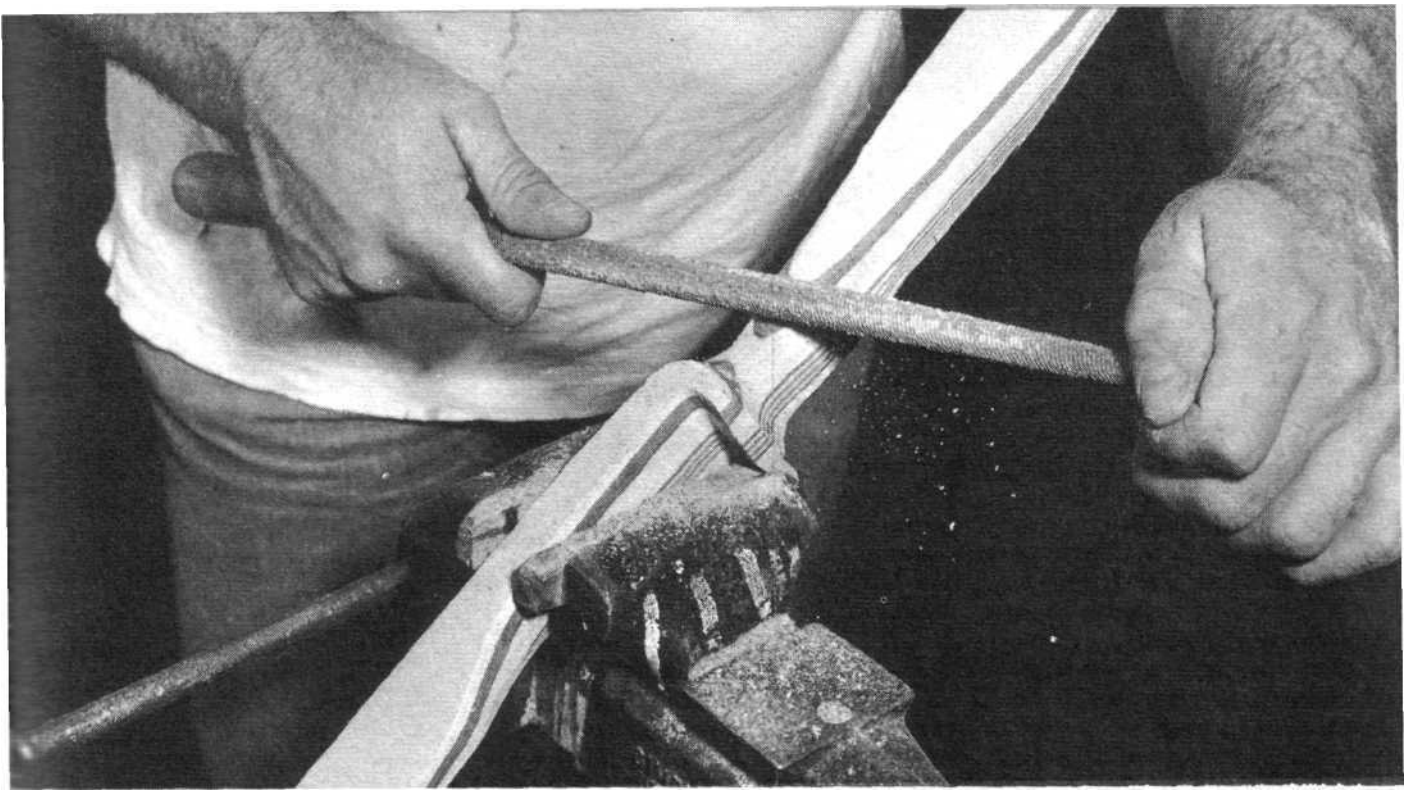
used) with very coarse sandpaper, preferably using a drum sander, to remove all the glaze. Do not be afraid to sand.

Next, join the two strips of back glass end to end with masking tape applied to the side opposite the one roughed up for gluing and lay this glass, rough side up, into the form. The wooden bow assembly then sets in on this, and the belly glass, joined end to end with masking tape like the back glass, is set on top of the whole assembly. This is a "dry run" to make sure that all the component parts are properly sanded and ready for gluing. It is a good idea to cover the outer surfaces of both the back and belly glass with masking tape. The tape will keep the glass clean and provide a surface for measuring and marking off the limb tapers to be cut later.

Now, using M-74 plastic glue and C-31 hardener, apply glue to the roughened glass surfaces first, then to both sides of the wood core, using a 1-1/2-in. brush. Plastic glue and hardener should be applied *immediately* after they are mixed. The glue is mixed four parts adhesive to one part hardener by weight. Add the hardener to the resin and stir for five minutes. The maximum time you can allow the mixed glue to set in the pot is five to 10 minutes. However, once it is spread on the laminations and glass, you have 30 minutes to join and clamp the pieces together. Glue surfaces must be absolutely free of moisture.

After you've glued the surfaces, set them into the form with a spacer strip laid across the top as was done when gluing the second pair of laminations to the first, and after lining up the center mark with the one on the form, use a C-clamp over the center mark to hold the assembly to the form. Then, as was done before, wrap the billet tightly to the form with loops of inner-tube rubber or masking tape, starting from the center point and working your way toward the tips. The glass will take the shape of the curved form as you carry the wrappings outward. Be sure to save some of the plastic glue and hardener (in unmixed form) for the tip blocks. Dry the billet with heat of at least 120 degrees F., but not over 140 degrees, for six hours, then let harden for another 48 hours. Important: this glue will not function properly without observing the stated degree of temperature.

You now have the completed billet. Clean and square up both sides of the billet with very coarse sandpaper, using your disc sander. Leave the masking tape on the bow for use in marking the layout. Now draw



Final shaping is done with files. You can shape the sighting window to your own requirements, there being no hard rales concerning the location oi the window or the depth to which is should be cut.

two center lines on the bow, one lengthwise and the other crosswise. From the crosswise center line, measure the distance to the exact end of the fadeout on one side and draw another crossline at this point. Then measure an equal distance on the other side of the center line and draw another line across the bow belly. These lines at the ends of the fadeout will mark the points from which the bow limbs begin to taper toward the tips.

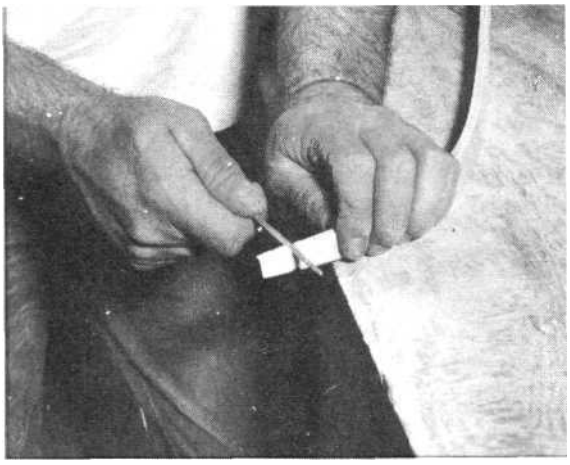
Next, at the tips of the bow, measure % inch from each side of the longitudinal center line. This will give you %-inch wide bow tips. Now draw diagonal lines from these bow tip marks to the outer ends of the fadeout cross lines and you will have the correct limb taper as shown in diagram. For a 25 to 30 lb. lady's bow, the billet, which is normally 1-5/8 in. wide, should be narrowed down on a disc sander to a width of 1-1/2 in. and the limb taper should end up with 5/8-inch-wide tips instead of 3/4-inch.

After marking off the limb tapers, cut away the excess limb along these lines and then clean and face the edges up to the layout lines. Round the glass slightly on the face and back with a mill file, but do not go to too much trouble because these Limbs are rough width at the tips and will be changed when the bow is lined up.

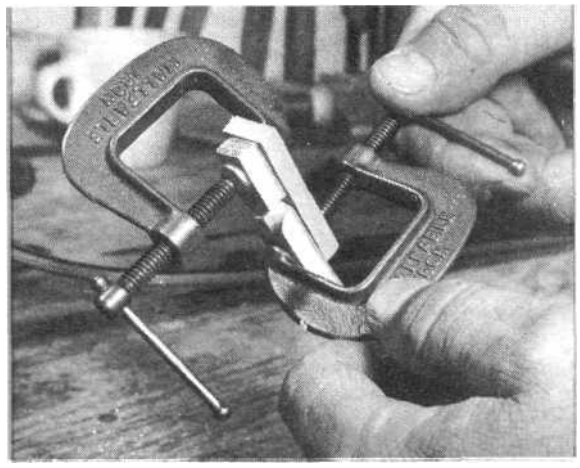
Next, locate the points for the string grooves by measuring 33 inches each way from the center line with a flexible tape or rule, letting the rule follow the curve of the bow along the belly. Use a small round rat-tail file and file the string grooves 1/8 inch deep on both sides of the tip, rounding them off slightly to prevent their cutting the tillering string.

You are now ready to string the bow for tillering. The tiller is the shape of the bow at strung position. Use a string with large loops for the tillering string. After stringing up the bow, check its limbs for evenness by sighting along the string from tip to the middle of the main part of the limb as shown in photo. If the recurve twists to one side of the middle of the limb, remove material on that side and refile the string groove on that side. Repeat this process until the recurve is in the middle of the main part of the bow.

After the tips are in line, sight along each side of the limb and file out any bumps you may see. In doing this, you may change the tiller of the bow, so check frequently to see that the recurves do not take on an off-side twist. If they do, you can correct it by tak-



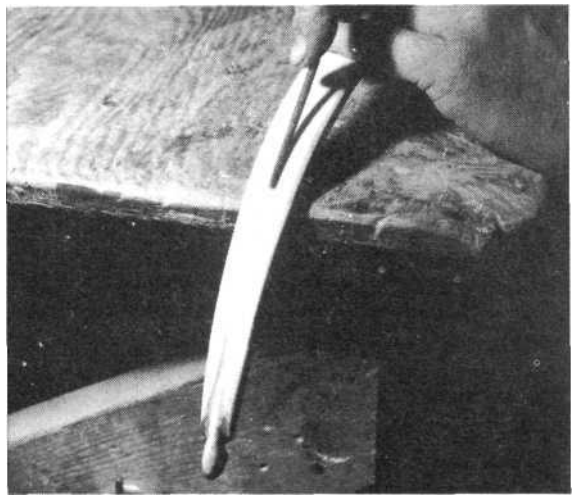
String grooves, 1/8 inch deep, are filed into both sides of each bow tip using small rat-tail file.



Glue tip blocks to bow tips over string grooves; Fiberglas should be well roughened before gluing.

Shape bow tips to the contour of the bow limbs. File string grooves into tips with rat-tail file.

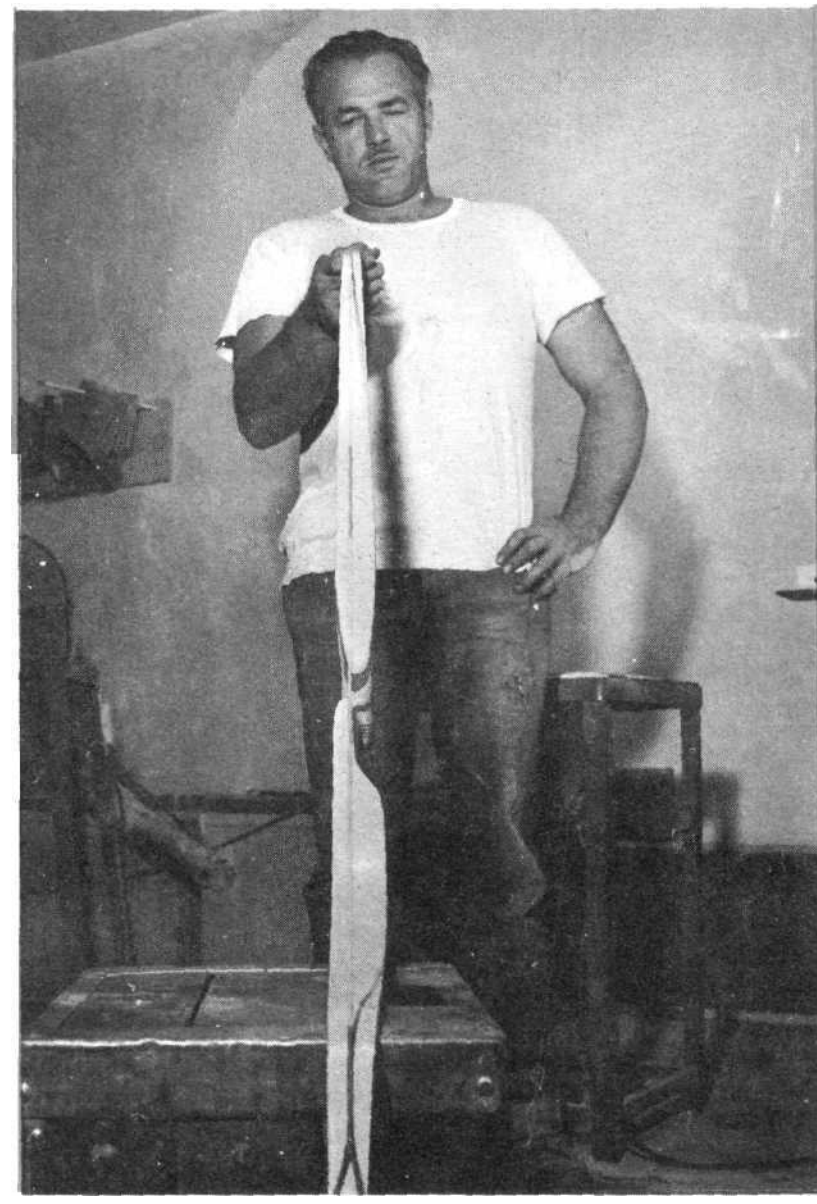
Finishing off the bow, file string grooves along the recurve cm belly side of each of the limbs.



ing off sufficient material from the side to which the limb twists to even out the limb.

Before the handle can be shaped out, you must determine which limb will be the upper limb, since the upper limb should be weaker than the lower limb. This is because when drawing the bow, you will be exerting more palm pressure below the center line on your grip, as well as putting more tension on the lower half of the bow string due to having two fingers below the nock of the arrow and only one above it. To equalize this, the lower limb of the bow should be a little stiffer than the upper limb, and you determine this by measuring the distance between the bow string and the limb curve at the point of the fadeout on both limbs. The points along the limbs at which you take this measure should be equidistant from the center line of the bow. The weaker limb should then measure 3/16 inch more between limb face and string than the stronger limb and this limb should be used as the upper limb. If it measures less than 3/16 inch, you can lighten the limb by rounding the face glass slightly.

Having tillered the bow and determined which is to be the upper limb, you can now mark the handle for the grip and window cutout as shown in diagram, lining it up so that the window cutout is on the upper limb. Cut out the handle as shown in photos with files and disc sander; round out the handle and sight window to the desired shape as shown in diagram. You can shape this to your own taste, there being no hard and fast rules concerning the location of the sight window and the depth to which it



String the bow and check the limbs foi evenness by sighting along the bowstring from tip to tip. If recurve tends to twist to one side, correction can be made by removing additional material from side to which limb twists, refiling string groove on that side.

should be cut. However, it should not be cut to a depth greater than 1/8 inch from the longitudinal center line as shown. This sight window should be cut on the left side of the bow (as bow is seen by archer when shooting) for right-handed shooters, on the opposite side from that shown in the diagram for left-handed shooters. File a slight curve into the top surface of the arrow rest so that the shaft does not rest on too broad a surface when shooting.

Filially, cement the tip blocks to the bow tips over the string grooves. Finish off the tips by shaping them down to the contour of the bow limbs and filing the string grooves into them with a rat-tail file.

Your bow is now ready for sanding and painting. Sand to a fine smoothness and paint with clear varnish or lacquer.

SOME FINAL TIPS:

1. When removing masking tape, strip from center of bow out toward tips so as not to lift any glass splinters along the edges. Use care.
2. When filing bow, always file toward glass to avoid chipping.
3. Before any clamping, always have a "dry run" before applying glue.
4. Remember, you must use heat to cure this glue right.
5. Glass surfaces to be glued must be roughed thoroughly.
6. Extreme care should be used in fadeout to avoid gouging base lamination or have fadeout end too abruptly.
7. Do not get impatient to shoot bow before it is finished. •

COVER STORY

Hunter's Crossbow

This old-time weapon has the hitting power and accuracy of a modern rifle.

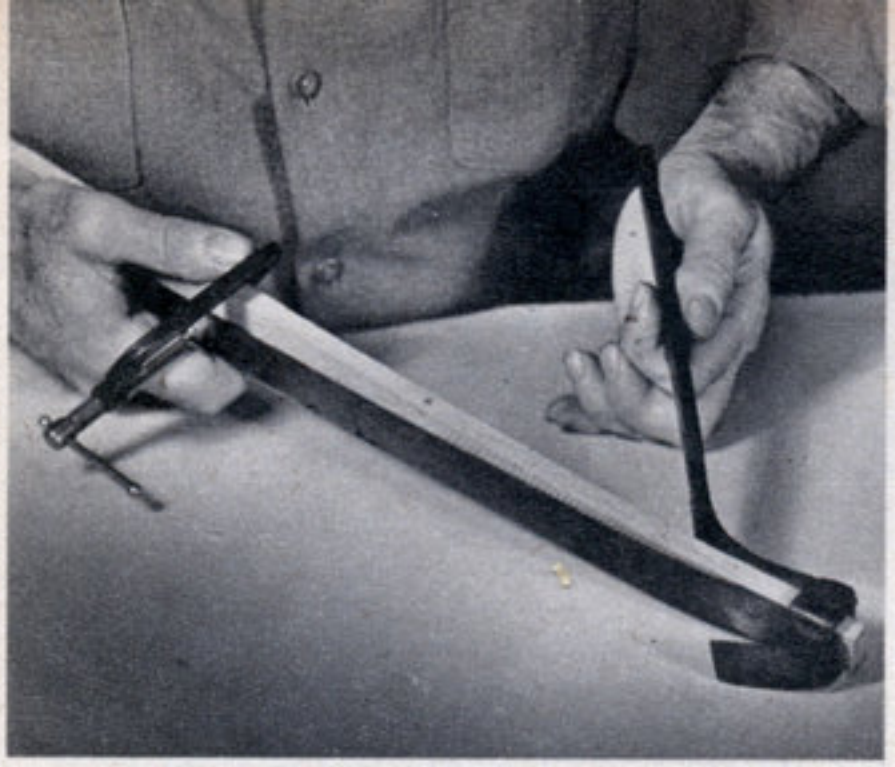
By E. Milton Grassell

THIS crossbow, with all the romance and charm of a medieval weapon, is so powerful and accurate that it is used extensively for hunting and precision target shooting. It's a deadly weapon, not a toy, exceptionally fine for hunting rabbits, pheasants, squirrels, and even capable of killing big game like deer, elk, antelope, and cougar when used by one skilled in its handling. Therefore it is most imperative that the crossbow be handled carefully. Never hold it in a position where it might endanger anyone if fired accidently, and always reckon with the area beyond the target or game in the event you should miss hitting the object aimed at.

A similar crossbow would cost from $50 up commercially, but the total cost, if you make it, should not exceed $7.50, providing there are a few scrap hardwood pieces, a dab of lacquer, welding rod and some other common materials around your workshop.

