Desktop Ballista Assembly Instructions

Revision 3

Hello, and thank you for puchasing the Desktop Ballista. This document will instruct you in how to assemble the ballista. Assembly should take about 30-60 minutes, although if you are assembling with a child, you should allow more time.

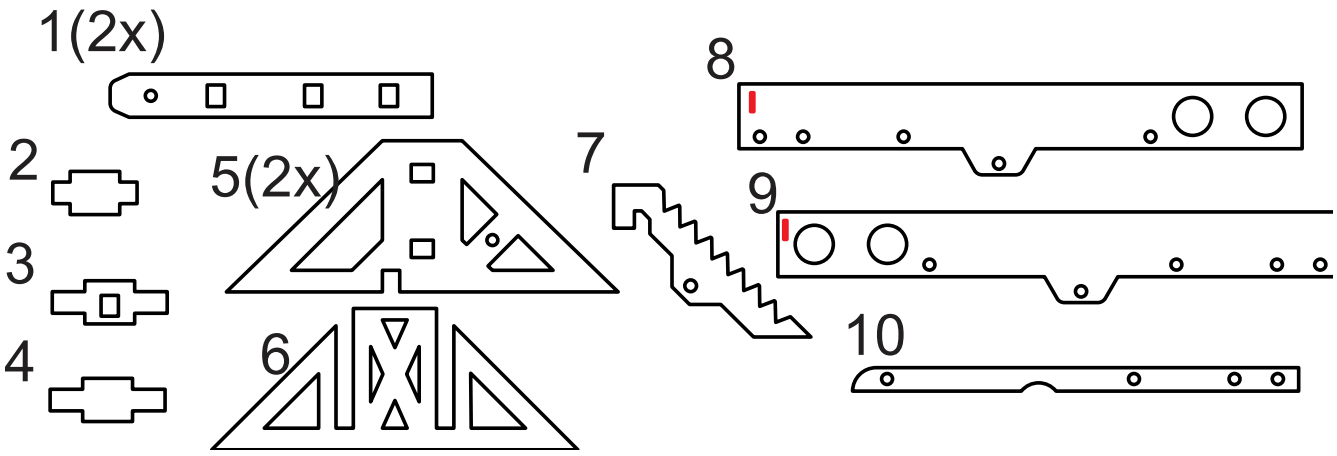
Tools/Materials you should have on hand to assemble:

- Pliers, needle nose are recommended
- Wood glue is recommended but is not required. The desktop ballista will assemble and stay together without glue. But wood glue will ensure a more permanent and solid assembly.
- Tweezers (not required but very helpful)

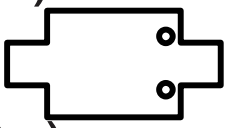
A Brief History: The ballista was a siege weapon invented by the ancient Greeks. The Romans later improved on the design and used it extensively in their armies. Ballistae (plural of ballista) was built in two general sizes. The larger version stood as much as 25 feet high and fired rounded stones and was used to batter down walls and fortifications. The smaller version was used by the smaller infantry units, called centuries (a unit of 100 soldiers) as an anti-personnel weapons. This smaller ballista was often called a "Scorpion". Modern day armies are organized much the same as ancient Roman armies. The Scorpion is similar to a machine gun that is attached to a relatively small unit like the infantry platoon (20-30 men generally). The larger ballista however, would be equivalent to a modern day mortar or light artillery piece which is used by larger units like a company (consisting of 4-6 platoons).

Parts list: You should have the following parts in your Desktop Ballista Kit

Wooden parts: Parts are numbered below to identify them. If there is more than one of a part, the number is indicated in parenthesis. As an example, there are quantity 2 of part 1 but only quantity 1 of part 7.



11(2x)



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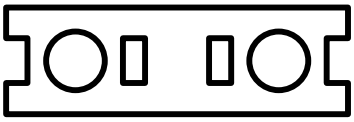

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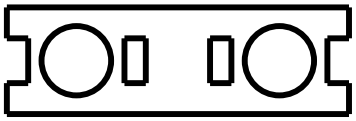
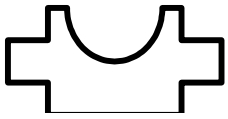


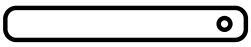
larger holes than item 11

14(4x)

15(2x)



16(2x)



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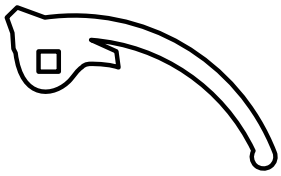

18(5x)

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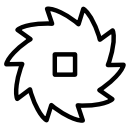

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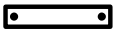

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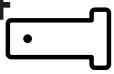

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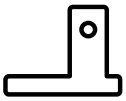

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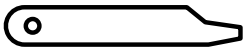

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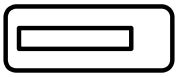
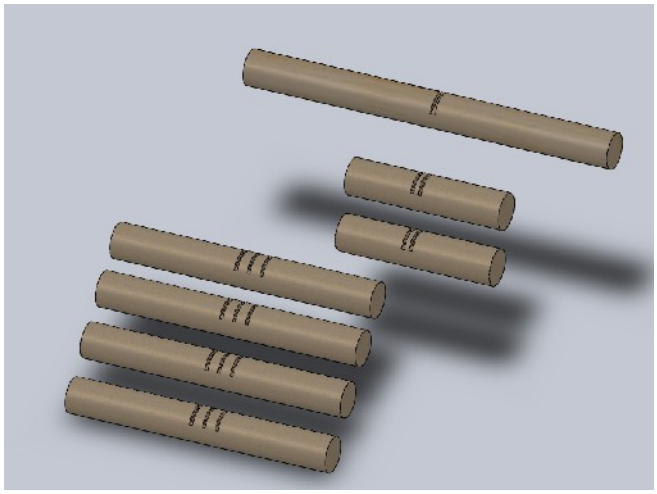


Other parts:

Dowels, wooden. 3 different lengths. Each have a mark on them. There are quantity 1 of the dowel with 1 mark, 2 of the dowel with 2 marks, and 4 of the dowel with 3 marks



Metal pins – quantity 5, brass colored metal

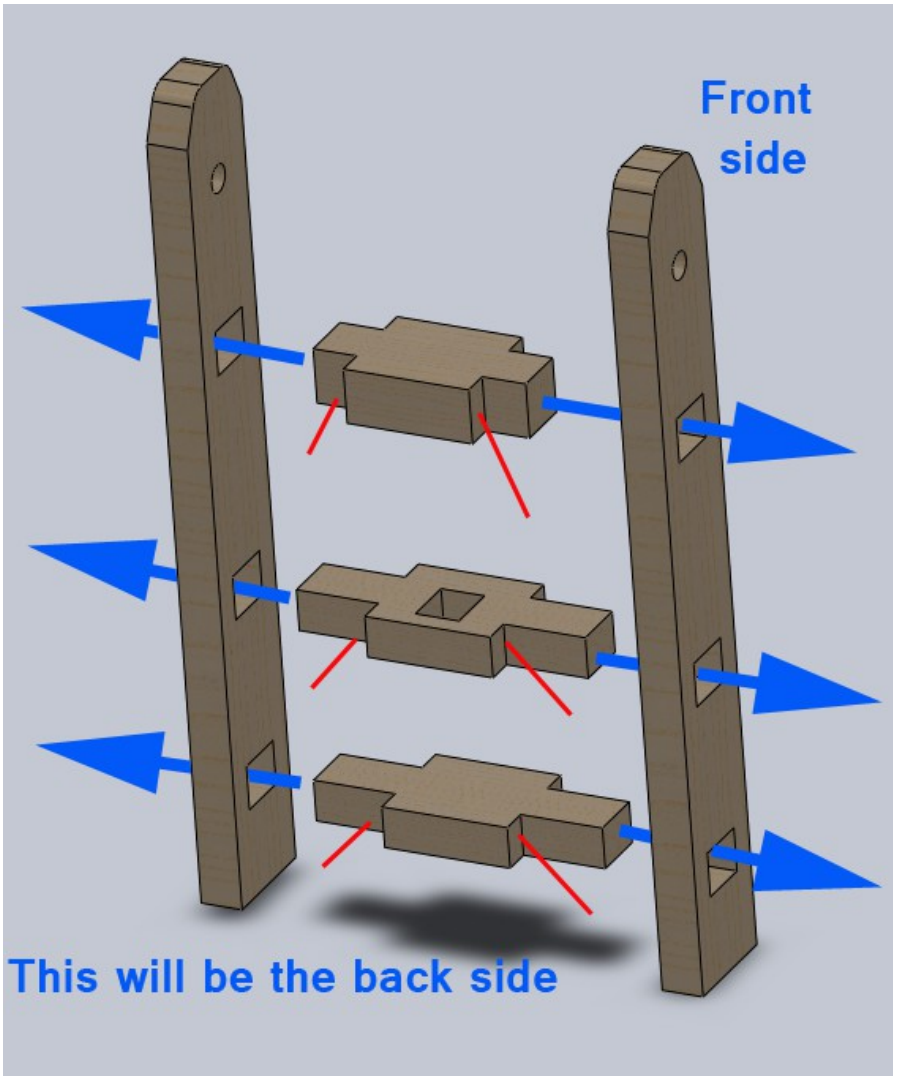
String pack (contains 2x 20-24 inch long, and 2x 12-15 inch long lengths)

Spring - The spring is no longer needed with the ballista. If you find a spring in your hardware pack, you will not need it. Some ballistas may be packed out with a small spring.

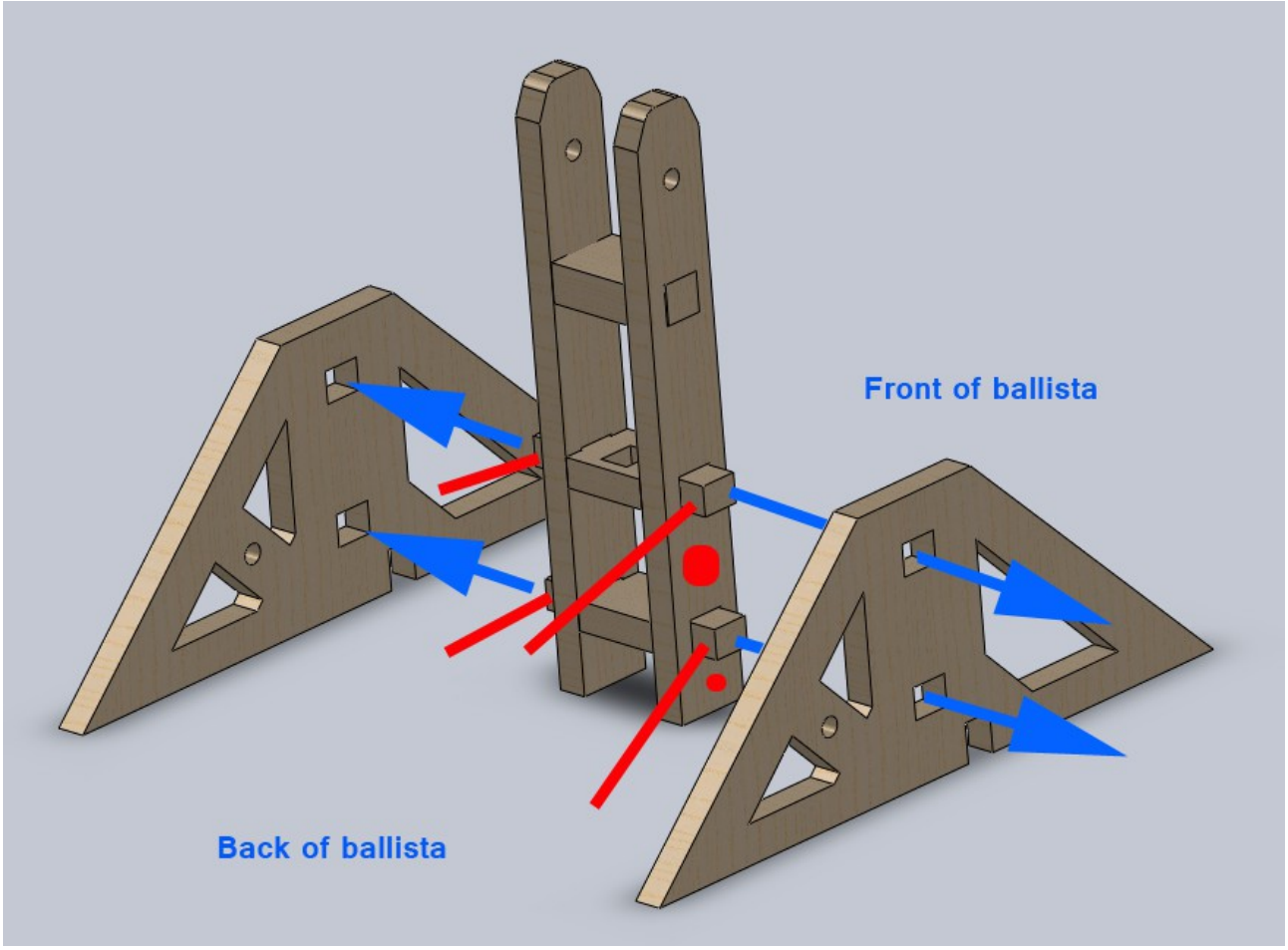
Assembly Steps:

Note about appearance. The wooden parts are cut by a laser, which results in a light burnt appearance on one side of the part. The parts were cut so that this light burnt side would be visible if only one side is turned up. You are encouraged to consider arranging your parts so that the most visible side is uniform for best appearance, but the decision to do this or not is yours.

