

*The Academy of the Bow
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Being 2003 by the Common Reckoning*

*Building a Spining Jig and
A Simple, Accurate
Spline Tester
by:
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The Proceedings of The Academy of the Bow

Building a Spining Jig

Before you start, gather the following materials:

- 1 - 32" 1"x6" board
- 1 - 10" x 10" section of 1/8" plywood
- 3 - 12" 1"x6" boards
- 20 - 3/4" wood screws
- 9 - 1 1/2" "L" brackets
- 1 - 1 1/2" bolt
- 2 - nuts and washers for the bolt
- 1 - 1 1/2" "S" hook
- 1 - empty metal can (needs to be thick enough to hold melted lead)
- 1 - 2lb lead weight or 2 lbs of lead
- 1 - bag of BB's or marbles
- 1 - can of All Purpose glue
- 1 - 12" section of coat hanger, welding rod, or 24-gauge 1/4" bar stock
- 1 - copy of the attached dial face
- 2 - 3/4" brads
- 1 - torch (oxy-acetylene or propane)
- 1 - large hammer

Before we start, I want to offer one caveat. This is NOT a precise piece of equipment. The instructions provided will allow you to build a spining jig which will determine spine weight with a margin of +/- 2lbs of error. I would also like to mention that these instructions are adapted (with permission) from instructions provided on the Internet by Johnny Johnson (aka 2jays). The dial face provided is solely the work of Mr. Johnson, who has graciously given his permission to include it for reprint here. The original instructions may be found here. (<http://www.bambooarrow.com/tester.html>)

To begin, take two of the 12" 1"x6" sections and cut a 1/2" notch in the center of one end. Set these to the side.

On the 32" section of 1"x6", measure 3" from one end and mark this spot. From this line, measure 26" and make another line. These will mark the inside edges of the jig. Finally, measure 13" from the first mark and make a line. Using "L" brackets and screws, mount two of the 12" sections of 1"x6" at these lines. Remember that the inside of these two upright sections should be at the lines you just marked.

Get the plywood and the dial face. Evenly glue the dial face to the plywood and let it sit for an hour or so. After the glue has begun to setup, you can work with the dial face.

Now take the coat hanger or welding rod and pound a flat space into it 3 1/2" from one end; this should be approximately 2" long. Now drill a hole just large enough for your bolt to run through. Measure 2" (the length of the "Line A" on the dial face) from the hole toward the short end of the wire. (or bar stock) Make a 90 degree bend; this will be the hook that allows the jig to work.

Using the bolt, nuts, and washers, attach the dial to the dial face. Be sure to leave enough slack so the dial moves freely.

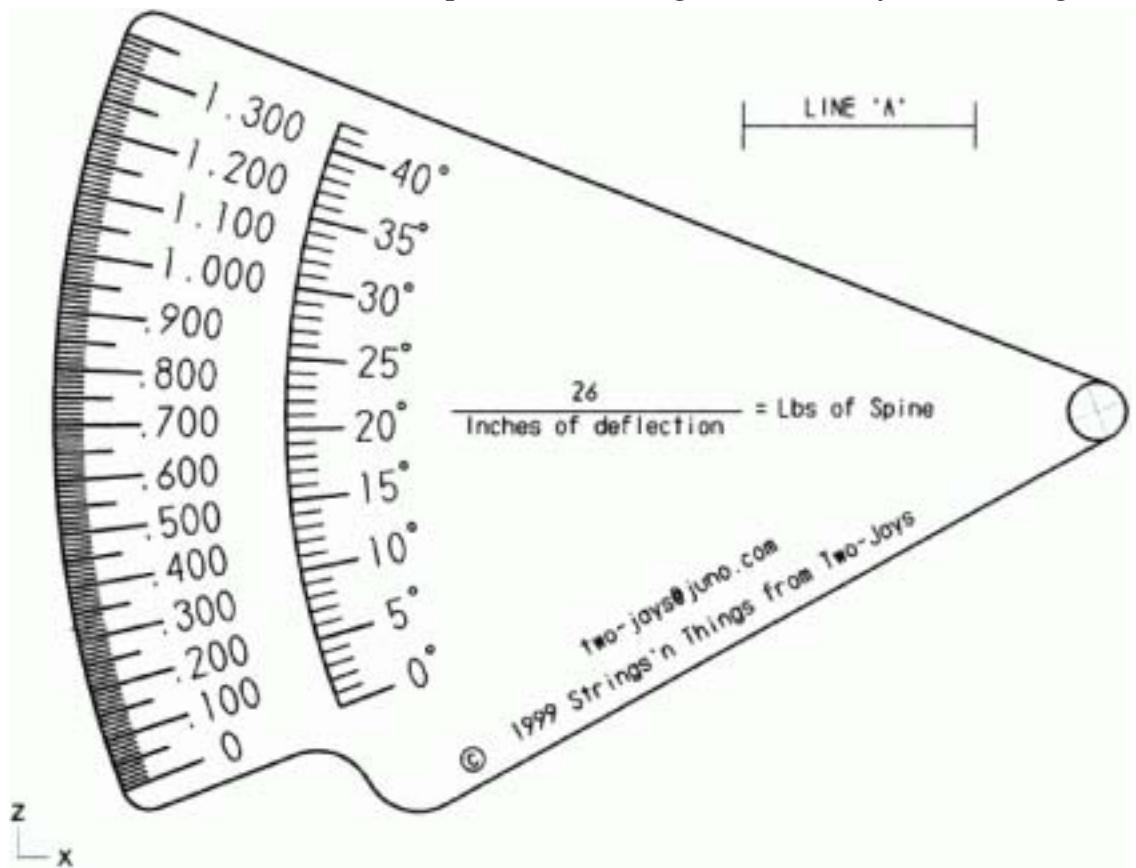
Put one brad into the dial face at the bottom of the dial to stop the pointer.

