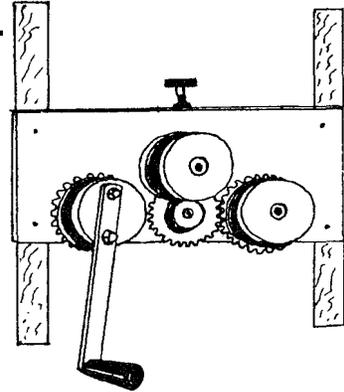


# CROWNARC

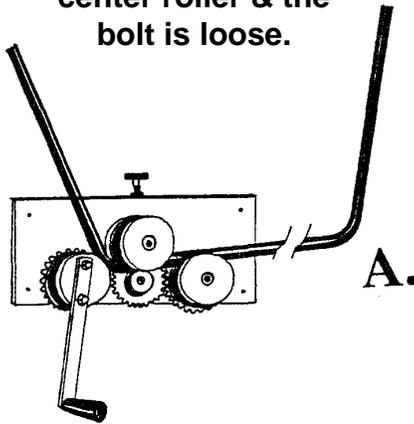
Screw your new **CROWNARC** to 2 pieces of 2 x 4 using the 4 holes. Then, mount the 2 x 4's to the wall. You'll have best control when the **CROWNARC** is just above waist level.



To crown a bow: Lay a piece of straight tubing across the 2 lower roller wheels. Turn the top adjusting bolt until the middle roller just starts to tighten on the tubing. Remove the straight piece. Insert your bow (as shown in Sketch A), tighten the bolt 1/2 to 1 turn, and crank the bow through. If you wish some more arc, tighten some more and crank the bow back. Repeat as necessary.

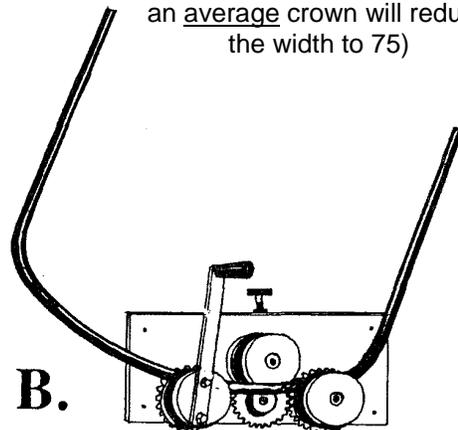
Don't forget to allow some extra width, because the rolled crown will take up width. The higher your crown, the more width you lose. Crowning will also reduce your leg angle. You should leave the legs angling farther out than you need, because the crown will pull the legs in. (See Sketch B.)

Turn the adjusting bolt only when the "elbow" is under the center roller & the bolt is loose.



**Tip: Try bending your bow 1/2" wider for each 15" of width to allow for the crown.**

(So, if you need a 75" wide bow, bend it 77 1/2" wide and an average crown will reduce the width to 75)



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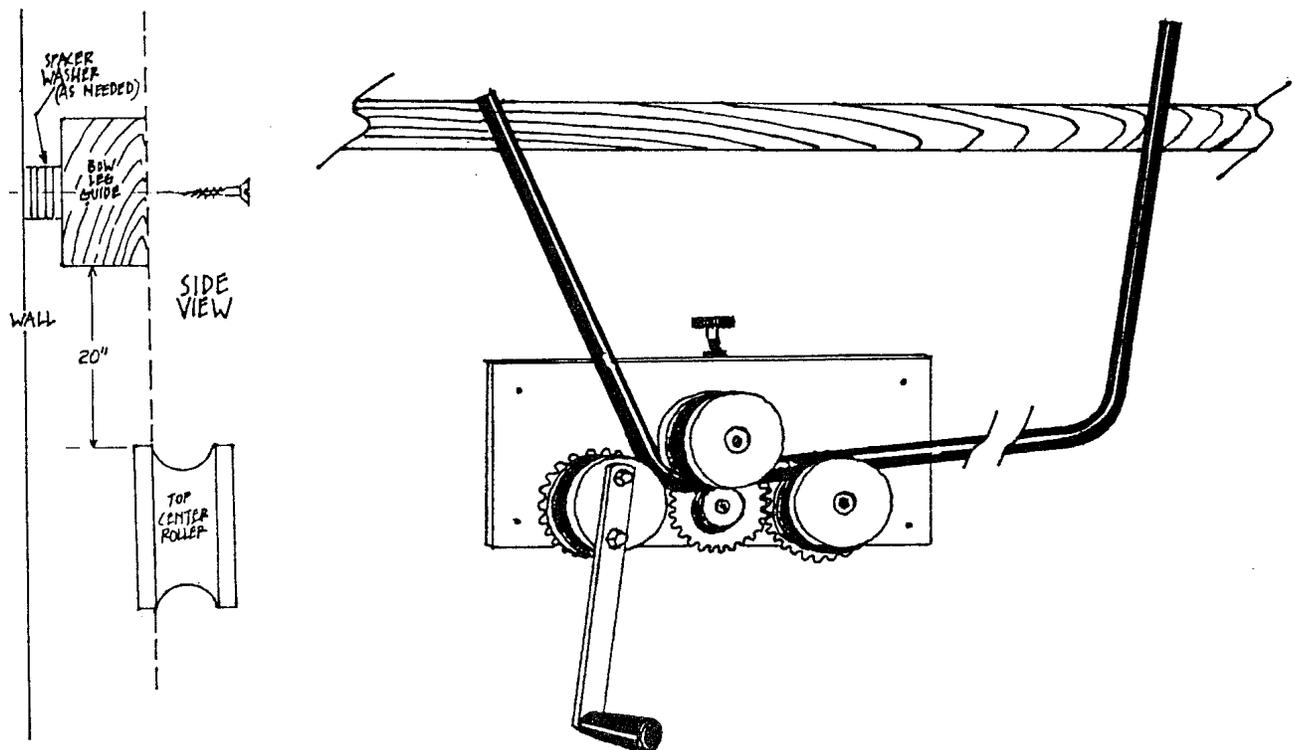
Columbus, OH USA