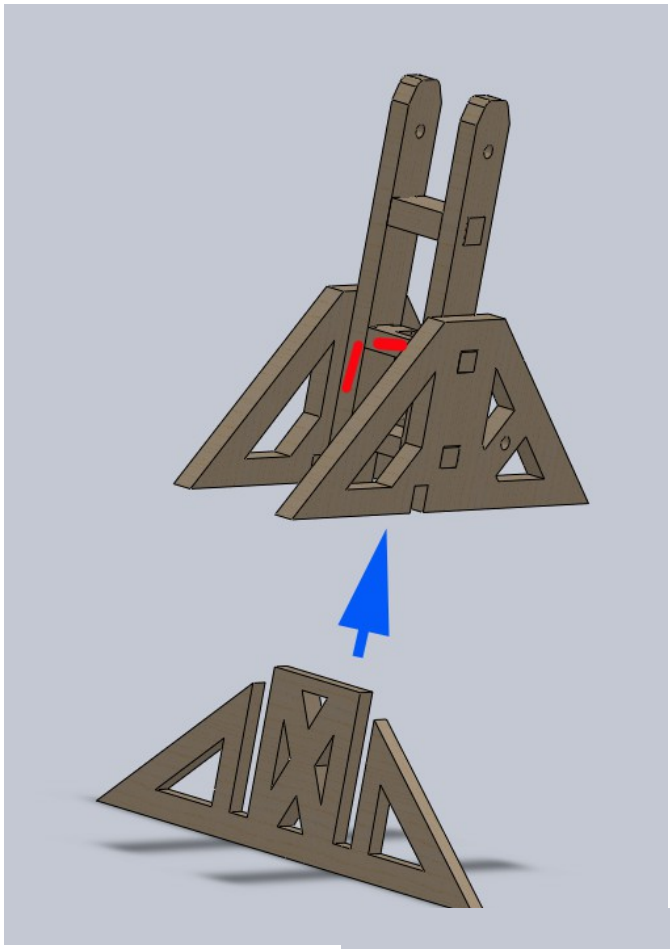
1) Assemble the mast, using the parts shown below. IMPORTANT: Part number 3, the middle horizontal part, has a hole in it that is not centered. It is closer to one side than the other. The side that it is closest to goes to the BACK of the ballista. **GLUE NOTE:** If you elect to use wood glue, place a small amount of glue at the points shown by red arrows on both sides of the parts, before assembling them. Wood glue is not required. The ballista will stand up and operate without gluing. Glue is optional and will result in a more solid unit, but will be permanent. The Romans made the ballista so that it could be disassembled for transport. So it is up to you to decide permanent installation or not.

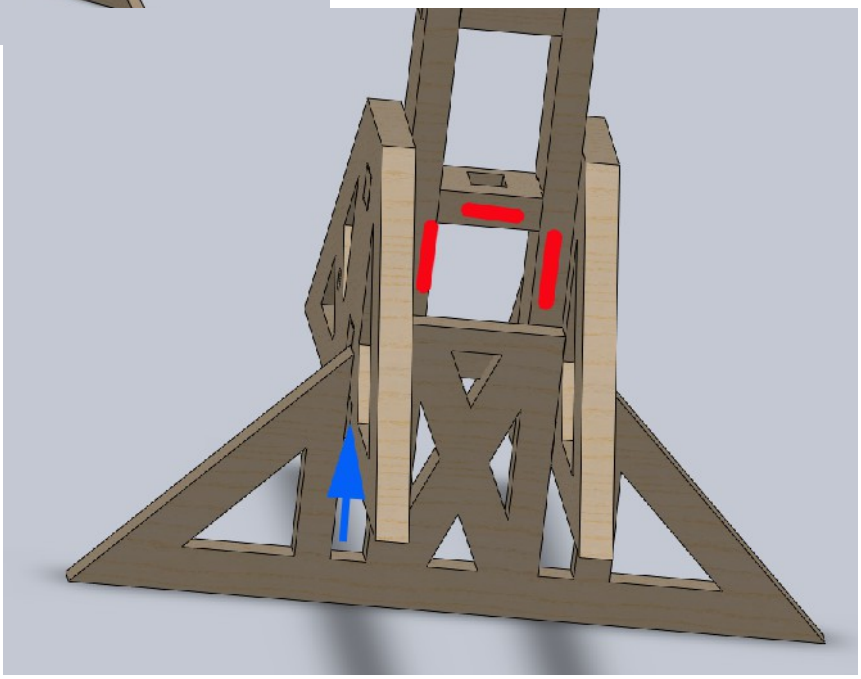


2. Insert the completed mast into the side feet parts. IMPORTANT: The notches in the side feet parts (part number 5) go to front of the ballista. Part number 3, the middle horizontal part in the mast has the hole closest to the back side of the ballista. If part number 3 faces to front of ballista, then the elevation ramp (part number 7) will not align properly. See step 4 to see how that part attaches. GLUE NOTE: If you use wood glue, the red arrows show the areas to apply wood glue.

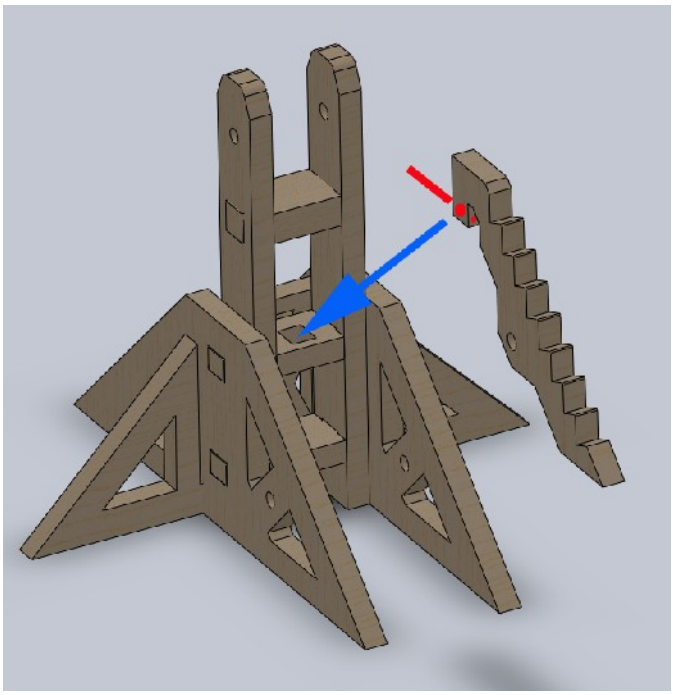


3. Insert the base foot front as shown. GLUE NOTE: If you are using wood glue, add wood glue as shown by areas in red.

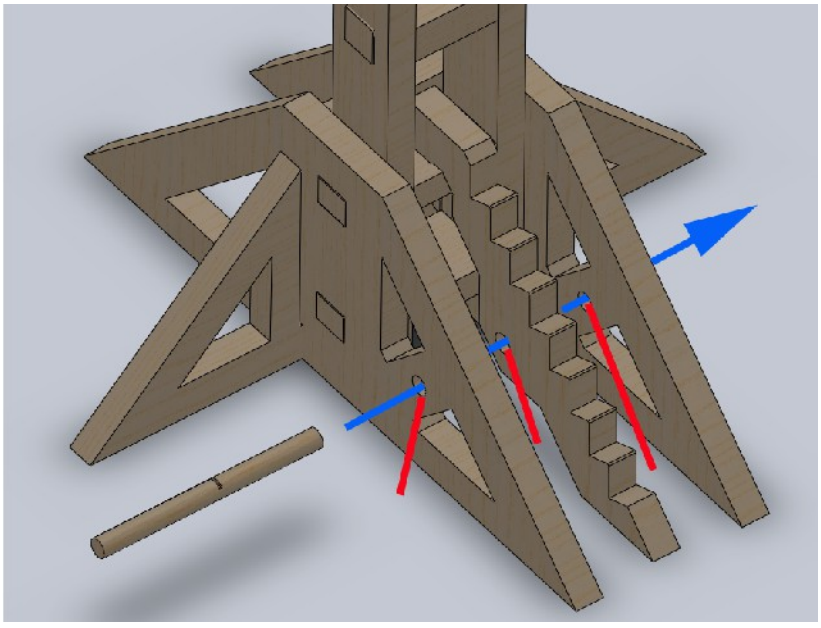




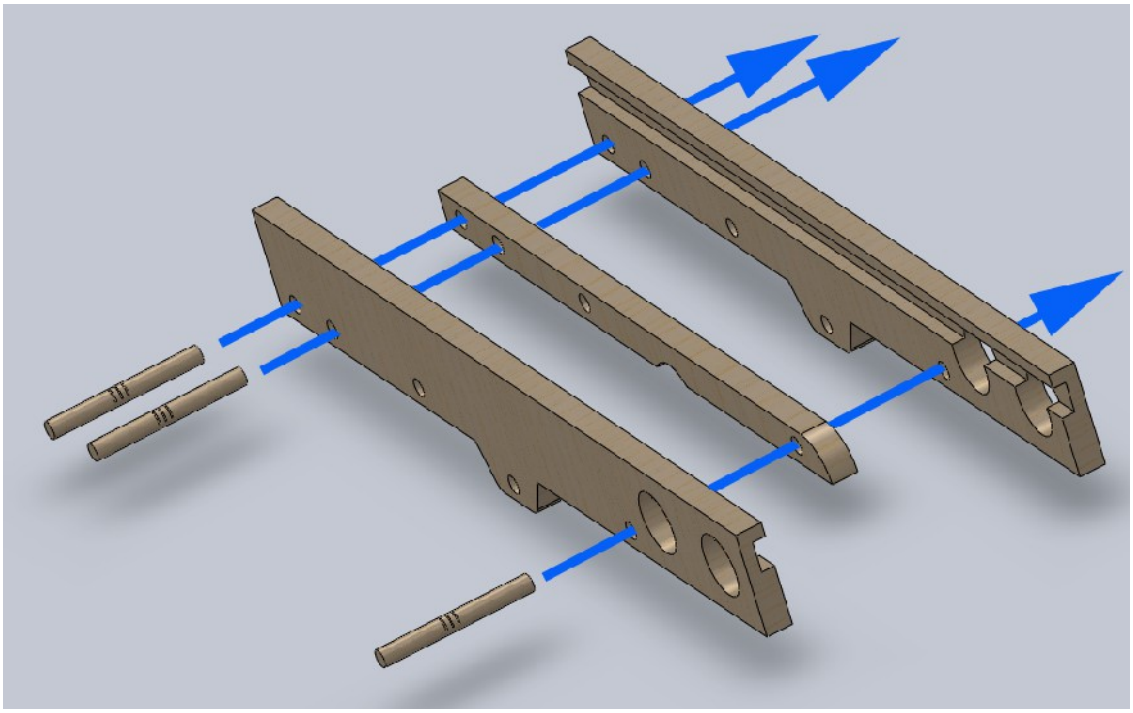
4. Insert the elevation ramp piece into the base as shown. If you do not have the hole in the middle horizontal part of the mast assembled correctly, the dowel holes for the elevation ramp (part number 7) will not line up. GLUE NOTE: If you use glue, place as shown by red.

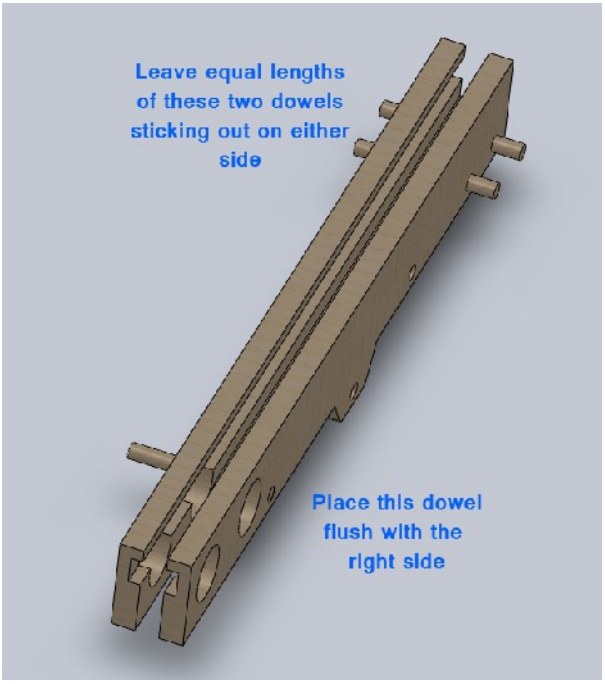


5. Insert the dowel with the one line mark (longest of the dowels) as shown to fix the elevation ramp in place. If you do not have the hole in the middle horizontal part of the mast assembled correctly, the dowel holes for the elevation ramp (part number 7) will not line up.GLUE NOTE: If you are using wood glue, place as shown by red lines into the dowel holes.

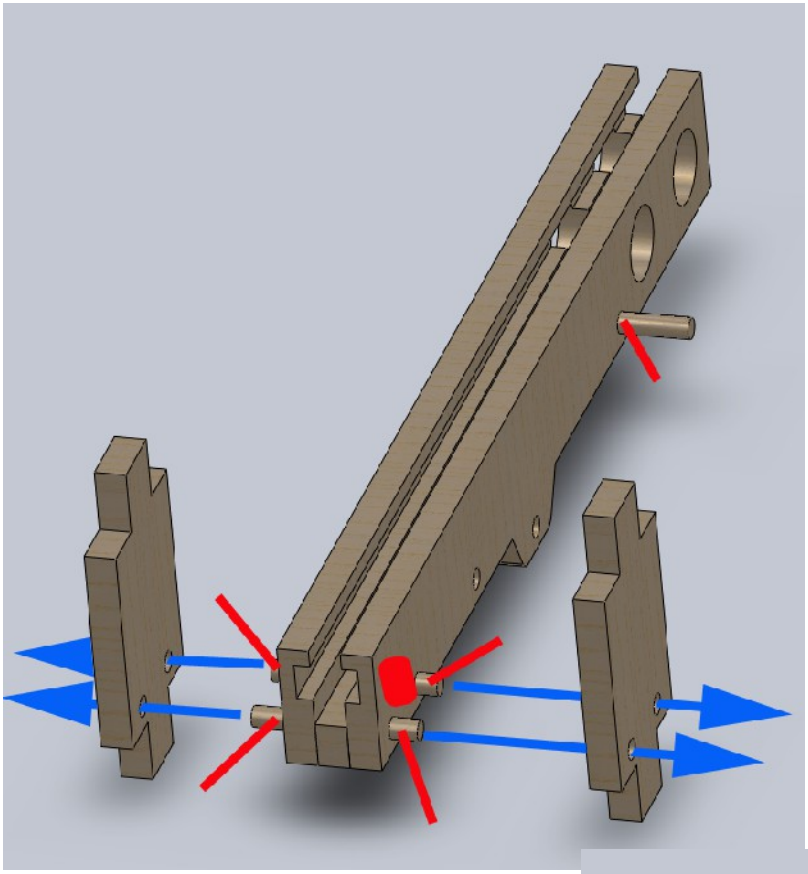


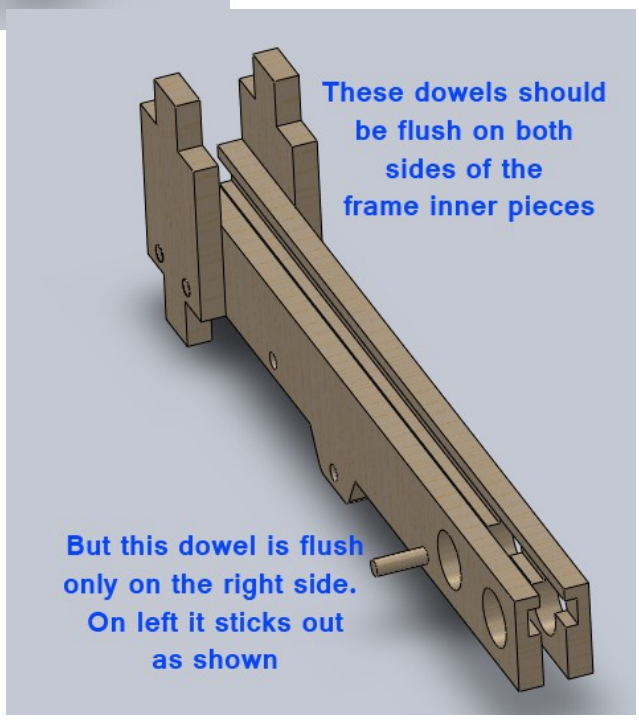
6. Assemble the “breech” with the parts shown below. Use 3 of the three line marked dowels to temporarily bind the 3 wooden parts together. Once you have them put together, leave equal lengths sticking out of either side on the front two dowels. But the rear dowel will end up flush on the right side. GLUE NOTE: **Do not glue these parts yet** as you may need to adjust them later.