Mount the final section of 1"x6" approximately 1 1/2" from the line where the arrow will sit. Now mount the dial face to this upright, assuring that the bolt in the bend in the dial is centered between the both ends of the jig and that the bend in the dial connects to the bottom of the arrow without the arrow pressing the dial down.

Now we've finished the jig, so we need to put together the weight. If you have a 2lb hanging weight, you're done. Chances are, you don't have this, so we have to make our own. Melt most of the lead into the empty can and let it cool. Once the can is cool enough to handle, you need to weigh the can and the "S" hook together. When you weigh the can, have the BB's or marbles on hand. If the weight is less than 2lbs, add these until the weight is precisely 2lbs. If you have too much lead in the can, you can drill out some of the lead, then start the weighing process again. A precise scale can be found at your local post office or feed store. Be sure to ask permission before using the scales. Once the measurement is good, attach the "S" hook to the can.

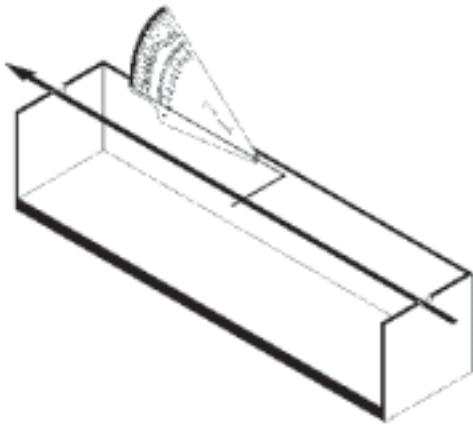
Now that we have the weight, let's check the jig for accuracy. Take an arrow shaft with a known spine weight (or spine grade; e.g., 35-40lb) and place it on the jig. It should sit without moving the dial. Now hook the weight over the arrow next to the spot where the dial touches the arrow. Determine the spine of the arrow by dividing 26 by the distance of deflection. (26 / deflection; ex. 26 / .74in deflection = 35.135lbs spine weight) This should be the spine weight of your arrow, +/- 2lbs. If this does not match the known spine weight of your arrow, check the jig to assure that you are using a precise (within 5 thousandths [.005] of a pound), then check that your dial is starting at 0 on the dial face. Finally, check that the dial is only touching the bottom of the arrow and not moving the dial at all.

In closing, I would like to encourage everyone to compare these instructions with those of Johnny Johnson, and determine the best possible building methods for you. Building this jig really is more art than science, and it is shown in that the jig is NOT a precise instrument, but rather gives a close determination without having to spend exorbitant amounts on a professionally built jig. Good luck and good shooting.



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A SIMPLE, ACCURATE SPINE TESTER
developed by John C. Johnson (2jays)
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Most of us have, at some point, thought "Sure would like to have an accurate spine tester, but that's a weeks groceries for the four of us."

Well, if you can scrounge up a few simple things shown here, chances are you can build yourself a spine tester accurate enough to measure shaft deflection within about .020" deflection. That is 0.00077 lbs of spine. Pretty dern tight tolerances.

I was inspired to develop this spine tester after seeing and building one developed by Rob Goebel (ArcheryRob on the Leather Wall). All I have done is to combine the best parts from a number of sources. There are no new ideas in the world, just new ways of putting them together.

There are only two hard-to-get parts involved. We're going to give you one and teach you how to make the other.

NOTE: if at all possible, do all drilling with a drill-press, as alignment is important to accuracy. Wear Safety goggles and avoid loose clothing when working with machinery. Remember, the best safety device is between your ears. You and you alone are responsible for your safety.

STANDARD DISCLAIMER: I am not responsible for anything you screw up, including but not limited to your body, your marriage, or your budget.

PARTS LIST

- (2) pieces 1" x 6" x 26" lumber
- (1) 1/8" x 3" machine screw

(3) 1/8" self-locking nuts
(6) 1/8" fender washers
(2) end-caps 1/4" x 5-1/2" x 6-1/4" plywood
(1) shim - 3/4" x 1/2" thick square of hard
foam-rubber or something similar. I snipped a
piece from my GI surplus sleeping-pad.

THE FIRST HARD-TO-GET PART

After lots of research on the dial-design, I finally figured out how that bad boy was designed and why equal increments on the dial didn't work. Thanks to Bruce Woodard, my Machining Technology instructor, for his encouragement and mentoring.