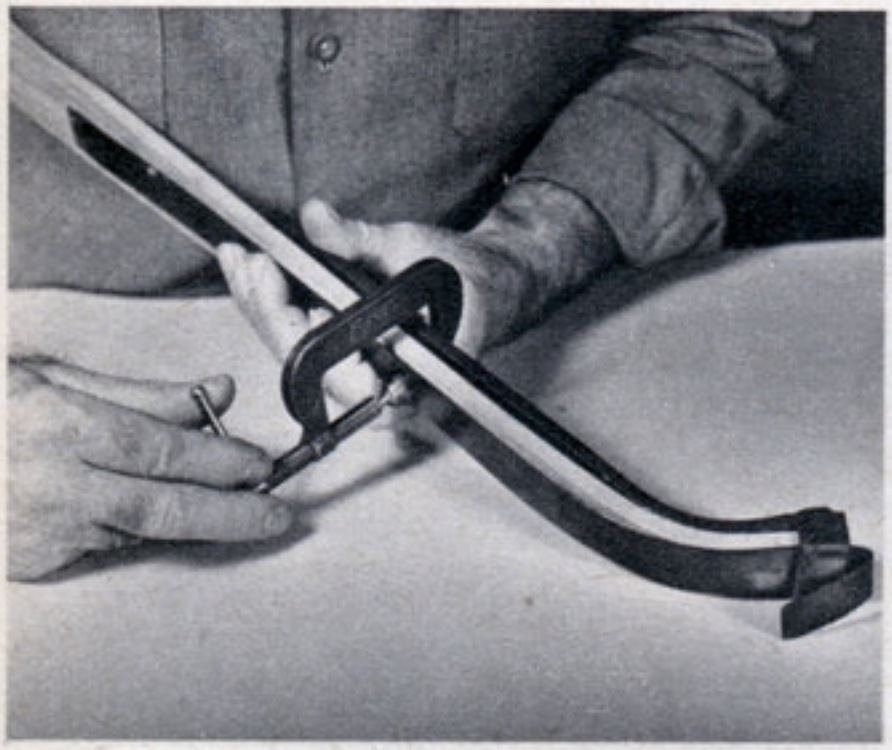
Sold on making one? Okay, here's how Mr. Chester Stevenson of Eugene, Ore., makes his most popularly demanded crossbow, and

Photos by Frances R. Schultz

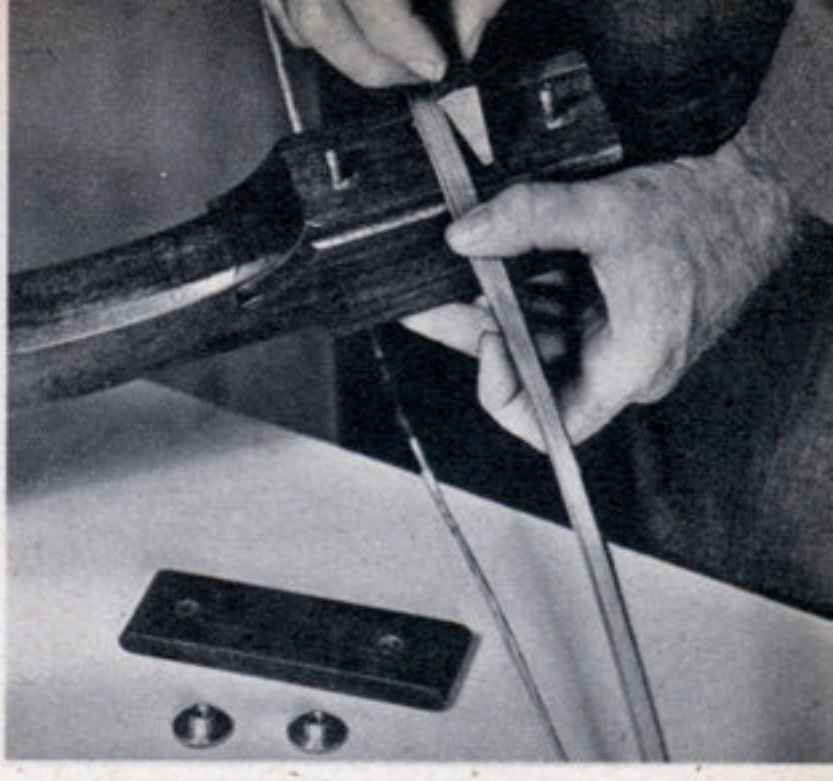


1. After steaming for about 15 minutes, the bow wood is placed in the bending jig which is held against the wood by means of an ordinary C-clamp.

2. The sheet metal strip of the jig keeps the bow wood from splintering while the reverse bend is made in the tips. Remove clamp when wood cools.



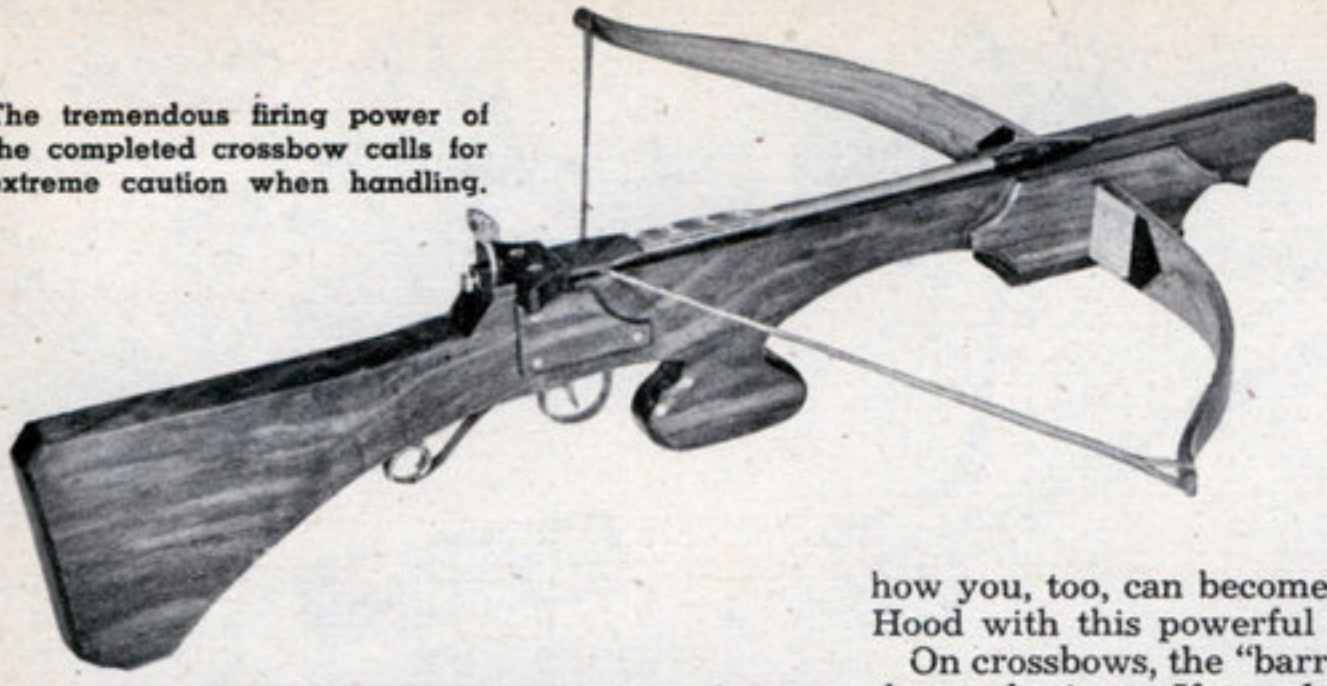
3. When gluing the Fiberglas to the back of the bow, use one-inch rubber strips cut from an old inner tube as clamps to hold materials together.



4. Weakest part of the crossbow is at the slot for the bow. To prevent horizontal play, a wedge-shaped block is slipped into slot behind the bow.

5. The bow lock plate takes up any possible vertical play once the lock nuts have been tightened. Ordinary wing-type nuts can be used if desired.

6. A precision peep sight for target shooting can be made (see drawing) using only three drills, a hacksaw, and a file. It has two-way adjustments.



The tremendous firing power of the completed crossbow calls for extreme caution when handling.

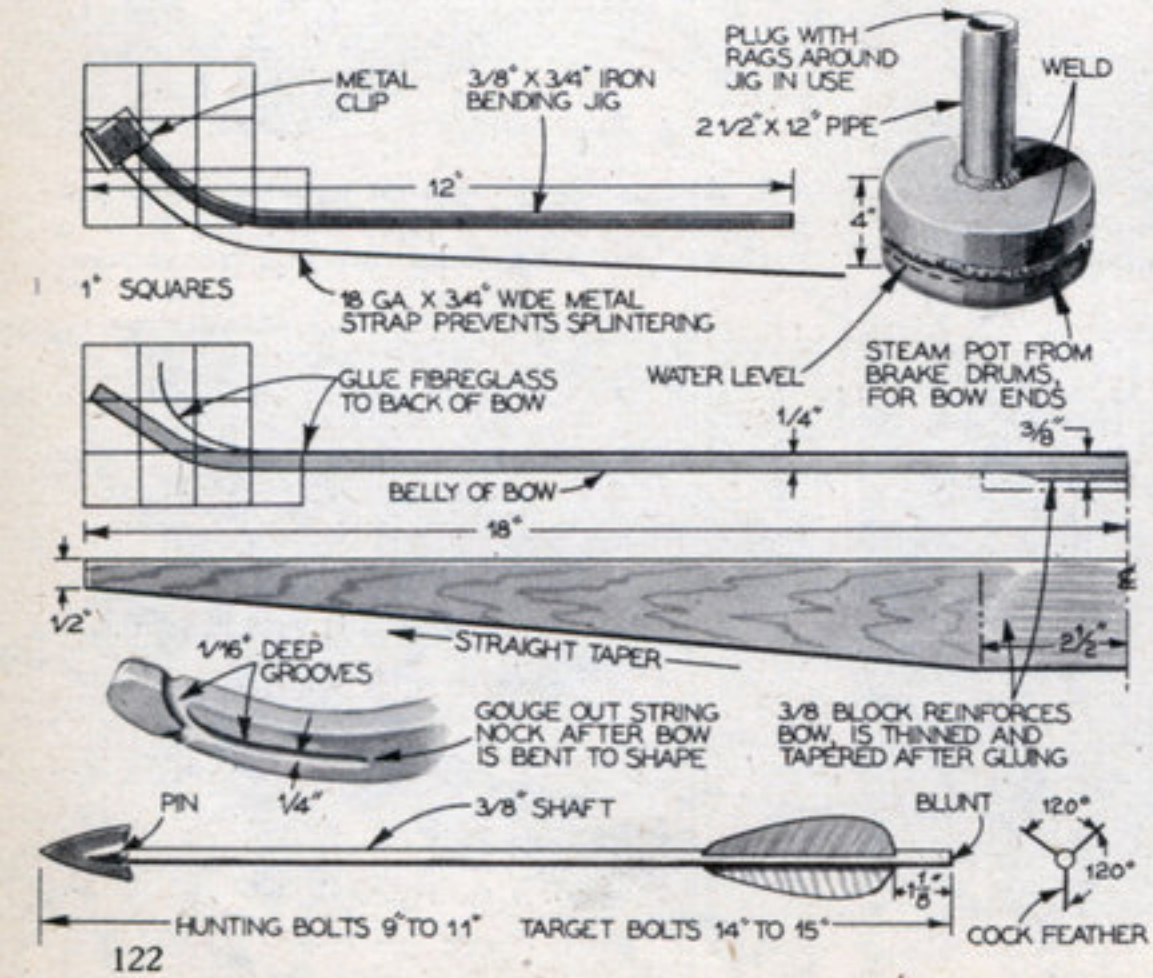
The proper method of cocking the crossbow with a bolt in firing position. As shown here, practice cocking without a bolt until you acquire skill.

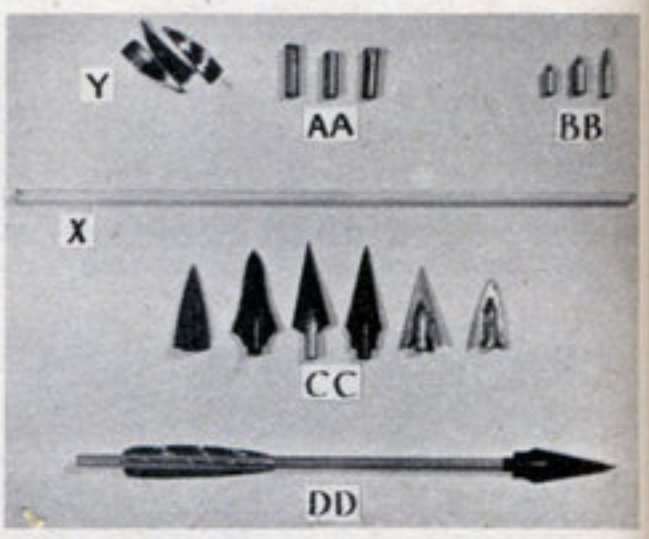
how you, too, can become a jet-age Robin Hood with this powerful weapon.

On crossbows, the "barrel" is included in the stock piece. If you don't have a hardwood board about 1½x8x36-in., glue scrap pieces together. This works just as well. In fact, the whole design can be modified, providing the draw (14-in. from the back of the bow to the trigger release latch) and the trigger unit are not altered. Follow the drawings and you'll have no trouble making any parts of the crossbow.

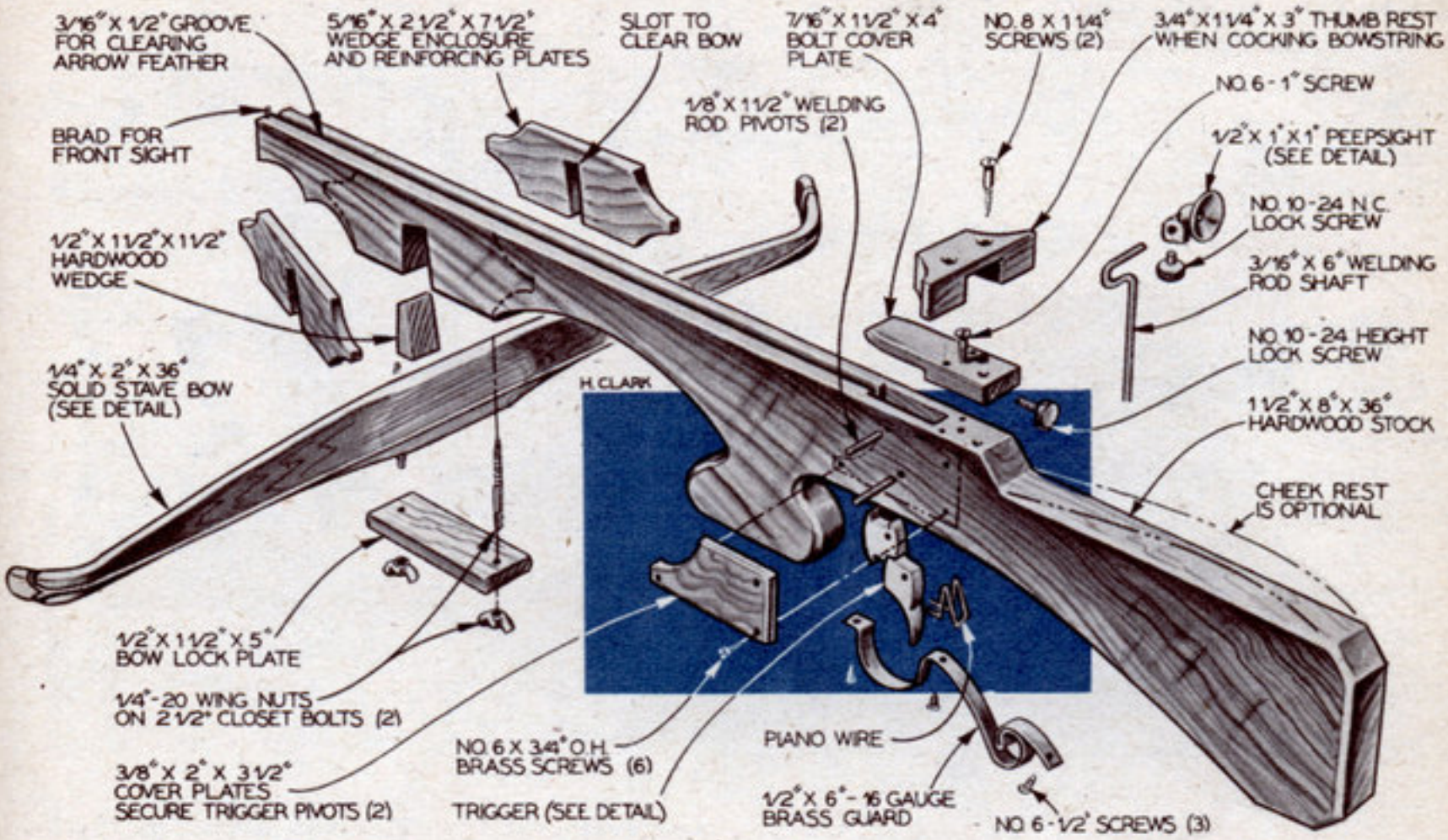
After cutting the general contour, a recess is chiseled in the stock for the trigger assembly. Between this and the end of the barrel, make a kerf (a bolt groove) approximately $\frac{3}{16}$x½-in. deep down the center. Sandpaper is used to make the ⅛-in. chamfer on both edges of the bolt groove.

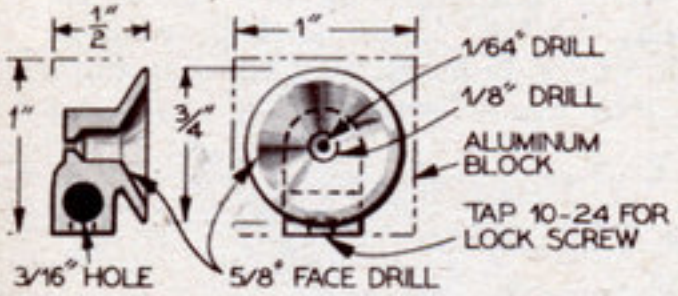
The unique trigger, modified by Mr. Stevenson, will fire the bolt with approximately the same finger pressure used to shoot an ordi- [*Continued on page* 196]



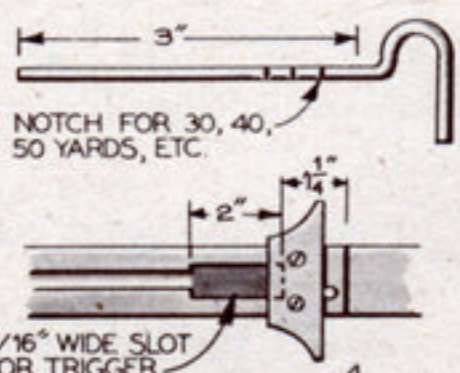


Making bolts is largely a matter of assembling stock items obtained from archery supply houses. Shown here are: AA—blunt points for small game, BB—target points, CC—big game points, X—shaft, Y—trimmed feathers, and DD—a fully assembled hunting bolt.

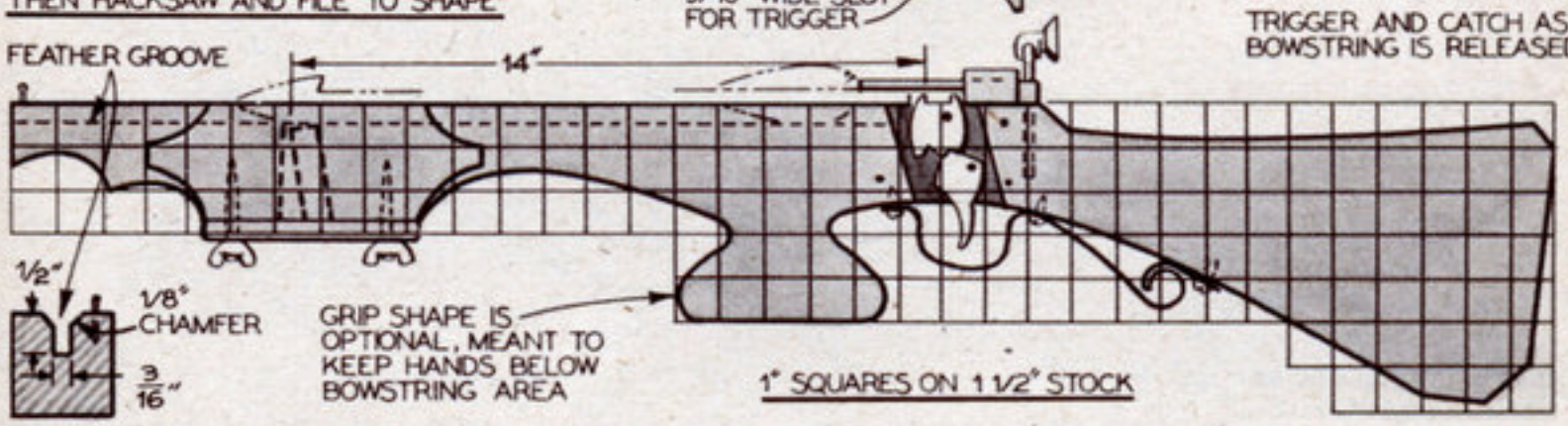




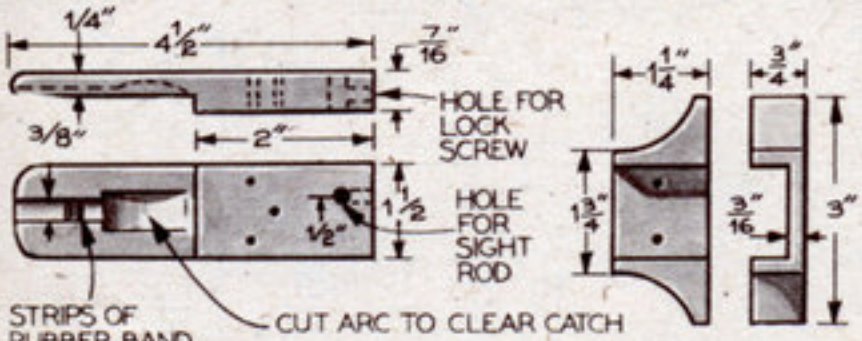
MAKE PEEPSIGHT WITH THREE DRILLS, THEN HACKSAW AND FILE TO SHAPE



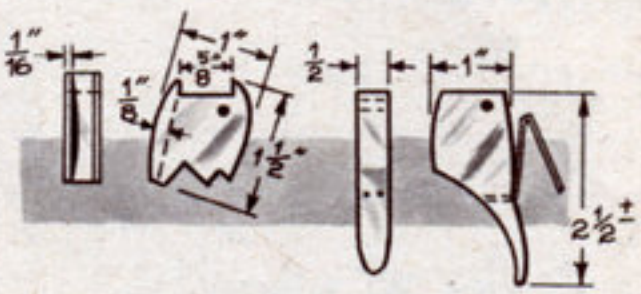
TRIGGER AND CATCH AS BOWSTRING IS RELEASED



1" SQUARES ON 1 1/2" STOCK



COVER PLATE AND THUMB REST



BOWSTRING CATCH AND TRIGGER FROM METAL OR FIBER SHEET

Hunter's Crossbow

[*Continued from page 122*]

nary rifle, when the release latch is cocked with a 75-pound pressure.