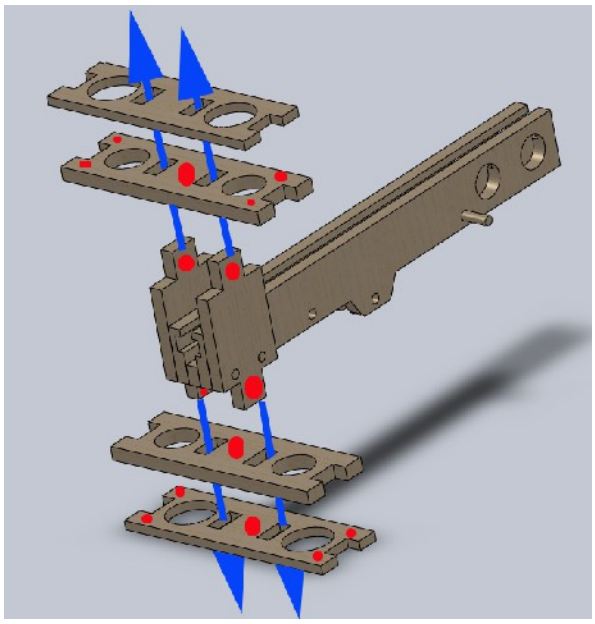


7. Add the frame inner pieces to the assembled breech as shown, inserting the dowels through the holes in the frame inner parts. GLUE NOTE: If you are using glue, apply glue to areas shown by red indicators. Apply only a small amount to the dowels. Once together, ensure that the 2 front dowel ends are flush on both sides but the rear dowel is only flush on one side.

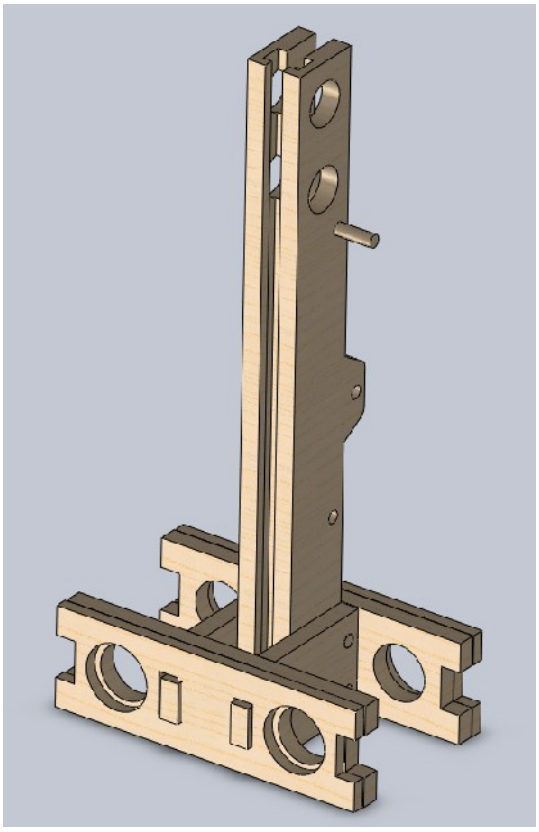




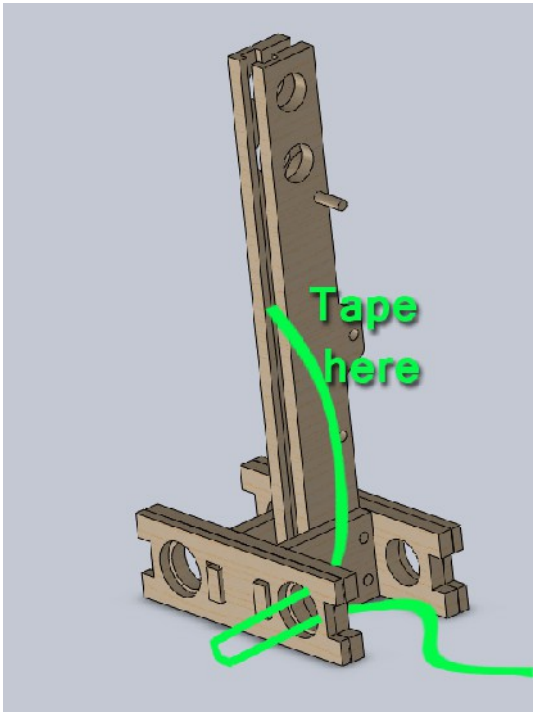
8. Add the frame horizontal pieces as shown. Note that the outside most pieces will be thinner material and will have a larger diameter circular hole than the inner most pieces. GLUE NOTE: If you are using glue, add to areas indicated in red.



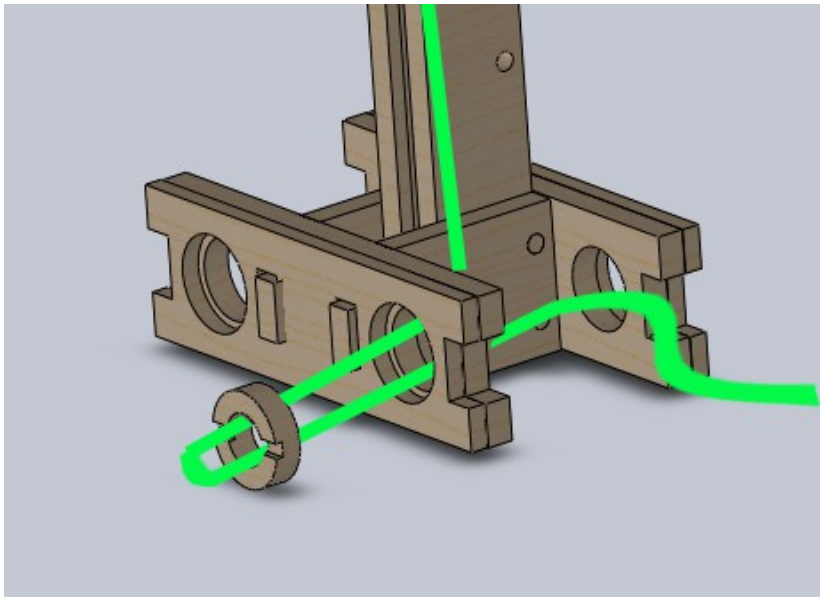
9. Stand the frame and breech assembly on end as shown



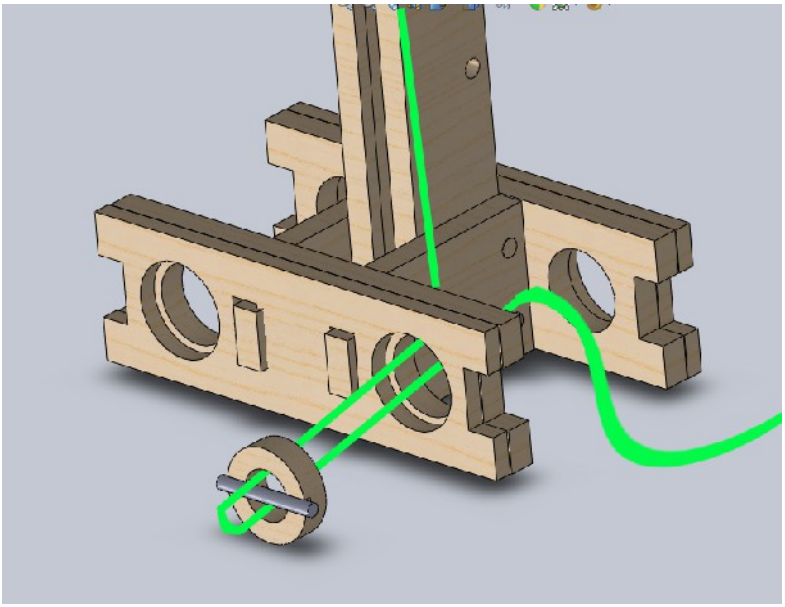
10. Find one of the two longest strings and untangle it completely. Tape one end of it to the breech body to hold it in place as shown. You can use plain cellophane tape for this. It does not need to be very strong. Form a loop and feed it through the round hole in the frame as shown.



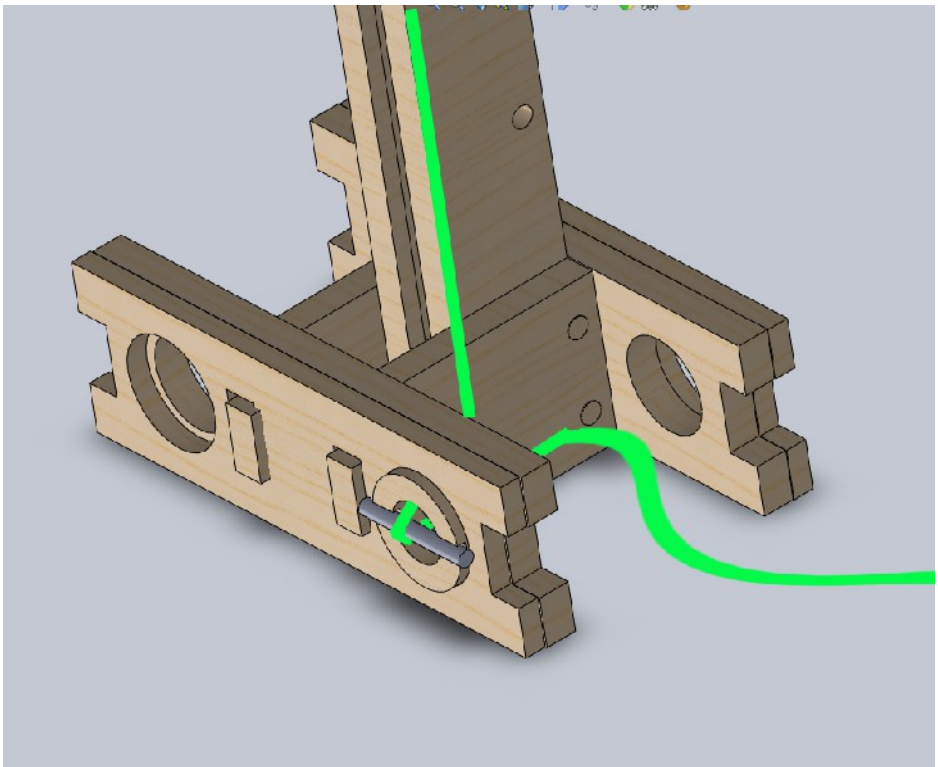
11. Find a round washer and thread the string loop through it.



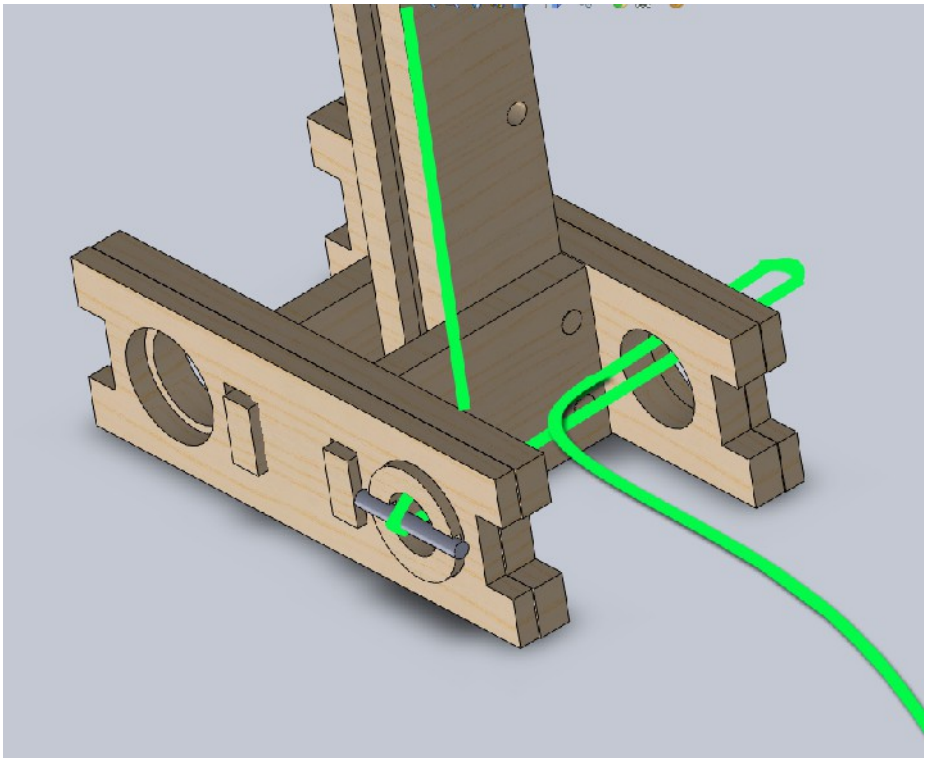
12. Then insert a steel bar through the loop.