MAKING THE DIAL

1. Photo-copy the dial illustration. Most commercial photo-copy machines have an enlargement feature. Enlarging / reducing does not normally affect the accuracy of this dial in any appreciable way if you keep the short spoke of your needle equal to 2" (50.8 mm). Use the brightest white paper possible and clean the glass plate of the copy machine to reduce "specks" on your finished copy. I'm currently working on a dial that I can email and you can copy it to a floppy disk, then take to your neighborhood surveyor [or anyone using a CAD-dxf program] to have printed any size you like, but with the current workload it probably won't be ready before Christmas, 2002.
2. Glue it to a stiff backing (sheet aluminum, thin Plexiglas, scrap wall-paneling, etc.).
3. Drill a 5/32" hole at "X marks the spot". If you use Plexiglas, use a new 16d finish nail to drill a pilot hole, then run the drill-bit backwards to avoid breaking the backing.

MAKING THE NEEDLE AND ASSEMBLING THE SCALE TO IT

You need something round and flat for a hub and some stiff wire for spokes. I used a 3/4" thick slice from a hardwood closet rod and two bicycle spokes.

1. Drill a 5/32" hole through the center of the hub for the axle.
2. Drill two holes opposite one another around the rim. Be sure they are the right size to epoxy your spokes into. Install the spokes into these holes. Don't trim them yet. Be sure not to plug up the axle-hole.
3. Bolt the needle-hub through the hole in "Line A". Make a 90° bend outwards in the short spoke 2 inches [50.8 mm] from the center of the axle. Be as accurate as possible. THIS LENGTH IS MOST IMPORTANT MEASUREMENT YOU WILL MAKE ON THE WHOLE DERN THING!!

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3. Remove the hub and put a washer on the machine screw, install the hub to it, another washer, and a self locking nut. Tighten the nut so that the hub spins freely but has a minimum of side-play.

4. Put the axle through the hole in the dial and mark where you want to cut the indicator end of the needle. Cut and shape it to a rounded point.

5. Then install another washer, the dial, another washer and another self locking nut. Here again, tighten the nut so that the dial spins freely but has a minimum of side-play.

THE FRAME

1. Glue and nail the 1" X6" boards together edge to edge.

2. Glue and nail the end-caps on. The 4-3/4" x 26" inside surface is the floor.

3. Locate and mark the center of the top edge of the back wall.

4. Measure and mark the length of line A to the left of this mark.

5. At this point measure down 1/2" and drill a 1/8" hole front to back.

6. Put another fender washer on the axle, install through this hole, add a washer and lock nut. This one is to be tight.

7. Glue the shim on the back wall about where the degree numbers will pass over it. This is so you can zero-adjust the scale and it will stay where you put it.

8. Place an arrow shaft across the two end-caps to locate where you want your grooves. This may vary according to what you used for a hub.

9. Use a 1/2" round rasp to cut the grooves 1/2" deep and sand smooth.

10. Cut the arrow-rest portion of the short spoke to the length you want and balance the needle. I used split-shot fishing weights crimped on the short spoke.

11. Remove the needle assembly, stain and finish the frame to your liking. and re-assemble.

THE "NO-BOX" METHOD

One young man, Andrew Bochnovic, ("Damn Yankee" on the Leather Wall), had the idea of mounting two screws in his garage wall 26" apart and placing the pivot bolt at the appropriate place between them . I might suggest using nails or cup-hooks rather than screws so the shaft doesn't get scarred.

Thanks, Andrew, for sharing this.

THE OTHER HARD PART

The second hard part is getting an accurate 2-pound (0,909 kg) weight. After all, if we're going to talk about thousandths of an inch, $\pm 1/2$ ounce is not close enough. Here's how I did it.

MATERIALS

- (1) Empty PVC pipe cleaning fluid can Be real sure it's clean and aired out.
- (1) 1/8" machine-screw hook
- (2) nuts & washers
- (6) 4-oz fishing weights
- (3) 2-oz fishing weight
- (1) 4-oz tube BB shot or lead shot
- (2) baggies

1. Remove the brush from the lid and dispose of it.
2. Punch a hole in the lid and install the hook with a nut & washer on each side. Put as much thread as possible through the lid and cut off the excess.

Gather all this stuff up and head on down to your local Feed 'n Seed store. Buy a sack o' feed for Fido and talk nice. If you don't have a Fido, buy it anyway and give it to a neighbor. Notice that they probably have a government-inspected pharmaceutical-type balance for weighing seed, (Man, that stuff is costly, so they want it to be right on the money). Ask if they'll help you get a good weight. You brung the baggies so your lead wouldn't contaminate their scale.

This may be a 2-lb balance but chances are it is only a 1-lb'er, so you can do this in 2 stages:

3. Use 1 baggie for the can and enough lead to get a pound.
4. Use the other baggie for the lid/hook and enough lead to get the other pound.

Shot only weighs a few grains each, so you can trim this real close.

Take it home, put it together, and start making arrows.

GOOD HUNTING, NEIGHBOR!!

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