The trigger guard, made from No. 16 gauge brass, ½x6-in., is bent and fastened with three No. 6 half-inch roundhead brass screws.

When hunting, you will probably aim along the bolt, but sights are preferable for target shooting. The peep sight shown in the photos, made from ½x1x1-in. brass scrap, is extremely precise, yet it can be made with three drills (1/64, ⅛, and 5/16-in.), a hacksaw and a file. It has both vertical and horizontal adjustments which are held with lock screws (see drawing).

The bow attachment assembly is the weakest part of the stock assembly. Therefore, two ⅜-in. thick strips are used to reinforce this area. You can machine the required combination screw-bolts, and the fancy knurled lock nuts, but it's simpler to buy two closet screws from the neighborhood plumber.

There are two other parts to this unit—a wedge-shaped block, and the bow lock plate, used to hold the bow securely in place.

The bow has two unusual features: (1) the ¼x2x36-in. solid stave (either yew wood or osage orange), and the Fiberglas, when cut according to plan, requires no tillering, and (2) the reverse curve gives added speed. That's the reason this crossbow has jet-like power.

Don't let the steaming and reverse curve bending worry you. It's really simple, as the photos show. You can make a steam pot from old brake drums and a piece of pipe, as shown in drawing. The strap metal bending jig is also easy to make.

Take the measurement of the finished bow from nock to nock and order a bow string from an archery supply firm. Today, archery supply houses also sell arrow shafts, piles (points), ground feathers, and other accessories that practically reduce bolt making to an assembling and finishing job.

Order several 5/16-in. straight 30-in. shafts. Since bolts are shorter than long bow arrows, these can be cut so as to make two bolts from each shaft.

If you purchase slip-over type points, no tenon is necessary on the shaft. This further simplifies bolt making.

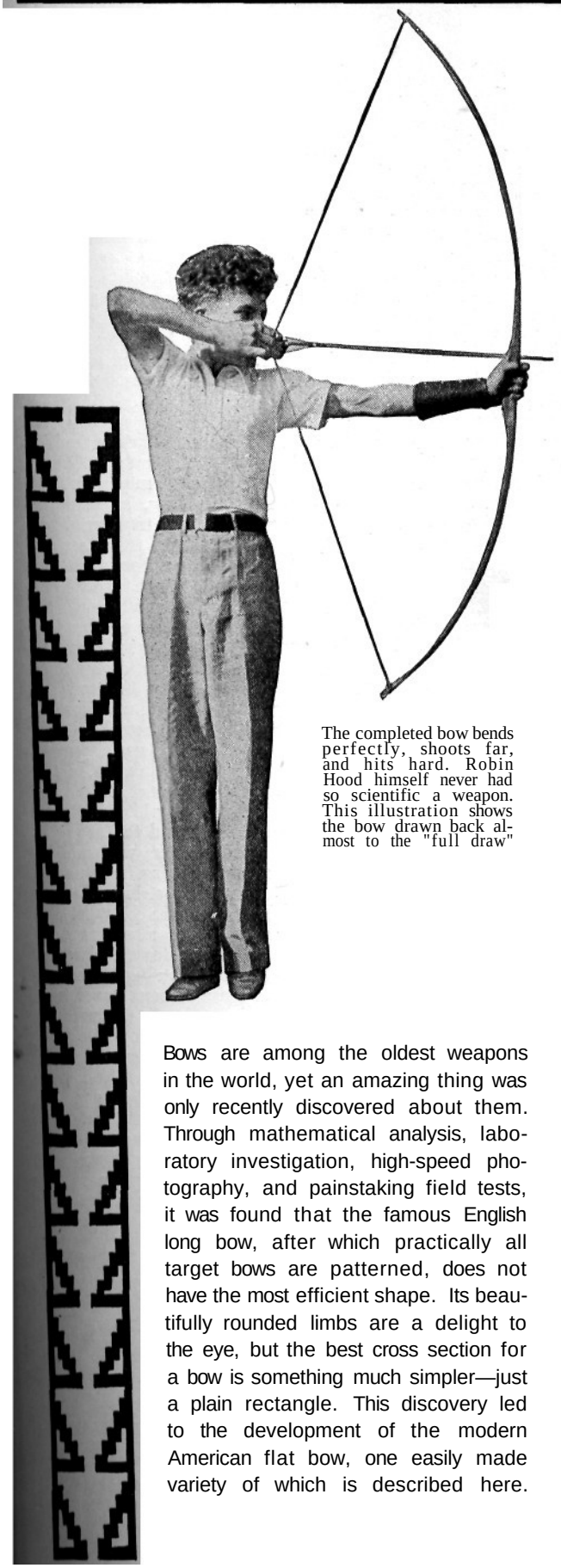
Before fletching the shaft, finish it with dipping or brushing lacquer. Never use varnish on target bolts. Friction causes the shaft to heat when it penetrates straw targets and the varnish blisters.

Either right or left wing turkey feathers can be used, providing they are the same on any one arrow. The feathers can be trimmed with scissors. Place them in a fletching jig (these sell from $1.50 up with directions included) and glue them on the shaft with household cement. When fletching shafts with broadhead points, be sure the cock feather and the vertical surface of the broadhead are in the same plane. (See drawing.)

The nock, customarily found on arrows, is not used on bolts. Nothing is done to the rear of the shaft. Before you load the crossbow with a bolt, try cocking it a few times, as shown in photo, until you have developed a real feel for the job. •

BILL OF MATERIALS

1	1½"x8"x36"	hardwood stock (including barrel)
1	½"x1"x1½"	aluminum, fiber, or bronze release latch
1	½"x1"x2½"	aluminum, fiber, or bronze trigger release and 8" piece of .030 piano wire for trigger spring
2	3/16"x1½"	mild steel welding rod used as pins for trigger assembly
2	2½" long	closet screws and caps from plumbing shop
2	¼-20 N.C. lock nuts	can knurl your own lock nuts or use wing nuts
1	½"x1½"x5"	hardwood bow lock plate
1	½"x1½"x1½"	hardwood wedge
2	5/16"x2½"x7½"	wedge enclosures and barrel reinforcement
2	⅜"x2"x3½"	cover plates and six No. 6¾" brass screws
1	16 ga. ½"x14½"	brass strip trigger guard
1	small brad	round head for front sight
1	7/16"x1½"x4"	bolt cover plate, and one No. 6-1 flathead screw
1	¾"x1¼"x2"	thumb rest (for cocking crossbow), and two No. 8-1¼" brass screws
1	3/16"x6"	brass welding rod for shaft for adjustable peep sight
1	½"x1"x1"	brass for peep sight
1	No. 10-24	lockscrew for peep sight wind gauge
1	No. 10-24	lockscrew for vertical adjustment on sights
The Bow:		
1	brake drum and 2½" pipe, 12" long	steam pot
2	⅜"x¾"x12" strap iron; 16 ga. sheet metal, 18" long	bending jig
1	2"x36"	Fiberglas, 2 or 3-ply
1	⅜"x2"x6"	backing block to bring bow to size when it fits in slot in stock
1	¼"x2"x36"	yew or osage orange wood for bow
	1" strips from innertubing	for clamps
The Bolts:		
4 or 5	5/16"x30"	Port Orford Cedar bolt shafts
	as needed	turkey feathers
1		fletching jig



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"

Now you can shoot

THE NEW

American FLAT BOW

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.

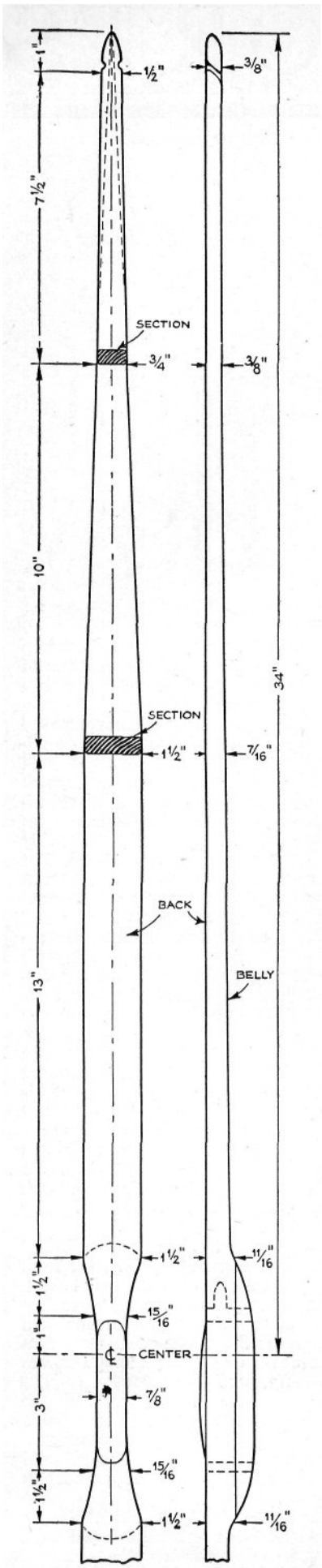
The dimensions given are for a bow 5 ft. 8 in. long with a weight (the archer's term for the strength of a bow) of from 45 to 50 lb. at a draw of from 27 to 28 in. This combination is suitable for the average man. When new the bow will draw 5 lb. or more above these figures. For clearness, only the upper limb of the bow is shown on the drawings. The lower limb is similar but slightly stronger. It should be 7/16 by 1½ in. at a point 14¼ in. below the center line; 3/8 by ¾ in. at a point 24¾ in. below the center; and 3/8 by 9/16 in. (instead of 3/8 by ½ 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 unkinked 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

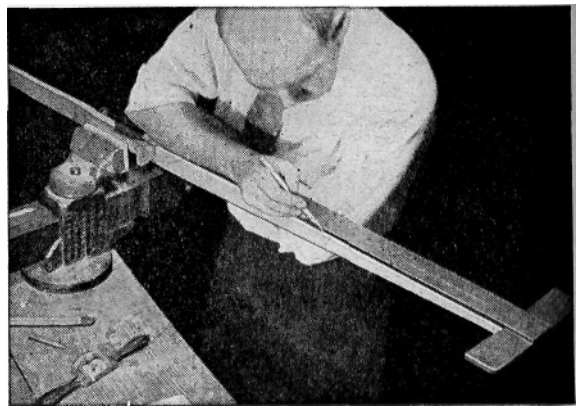


out to the tips to mark the thickness of the bow, following the dimensions on the drawing. Both edges of the stave should be marked. Now mark the profile of the riser at the grip, dipping it boldly into the run of the belly at each side of the handle. If the stave did not come with a piece glued on to form the handle, you will, of course, have to cut a suitable block of hardwood about ½ 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

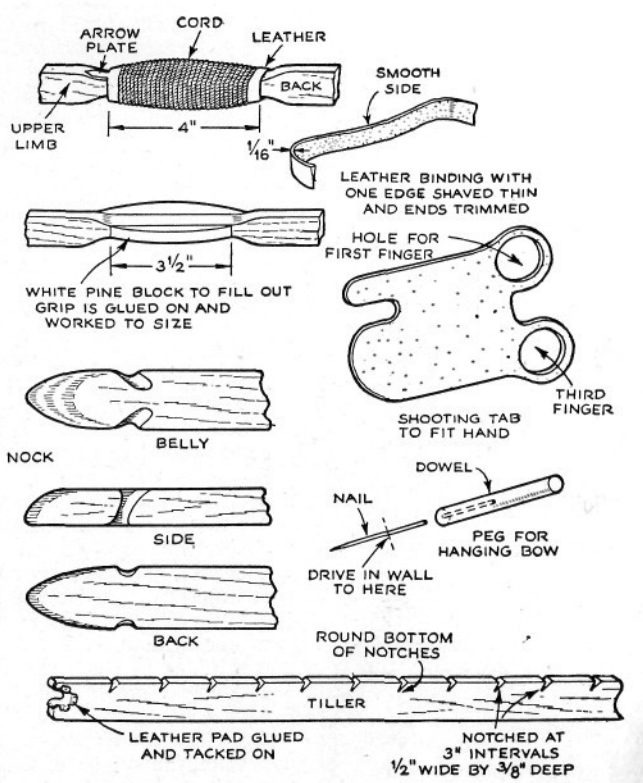
The tiller serves to hold the bow bent for inspection during construction and, as it will be used often, should be carefully and accurately made.

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.

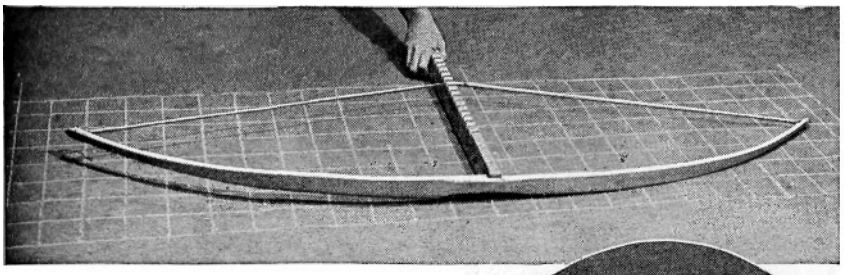
Later you will need a shooting string, and because a breaking string endangers not only the bow but the archer and bystanders as well, it is better for a beginner to buy a few strings. When one of these becomes frayed, take it apart, study the make-up, read a bit on the subject, and try to make one yourself. 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 gridiron 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 3¼ 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.

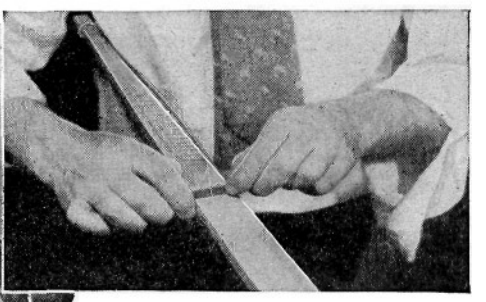
PLUSH, velvet, leather, and gimp braid are also used to pad handles, but cord affords a firm grip and is very durable.

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.

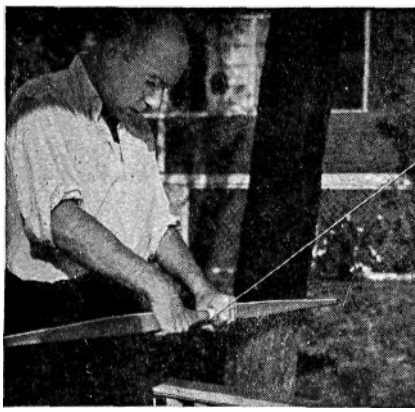
So far as the making of various types of arrows, bowstrings, bracers, quivers, targets, and other archery tackle is concerned, there are several excellent handbooks and a variety of booklets that give detailed information.

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

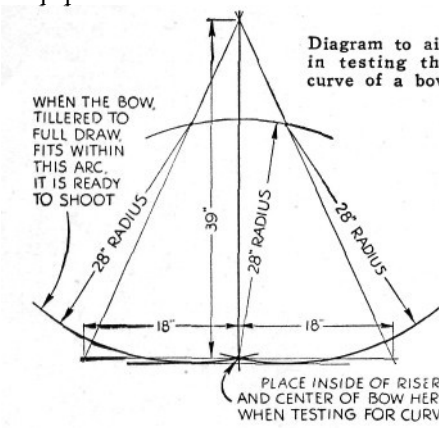


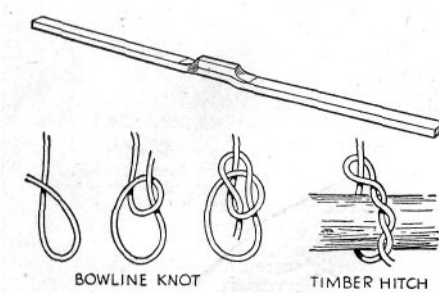
Wrapping the grip with crab line. The line is clove-hitched to a convenient nail or hook

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.





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

Making a Flight Bow

Few flight bows are commercially produced, and the construction of his own record-making bow is the dream of many an ambitious archer

The Yeoman flight bow at full draw. Angle shown is approximately correct one for maximum flight.

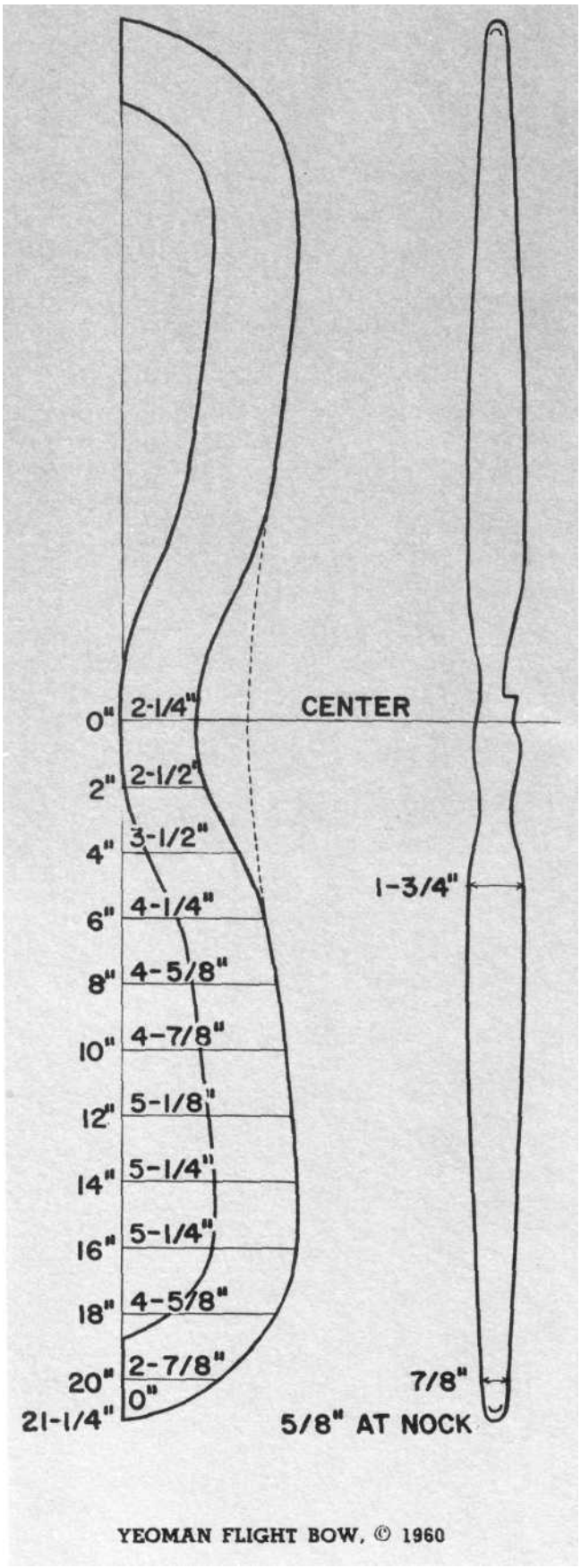
THE flight bow is the ultimate in the bowyer's field. Many flight bows are made, shot once and then abandoned. Or, they may shatter during that single use and go into discard that way. Just the same, flight bows serve a valid purpose in the archers' world, for they are somewhat like the Formula cars in international racing—paving the way for future developments based on their performance.

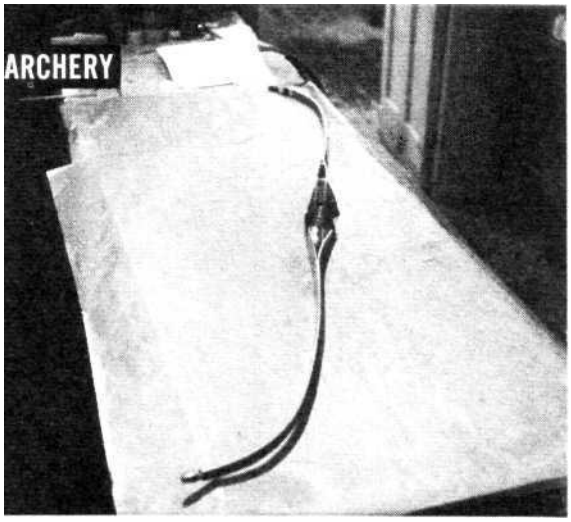
To make a record-setting flight bow is the aim and dream of many a bowyer—a goal all too seldom realized. Because flight bows are the final word in bowyery they are seldom, if ever, commercially produced. You just cannot go into your nearest tackle shop and buy a flight bow You may be able to have one made for you, if you're lucky, but essentially the flight bow is a personal thing. It conforms to you and to your ideas. It may be the result of months of planning and days of work and when once it's finished, you will be faced with the decision as to whether or not you'll overdraw just once, in the big gamble which may—or may not—pay off.