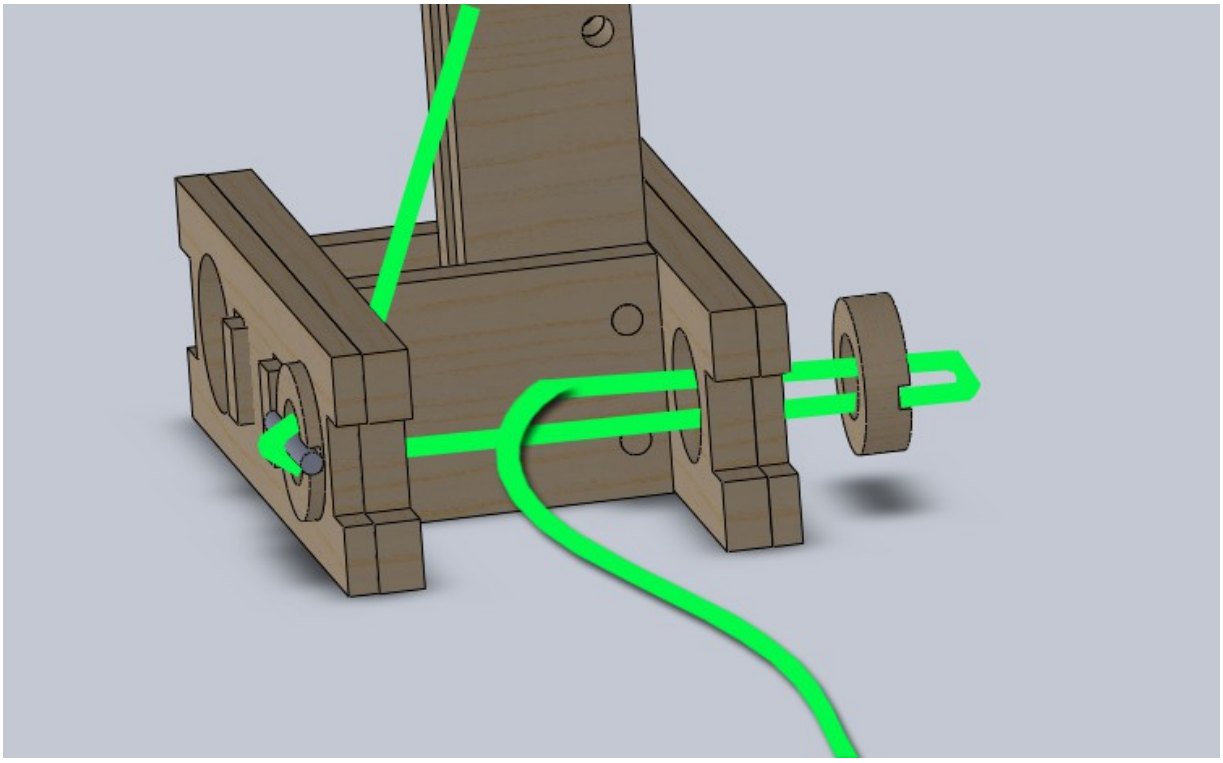
13. Gently pull the string until the washer and steel bar are pulled into the frame hole. Maintain tension on the string to keep the washer and steel bar in place as you do the next steps. You want to keep tension on the string throughout this process.



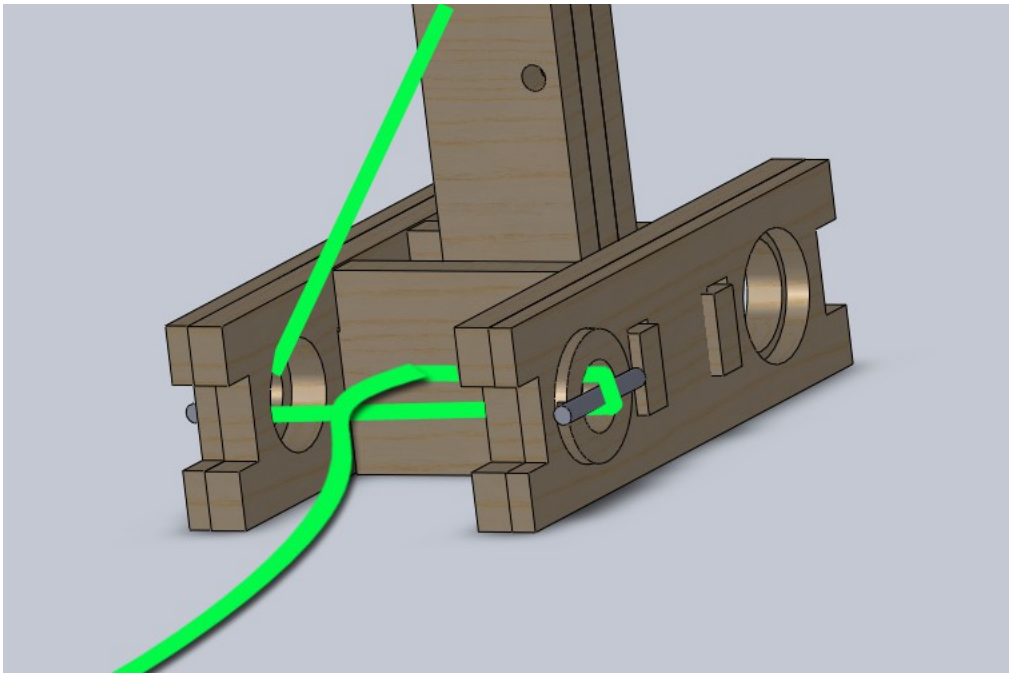
14. Form a loop and send through the frame hole on other side



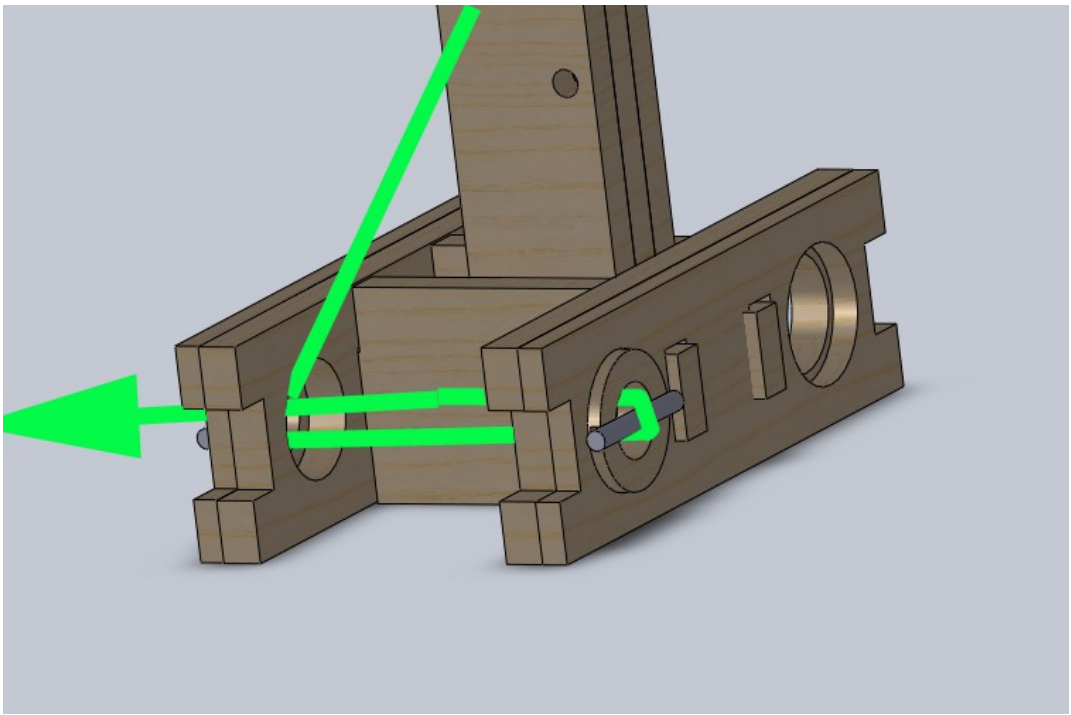
15. Thread this loop through another round washer on the other side of the frame as shown.



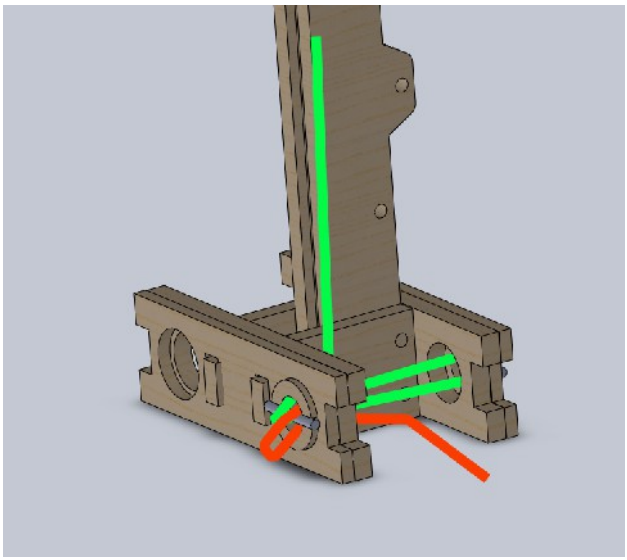
16. Insert another steel bar through the loop and tighten the string to pull the washer and steel bar into the frame as you did on the other side.



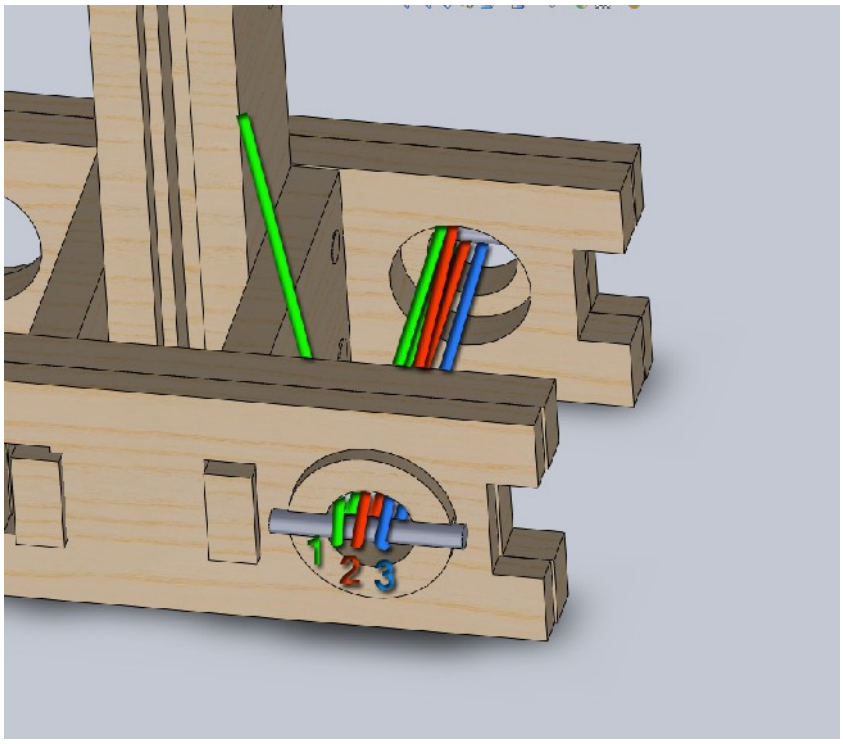
17. Then thread the end of the string through round hole in the washer and over the steel bar



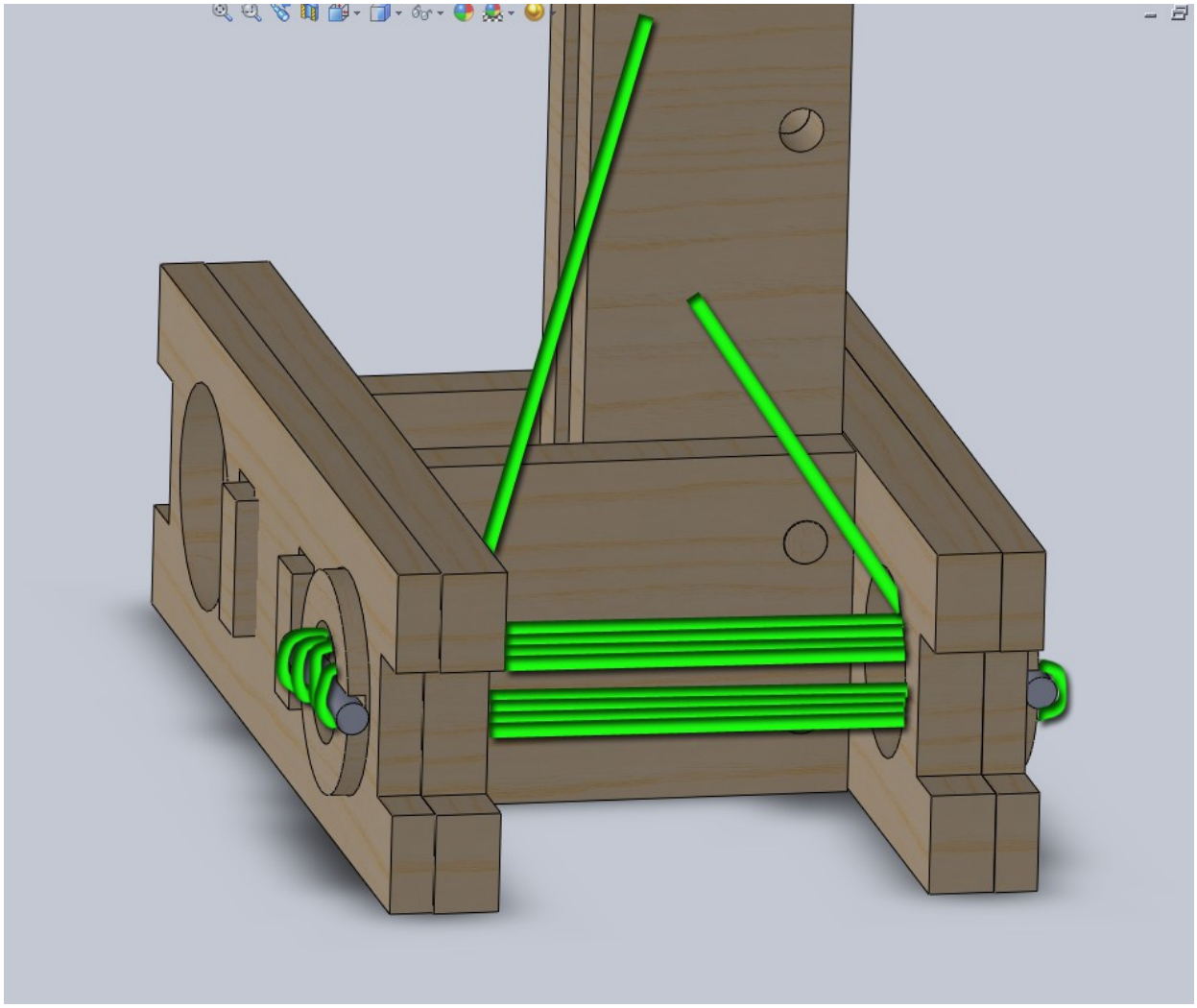
18. The color of the string in the illustration changes from green to red to show the transition from loop number 1 to loop number 2. This looping path is repeated to create 4 to 5 total loops.



You want to keep the string under tension as you wrap and try to not let the string stack over itself. Rather, you want each loop where it passes around the steel bar to be separate. In the illustration below, the first loop is green, changing to red as it passes back through the washer closest to you, then to blue. Only 3 loops are shown for clarity. **Make 4 to 5 loops.**



19. In the illustration below, the different colors are removed and only a single color is used to show 4 loops with the end of the string finally coming through into the inside of the frame where the taped end is. You will join these two ends with a square knot. Do not cut off the excess string ends yet. You can remove the tape.