(614) 235-8181 Fax (614) 235-6030 bendarc.com

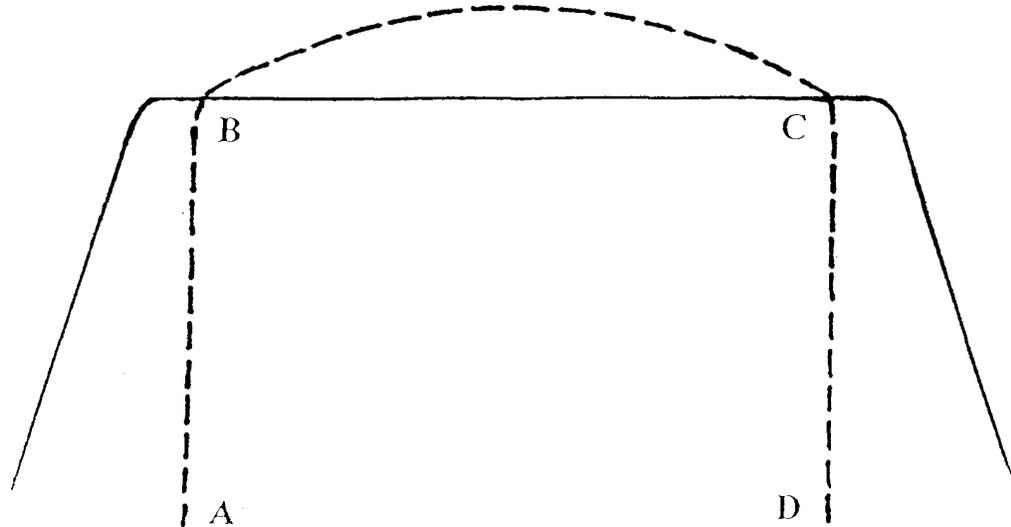
## **A WELL PLACED PIECE OF WOOD CAN MAKE YOUR NEW CROWNARC WORK EVEN BETTER.**

Screw a piece of wood to the wall about 20 inches above the **CROWNARC**. Be sure it projects out from the wall just enough so the legs of your bow are exactly straight up when resting against the wood. (Not tipped in or out)

While you are cranking the bow through the **Crownarc**, be sure the legs lightly brush the wood. That way your finished bow will be crowned straight up, not tipped fore or aft. You can crank with your right hand and hold a bow leg lightly against the guide board as you push with your left hand.



**A note for "lefties": The lower wheels are easily reversible.**



## Here's a basic way to calculate your bow:

When you crown your bow, you must allow for the arch. The crown (an upward curve in the B to C dimension) allows water to drain off the finished top. Crowning creates 2 changes: The B to C dimension (the width) shrinks, and the legs drop.