For these reasons, any plans for a flight bow must be offered somewhat diffidently. They are the end product of someone else's thinking—not yours—and they may not embody the ideas and principles which you, as a bowyer, feel are necessary for success. However, the bow which resulted from these particular plans is a lovely thing, light in the hand, sweet in performance with no harshness on the hand. Surprisingly enough, there seems to be no drastic stacking up at the end of the draw and there is comparatively little pinch. However, since all good flight shooting today is done by means of the hook, the matter of finger-pinch is relatively unimportant.

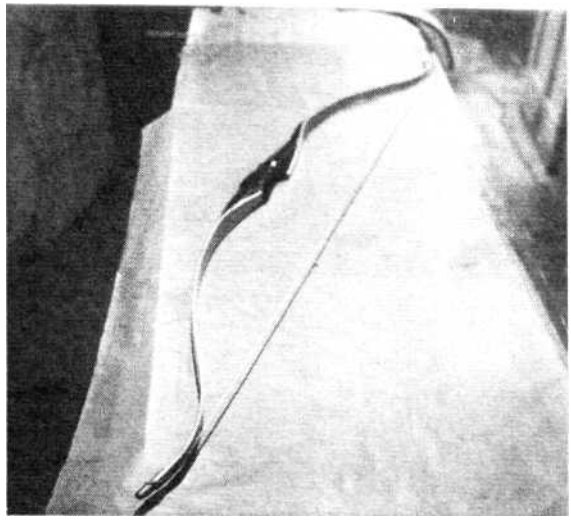
The plans have been designed by Frank Bilson, one of England's foremost archers, and in his capacity as head of the Yeoman Bow Company, a liveryman of the Worshipful Company of Bowyers. These then are the plans and specifications of the Yeoman Flight Bow (Copyright 1960)

Many flight bows, following the precedent established by the Turkish and Persian bowyers, carry the big *siyahs*, or ears, which impart additional impetus and cast. Now siyahs were developed long before our new synthetics and it is our contention that using modern fiberglass, it is no longer necessary to incorporate them in flight bow design. Since the siyah is not an integral part of the limb-arcs, it is slow moving in relationship to the bow itself. Thus, with the materials available today, i.e. those

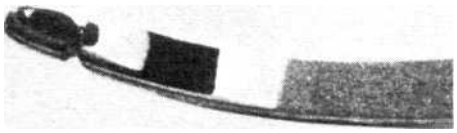




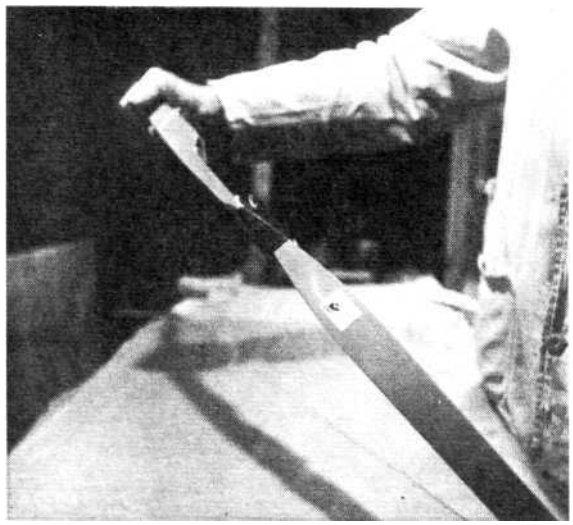
Elongated view of the bow shows powerful curves which impart cast; retain smoothness in shooting.



Here the bow is braced. Comparison shows way in which power is converted within bow when braced.

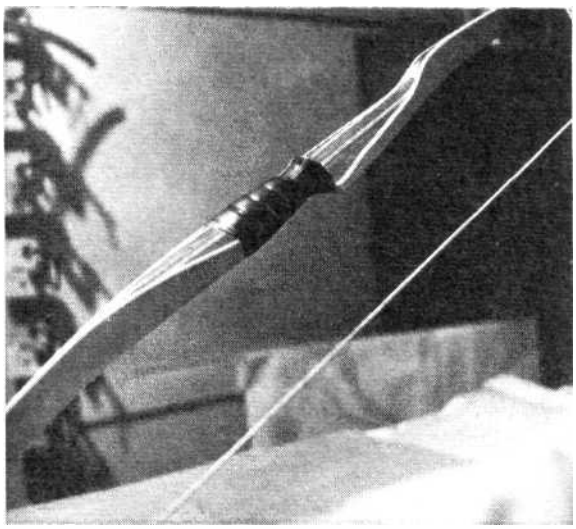


Ornamental nock beautifies bow. Thin strips of plastic strengthen any inherent weakness in bow.

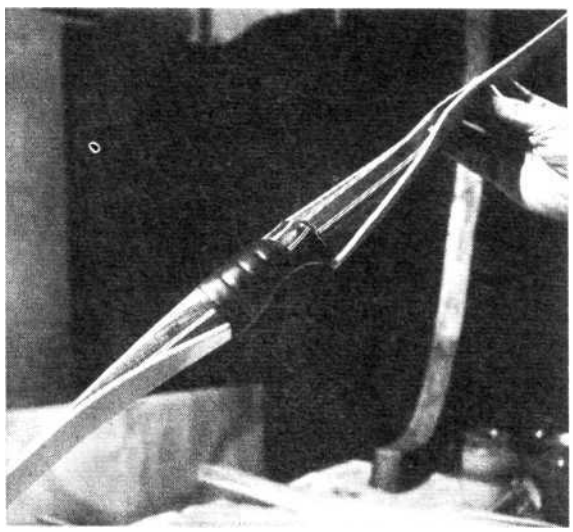


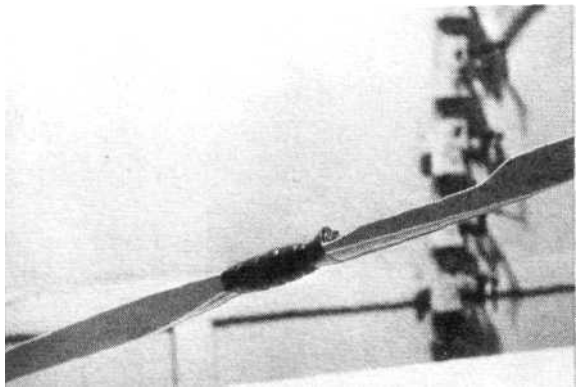
View of the braced bow, showing a part of upper limb cut away to form "semi-center shot" section.

With center-shot device, force of the string is exerted down center of bow with greatest effect.

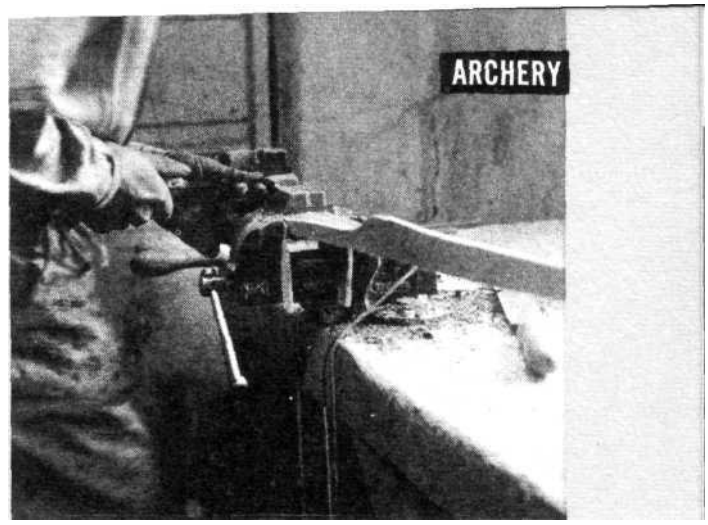


This is a view of the finished handle of a good target bow. Also shown is laminated handle riser.





The "feather" arrow rest is seen above. This is great aid to efficient use of plastic fletchings.



After taking laminated bow from clamps, excess glue must then be removed from handle and limbs.

which inherently do the work formerly given to the siyah, the addition of the ears results in a lowered performance.

Dr. Paul Klopsteg has advanced the theory that the ideal bow for cast would be based on the principle of the uncoiling arc. These plans are adaptations of his theory using fiberglass both for the backing and the facing in the two limbs.

MATERIALS

For a 48" bow you will need the following materials:

Four (4) Maple Laminations24-1/2"xl-7/8" The taper on these should run from .68 thousandths of an inch down to .45. An additional .15 thousandths will give you, in your finished bow, an increased draw weight of approximately 20 pounds. Thereafter the draw weight increase is partially nullified by the mass increase.

One (1) Handle Riser. This should be of any good hardwood, with walnut being a good choice. 8-1/2" in length, the riser tapers at both ends.

Four (4) Fiberglass Strips 24-1/4"xl-7/8" Personally I prefer Bo-tuff, but any similar material can be used. Get strips which measure .40 thousandths in thickness.

Twelve (12) C-clamps. Glue. Urac-185 by preference. One (1) Former. See instructions which follow. Rubber wrapping. Thin plywood battens. Grease-proof paper.

INSTRUCTIONS

The former is cut according to the scale shown. Your material is any block of sufficient length and thickness, free from knots and twists. The basing line, along which the inch-stations are located, should be perfectly flat. If a block of sufficient thickness is not available, you can make one by gluing sheets of plywood together in order to get the right dimension. The width must be a minimum 1-3/4" and it may be advisable to have it an inch wider. Since this is a one-step glue-up, you can use the spare width to place brads, in order to hold the materials in position.

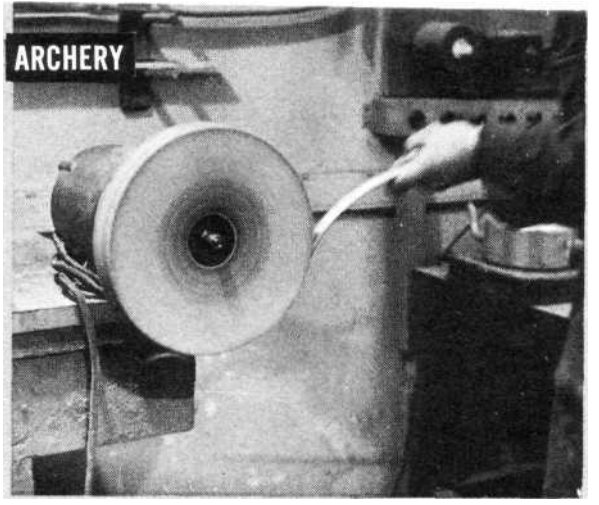
When the former is cut, you can rout out the excess material along the base line so that the jig follows the working area. This is not essential, but unless you are using extra large C-clamps, it will facilitate the clamping. Be sure that the working surface is absolutely flat and free from splintering.

Cover the former with two layers of your grease-proof paper, holding it in position with Scotch tape or thumb tacks. This will keep the bow from sticking to the jig with any expressed glue.

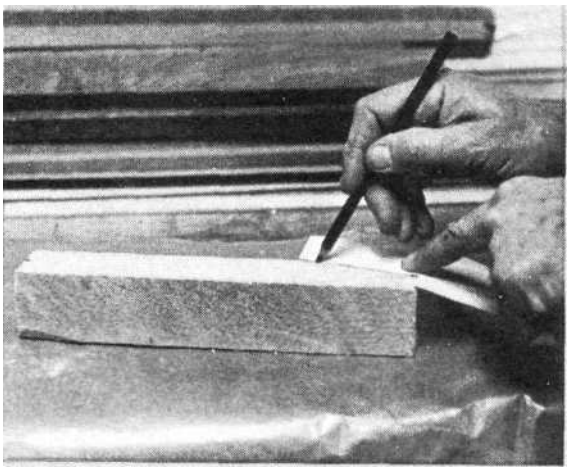
Prepare the fiberglass and the laminations carefully. The pair of lams which will be on the back of the bow will have a 1/2" overlap at the center and accordingly must be feathered or chamfered to form a smooth overlay. Set up your series in a dry run, clamping as you go so that when you are ready to glue you will know what you are doing.

With the backing down and the first pair of lams, you are ready to set the handle riser. Since this block will come above the line of the bow belly the lams and glass will not meet over it and they must be feathered down to lie as smoothly as possible.

Having finished your dry run, you will now do your actual gluing up. There are six surfaces to be covered—the insides of the glass and both sides of the laminations. Make sure that with the latter the taper runs along the outside of the pairs and that the flat sides are together. If you are using Urac-185, work carefully in a room with as low a temperature as you can manage.

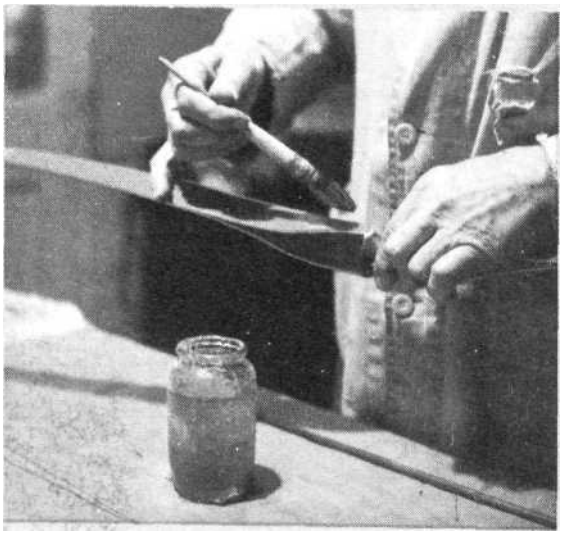


A wheel with lamb's wool buffer is used here to apply final glossy finish to the nock of the bow.



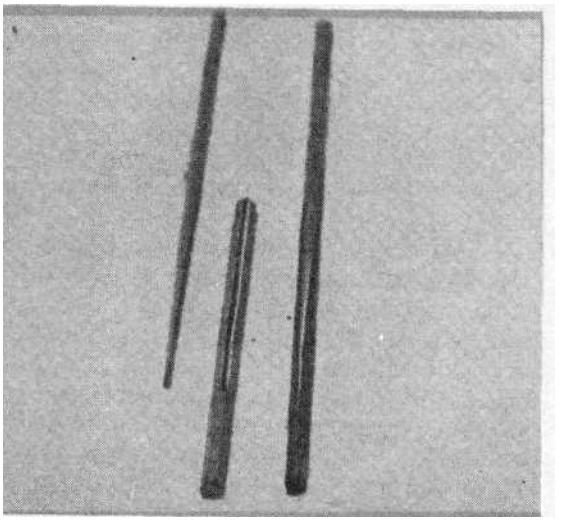
French curve would come in handy to mark curvature of handle riser, but other ways can be used.

If French curves are unavailable then cut your own patterns in reverse and use them for marking.

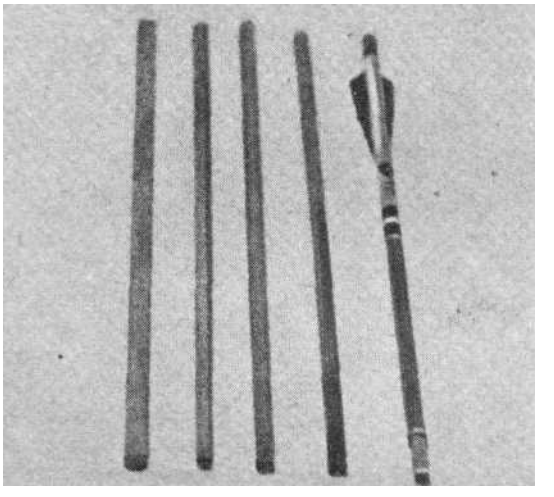


Finish the bow with series of coats of plastic-based elasticized varnish, to protect from wear.

Shaft (left) and footing (center) are used when you decide to make your own target arrow (right).



Successive stages show how the gradual rounding of the shaft is done with planes and sandpaper.



Being a heat-curing adhesive, the lower room temperature will give you more time to finish the work.

Once your glue is applied, thoroughly but not too thickly, cover your glass-lamination sandwich with more grease-proof paper. Over this lay a strip of rubber wrapping, *2"* wide and running slightly longer than your bow. Now take your battens and lay them along the surface, in the place of the more conventional pressure blocks.

Apply your clamps, working out along both limbs from the center and putting minimum pressure on at first. When all the clamps are in place go back to the handle and increase the pressure on each in turn. Don't attempt to tighten them beyond hand pressure since this will glue-starve your joinings.

Now set your bow aside in a warm, dry place. The ideal temperature is just above 80° and it should be maintained for at least five days. By that time the glue should have made a specific weld, but remember that Urac and other urea-based adhesives make a firmer bond as times passes.

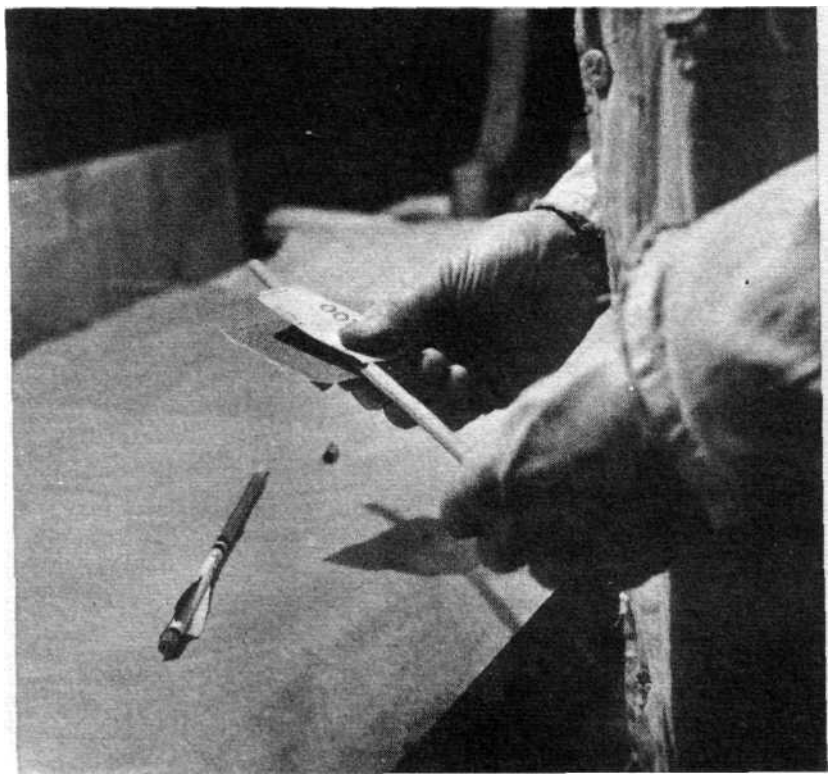
The limbs of the bow should now be reduced according to the profile given here. The best method is to cut With a hack saw, the blade having been turned flat so as to give you a firm guide as you cut. Make the cut 1/16 wider than the profile and finish by rounding both back and face toward the core. During this process you should tiller the bow, as you would any other, remembering that if your laminations have been tapered correctly and your gluing-up done with equal pressures down along both limbs, the curves should need very little fixing.

Lay out the arrow rest on your handle riser, remembering that the view given here is from the back of the bow. Remove the wood with a draw shave and finish off with a file. The handle can then be covered with leather.

Nocks are cut with a file, rounding them in carefully so as to avoid any friction on the string. At the throat of the nocks, bring a groove down the back of the recurve so that the string will lie there when the bow is braced. Due to the working of these curves the string will not entirely clear them until the bow is nearly at full draw. It is vitally important that these nocks are exactly in the center of the recurves, since to off-center them in any way will cause twist and may easily ruin your bow.

This finished bow is designed to take a twenty-four inch arrow and will give you just about 45 pounds at full draw. You may want to overdraw it, to gain that extra few yards, but it is not a course that can be recommended. Far better to practice until you are sure that you are getting the maximum flight from your arrow before you experiment with overdrawing. A snapping or shattering bow is not only dangerous but it represents the waste of all your time and energy spent in making it.

Psychologically, too, careful handling is greatly to your advantage, because getting gradually used to your bow will imbue you with the confidence you need. •



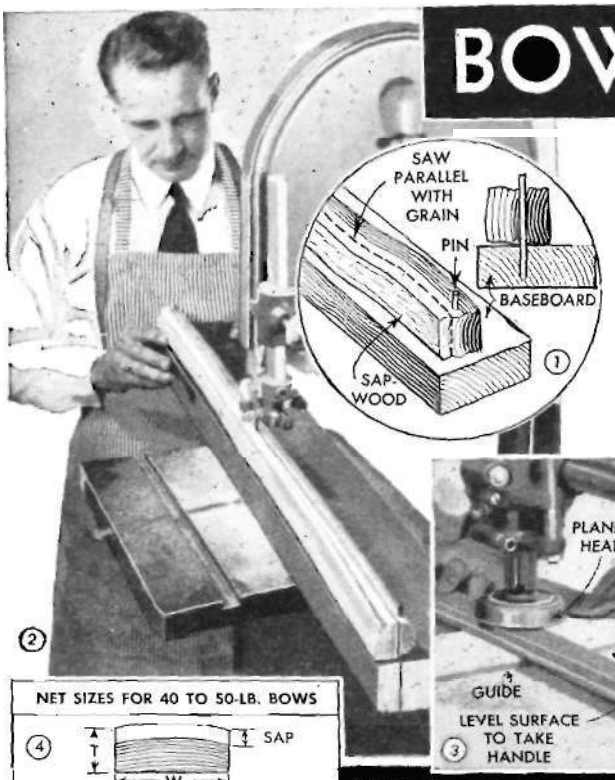
Now comes the fined part of making your arrow. It is finished by a careful sanding of the shaft It calls for meticulous and time-consuming work, but it's still a pleasure to many archers who desire a set of matched arrows.