20. Repeat steps 10-19 for the other side of the frame.

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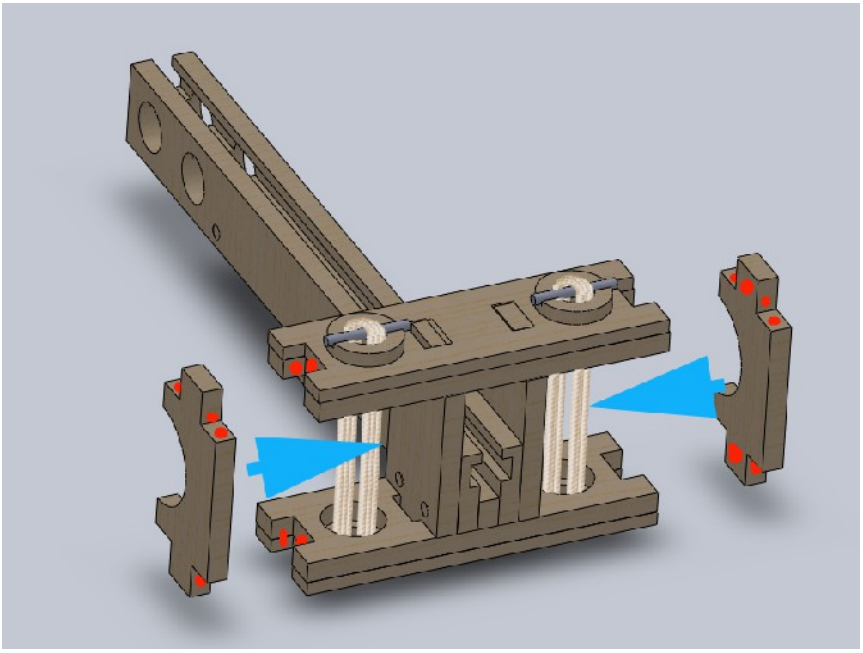
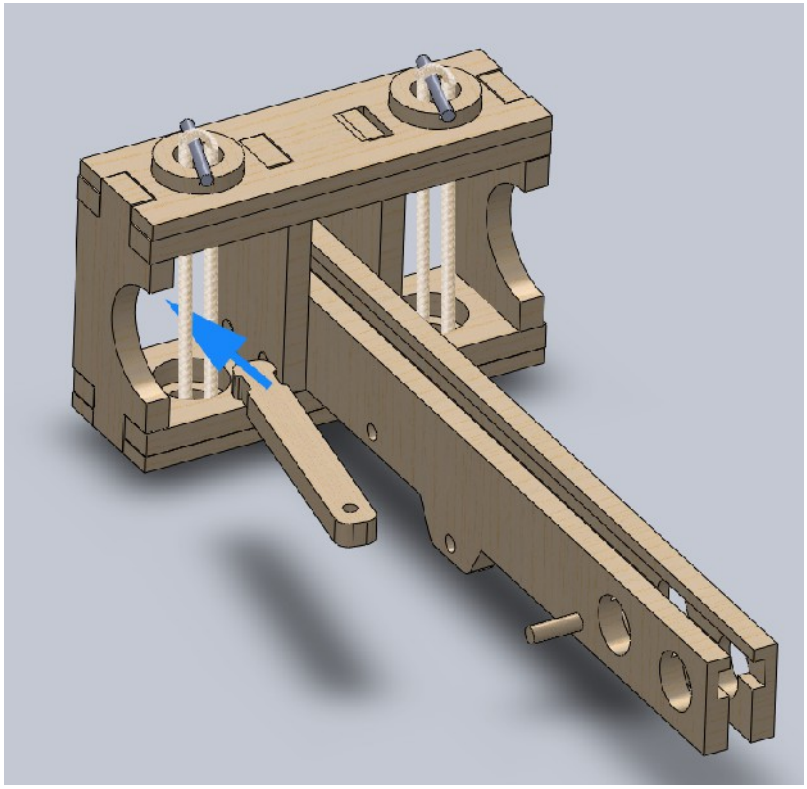
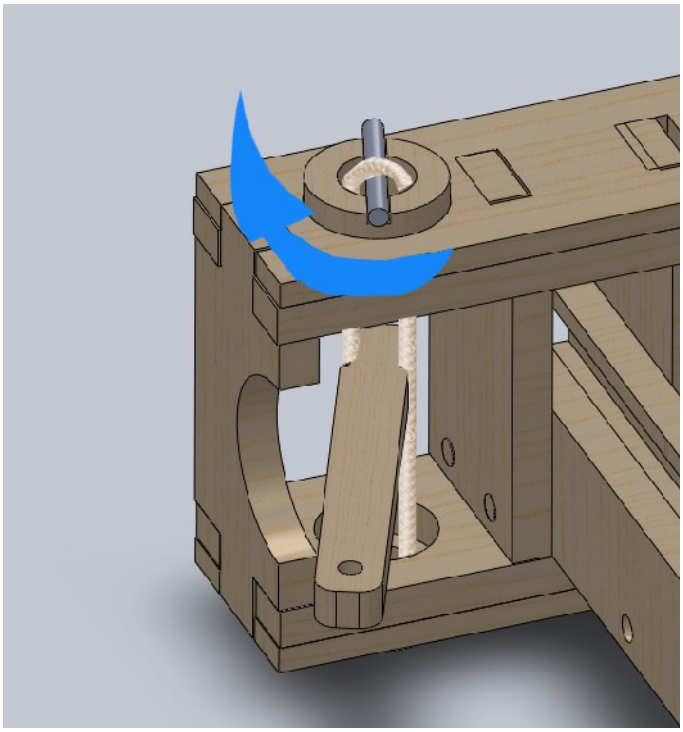
21. Add the frame outer pieces as shown (the curved cut out section faces to rear. GLUE NOTE: If you are using glue, add where shown in red.

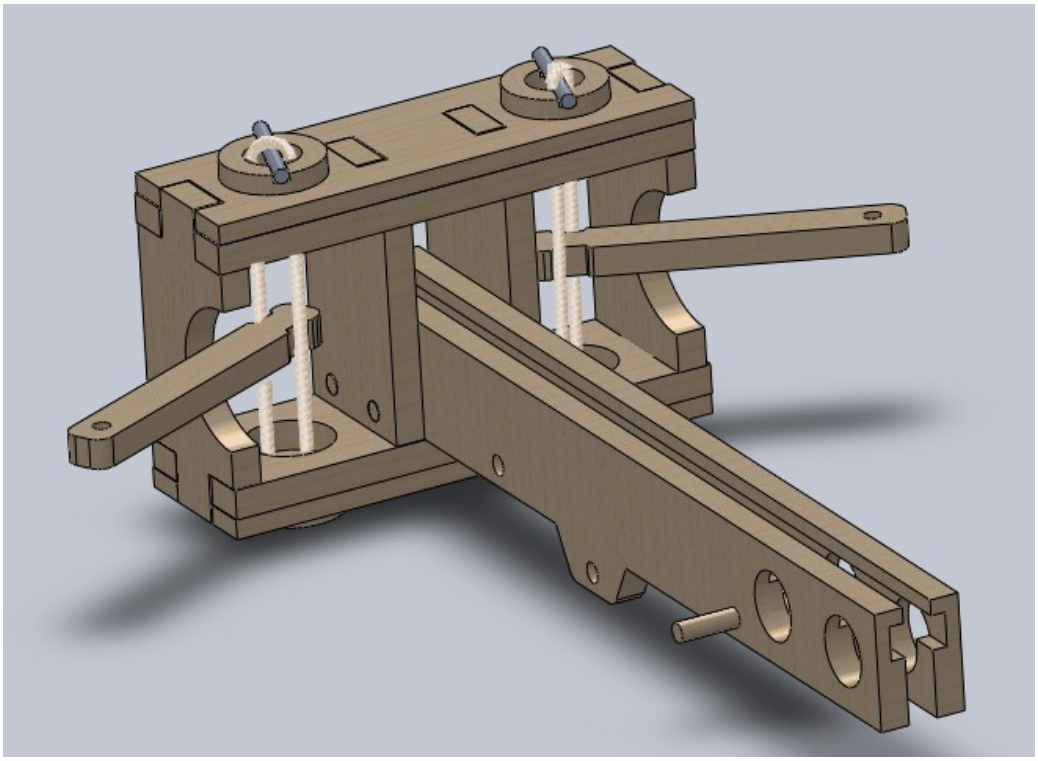


22. Insert an arm into the skein center as shown.

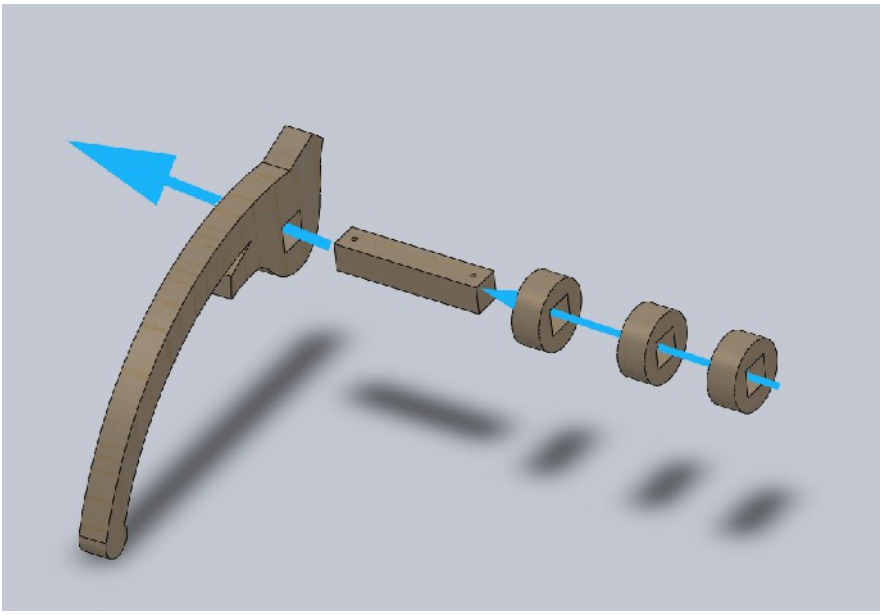


23. Turn the washer/steel bar so that a twist is created into the skein (string), causing the arm to rotate to the outside of the frame. Turn about 45 degrees at a time on both top and bottom washers, until the arm is against the outer frame.

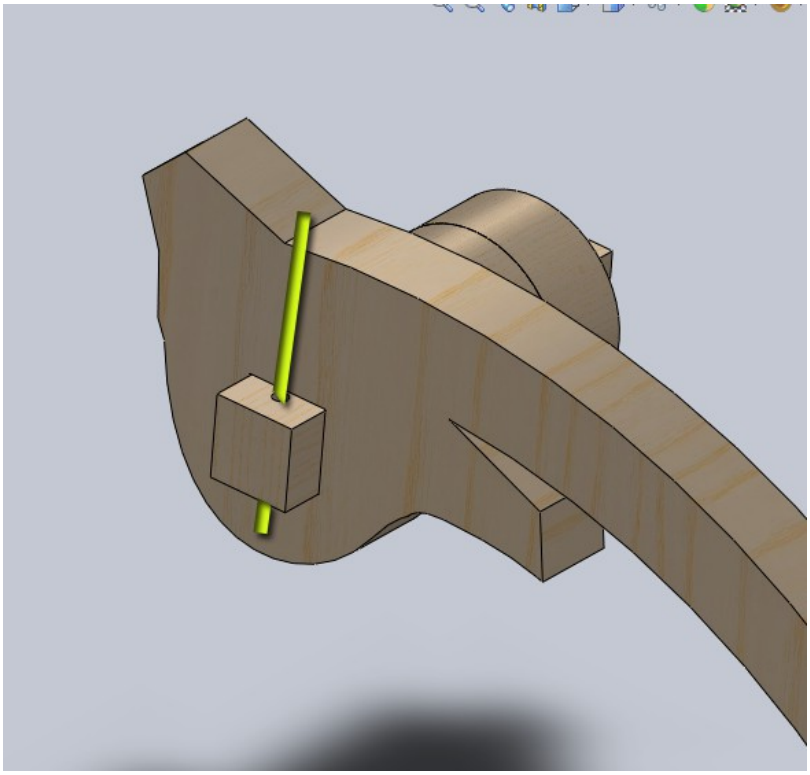




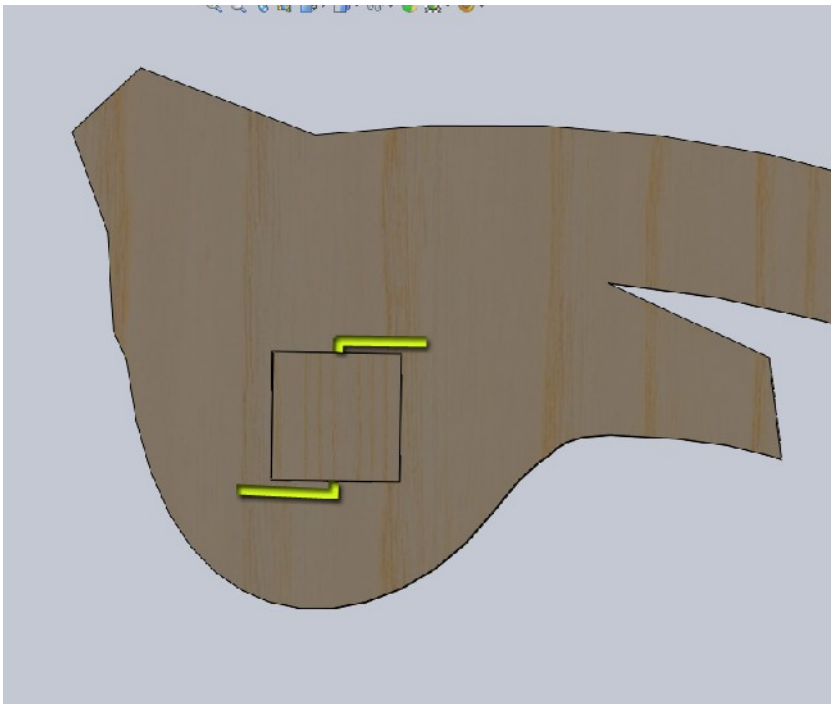
24. Assemble the pawl and its axle by sliding the pawl and 3 of the windlass drum pieces onto the pawl axle as shown.