To allow for the "shrink" in width (B to C), try adding 1/2" for every 15" of width. Example for a bow that's 75" wide:  $75/15 = 5$ .  $1/2 \times 5 = 2\ 1/2$ .  $75 + 2\ 1/2 = 77\ 1/2$ . So in this case measure, cut & bend the bow as if it were 77 1/2" wide, because when you crown the width will shrink toward the 75" you really need. This is a guide not a hard rule. If you want a higher crown, try adding 1/2" for each 12" of width.

Crowning also drops the legs so **leave them high!** You can bend the legs down more, later if needed, but you can't raise them once they are bent.

1. Measure the distance from A to B, from B to C, and from C to D and total these 3. (Remember, the B to C dimension is always increased to allow for the crown – see above)
2. Subtract from this number:
  - 5" for a 6" radius Bendarc
  - 6<sup>7</sup>/<sub>8</sub>" for an 8" radius Bendarc
  - 8<sup>1</sup>/<sub>2</sub>" for a 10" radius Bendarc
  - 10<sup>1</sup>/<sub>4</sub>" for a 12" radius Bendarc
3. Cut a piece of tubing that long and mark the midpoint.
4. Put the tubing in your Bendarc and align the midpoint mark with the number on the scale that's the same as the adjusted B to C distance (the width). Clamp & bend a leg.
5. Turn the tube around; align the midpoint mark on the scale again and bend the 2nd leg.
6. It's important that the 1<sup>st</sup> leg bent is straight down when it's turned so that the 2<sup>nd</sup> leg will come down in line with the 1<sup>st</sup>. Accurate guide boards will help.
7. If you're bending matching bows, each one must follow the same crown pattern as the 1<sup>st</sup> one. Example: You turn the adjusting bolt down 3/4 turn, then turn it down another 3/4 turn on the 2<sup>nd</sup> pass, and then 1/2 turn on the 3<sup>rd</sup> pass to get the crown you want. Each matching bow must follow the same sequence.

## CROWNARC Instructions - Page 4

The greatest problem when bending boat top frames is allowing for the crown. When you crown (rolling in an upward curve for water drainage) the angle of the leg bend increases. (The legs drop.) The overall width also decreases from the upward thrust of the crown, see figure 1. Experienced fabricators have learned, through sometimes expensive trial and error, how to get close. They've learned how to allow for the changes caused by crowning, but even experienced "pros" occasionally misjudge the leg-drop or width-shrink caused by the crown.

Our consultant, Professor Michael Shaevitz, developed a formula to calculate these two critical variables which has been made more user friendly by Professor Shaevitz's application chart.

### Here's how to bend a bow using the chart:

Suppose you'd like to bend a bow that has a finished width after crowning of 72" with crown height of 8" a leg length of 40" and a leg angle of 90°.

1. Divide the crown height by the finished width.  $8 \div 72 = 0.111$ .
2. Find the number on the top line of the chart closest to 0.111. It is 0.110.
3. Under 0.110 note the angle change - 24.8 or rounded off about 25°.
4. You will "under-bend" the legs by 25°. Instead of a 90° bend, bend them 65°.
5. The last number under 0.110 (1.0320) is the ratio of full width to finished width. Multiply the finished width by the ratio to get the width before crowning.  $72 \times 1.0320 = 74.304$  or about  $74\frac{3}{8}$ ". You will bend your bow  $74\frac{3}{8}$ " wide to get the finished width of 72" after rolling in an 8" crown. You're now ready to measure and cut the tubing.
6. Add the 2 leg lengths to the "before crowning width"  $40+40+74\frac{3}{8} = 154\frac{3}{8}$
7. Deduct for the corner radius of your bender. For example, if you're using an 8" Bendarc deduct  $6\frac{7}{8}$ " as a corner allowance.  $154\frac{3}{8}" - 6\frac{7}{8}" = 147\frac{1}{2}"$ . Cut off  $147\frac{1}{2}"$  of tubing.
8. Mark the midpoint and align the midpoint with  $74\frac{3}{8}"$  on the width scale.
9. Clamp and bend your leg 65°. Turn the half-bent bow around line up the midpoint on the scale again and bend the other leg to 65°.
10. Insert the corner of the bow in your Crownarc. Drop the center roller 1/2 to 1 turn below level and crank through to the other corner. Drop the center again and continue to "rock" back and forth until you have the 8" crown.

The crown 'shrinks' the width to 72" and 'drops the legs to 90°.