BOWS to Bring

By Sam Brown

Hunting game with bow and arrow packs a real wallop. There's a thrill in seeing an arrow go winging toward its mark. Even a close miss is fun. So many sportsmen have adopted this sport that some states have exclusive bow-and-arrow hunting reserves where firearms are prohibited.

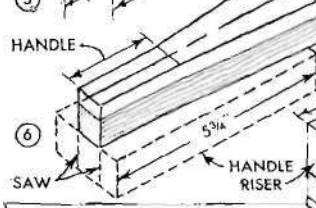
A bow for hunting should be as short as practical, ranging in length from 4 ft. 8 in. to 5 ft. 6 in. It should be a plain bow, able to stand a lot of knocking around.

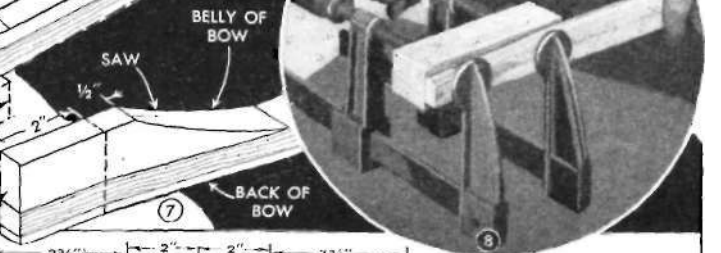


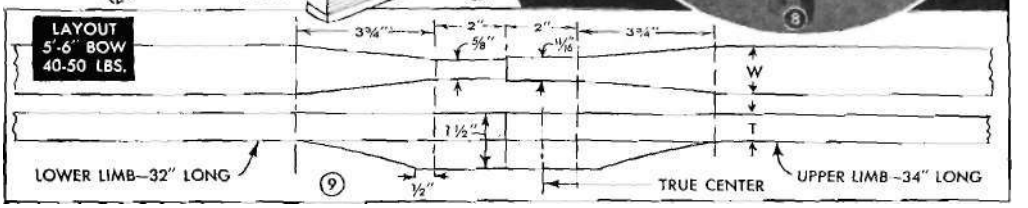
NET SIZES FOR 40 TO 50-LB. BOWS

4

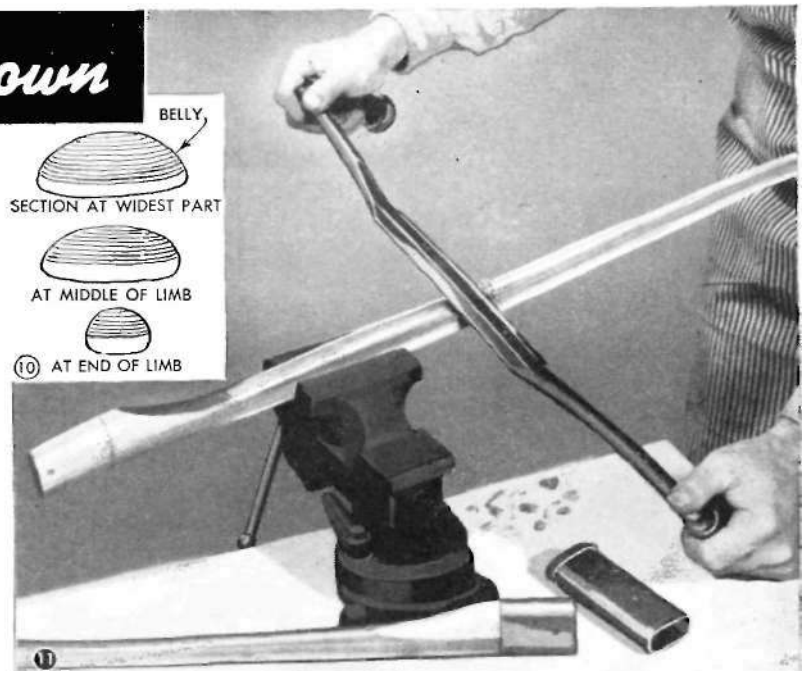
WOOD	T	W	SAP
OSAGE ORANGE	11/16"	1 5/16"	3/16"
YEW	3/4"	1 7/16"	1/4"
BOAM	3/4"	1 1/2"	5/16"
LEMON-WOOD	11/16"	1 1/4"	NONE





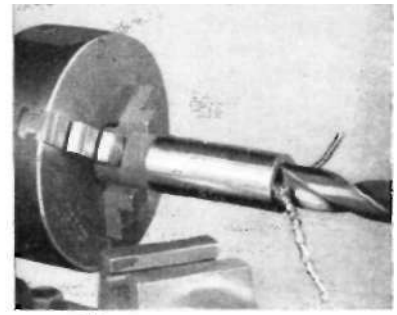


'em Down

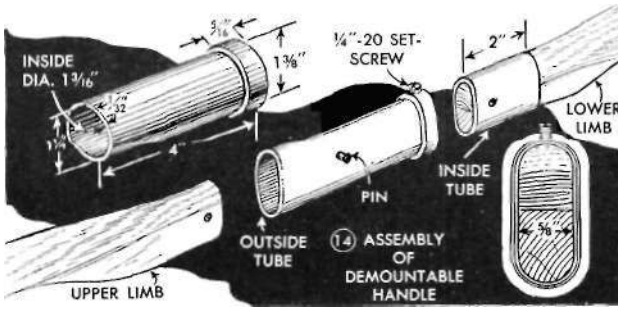


The drawing weight need not be excessive; you can bring down the toughest game in the country, including moose, bear and wild boar, with a 45 to 50-lb. bow and a steel broadhead arrow. Most hunters prefer a flat or semiflat bow. The demountable type of semiflat bow described here is popular because of ease of transportation, and the knockdown handle in no way affects smooth, fast shooting. If this is your first bow, by all means make it of lemonwood, as this compact and nearly grainless wood permits mechanical shaping without any regard to grain structure. If you want the best, however, use osage orange or boam. Yew is good, too, although a little too soft for rough usage. All bow woods except lemonwood require careful following of the grain.

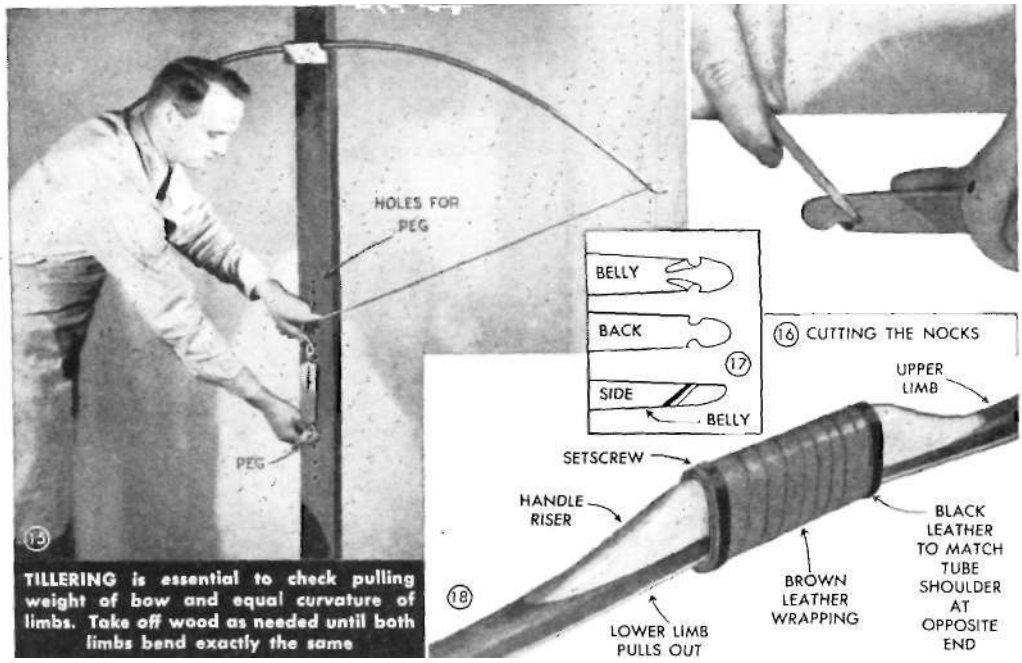
Start by roughing out the back of the bow. Osage orange is perfect in this respect; just peel off the bark, and the remaining layer of sapwood, about *Via* in. thick, is just right. Yew and boam have more sapwood and will require trimming down. This can be done best on a band saw as in Figs. 1 and 2, mounting the stave on a guide board and then saw-


⑫ BORING THE HANDLE TUBE


⑬ VISE PRESSURE GIVES OVAL SHAPE



THE HUNTING BOW should be as short as practical, with pulling weight of 40-60 lbs. Style shown is semi-flat, with demountable handle for ease in transportation



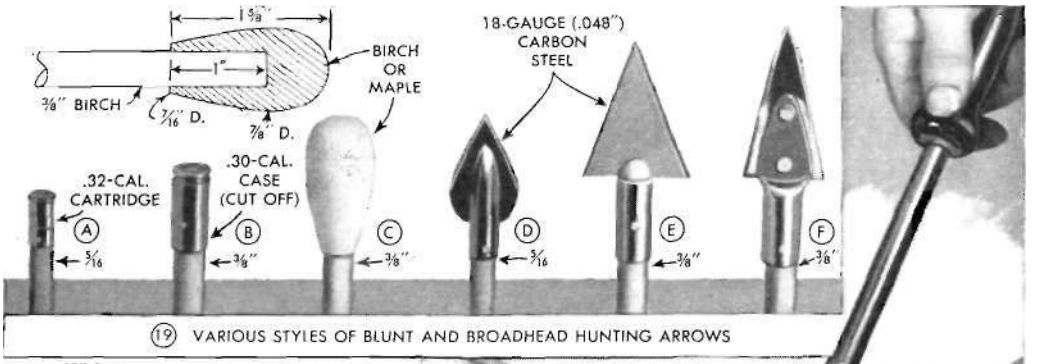
ing on a line the required distance away from the heartwood. Pins holding the stave should be a snug drive fit in holes drilled squarely across the chord of the grain, as indicated in Fig. 1, If there is too much heartwood, it can be trimmed down with the same setup. Where there is just a little extra wood on the heart side, a planer head in the drill press will remove it in a jiffy, Fig. 3. In the absence of power tools, the staves can be trimmed with a drawknife. The first stage of cutting gives you a flat stick about % by I^{x}/z in. with a thin layer of white sapwood on the back as shown in Fig. 5. Here you can see why it is easy to work with lemon wood; you have no sapwood to worry about, and the compact grain permits ripping and jointing to straight lines. All the other woods will be crooked, the back of the bow following every dip and curve in the grain. After band-sawing, smooth up the back of the bow -with drawknife and scraper, following the grain. Fig. 4 shows table of net sizes for bows of different woods.

On the back of the stave, draw the outline shown in Fig. 5, band-saw to shape and taper the belly side as in Fig. 6. You will cut across tKo grain to some extent in both operations, but it is only on the back of bow that you positively must follow the grain. Glue the handle riser in place, Fig. 8, and then band-saw it both ways to the shape shown in Fig. 7. Both limbs of the bow are treated in the same way except that the upper limb should be 2 in. longer than the lower one, as in Fig. 9.

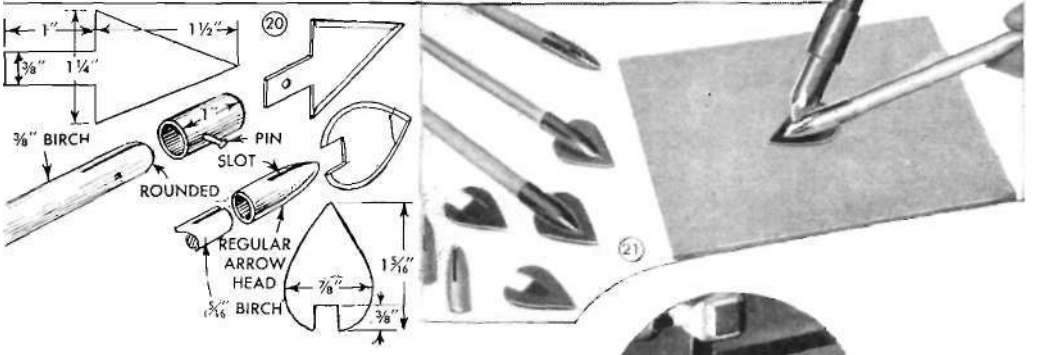
The demountable feature is accomplished by fitting the limbs of the bow inside a metal tube. You can buy telescoping tubes for this purpose, or you can make your own. Fig. 14 shows the general nature of the assembly. The short inside tube is pinned to the lower limb and the long outer tube is pinned solidly to the upper limb, the lower limb being a slide fit inside the outer tube, where it is held rigidly by means of a setscrew. Making your own telescoping tube is just a matter of turning and boring, Fig. 12, and then squeezing the assembled tubes in a vise as in Fig. 13, to get the required oval section. It is advisable to heat the work, otherwise the steel may crack at the shoulder portion. The original fit of the round tubes should not be too snug.

Figs. 10 and 11 show the final stage of shaping the bow, rounding off the belly with a drawknife or coarse and fine rasps. Osage orange may be so knotty as to require entire shaping by filing. Whenever you run into a knot, leave a little extra wood to compensate for the natural weakness caused by the defect. Finish off the limbs by scraping with a hook scraper or a piece of broken glass.

As you work down the belly side, tiller the bow frequently as shown in Fig. 15, checking its drawing weight, and more important, the bend of the limbs. Some workers tiller against a -wall and use a grid of pencil lines to check for equal bending.



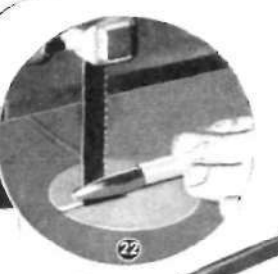
(19) VARIOUS STYLES OF BLUNT AND BROADHEAD HUNTING ARROWS



(20)

(21)

HUNTING ARROWS in blunt and broadhead styles are shown on this page. Steel for heads can be obtained from old power-hacksaw blades



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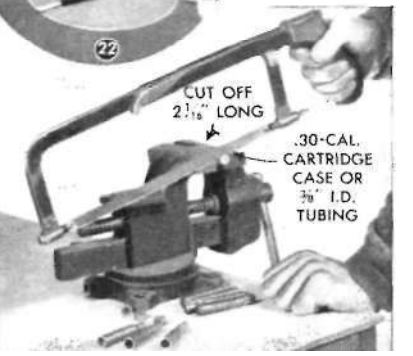
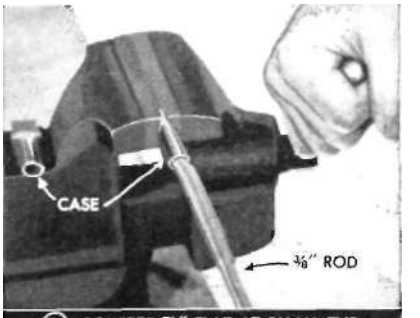




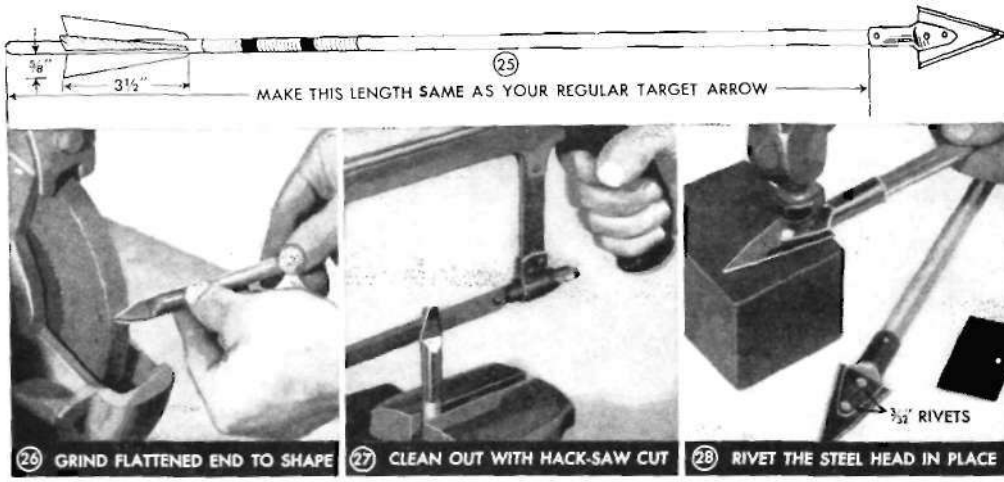
(24) SQUEEZE ⅞" FLAT AT SMALL END

However, good results can be obtained by eye inspection alone, and by noting if the string tends to pull off to one side as you pull it back. The bow should be rigid through the handle, and almost rigid the full length of the handle riser. Starting at the end of the handle riser, the limbs should bend in a graceful arc. Go slow at this stage; it is very easy to remove too much wood and ruin the bow. If you get a little under the poundage you want, cut an inch off both limbs and try it again. Get the pull about 5 lbs. more than you want; it will let down about that much after you have used it a few hours. If the bow is much too heavy throughout, make a fast dip immediately beyond the handle riser to get a thinner section, and then taper gradually to the tips. Nocks should be of the plain type cut into the wood as in Figs. 16 and 17. Fig. 18 shows the finished bow at the handle.

There are two kinds of hunting arrows: blunts and broadheads. The blunt points, details A, B and C of Fig. 19, can be made from cartridge cases

dous hitting power. They will bowl over a rabbit or knock a squirrel out of a tree. The need for the blunt point is obvious; you can imagine what happens to a sharp steel broadhead when you wham it into a tree trunk, or worse, a high tree limb.

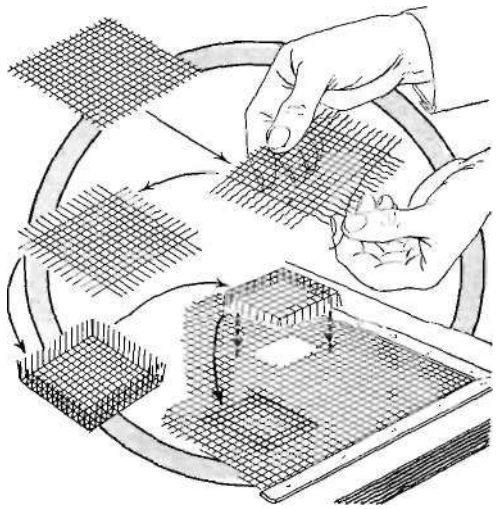
Steel broadheads are needed for both small and big game. With sharp-cutting edges, even a 40-lb.



bow will send one of these shafts right through a two-point buck. The smallest practical head is the lancet shown at D, Fig. 19. This is made by slotting a regular bullet-type arrow head, and then soldering the notched steel head into the slot as in Figs. 20, 21 and 22. Easiest type to make in any size of broadhead is the tang-and-sleeve style shown at E and explained in Fig. 20. The step-by-step operation in making a broadhead, style F, is shown in Figs. 23 to 28. If you use .30-cal. ball cartridge cases, it will be necessary to have a tang on the broadhead for needed strength. With a sleeve of thicker copper or steel tubing, the split ends of tube alone will hold the head, which can be made a simple, triangular shape without tang. Old power hacksaw blades furnish good steel for heads. All of the styles shown can be purchased readymade if desired. Fletching of shafts follows standard practice except that the feathers are preferably of the low, long triangular style as shown in Fig. 25. Complete construction kits including heads, cut feathers and birch shafts can be purchased at a nominal cost and provide an ideal method of working. The diameter of shafts will depend somewhat on the pull of your bow. If the pull is 40 lbs. or under, %e, or n/32-in. shafts are plenty heavy. Bows pulling over 45 lbs., especially when big broadheads are used, must have %-in. shafts to stand up under the terrific impact.

Holes in Window Screen Mended by Easily-Made Patches

Small holes in window screens can be mended by easily-made patches cut from ordinary screen wire, thus making it unnecessary to replace the entire screen. To make a patch, cut a piece of screen a little larger than the hole to be mended. Next, pull two strands from each side of the cut piece, and bend up the projecting wires at a right angle as shown. Place the patch over the hole, push the wire ends through the screen and fold them inward to secure the patch. For a tight seam all around, tap the folds lightly with a hammer, using a block of wood as a support.