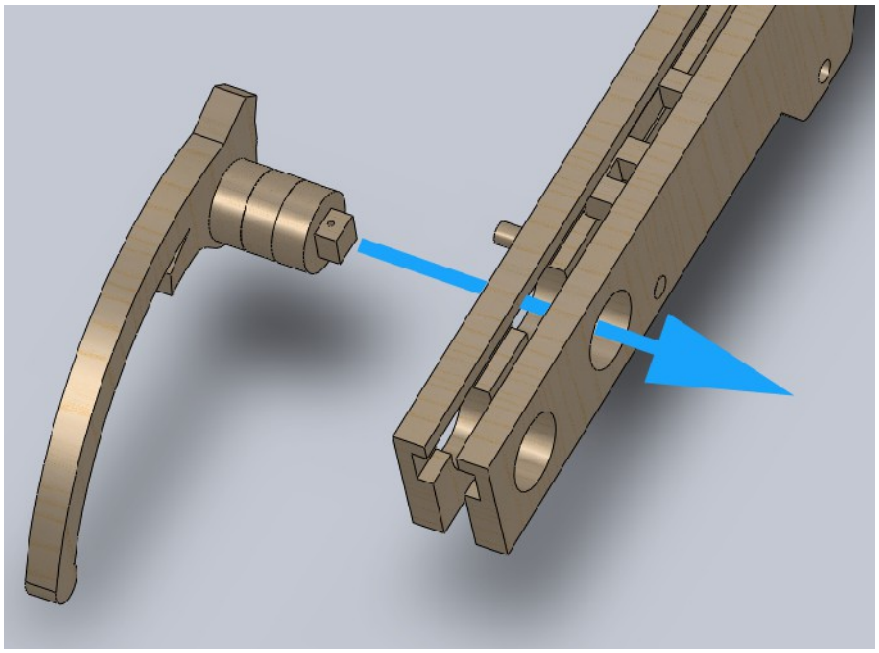
25. Insert one of the short metal rods into the pawl axle hole at end where the pawl is located.



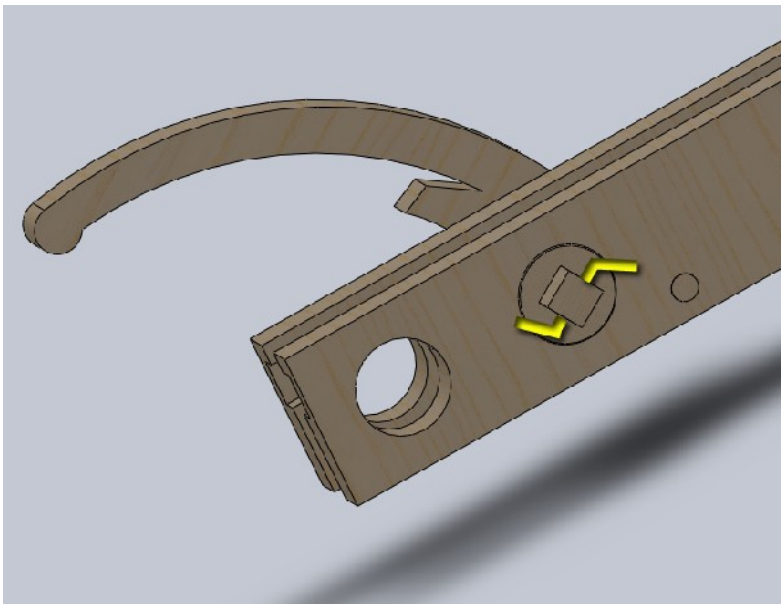
26. Bend the ends of the metal rod to hold the pawl onto the end of the pawl. Needle nose pliers are best for this, but the metal is soft enough to where this can be done by hand.



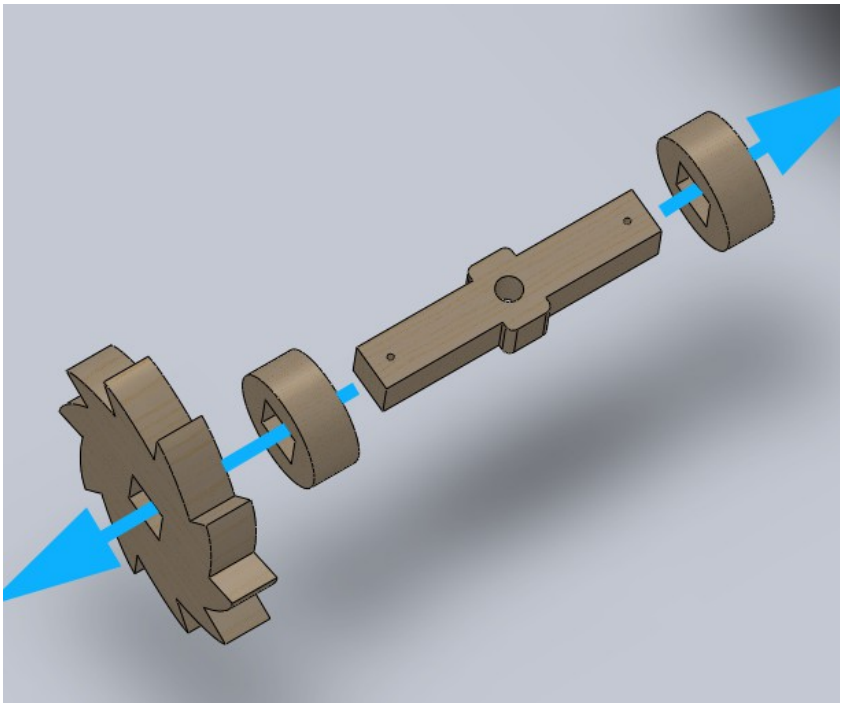
27. Insert the pawl and axle into the breech as shown.



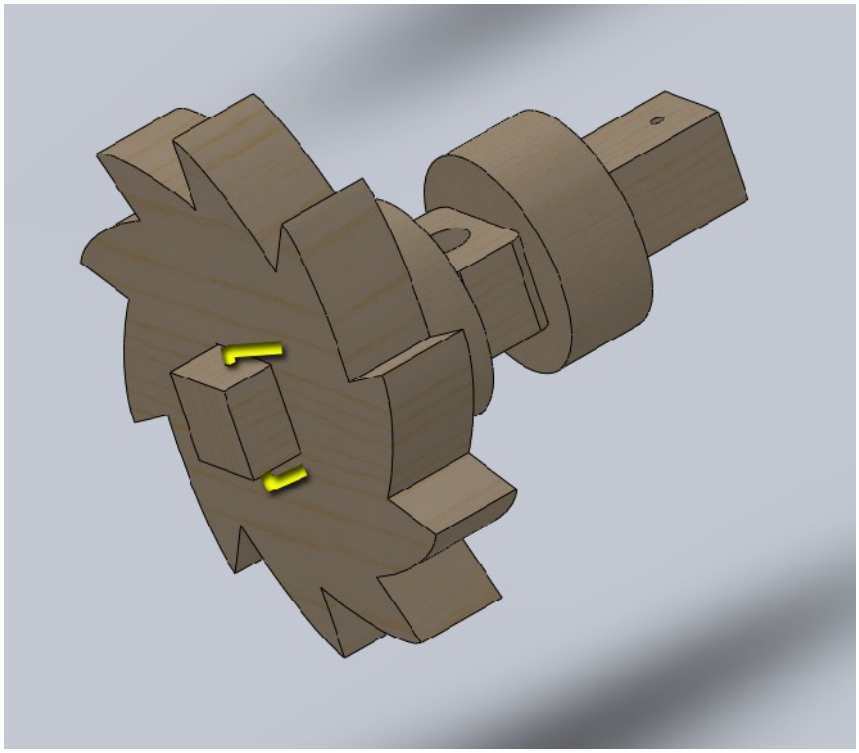
28. Insert another metal rod into the pawl axle on the other end in order to hold the windlass drum onto the axle. Note that you want to bend the wire so that the ends overlap the windlass drum and the breech part as shown. If you only bend around the axle, the entire pawl axle assembly can still slide out to the left.



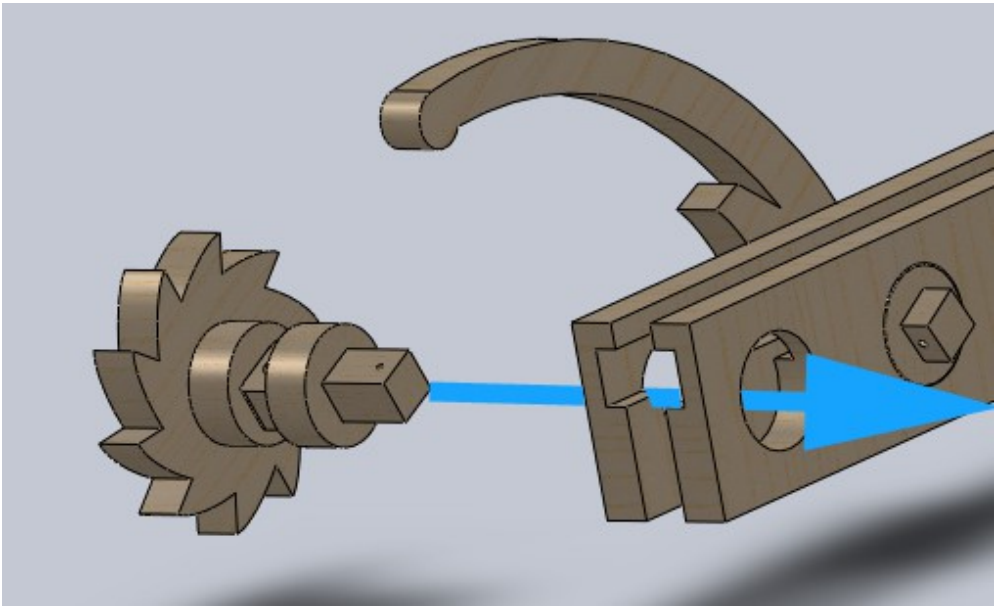
29. Assemble the windlass axle as shown using the ratchet gear, windlass axle and 2 windlass drums. Note the direction of the ratchet gear's teeth.



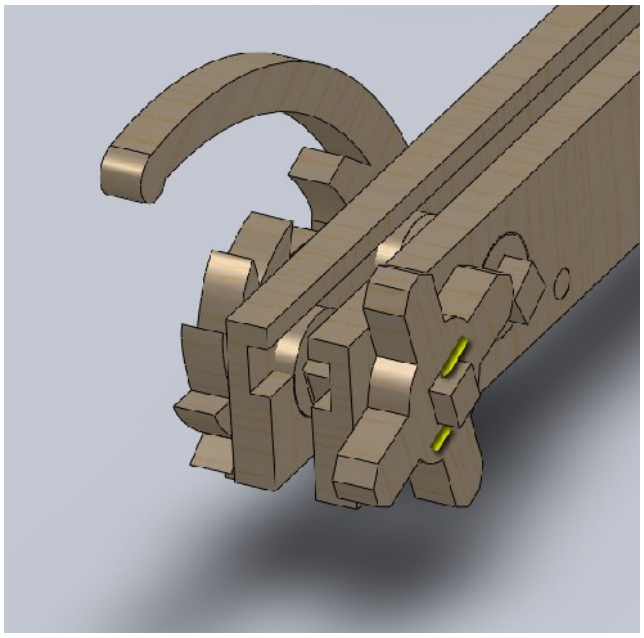
30. Fix the ratchet gear onto the axle using a metal rod.



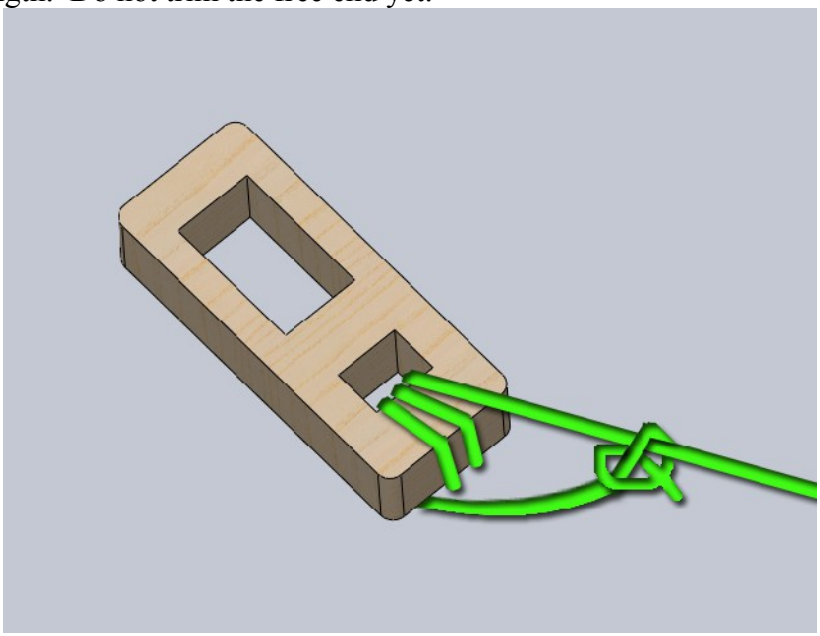
31. Insert the assembled windlass axle into the breech.



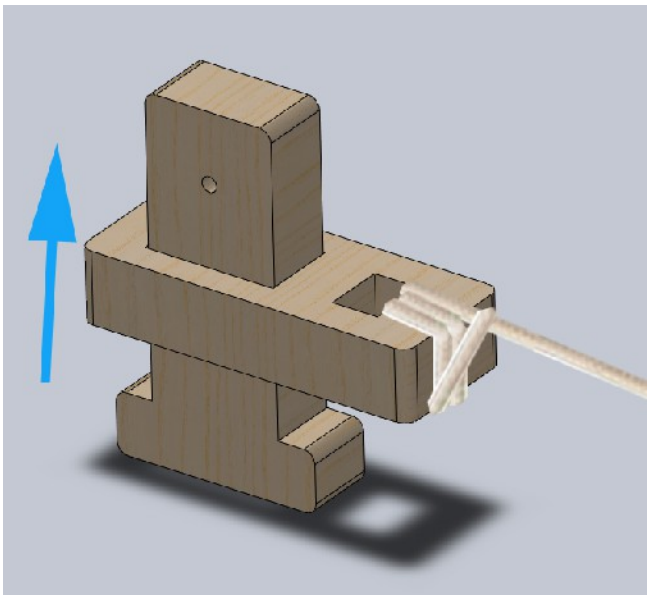
32. Add the windlass crank handle onto the end of the windlass axle and fix it in place with a short metal rod by bending the ends around the axle as you did on the side with the ratchet gear.