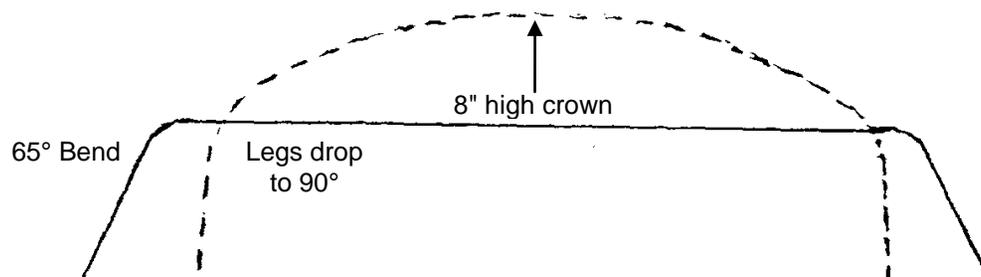


Figure 1.

**Angle and Length Changes for Bowing a Length of Material**

9/26/94

- Directions: 1) Calculate the ratio of the crown height to the finished width.  
 2) Find the appropriate entries in the table for the angle change and length ratio  
 3) Multiply the length ratio by the finished width to obtain the Full Length

<b>Crown/Finished Width</b>	0.005	0.010	0.015	0.020	0.025	0.030	0.035	0.040	0.045	0.050
<i>Angle Change (Degrees)</i>	1.1	2.3	3.4	4.6	5.7	6.9	8.0	9.1	10.3	11.4
<i>Full Length / Finished Width</i>	1.0001	1.0003	1.0006	1.0011	1.0017	1.0024	1.0033	1.0043	1.0054	1.0067
<b>Crown/Finished Width</b>	0.055	0.060	0.065	0.070	0.075	0.080	0.085	0.090	0.095	0.100
<i>Angle Change (Degrees)</i>	12.6	13.7	14.8	15.9	17.1	18.2	19.3	20.4	21.5	22.6
<i>Full Length / Finished Width</i>	1.0080	1.0096	1.0112	1.0130	1.0149	1.0170	1.0192	1.0215	1.0239	1.0265
<b>Crown/Finished Width</b>	0.105	0.110	0.115	0.120	0.125	0.130	0.135	0.140	0.145	0.150
<i>Angle Change (Degrees)</i>	23.7	24.8	25.9	27.0	28.1	29.1	30.2	31.3	32.3	33.4
<i>Full Length / Finished Width</i>	1.0291	1.0320	1.0349	1.0380	1.0412	1.0445	1.0479	1.0515	1.0552	1.0590
<b>Crown/Finished Width</b>	0.155	0.160	0.165	0.170	0.175	0.180	0.185	0.190	0.195	0.200
<i>Angle Change (Degrees)</i>	34.4	35.5	36.5	37.6	38.6	39.6	40.6	41.6	42.6	43.6
<i>Full Length / Finished Width</i>	1.0629	1.0669	1.0711	1.0754	1.0798	1.0843	1.0889	1.0936	1.0985	1.1035
<b>Crown/Finished Width</b>	0.205	0.210	0.215	0.220	0.225	0.230	0.235	0.240	0.245	0.250
<i>Angle Change (Degrees)</i>	44.6	45.6	46.5	47.5	48.5	49.4	50.3	51.3	52.2	53.1
<i>Full Length / Finished Width</i>	1.1085	1.1137	1.1190	1.1244	1.1300	1.1356	1.1413	1.1471	1.1531	1.1591
<b>Crown/Finished Width</b>	0.255	0.260	0.265	0.270	0.275	0.280	0.285	0.290	0.295	0.300
<i>Angle Change (Degrees)</i>	54.0	54.9	55.8	56.7	57.6	58.5	59.4	60.2	61.1	61.9
<i>Full Length / Finished Width</i>	1.1653	1.1715	1.1778	1.1843	1.1908	1.1975	1.2042	1.2110	1.2179	1.2250

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## Here's how to adjust the Slide Block Assembly behind the center roller:

1. Loosen the set-screw on the back side of the Crownarc behind the center roller.
2. Tighten the center roller shoulder bolt from the front until the roller cannot slide.
3. Loosen the center roller shoulder bolt enough to barely permit up & down sliding.
4. Tighten the set screw in the rear to lock the adjustment in place.
5. Lubricate all sliding parts with axle grease when new and yearly.

The objective is to tighten the center roller's up & down motion as much as possible using the procedure above. The tighter the sliding mechanism, the less wobble there will be in the center roller. Less up & down wobble yields truer, straighter crowns. (Side to side movement doesn't matter.)

## Crownarc Maintenance

Remove the 3 rollers.

Apply a film of axle grease to the inside of the metal bushing and to the back of the steel gears as well as to the inside of the hole of the gears. Do not get grease on the plastic surfaces. Spray silicone on the center holes of the rollers.