H. S. Siegele, Emporia, Kas.

Sticking of Stamps Avoided When Carried in Pocket

I find that when carrying loose postage Stamps in my pocket ox pu™: Lhcy will not stick together if I first rub the gummed surfaces lightly over my hair. The thin oil film deposited on the stamps from the hair will last indefinitely and keep the stamps ready for use without interfering with the adhesive.

George K. McKeowan, Painesville, Ohio.

MOTHER EARTH NEWS®
The Original Guide To Living Wisely

The Classic Crossbow: You Can Build Your Own!

It was the "hot setup" during the Crusades... and it's going through a new revolution today

An archer might consider it kin to a firearm ...a shooter, on the other hand, most likely would think it a stock-mounted bow ...and you wouldn't need a poll to know the general public's feeling: It looks sinister enough to be a lethal weapon!

In short, there's not much doubt that the modern crossbow suffers an "identity crisis," but-regardless of the mystery that still surrounds this curious hybrid-it's been gaining in popularity among hunters and targeteers alike ...and that trend hasn't gone unnoticed here at MOTHER.

With several avid bowhunters on the staff, and a research department eager to take on such an interesting challenge, it wasn't *too* difficult to get the ball rolling on a project that we figured might be a first in the field: designing and building a quality crossbow from scratch ...testing its range, accuracy, and overall effectiveness ...and then comparing its performance to that of traditional recurve and compound bows.

A QUICK ANALYSIS

NOTE: Though we did build and test both of our crossbows, the potential for injury from any weapon is enough to compel us to say that whoever builds and uses this tool does so at his or her own risk.

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The takedown version is either a pistol or a long arm.

Nose Detail
Trigger and Safety Detail
Cocking Lever

The contemporary crossbow shares little beyond a basic design with its forebear, the medieval arbalest. Though both launch arrows (bolts) by means of a short bow transversely fixed to a stock, the superiority of modern materials-along with the improved geometry made possible by the use of such lightweight plastics, alloys, and composites—has turned what was a crude but effective weapon of war into an admirable piece of fairly uncomplicated technology.

Over the past few years, crossbow design has received considerable attention from various manufacturers, with the result that the old standard has been modified to run the gamut from a paramilitary-looking assault piece to an artistic expression of classical physics. And although these developments represent improvement in most cases, they're beyond the ability of all but the best-equipped crafts people to duplicate.

We chose the path of least resistance and used the simplest common denominators in our design. The stock of our crossbow consists of a center spine covered on each side by a strengthening flank. As a bolted-together unit, this flat-aluminum assembly serves as a combination barrel (or *chase* in crossbow terminology), trigger housing, handgrip, and shoulder extension.

The bow, or prod, is set into the nose of the forestock, and the two-piece trigger mechanism, cut from 1/4" plate steel, is pinned between the right and left flank pieces just below the receiver. Walnut stock inserts were trimmed and shaped to mate with the stock on either side of the shoulder extension.

Since the string does contact the barrel and is thus subject to friction, we added a pair of shoulder slides to the sides of the chase to reduce string wear and increase bolt velocity. Though these could also be made of walnut, we used Delrin (a Du Pont acetal resin) because it possesses an inherent lubricity.

Our crossbow's open sights consist simply of a front frame made of aluminum strap, and an alloy rear ring mounted to the receiver. Socket-head cap screws threaded into each of these brackets provide sighting beads, and the rear unit can be lowered or raised as necessary to zero the piece in at a specific range.

As far as we've been able to determine, a telescopic rifle sight is inappropriate on a crossbow for three reasons. First, the weapon's effective range is limited to 50 yards or so in all but an expert's hands, and at that distance, beads and the practiced naked eye should be sufficient. Second, a fired bolt's trajectory is such that, beyond 15 or more yards, its drop is enough to lower the point of impact many inches from the line of sight (see sidebar) ...and since most scopes are calibrated for rifles, the range of adjustment may be restrictive or the zeroing-in process tedious. Finally, a scope narrows the field of view and adds weight as well.

You've probably already noticed that our photos show two different crossbows. The first, detailed in this article, is a functional, no-gadget rendition that's not overly complicated to assemble, which should serve as a fine fieldpiece or target piece. The second is a multiuse version that has some interesting features, but for the most part it's best suited to range shooting or backyard "plinking." It sports a folding front handgrip, a removable shoulder stock extension (which allows the long arm to convert to a hand piece), and-no doubt the most practical feature of all—a positive trigger safety. (This last item, by the way, can be added to our standard crossbow if desired.)

PIECE BY PIECE

You might be interested to know that we spent about $102 making our fieldpiece; that breaks down to approximately $14 worth of' 1/4" aluminum flat stock (available at a scrapyard or a metals distributor); $8 in Delrin; $6 for the walnut billets; about $7 in assorted bolts, pins, and other minor hardware; and-here's the kicker—$67 worth of prod and Dacron bowstring.

Admittedly, it would have been nice if we'd been able to construct our own short bow by using common materials ...and believe us, we tried! But the laminated fiberglass plods we laid up just didn't have adequate draw strength or the resiliency to stand up to repeated use, possibly because we weren't able to duplicate the heat-and-pressure curing process used by commercial manufacturers

At any rate, we were pleased to learn that Barnett International (1967 Gunn Hwy., P.O. Box 934, Odessa, FL 33556) will sell prods, strings, bolts, and other accessories to anyone who orders the company's $2.00 postpaid catalog.

To ease construction, we've outlined the crossbow's major parts and drilling point within a grid, which will allow you to make up-scaled templates for the metal pieces. But play it safe by matching the templates perfectly *before* taping them to the metal and scribing their outline ...and be even more careful when actually cutting the aluminum stock, since [1] the pieces must join closely. or you'll be spending a lot of time with the file, and [2] the center spine's weak spot—the trigger guard—should not be any thinner than 7/32".

The best way to trim the parts accurately, by the way, is to use a band saw equipped with a metal-cutting blade. Because the smooth operation of the trigger and stringy catch depends in great measure upon the perfect alignment of the three stock component, we suggest that you postpone drilling the flank pieces until you've bored the 9/64" post holes according to the center points indicated on the template. Once those sockets are complete, clamp the aluminum center spine to one of the flanks and recheck the alignment, using the template cutout from the trigger housing. Then drill corresponding holes in the one flank piece

With that done, use No. 6 X 3/4" machine screws as temporary locating pins for the two bored components, and clamp the second flank piece in place. When you're satisfied that all three parts are evenly mated, drill the final member. Since the post screws are recessed, you'll need to countersink the exterior openings with larger bits according to the design of the screws and nuts you've chosen.

The steel trigger components have to be thinned by 1/64" in order to allow them freedom of movement within the stock. Once this is done, those parts can be drilled where indicated with a 1/8" bit, and the 1/8" X 3/4" expansion pin pivots can be pressed in and centered. The pivot pins ride in 9/64" sockets drilled into the right and left flank pieces; to be on the safe side, you might want to use the trigger-housing template cutout to position those openings accurately.

As we mentioned before, you can install a trigger safety mechanism according to our detail. Both the trigger and the safety catch are returned by small compression springs set into slots cut through the central spine.

Before assembling the stock for good, you'll want to bevel the inner surfaces of the barrel, and round the entire frame's outer edges. The rough work can be done with a grinder or file, and the metal then can be smoothed with emery cloth. Save the final extra-fine polishing for later, after you've bolted and pinned everything together and completed the cosmetic work.

The next portion of the project includes setting the bolt tang (the spring-steel leaf that holds the projectile snug against the barrel), adding the wooden (or Delrin) slides to the flanks, and cutting, shaping, and fastening the walnut inserts that dress the shoulder extension. (These pieces can be cut to shape using the template as a guide, then rounded with a sander and bolted or glued to the aluminum spine prior to being finished with varnish or tung oil.)

The front sight is a piece of 1/16" X 5/8" X 6-1/2" strap aluminum bent into an open frame configuration so the bolt can pass through it. It's fastened to the top of the forestock with two No. 6 X 1/4" machine screws, and a short cap screw locked through its crown serves as a bead. Though we used a machined ring at the rear (to provide a housing for an experimental scope sight), you can make an excellent sighting post by simply drilling and tapping a hole at the top of the receiver to accept a 632 socket-head cap screw about 1-1/2" in length. This can then be adjusted up or down for sighting.

We ordered a prod with a draw strength of 175 pounds ...but even if you choose a lighter bow to lengthen string life, you'll probably need a cocking lever to pull it into position. You can make one by bending four sections of 1/8" X 1" flat metal to create a two-armed, bolt-together yoke that uses mechanical advantage to ease cocking (see illustration). A pair of slots in the stationary part of the lever hook into a 5/16" X 3" steel rod fitted into the crossbow's forestock (this should be located as indicated on the template and pressed in place before you install the prod), and another set of slots cut into the short "jack arms" catch the string. The fulcrum's just a movable collar that can be locked into the optimal position.

The prod is held in place by a 1/4" X 1" X 1-1/4" block of aluminum faced with a strip of hard rubber. A similar pad, glued to the rear of the prod socket, provides additional cushioning, and the metal block is forced tightly against the bow's face by a 1/4" X 1-3/4" cap screw threaded into a tapped hole at the nose of the stock.

Once the prod's installed, you'll have the pleasure of stringing it. Unless you're extraordinarily muscular, we'd suggest you purchase what's called a *bastard* string along with the regular Dacron cable. This set of strands *is* longer than the service string and thus can be slipped onto the prod more easily. It's then used to draw the bow's ears back to the cocked position so the real string can be looped in place. When that's done, both strings can be released with the trigger and the bastard removed. This is the only situation in which the crossbow should be "dry fired," since that practice can split the prod.

It should be quite obvious that your finished project has a lethal potential and should be handled with the same caution that you'd give to any longbow or firearm. Don't load it until you're ready to fire it, and don't fire it without an adequate field behind your target to safely absorb any overshots. Too, if you're interested in exploring the crossbow's capabilities for hunting, check your state's game laws before you build ...it could save a lot of disappointment later. Meanwhile, you might want to look over the sidebar accompanying this article to see what kind of results you could expect from V Our modern day arbalest!

EDITOR'S N0 7Z': 1] you're interested 01 making the crossbow featured here (or the smaller takedown version) but would prefer detailed, step-by-step instructions, a set of building plans—complete with fullsize cutting template—is available at a cost of $10 plus $1.00 for shipping and handling from Mother's Plate, Crossbows, P.O. Box A, East Flat Rock, NC 28726.

Related Articles:

The Crossbow: Fact and Fiction

Tennis Ball Launching Crossbow

Construction Instructions

Aug 30, 1997 Matuesz z Plocka (mka Matt Henson)

Modified Sept 7, 1997


Top view #1


Top view #2


Side View #1

Material List

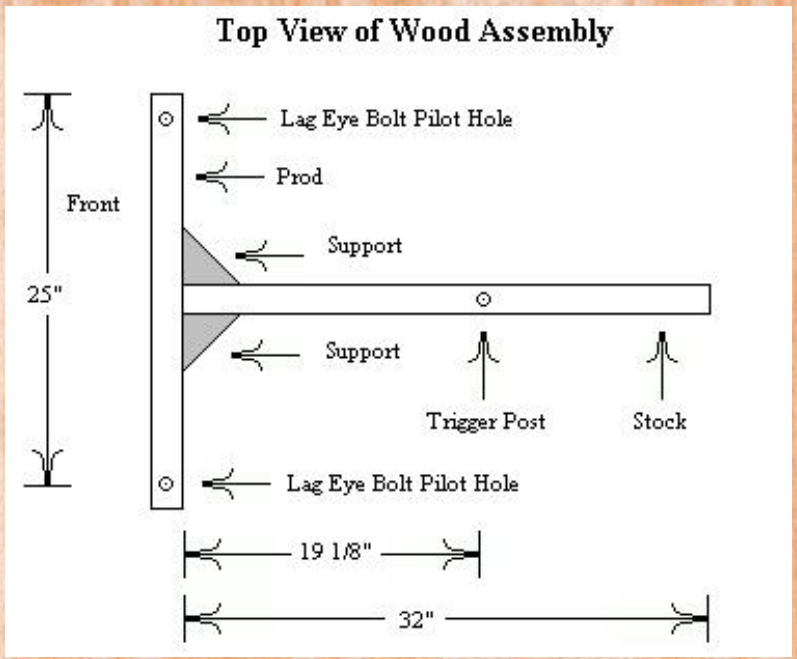
Amounts per Crossbow	Trigger assembly not included		
qty	Item	Cost ea.	extended
1	Leather pouch (7 1/2)	$1.00	$1.00
4	Grommets #0	$0.25	$1.00
36	1/4" Rubber tubing in inches	$0.04	$1.44
4	50 lb tie-wraps	$0.13	$0.52
1	3/4" Steel Welded Ring	$0.35	$0.35
1	3/4" Quick Link	$0.95	$0.95
2	leather Strip 24-28" long, (1 1/4") Wide	$1.00	$1.00
2	Lag Bolts	$0.64	$1.28
1	stock 32" (2x4 Wood)	$0.78	$0.78
1	Prod 25" (2x2 Wood)	$0.49	$0.49
1	rod 1 5/8th long 19/64th	$0.16	$0.16
2	Triangle supports 2/4 (3.5)x(3.5)x(4 7/8th)	$0.10	$0.10
3	Wood Screw #8 (2 1/2) for Prod	$0.16	$0.48
4	wood Screw #8 (1 1/2) For Supports	$0.10	$0.40
		Total	$10.60

Other Materials and tools not priced out.

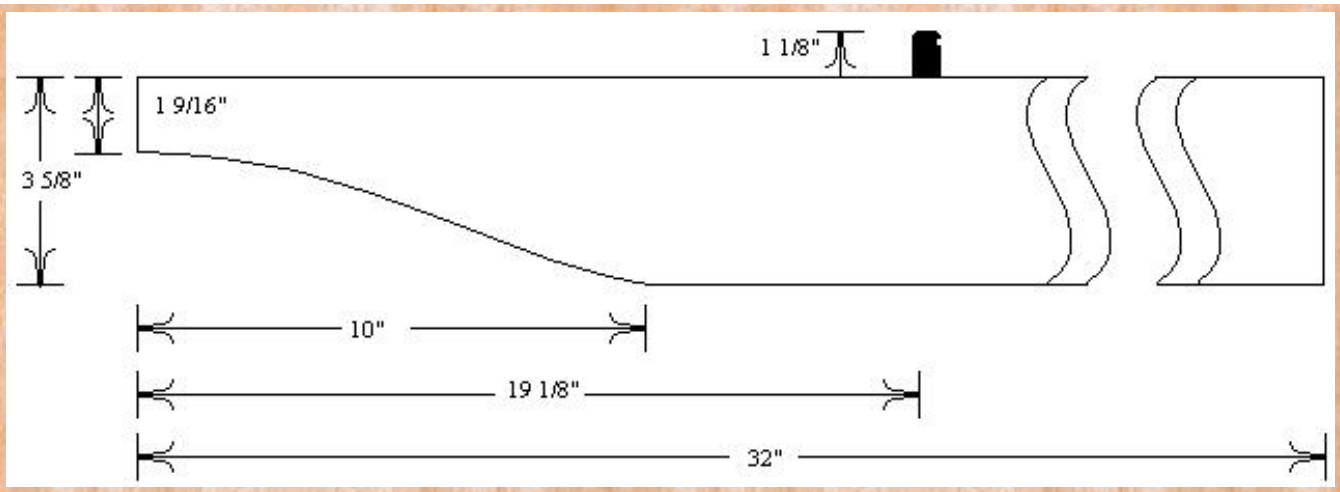
- White Glue (for wood to wood joints)
- Barge Cement (for leather to leather and wood to leather)
- Pencil
- Tape Measure
- Leather Punch
- Knife
- Small amount of Bee's Wax
- Phillips screwdriver
- Corner clamp (*optional*)
- Hammer
- Chainsaw file
- Pliers
- Hacksaw
- Hand Saw (I use a hand held jig saw or a draw knife)
- Sandpaper (I use 80, 120, 220, and 400 grits for finishing) (*optional*)
- A Finnish (I have used stains, Tru-Oil, and Wood Sealers) (*optional*)
- Drill and Drill bits
  - 19/64th"
  - 7/32"
  - 11/32"
  - 1/8"

Stock

Cut a 2x4 to a length of 32 inches. You can adjust the overall length to your preference and size but this gives you a starting point. I used Hemlock as it was cheap in my area You could use any wood for the stock. If your choice is a Hard Wood be aware that it will weigh more. If you use softer wood like cedar the joints and the center rod may loosen.



Cut shape of stock 10" to 12" from the front end tapering to 1 9/16th" at the front end. But no smaller than the width of the Prod that you are using. Mark the centerline of the stock along the top of the stock.



Drill a 19/64th" hole ¾ " deep on top of the stock 19 1/8th" from the front and centered.

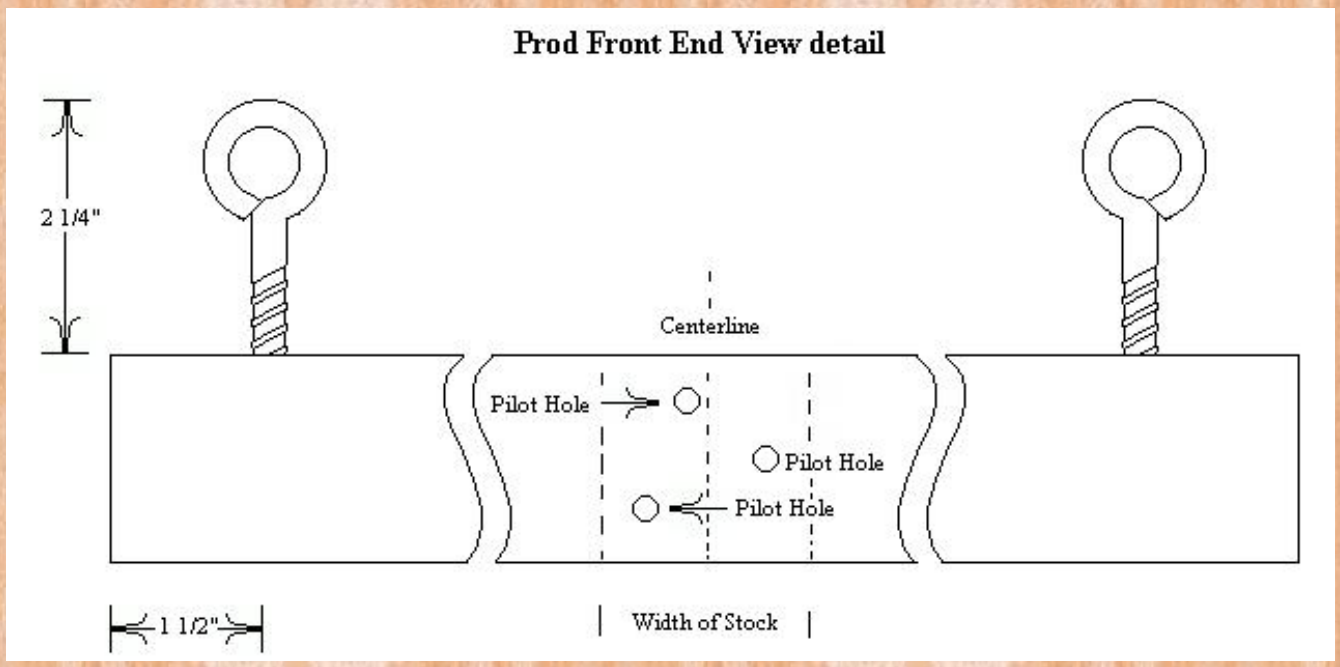
For the Trigger Post cut from rod (19/64th) a length of 1 5/8th" long then with a drop of glue drive into the stock. There should be 1 1/8" should be exposed.

Notch with a chainsaw file 1/16th" from the top about 1/64th" deep on the back side of the Trigger Post.

Prod

Cut a prod 25" long from a 2x2. I use both VG Fir and Oak with good success. I did one with Cedar and found that the lag bolts loosen and pull out of the wood. This could be very DANGEROUS!

Drill 7/32" pilot hole 1 1/8th" deep along the centerline 1 ½" from each end on the top of one side. and mark it as TOP. Mark the center of the Prod for later alignment to the stock.



Turn the prod 90 degrees. Mark this side as Front and pre drill 3 pilot holes completely through with a 1/8" bit in the center of the prod. I normally use a corner clamp to place the prod against the stock so that when I drill the pilot holes they are also in the stock at the correct positions.

Counter sink with a 11/32" bit. This is for #8 wood screws 2 ½ inches long to mount to stock.