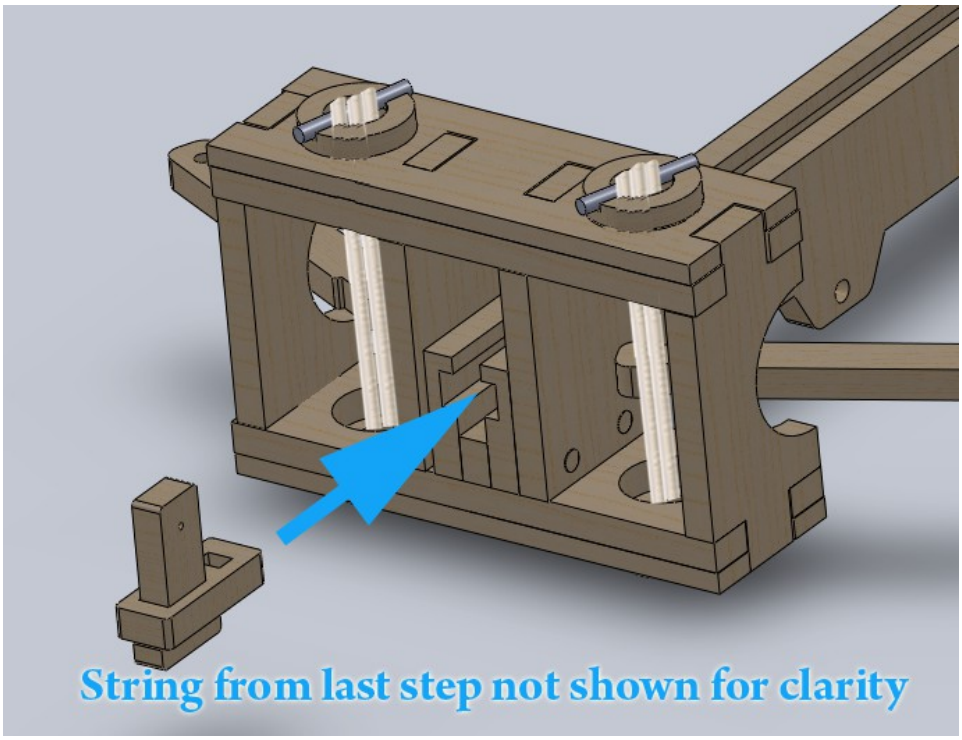
33. Tie one of the short strings onto the trigger's horizontal slide. You can use 2 turns and a half hitch type knot shown or use a bowline for more strength. Cinch the knot down to the wood and trim off the excess near the knot. The other end should be free hanging with at least 5 inches of length. Do not trim the free end yet.



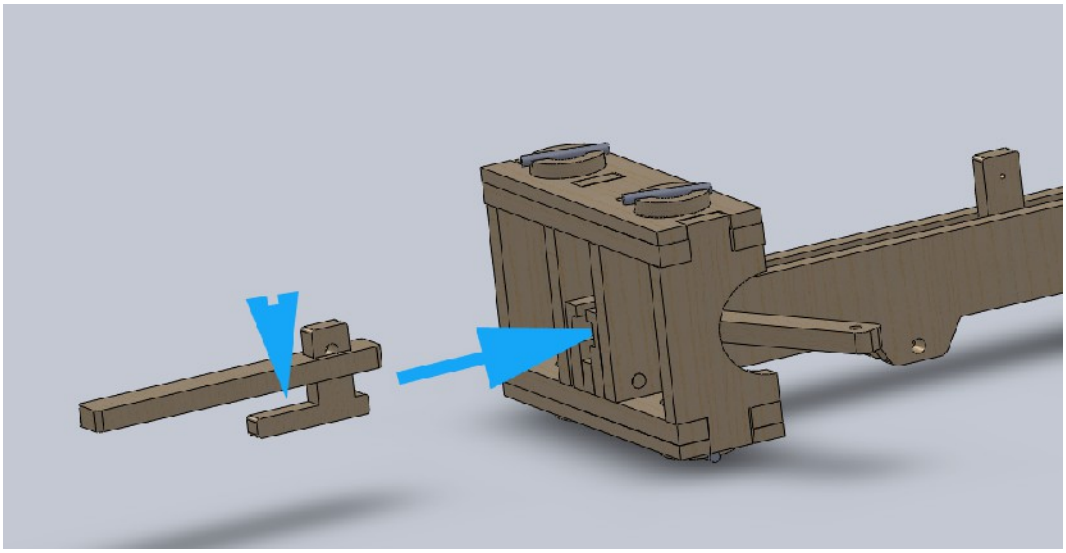
34. Insert the trigger vertical mast into the horizontal slide.



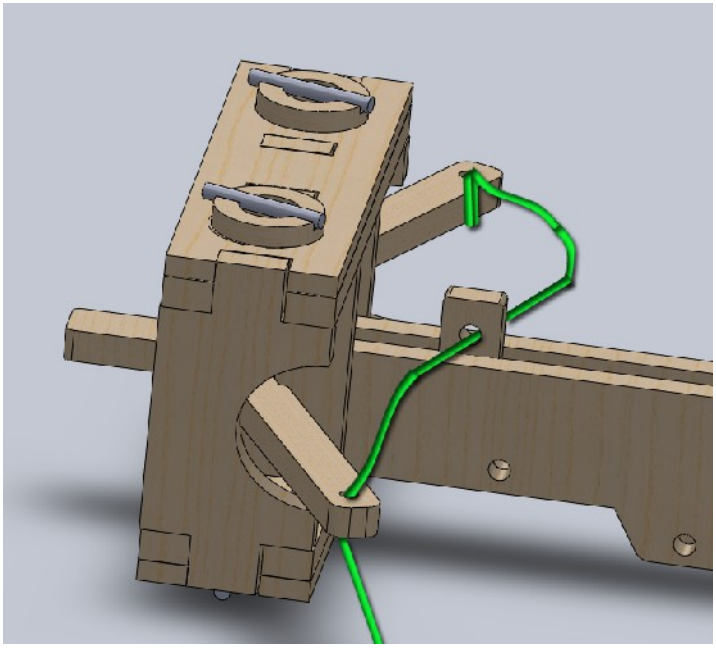
35. Insert the trigger horizontal slide into the breech from the front.



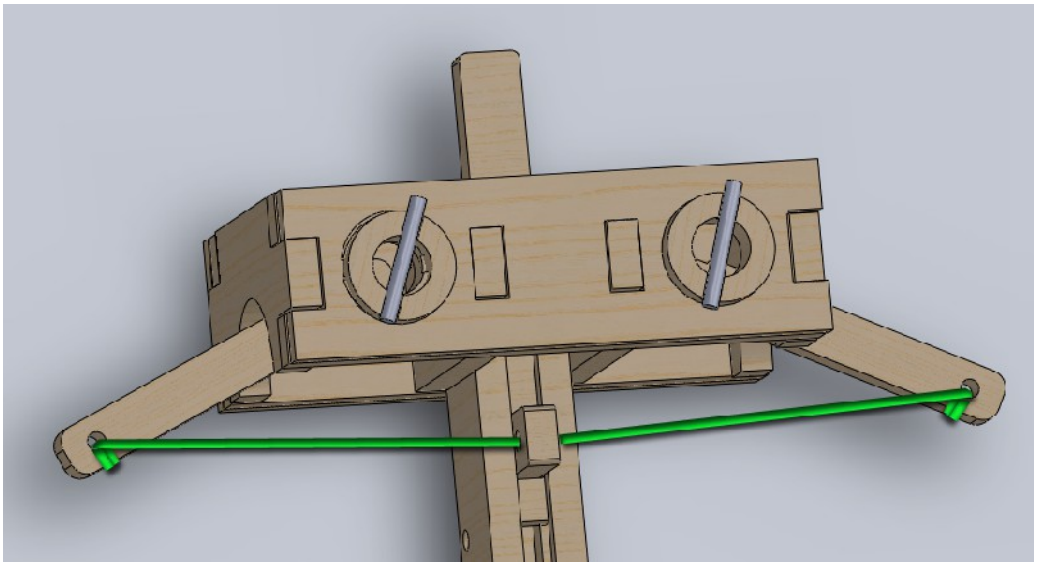
36. Assemble the firing rail and slide and insert this into the breech in a similar fashion to the previous step. It is recommended that you place dry lubricant into the firing rails and on the slide to allow it to move freely. Powdered graphite is an excellent dry lubricant for this purpose. You can also use talcom powder or even common house flower. The friction there can increase significantly in humid conditions. Simply sprinkle some into slotted area and work the slide back and forth to spread the lubricant. It is not recommended to use wet lubricant such as oil as this can be messy.



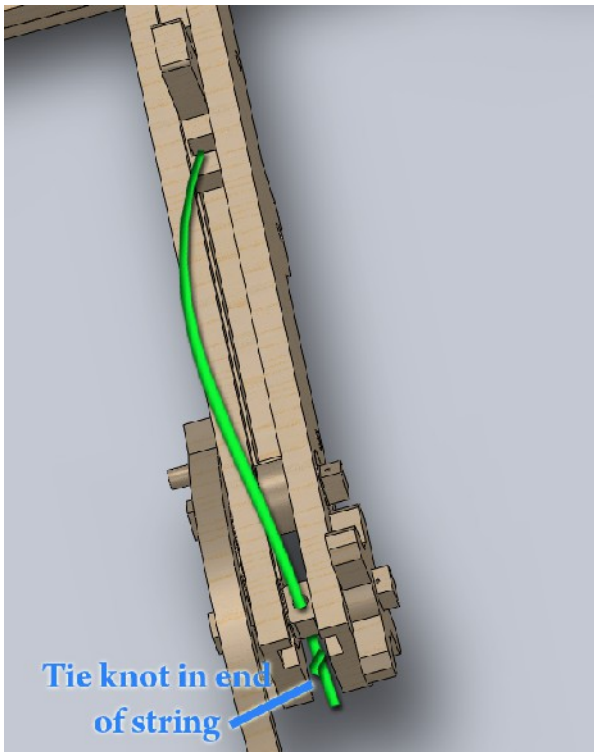
37. Using the remaining short string, tie through the hole in the arm on one side, then through the firing rail slide then into the other arm's hole. Don't trim the excess off the first arm's knot yet.



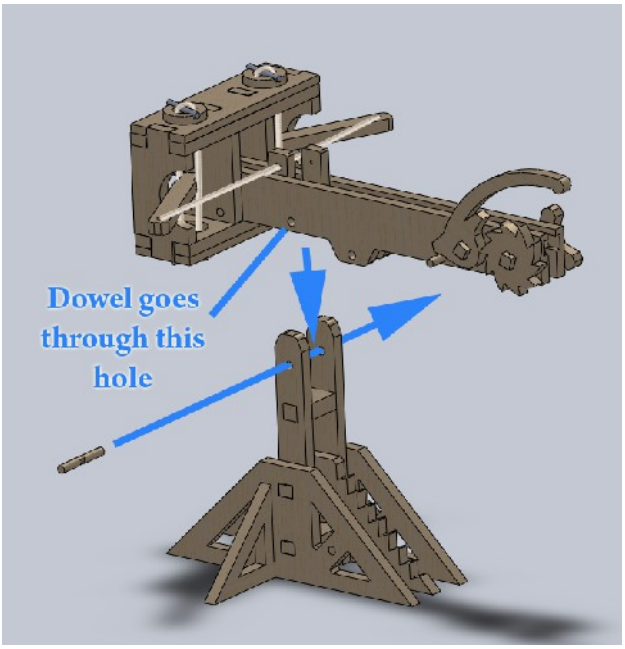
38. Then pull the string and tie it onto the other arm (2 turns and half hitch will work okay). You should end up with a string that goes pretty straight across. Some slack is okay, but it should be minimal.



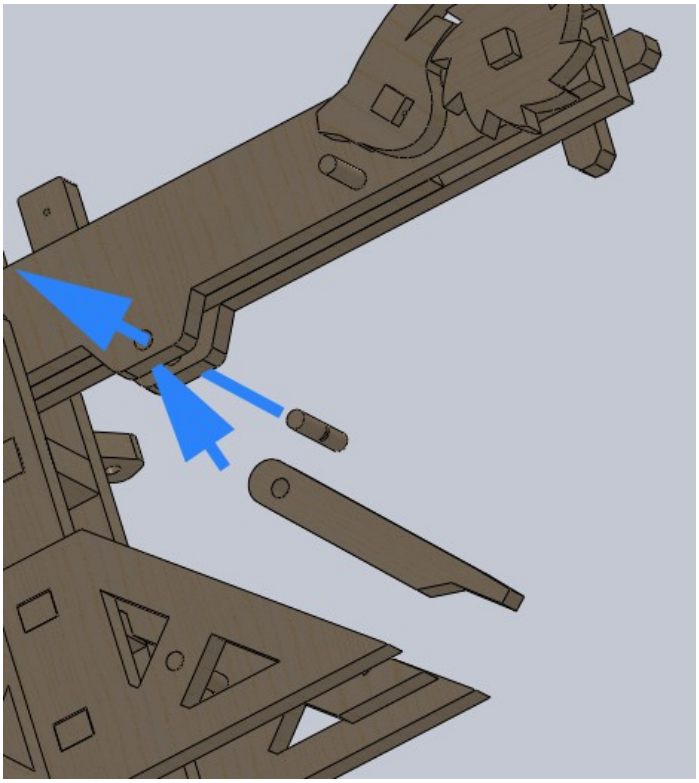
39. Slide the trigger slide forward until it rests against the firing rail slide. Then run the end of string from trigger slide through the hole in the windlass axle. Leave a bit of slack and tie a simple knot in the end and trim the string.



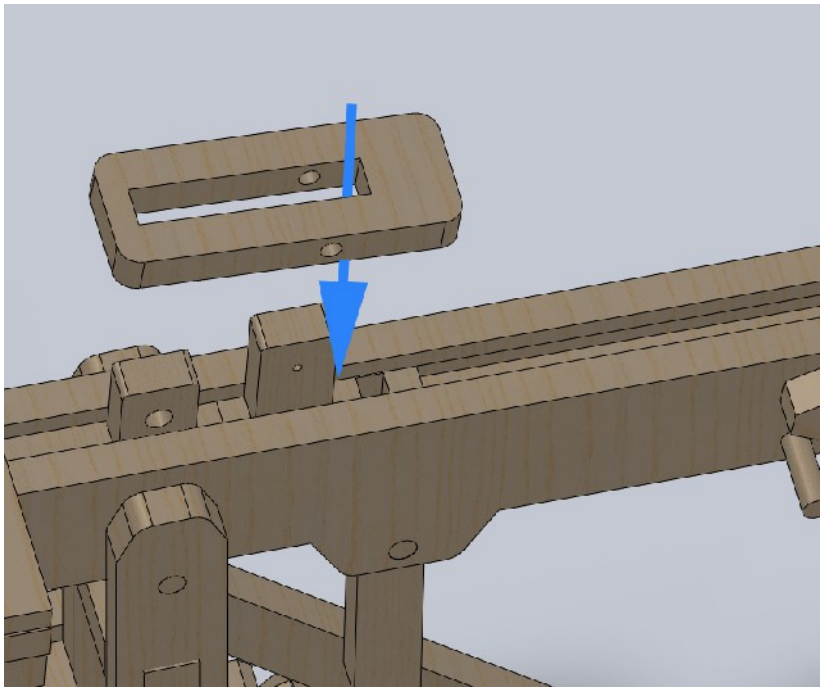
40. Mount the assembled breech and frame onto the base using a dowel marked with 3 lines.