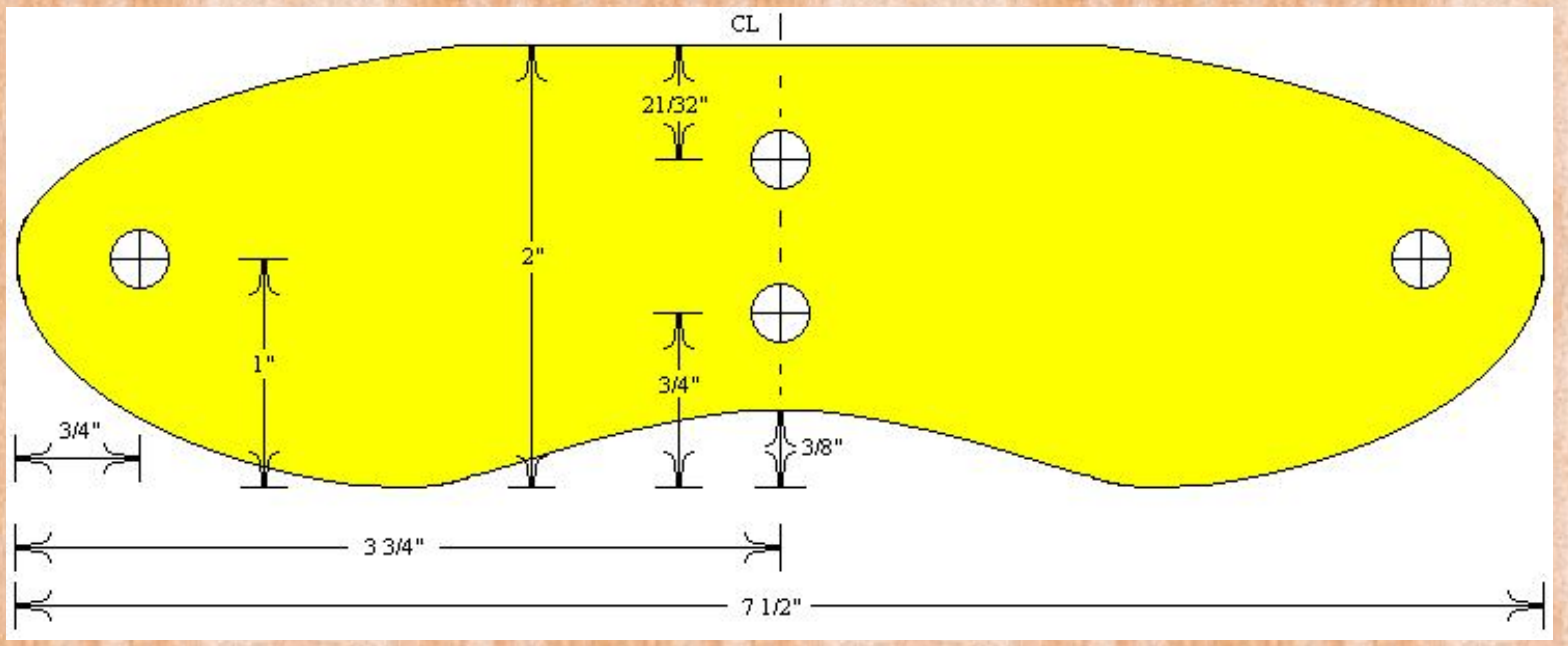
Prod supports

Cut 2x4 into 2 triangle pieces approximately 3 ½ x 3 ½ x 4 7/8.

Drill a 1/8" pilot hole in Hypotenuse face about 1" from each edge along centerline. And counter sink with 11/32" bit.

Leather work

Cut ball pouch as shown



I used suede and found that I needed two layers to prevent tear-out after repeated use. I have also use old Eye Glasses cases. Lay out and cut 2 pieces of leather then glue the layers with Barge Cement or other leather glue.

Punch holes and set the #0 grommets in the pouch. I have used #1 size for the tubing ends but they are too big for the center holes.

Cut leather strip 24 to 28 inches long 1 ¼ inch wide. Punch a hole (19/64th) about 4 ¼ from one end in the center of the strip. This strip will go on the top of the stock

Assembly

Mount Prod with white glue and screw the Prod to the Stock. Glue and screw the angled supports to the Prod and Stock. To install the Lag Eye Bolts use wax on the threads, then insert till about 2 1.4" is left exposed.

Glue Leather Strip with Barge Cement. Place the strip so that the punched hole is over the trigger post and the other end wraps around the Prod to the bottom. Trim the strip to the joint of the Prod and Stock at the bottom. This strip provides two functions. To protect the edge of the prod from the Steel ring and Quick link as it rebounds after it is shot. The other function is to provide a path for the tennis ball.

Take a length of tubing (18") and thread it through the end hole of the Ball Pouch to the center of the tubing. Thread both ends of the tubing through the Eye of the bolt so that about three inches overlap. Secure with a tie wrap about one inch for the eye and another one inch from the ends. Tighten the tie wraps with the pliers. Repeat with the other end of the Ball Pouch.

Use the Quick Link to join the Steel ring and the Ball Pouch.

Draw the Steel Ring to the trigger post and allow it to rest in the notch (cocked position). Re-tighten the tie wraps and snip the excess tie wrap.

Store the Crossbow in the un-cocked position.

Firing and Use.

I find it easiest to hold the crossbow with one hand, brace the back end against my hip, and draw to the cocked position with a tennis ball in the other hand. Fire the crossbow with a "Plucking" action of the thumb and forefinger. Hold the crossbow securely as it will recoil.

Trigger Assembly (*optional*)

Some people like the variation of the trigger add-on.

 Trigger detail #1  Trigger detail #2

 Trigger in forward position  Trigger in fired position

I do plan on improving the photo's in the near future. I am sorry they are hard to see clearly, but I wanted to get this on-line as soon as I could.

Material List

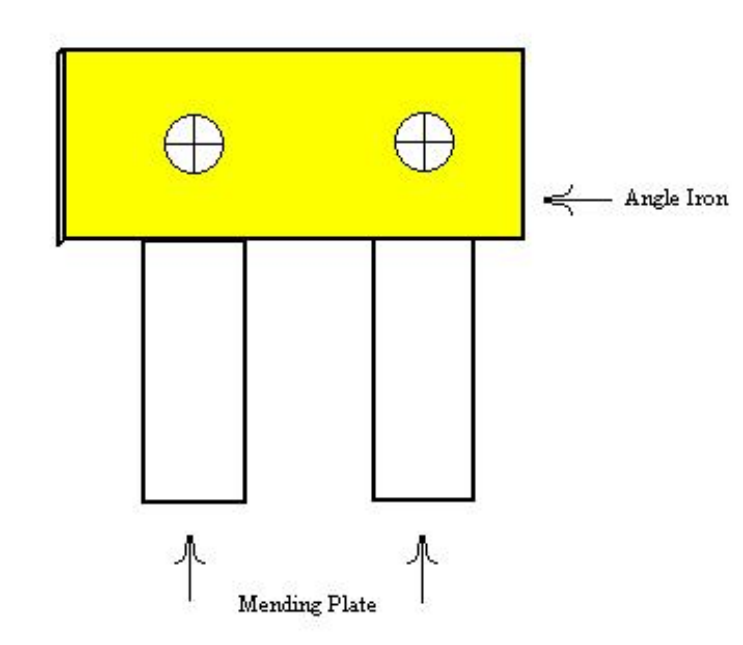
	Trigger add-on for Crossbow		
Qty	Item	Cost ea.	Extended
2	mending plates 2x1/2	$0.53	$1.06
2	upper nut 10x24	$0.17	$0.34
2	upper bolt 10x24x1/2	$0.22	$0.44
1	coarse hex cap grade 5 bolt 2 1/2x 1/4	$0.14	$0.14
3	nylon washers 1/4	$0.10	$0.30
3	USS flat Washer 1/4	$0.03	$0.09
1	USS flat Washer 5/16	$0.04	$0.04
1	nylon lock nut 1/4x20	$0.15	$0.15
1	corner iron 4 x 7/8	$1.29	$1.29
1	wood dowel handle 4 x 3/4	$0.40	$0.40
1	wood screw 1 3/4	$0.16	$0.16
2	Wood Screw 3/4	$0.10	$0.20
		Total	$4.61

Assembly

Cut angle iron 1 3/4" from the right angle corner (Measure from the inside of the angle). An angle iron is what they are called in the hardware store. used mostly as shelving brackets.

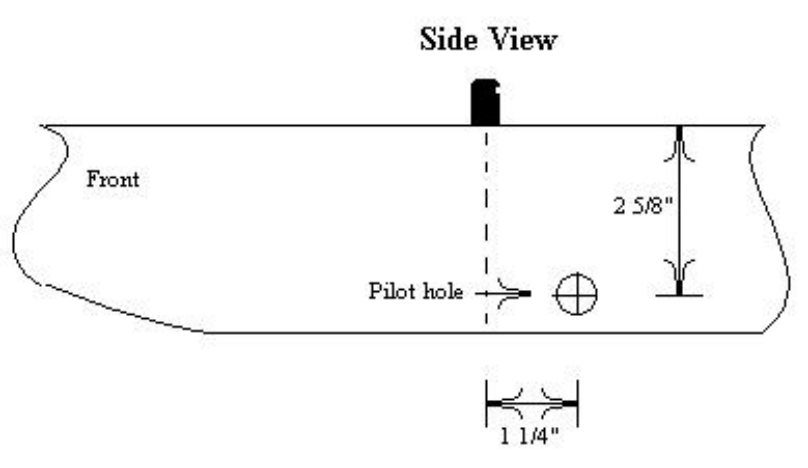
Drill 13/64 holes in the iron 5/8" from the outside of the corner and drill the other hole so that the distance between the two plates is slightly larger than the post.

Assemble the mending plates (That's what they are called in the hardware store. They are small strips of metal that Have two holes drilled in them.) to the bottom of the iron with the nuts on the bottom

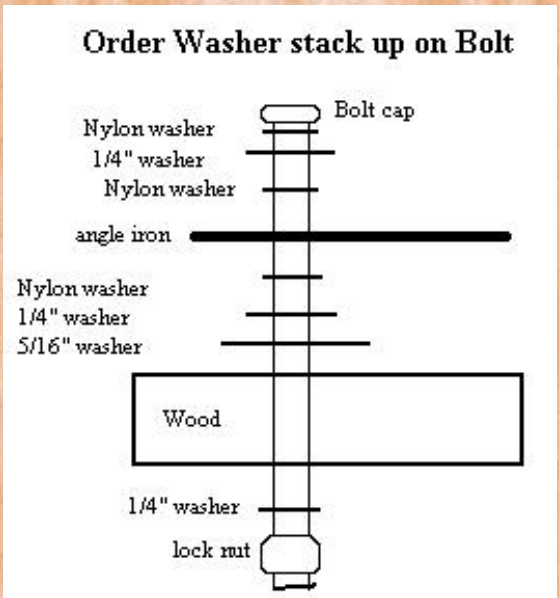


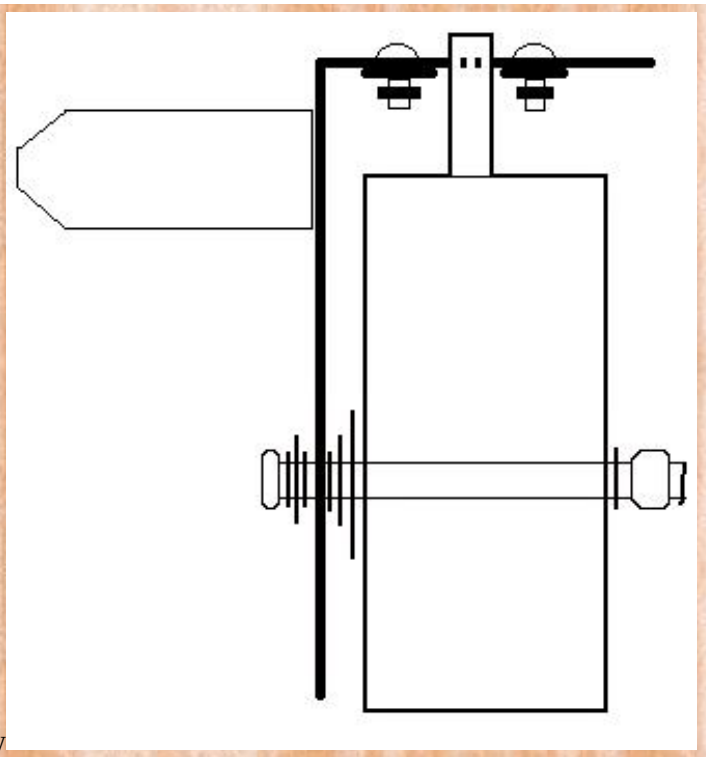
To assemble the handle drill pilot hole in the center end with a 3/32" bit and use a 2" wood screw with glue to attach the handle to the iron.

Drill a 1/4" hole in the stock 1 1/4" back from the post and 2 5/8" from the top of the stock.



Assemble handle to the stock as shown.





Front view

Place the handle in the forward position (rest) and install a 3/4" screw as a stop.

Place the handle in the back position (fired) so that the ends of the mending plates are about 1/4" from the post and install a 3/4" screw as a stop. This will prevent the nuts from gouging the stock when fired.

Happy Hunting!

If you find a link that is not working or just to give me feedback, I can be reached at
mhenson@telebyte.com
Thanks for stopping by.

Master Index Page | About Matt | Spirit Makers Guild | SCA Missile Combatants | Hobbies | Web Crawler | Yahoo |

Henson Consulting

Last Modified: Monday, June 19, 2000

Matt Henson, CNE, MCP, Provides consulting in MS-DOS, Windows 3.x, Windows 95, Win98 & WinNT, Novell 1.5- 5 and a full range of business software in the Kitsap County area. Go here for more about Matt a Certified NetWare Engineer (CNE) since 1993

Laura Henson provides Desktop Publishing, Newsletters, and Web Designs. Laura also provides beginner training on MS Windows, Word, and Excel.

Thank you for checking out my simple web pages.

I have removed several pages from my site that I really don't use that often. If you are looking for a link that is no longer here just email me and I will be more than happy to send you the link.

I have had several of my friends ask that I re-write my web-pages with fancy effects. After long thought I decided that I like to keep it simple. Faster load time and less distractions. If you would like to see more styles with frames and spinning logo's drop me a note. If we get enough I will make some changes. Laura has done some very nice work in web designs. to see some take a look at Ingasbo. We are also working on Autumn Creek. Take a look to see at a work in progress.

Currently I am working on my MCSE (Microsoft Certified System Engineer). After working with NT for over a year it was time. I have just completed NT Server 4.0 test, Workstation class and Server in the Enterprise tests. The TCP/IP class was fun now to take the test!

At my place of full time employment, I maintain a network with Novell, NT, OS2, Linux and UNIX servers. In my off time I help several small business with their networks. As everyone knows the Y2K is becoming a higher priority and Henson Consulting is there to help evaluate PC's and apply the software patches from major vendors.

Other issues that we help with is teaching data backup strategies and disaster recovery planning. Many of our clients have had poor or no data backup before we were called to help. Just remember your insurance payment won't be able to replace your customer records.

Computer tips for Novell, DOS, Windows 3.1 and 95/98 at PUD #1 of Kitsap , the place I work.
I will also write pages on anything else that fancies me. So check every now and then to see the latest.

Links

Network Professionals of Puget Sound | Interim Books | Washington State Gymnastics Home Page | Ingasbo

SCA Links

Spirit Makers Guild | SCA Missile Combatants | Barony of Dragons' Laire SCA Inc | The Kingdom of An Tir Infoscroll | Current Middle Ages Web Server | Autumn Creek gifts

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Soon to come to a viewer near you will be articles like:
Bowyering (that is making archery equipment), with my efforts in learning how to do it! Located on My SCA Marshalling homepage.
Brewing and what our local brew club is doing. Also Located on My Spirit Makers Guild homepage.

If you find a link that is not working or just to give me feedback, I can be reached at mhenson@telebyte.com
Thanks for stopping by.

Matthew T. Henson

Professional and Personal Resume'

Certified NetWare Engineer (CNE)1993, re-certified 26 June 1996

Microsoft Certified Professional (MCP) March 1999

Currently working on Microsoft Certified Systems Engineer (MCSE) 3 tests down 3 to go

1993 to present - Public Utility District #1 of Kitsap County Washington. - Data Network Manager

1992 to present - Henson Consulting, Small Business Network Administration.

1989 to 1993 - Barlows Electronics Inc. - Computer Repair Technician, Computer Consultant, Tutor, and Salesman.

1989 - Communications West - Voice Mail System Installer and Salesman

1979-1989 - United States Navy - Petty Officer First Class Electronics Technician (Submarine Qualified), Reactor Controls Division Work Center Supervisor, Engineering Department Training Coordinator, Automated Data Processing Security Officer, Nuclear Reactor Operator.

1976-1979 - Actor, Stage hand, Stage Manager, Lighting Designer, Scenery Shop Foreman.

My background includes experience which provides direct working knowledge in the following areas:

- Staff supervision, scheduling, evaluation
- Formal instruction, lesson plan development, lecture presentation, technical proficiency certifications
- Administrative responsibilities including records, reports, material history and personnel qualifications
- Budget development and tracking
- TCP/IP Management, File Management
- Developing Automated Data Processing Microcomputer systems for hardware/software security and accessibility, Firewall Administration

- Well-developed communication skills, written and oral.
- Proven leadership abilities.

Extensive experience in the following operating systems

- Novell versions 1.5 through 5.1
- Microsoft DOS 2.2 through 7.0
- Microsoft Windows versions 1.0 to Win95/98
- Microsoft Windows NT ver4 Workstation and Server
- Linux

Some experience with

- UNIX
- Xenix
- OS2

Provide help desk for many programs including

- Microsoft Office
- WordPerfect
- Email, Internet and Intranet
- Connectivity
- Scheduling software
- Desktop Publishing software

Member of Seattle Chapter of Network Professionals of Puget Sound (NPPS) 1996 to present

Networking Professionals Association (NPA) 1992 to 1997

Member of Kitsap Regional Telecommunications Committee 1999 to present

Founding Board Member of West Sound Technical Association 2000

Last Modified: Monday, June 19, 2000

Master Index Page

If you find a link that is not working or just to give me feedback, I can be reached at
mhenson@telebyte.com
Thanks for stopping by.

Year 2000 Page

As the year 2000 approaches the media hype starts to increase. Yes there is some problems with the computers and software concerning the transition from 31 December 1999 to 1 January 2000. However I believe that the real problems are being fixed and the problems that we will see are the product of fear and lack of understanding.

Health and safety items are getting addressed. I foresee that the real problems on January 1 will be only a minor inconvenience. I have been identifying and fixing problems for the last two years. Most of the computers I deal with are fixable. Now I do not work with Mini/Main Frames but with PC's.

I won't talk about the government your utilities or other outside entities. Rather I will talk briefly about small business and home computer systems.

First of all back up your data. Not just once but on a regular schedule. If you do not have a zip drive or tape backup I recommend that you get one. It really is good insurance. If you do not know how to implement a backup schedule then please read my backup plan page. If you plan on using a zip drive many of the ideas that I outline may require babysitting.

Upgrade your software to the latest release. Test your PC. There are several ways to test your hardware. See the links below on how. Take a look at the data you have now. If you just surf the web or use a word processor you do not have much to worry about. If you track date related data like your IRA or balloon payments then you may need to change your date data to have a 4 digit year. Make sure that you test each change that you make for the current year as well as setting your computer for some date in the year 2000, and 2001.

The links below are good source for more information on the Y2K Issues.

The Year 2000 Information Center

Washington State Y2K Information & Links

Westergaard Year 2000

BECRC Year 2000 Issues Y2K Y2000 resources

Microsoft TechNet - Year 2000

If you find a link that is not working or just to give me feedback, I can be reached at mhenson@telebyte.com
Thanks for stopping by.

Last Modified: Tuesday, February 16, 1999

Backup your data!

Not just once but on a regular schedule. If you do not have a zip drive or tape backup I recommend that you get one. It really is good insurance.

Here is a short description of a back up plan that I recommend. It requires about twenty backup sets a year. Five are active the rest are off site archives. I use the term "sets" as one backup may exceed one tape or zip disk. For the sake of clarity I will refer to each set as a single tape.

I recomend that you do a complete backup of your hard drive. Yes I said the entire drive. You only need to do this once and then only after you install or remove software. After that you should backup your data. Take your "Total backup" to an offsite location like your neighbor or good friend.

Label the first five sets as one, two, three, four, and the fifth one as daily.

Keep your data in an easy to find place. If you have Windows 95/98 then you have a directory called My Documents. A good place to keep all your data together. Save your files here. If you have programs that save data elsewhere (like Quicken) make a note of the directory name where your data resides.

On Friday night or early Saturaday morning (if you have an automated tape backup software) backup all you data directories to tape set number one.

Monday night set up tape "daily" to backup data that has changed since set one. This is called a differential backup in your software. I set this to tape to erase before backing up. Repeat the schedule for Tues, Wed, Thur, but set the tape to append.

Friday morning as you are getting your cup of coffee eject your tape and and put in the next numbered tape.

On the first Monday of each month take the Friday tape to an off site location. Make sure that you date it! Get a new tape and label it with the number you took off site.