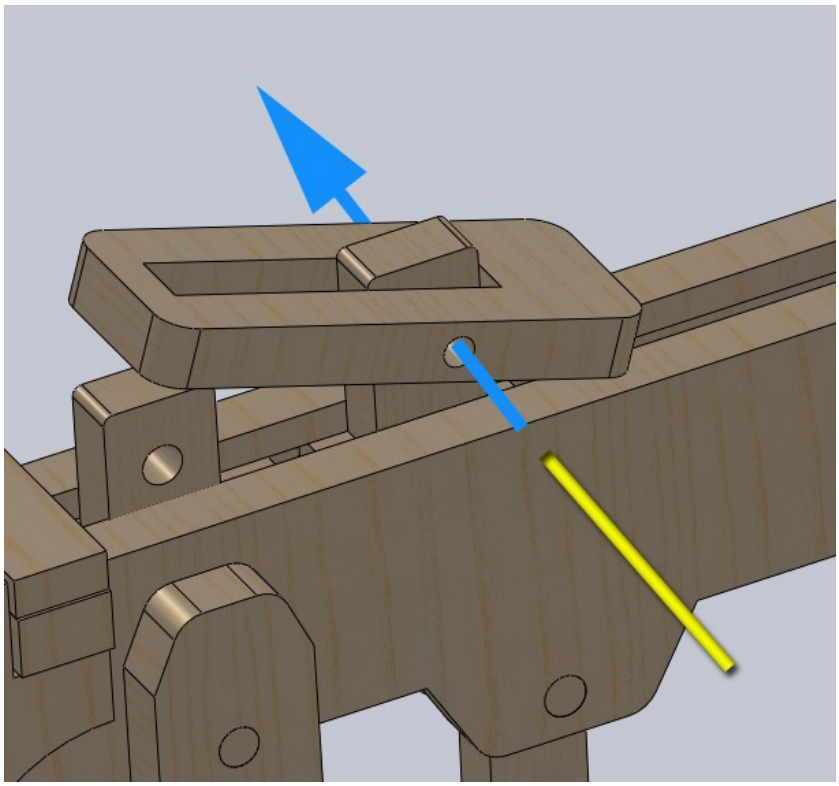
41. Mount the elevation stake to bottom of the breech using a dowel marked with 2 lines.



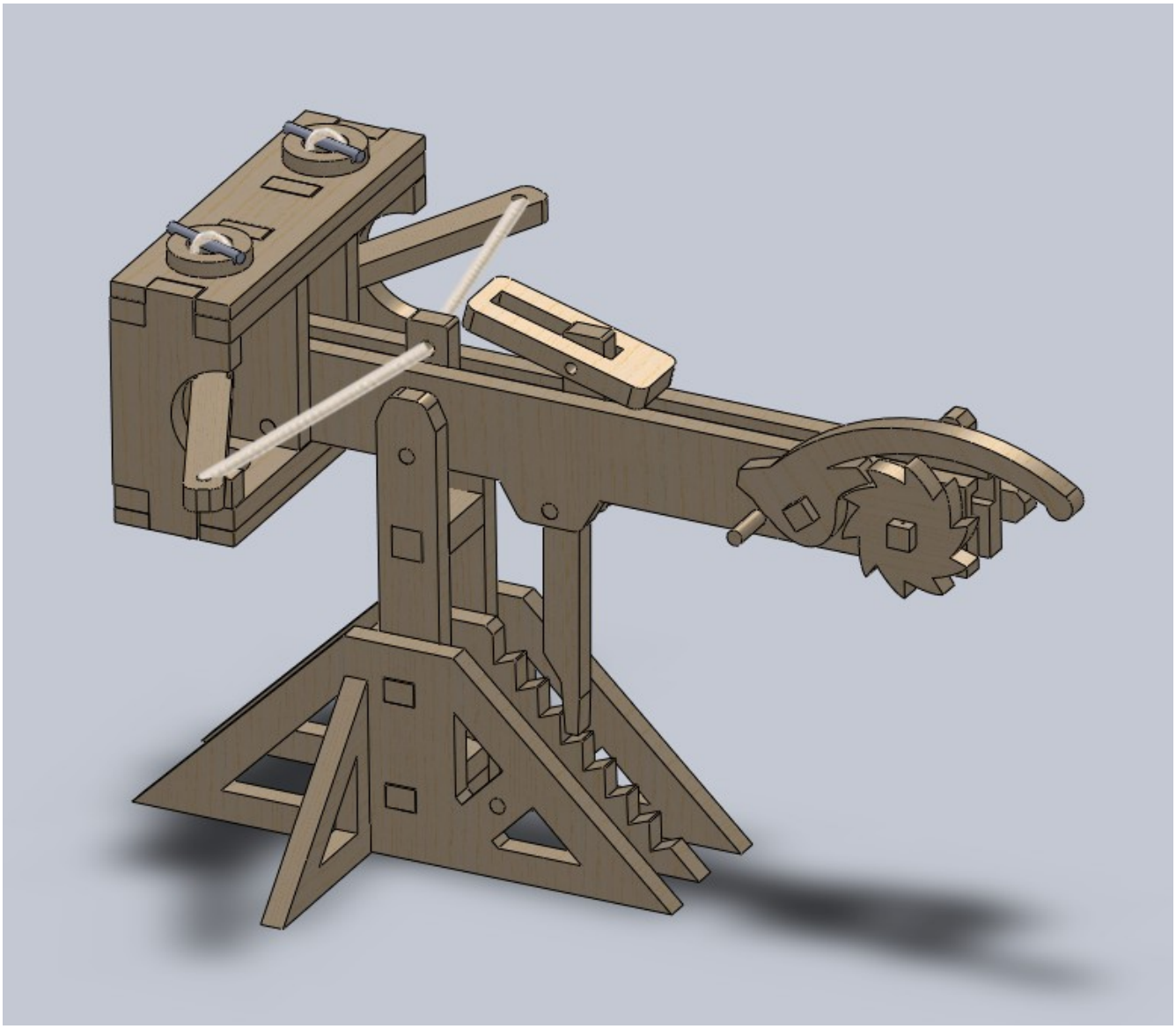
42. Fit the trigger as shown onto the trigger vertical mast



43. Insert a metal rod to fix the trigger to the vertical mast, and bend the ends of the wire on both sides to hold the trigger in place.



Trim the excess ends of string, and you are finished with assembly of the Desktop Ballista

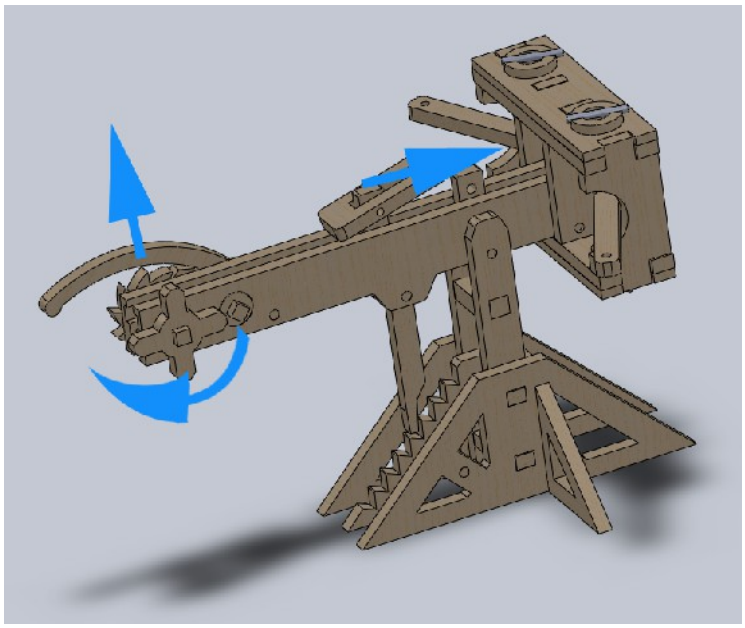


How to Load and Fire the Desktop Ballista:

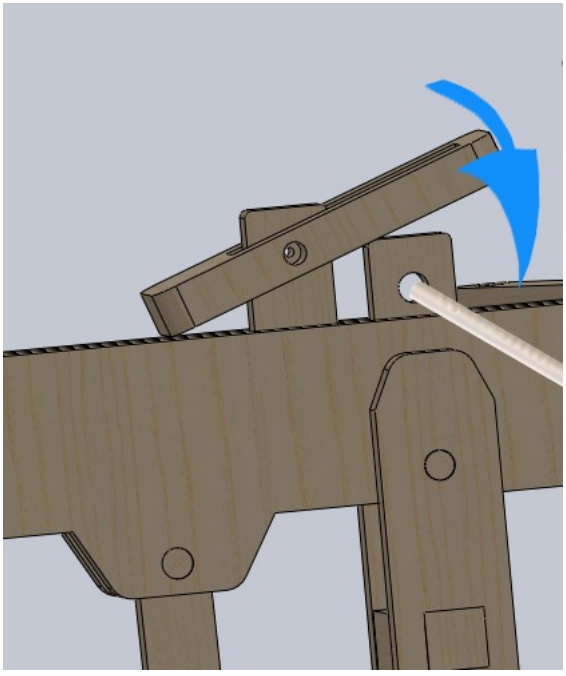
You can also view a short video clip on youtube that shows how to load and fire the ballista. View that video at

https://www.youtube.com/watch?v=nsRk0CpD8Io

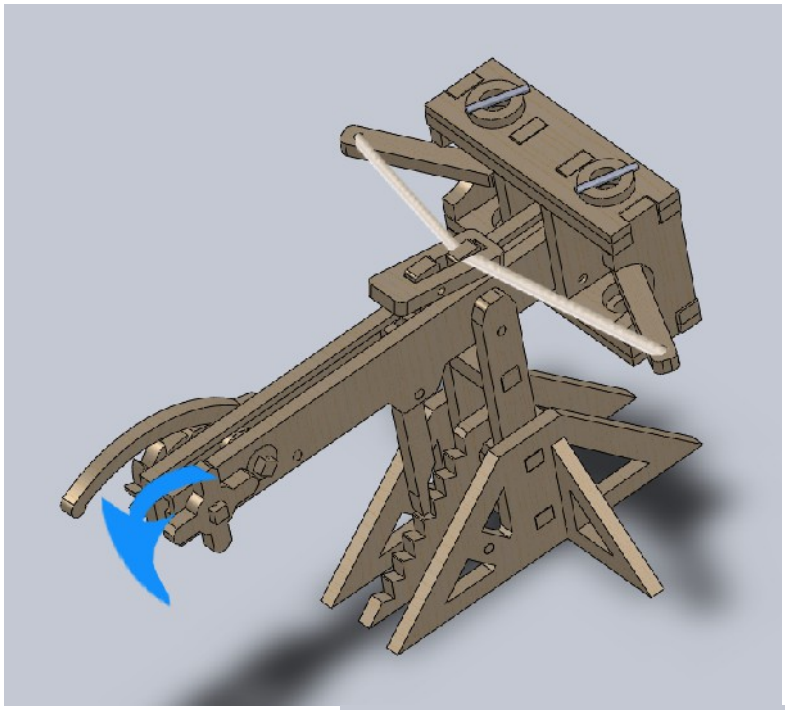
Loading: Lift the pawl to disengage the ratchet gear, and unwind some string on the windlass for slack so that you can pull the trigger slide forward. Then lift the trigger up and slide the trigger forward until you can drop the trigger over the firing rail slide.

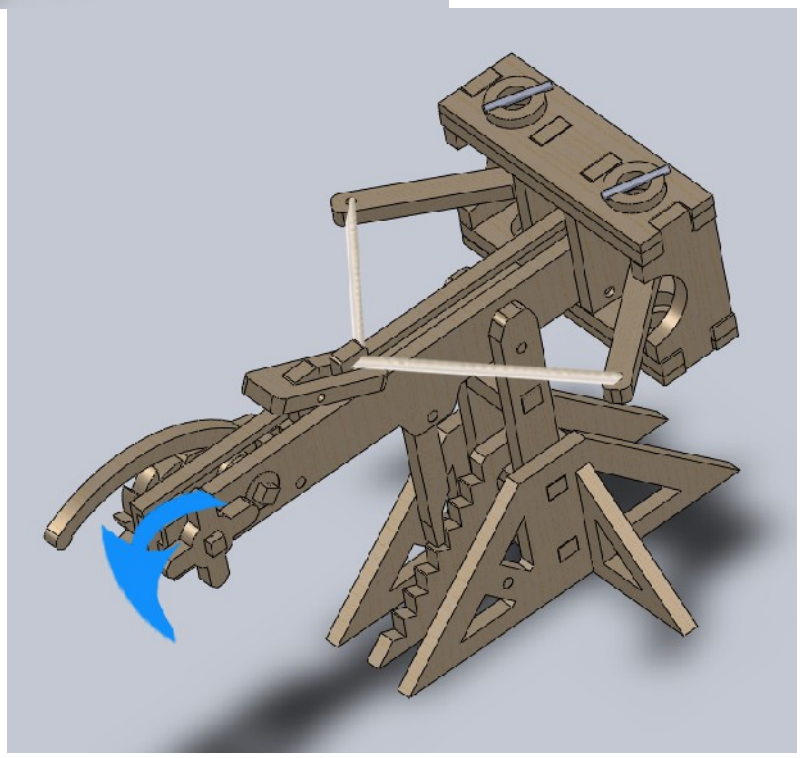


Lower the trigger's front edge down onto the firing rail slide



With the trigger over the firing rail slide, lowe the pawl to re-engage the ratchet gear. Then rotate the windlass crank handle as shown. This will pull the trigger toward the back of the ballista, dragging the firing rail slide with it. This will look much like drawing a bowstring.





Do not fire at other living beings, especially not at faces or eyes. Depending on how much tension you place on the skeins, the desktop ballista can fire with considerable force. Though it will not have enough force to pierce skin, a projectile fired from the ballista can definitely cause eye injury.

To fire: Load a toothpick or similar size bolt like ammunition onto the firing rail, just in front of the draw string, aim and then press down on the trigger to fire.