Thats how simple it is. Just takes some time to incorprate it in your schedule.

You should also test that you can recover data from the back up at least once a quater and more often if you find a problem. When you test the restore function I recommend that you create a dummy directory and a few un-important files in it. Back up as laid out above. Then delete the dummy directory. Check that the directory is indeed gone. Then try to restore the directory that you deleted. If you can not seek some help.

Backups are very important part of your computer use. Most people don't do any type of backup. When their computer hard drive crashes or some other major problem occurs and there is no back up. The data is gone forever. Customer data, Checkbook, Your great novel all gone or at best, days to re-create. If the worse happens such as a fire or flooding (this includes the upstairs bathroom tub running over and soaking your PC) or something that destroy's your residence or place of business and you have an off site backup then you can restore you data. When your insurance payment comes in all you need is a new computer with the same backup device that you had.

If you find a link that is not working or just to give me feedback, I can be reached at mhenson@telebyte.com

Thanks for stopping by.

Disclaimer: This webpage is maintained courtesy of Matt and Laura Henson. The Henson's do not assume any liability for the accuracy of information contained on this page nor the suitability of any materials linked to this page.

THE GUILD

The guild does not just do beer. That's just where we currently have the talent. Meetings are usually on the third Monday of each month with occasional meetings as required.

At each meeting we have samplings, but you do not have to drink to participate. We do this to educate our palates. Most meetings are working meetings with brewing bottling or vinting. Specifically there are no dues but contributions are appreciated. this is to cover expenses like prizes for contests and projects like the Baronial brews so far.

- Barony of Dragons' Laire SCA Inc
- The Kingdom of An Tir Infoscroll
- Current Middle Ages Web Server

Links to points in this page

- Most recent meeting notes
- SCA Alcohol Policy
- Disclaimer

The Most Recent Meeting

I am way behind on my meeting notes being posted here. Hopefully I will get caught up in the next couple of days.

Remember "Drink responsibly!"

SCA Alcohol Policy

&

SCA Insurance Policy

(as issued at the Seneschal's meeting Autumn Crown Council November 8, 1997)

SCA, INC--As per SCA Policy, it is prohibited to use any SCA funds for the purchase of alcohol This includes the USA and Canada.

This includes the following:

1. For use as Prizes in tournaments or raffles
2. As gifts
3. For re-sale at Taverns, Bar's or Inn's
4. Or given away at a Tavern, Bar or Inn

Any donated alcoholic items for any of the above reasons is also prohibited. SCA Funds are permitted for the

following:

1. Alcohol purchased for use in cooking.
2. The purchase of equipment and ingredients by Guilds. for the study and recreation of alcoholic recipes, as long as it does not fall under one of the four reasons listed above.

Failure to adhere to this policy will cause the SCA Insurance Policy to become null and void at an event. This only applies to the USA and all it's territories.

AS PER SCA INSURANCE POLICY--It is prohibited under the Insurance Policy for the SCA to participate in any of the following:

1. The Manufacturing of Alcohol
2. The Distribution of Alcohol
3. The Selling of Alcohol
4. The Serving of Alcohol
5. The Furnishing of Alcohol

The Manufacturing of alcohol for an A&S Competition is permitted as long as the following applies:

1. No SCA Funds were used
2. The competition is being judged by persons qualified in that field
3. Competition is held in a controlled area

always, Modern Laws apply regarding minors with alcohol

An Tir Alcohol Policy

SCA insurance will defend the SCA on host liquor liability claims relating to the incidental use of alcohol at events, but not if we go into the business of selling the stuff.

SCA sponsored taverns are not allowed where the branch is serving alcohol. The risk of a tavern-keepers' lawsuit is more than the SCA can stand.

A. Minors with alcohol will not be tolerated. This means that a minor with alcohol will be told to leave the site immediately. The minors guardian/parent will be required to leave the site with the minor. No exceptions. failure to comply must be followed by a call to the police.

B. If the minor is on site without a parent or guardian, the constables responsible for granting access to that minor must be warned such action is a violation of duties. The minor must become sober and then told to go home. No exceptions. Failure to comply must be followed by a call to the police.

C. If the minor is 18 years of age but under 21 years of age and on site without a parent or legal guardian (as none would be required in most jurisdictions at that age) the minor must become sober and then told to go home. No exceptions. failure to comply must be followed by a call to the police.

D. if a minor came to the event with other participants who are not dunk but are the minors sole source of transportation - all in said vehicle must be told to go home with tile

minor. No exceptions. failure to comply must be followed by a call to the police.

E. If the person with alcohol is not a minor but disruptive to the event and its participants (reasonability issues apply here) the person must be told to go home - by means of a sober driver or cab or given time to sober up and then told to go home. No exceptions. failure to comply must be followed by a call to the police.

Spirit Making links

Recipies

- Baronial Beer batch 1 |
- Baronial Beer batch 2 |
- Baronial Beer batch 3 |
- Guild Mead batch 1 |

Minutes and Reports Have been moved off line

Other SCA related Links

- SCA Missile Combatants page that I maintain
- SCA Arts and Sciences Homepage

Matt's SCA resume'

If you find a link that is not working or just to give me feedback, I can be reached at mhenson@telebyte.com
Thanks for stopping by.

Last Modified: Friday, May 14, 1999

Last Modified: Sunday, October 04, 1998

Baronial Batch for June Faire 1995

Bad Notes

May 8, 1995
We used
1 Can Geordie mild scottish Ale
3 lbs M&F dry malt amber
Boiled in Two Gallons of water for one hour
og= 1.054 @ 60F
May 14, 1995 Racked into second carboy sg= 1.020 @ 60F
May 15, 1995 Bottling day
Primed with 3/4 cup Corn sugar, 1 pint of water
Bottled 48 20oz Bottles with sg 1.015
Presented at June Faire 1995
Everyone thought it was great. The guild thought it was too young

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mhenson@telebyte.com
Thanks for stopping by.

Last Modified: Sunday, October 04, 1998

Baronial Batch for Candlemas

Started 18 Dec 1995

Recipe by Derek Lyons (aka Lord Theodoric the Scholar), Chuck Babcock, Matt Henson (aka HL Mateusz z Plocka)
1 Can Geordie mild scottish Ale
3 lbs M&F dry malt amber
1/4 lb roast barley light 350L
1/4 lb roast barley dark 500L
2 lbs crystal Malt 20L
1/4 lb chocolate malt 350L
W yeast 1028 London Yeast culture

Put grain in 2 grain bags slpit evenly
18:25 put to steep in 2 gallons 158 F water
18:32 stirred
18:40 stirred
18:55 Shifted grains to spare tub
19:00 2 gallons water added to brew kettle
19:04 added malt extract to Brew kettle
20:00 removed kettle from heat. placed in Cold water bath
20:05 Added Ice to sink
20:15 poured into Primary og 1.032 at 70F

27 Dec 1995 sg 1.027 at 70F
3 Jan Bottled
Conditioned between 60 to 65F

Opened first bottle 10 Feb 1996

19 Feb 96 Tasted and Judged at Dragons Laire Spirtmakers Guild
Need to add hops for better balance.

If you find a link that is not working or just to give me feedback, I can be reached at
mhenson@telebyte.com
Thanks for stopping by.

Last Modified: Sunday, October 04, 1998

Baronial Batch for June Faire 1996

Started Mar 23, 1996

Recipe by Derek Lyons (aka Lord Theodoric the Scholar), Chuck Babcock, Matt Henson (aka HL Mateusz z Plocka)

Ingredients
1 Can Geordie mild scottish Ale
2 lbs M&F dry malt amber
1 lbs Wheat DME
1/4 lb roast barley 350L
1oz roast barley dark 500L
1 lbs crystal Malt 20L
1 lbs Special B 190L
1/4 lb chocolate malt 350L
1 oz Black Patent
1/2 oz Willamette Hops
1/4 teaspoon Irish Moss
W yeast 1028 London Yeast culture

14:11 Started the Steep
14:42 Started the Sparge
NOTE: Don't use a small pot. We used a 2gal pot and the bags displaced half of the volume.
14:45 End sparge
15:06 Added extract
15:35 Start boil and added 1/2 oz Willamette hops
15:50 Added Irish moss
16:35 End Boil, Began chilling in ice bath
17:36 og= 1.055 at 60 degrees F Pitched Yeast

March 4, 1996 Racked 5 full gallons sg=1.020 @60F

Costs of Brew
$ 2.00 Ice
$26.29 Grain
$ 2.00 Hops
$11.00 Bottles
$ 4.00 Yeast ----------
$45.29 Total
Donations from Guild Members $25.00 to date Mar 5, 1996 (Derek and Matt still need to be re-embersed)

If you find a link that is not working or just to give me feedback, I can be reached at mhenson@telebyte.com

Thanks for stopping by.

Last Modified: Sunday, October 04, 1998

Guild 5 year Mead

October 16, 1995
Boiled 2 gal Water and added 16+ cups of Raw Blackberry honey (aproximently 12 lbs)
Boiled for 30 Minutes skiming
Added 2 tsp yeast nuterient, 4 tsp acid blend.
Cooled to room temp with water and ice bath
Made starter with Prisse yeast at 90F
added 2 gals to carboy and added the must
og=0.068 @ 60F

March 9, 1996 Racked with Sparkloid (fining agent)
sg= 1.000 @ 57F

March 18, 1996 Bottling day, sg=0.997 @ 60F
Bottled 24 Wine bottles and Named the "Stumbling Bumble Bee"

If you find a link that is not working or just to give me feedback, I can be reached at
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Thanks for stopping by.

SCA Missile Combat

Last Modified: Sunday, October 04, 1998


Alpine Pass War 1989

Jump point
Master Index Page | Spirit Makers Guild | Draft AnTir One-On-One Combat Rules

Links to points in this page.

- Non-Contact Combat WAR!
- Bowerying Longbows
- Other Archery pages both SCA and Not
- Disclaimer yes I have one too.

Missile Combatants

I have just finised writting a new page for Tennis Ball Launching Crossbows. Pleas take a look at it ant let me know what you think.

We recently held war practice at my home on Sunday, All Dragons Laire citizens are encourged to support you troops!

Tennis balls are available to anyone in the Barony. If I am at the war and you need some just ask. If you are planning to go to a war and I am not, just call and I will arrange to get them you.

Work is progressing on the tennis ball crossbows I am making for tourney season. I plan to have more than one with me at any war I am going to. If you show up and THEY decide at the last minute no Arrows see me!

I have gone out with my equipment and determined the ranges each performs at. I shot 12 times with each weapon into the wind and with the wind. Here is what I have found.

What range and accuracy do you get with your combat arrows.

1) Type and weight of bow: eg solid fiberglass, laminate recurve,crossbow, etc.

1. Tennis ball cross bow 35# at 17" for 595 inch pounds made from lumber and rubber tubing.
2. Fiberglass recurve 25# at 28" draw

3. Wood fiberglass laminate recurve 30# at 28" draw

2) Type of combat arrow: Golf tube, tennis ball or thrusting head.

1. unaltered tennis balls (moderatly flat)
2. ii) and iii) Wood shaft, 3/4 inch blunt

3) Maximum range at 45 degree angle.

1. Average 34 yrds
2. average 63 yds
3. average 84 yds

For comparision I shoot 12 wood shafted target arrows both with and against the wind for an average of 107 yrds.

4) Maximum range at which you can <usually> hit a fighter.

1. 20 yds
2. 35 yds
3. 40 yds

I have found that I can hit where I want more in armor on a war field than I can on a royal round.

5) Best range for <almost always> hitting a fighter.

1. 20 yds
2. 25 yds
3. 30 yds

6) If you have used both golftubes and woodshaft, how would you compare them?

One time effort using sone else golf tubes at AnTir/ West

1. na
2. no range could'nt even get close enough.
3. maybe 10 yds.

Even though I have short range with the tennis ball crossbow, I have more heavies acknowledge the hits. The low cost of the weapon and amunation make it less painful to play. I can play in more battles than shafted weapons. My oponents do not need screening. The disadvantge is I do a lot of running. Too easy to get too close to heavies engaged in combat. takes about twice as long to reload and fire than shafts but I am working on that.

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Bowerying

I am really enjoying making strings. Getting ready to start a few kid's bows. I found a hard wood store in Seattle that I can buy seasoned kilm dried wood. I figure for about $30.00 I can get two bows out of some Ash. That is as soon as I can talk a friend into cutting the boards with his band saw.

I have completed my first bow of Oak. Learned a lot about wood in making it. but I over tillered and it is now a 15 pound kids bow.

My original intention was to make a period style long bow with a 30 pound pull at 28". What I ended up with is a bow the is an over tillered replica of a Frankish flatbow. The bow is similar to the dimensions as the Asby-Stigtoma find dated between 400 and 700 A. D. The bow is un-backed Spruce that is man height.

I started off by going to a bow making class taught at Pacific Yew, Inc.(Northwest Archery) by Jay St. Charles. And then reading everything I could. When I felt brave enough I spent several days visiting many lumber yards searching for a suitable wood and grain structure. The early bows of Europe were made from Yew, Elm, Spruce, and Oak. I did find a 2 by 2, eight foot piece of straight grained Oak.

After picking the best six feet of the board and cutting it to height, I then used a draw knife to bring the bow to life. By

using the Draw knife upside down I was able to shape the bow and follow the growth rings. I then began to use a spoke shave to further tiller the bow and shape the riser section. When the bow felt ready and floor tillered evenly I cut the string notches with a file. I started using a tillering stick to match the limbs curves. By paying too much attention to the shape of the bend I lost the desired weight. I was down to a five pound pull. To compensate I started removing length. The Bow is now 6 inches shorter and I brought the pull to 13 pounds at 28". A good kids bow.

I then used a scraper to remove most of the tool marks. To polish the bow before applying the finish I used a glass bottle. The olive bottle is about the same shape of a polishing stone. Then I used a wet towel to raise the grain and ran the scraper over the entire length again. After repeating the process of damping, scraping and polishing three times I was no longer in danger of raising splinters.

The finish is commercially available as Tru-Oil, a linseed based finish used on gun stocks. I then buffed the bow with steel wool and 400 grit sandpaper after each of 10 coats. I then cut and glued the handle and arrow rest to the bow.

I picked up a 10 foot 1 by 4 of Elm for another try. The cost was $15.00, a good start. From this piece I was able to make one bow at 25# for my nephew, Broke one while tillering it, and Currently working on the third and final bow I could get from the board. Not too bad eh.

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My Schedule (or where I have been)

An Tir/West War 3-6 July, 1997

This is me at Master Ed 1996

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Other Links

- SCA Archery Homepage
- SCA Archery mailing list home page
- Archery This is a collection of Rialto (rec.org.sca) articles made by Stefan li Rous
- Rialto Archive This is a collection of Rialto (rec.org.sca) articles made by Stefan li Rous
- Historic Enterprises Great for Armor ans some other stuff.
- Kingdom of An Tir - An Tir Book of Combat
- Home-built Crossbows
- DETAILS AND OPTIONS Crossbow's
- Timber Framers Guild: Report on the Trebuchet Workshop

Non SCA but good

- Gold Fox Traditional Archery
- Ryan Herco Products Corporation[Home Page] Possible source for shafts
- (Ted Nugent World Bowhunters)The official Ted Nugent World Bowhunters pages, with Nugent biography and (soon we hope) stuffed with stuff.
- Maryland Archery (Kennesaw Archery Club) The pages have club information, tournament schedule and tournament results.
- Pacific Yew, Inc. - - Maker of fine yew longbows
- Traditional Bowsites

If you find a link that is not working or just to give me feedback, I can be reached at
mhenson@telebyte.com
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Draft AnTir One-On-One Combat Rules

DRAFT - FOR DISCUSSION PURPOSES ONLY

9 May 1998

Rules for Missile Combat Tournaments

By H. L. Eric de Dragonslaire, OGGS, An Tir Royal Archer

These are the rules for the An Tir Kingdom Protector Tournament and for standardized one-on-one missile combat tournaments within the Kingdom of An Tir.

THE ERIC:

Combat shall take place in two squares, 10 feet by 10 feet, which be set up so that the distance from the back of one square to the back of the other is 20 yards. (Make sure that the poles used to hold the ropes do not pose a threat to the combatants should they fall on one.) The eric will be centered in a 20 yard by 60 yard overshoot area where no one other than authorized marshals will be permitted during combat. It is recommended that the overshoot area by demarcated, preferably by roping the area off so that spectators do not stray into the area. Spectators should not be permitted along the short ends of the field.

ARMOR AND WEAPON STANDARDS:

All combatants must wear light combatant armor that meets the standards set in the An Tir Book of Combat. Only missile weapons that meet the standard set in the An Tir Book of Combat may be used; except that experimental missile weapons may be used if approved by the marshal in charge and the person's opponents do not object to the use of the experimental weapons. A combatant may only use weapons that they are authorized touse.

Each combatant may carry up to 12 missiles with them into the eric; e.g., 12 arrows, or 11 arrows and one throwing axe, or 6 tennis balls and 6 javelins, etc.

Each combatant may carry only 1 projectile launching piece of equipment; e.g., a bow, crossbow, stone bow, or staff-sling, etc. One buckler may be used, provided it is not greater than 15 inches in any dimension.

All armor, weapons and ammunition must be inspected by a warranted light marshal prior to each tournament.

The minimum sized blunt on combat arrows shall be 5/4 inch. Arrows shall be inspected prior to each fight by the contestant or a light marshal.

COMBAT:

The rules of the lists shall be enforced. Contestants must show their authorization card when signing up for the lists.
Upon the Marshal's command of "lay on" fighting shall commence. Prior to lay on arrows may be nocked, but not drawn; crossbows and stonebows may be drawn and loaded, but must pointed groundward; and hand weapons may be at the ready (the arm may be cocked). A fighter wins the battle by killing the enemy, having their opponent
step out of the square during combat or scoring more points.

If a combatant steps out of the square, the combatant is considered to have lost. This is at the marshal's discretion and should be judged leniently. (It is very difficult to see the lines at one's feet while wearing a helm and watching one's opponent.) If a bow is struck, it is considered to be broken, and must be discarded.

If a quiver is struck by an arrow, one arrow is considered to be broken, and must be removed from the quiver and not loosed at the opponent. If it is struck by a javelin or throwing axe, all the arrows are considered broken. Note that arrows and bolts are damageable, but javelins, throwing axes, and rocks (from a staff sling or stone bow), are not vulnerable.

An arrow hitting the ground for any reason is dead for that fight. Other projectile weapons that are dropped must be re-inspected by the combatant before being used.

The entire body is a legitimate target, from toes to fingertips (it is recommended that combatants do not intentionally shoot at the bow hand or groin). A hit to a limb disables that limb. A hit to the head or torso kills. If both combatants run out of missiles without either one being killed, the winner shall be determined by points. An arm or a leg being disabled counts as a point. Multiple hits on the same limb do not score multiple points. Shots that hit a stray piece of cloth do not count as a hit. A bow hit does not count as apoint. Thrown arrows or rocks do not score.

If points are equal at the end of combat, or if a double-kill occurs, the bout is considered a tie. A tie is re-fought, then if a tie occurs on the second bout, both combatants are considered to have lost.

MARSHALS:

The marshal in charge of the tournament must be a warranted junior or senior light marshal. Marshals must wear a minimum armor of a light helm or three weapon fencing mask. Full light armor is recommended.

Marshals shall bear fair witness when requested. The marshal in charge of the tournament shall declare before the fighting begins what type of tournament it is; e.g., round robin, double elimination, triple elimination, etc.

If you find a link that is not working or just to give me feedback, I can be reached at mhenson@telebyte.com
Thanks for stopping by.

SCA Resume'

In 1976 my wife Laura (then girlfriend) told me about an SCA event that she had been to, in fact she had attended two events. Immediately we began searching for a chapter of the SCA in that town. In 1987 We found Dragons' Laire and our hearts had found their home.

I hold my Lady with the highest regard and carry her favor with honor.

There for I put my SCA Resume' forth

HL Matuesz z Plocka

Joined the SCA and Dragons' Laire in 1987 AS XXI

Offices and Jobs

Seneschal of Dragons' Laire Apr. 1990 to Aug. 1992
Dragons Laire Spirit Makers Guild head 1994 to present.
Commander of Lights for the Barony of Dragons Laire 1995 to present
Baronial Constable July 1996 to 1998

Autocrat

May Crown 1991
June Faire 1993
Barony of Dragons Laire Sargentry Yeoman Gallant trials 1996

Qualified

Senior Lights Marshall
Junior Heavy Marshall
Senior Constable (Teaching) at large
Apprentice level Archer

Skills

Maker of Mead's and Beers.
Apprentice level Bowyer (maker of Bows, Arrows etc.)

Awards

- Award of Arms -1991
- Order of Goute de Sang - 1992
- Dragons Laire Wyvern Service Award - 1992
- Kingdom Constabulary Award 1995
- Bumble Bee Award for Spirtmaking 1996
- Snapdragon Baronial Service Award 1996
- Baronal Arts and Sciences Champion 1996-1998

- Jambe de lione 1998

Last Modified: Saturday, January 30, 1999

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