

## Operating a Ballista

Many people have seen a picture of ballista and built one themselves, or at least what they believe to be a ballista. In many cases they're actually made a big crossbow. Because they feel they understand the principals involved they do not give full consideration to the issue of actually operating it. The reality is that the ballista is a powerful and complex weapons system. Like any other weapons system it needs to be operated correctly in order for it work correctly and safely.

## Safety

The first issue is safety. This is not the obvious do not aim at people make sure you have a safe area etc, this about the operator leaving the field with all their bits, upright and alive. If you screw round with a ballista it can kill you, that's kind of its job. So don't give it an excuse. The power of the twisted skeins is the same as gunpowder. So if you think that sitting on the ground with some black powder and hitting it with a hammer is a good idea then by all means play with a ballista to see what will happen. Please have it videoed and have you estate send me the link because I collect safety videos as warning to my crews.

In spite of what one expert engineers claim in a documentary, the ballista cannot "explode", but it will certainly implode given any provocation to do so. So you either build your machine well or expect it to suffer a sudden size reduction and unplanned total systems failure.

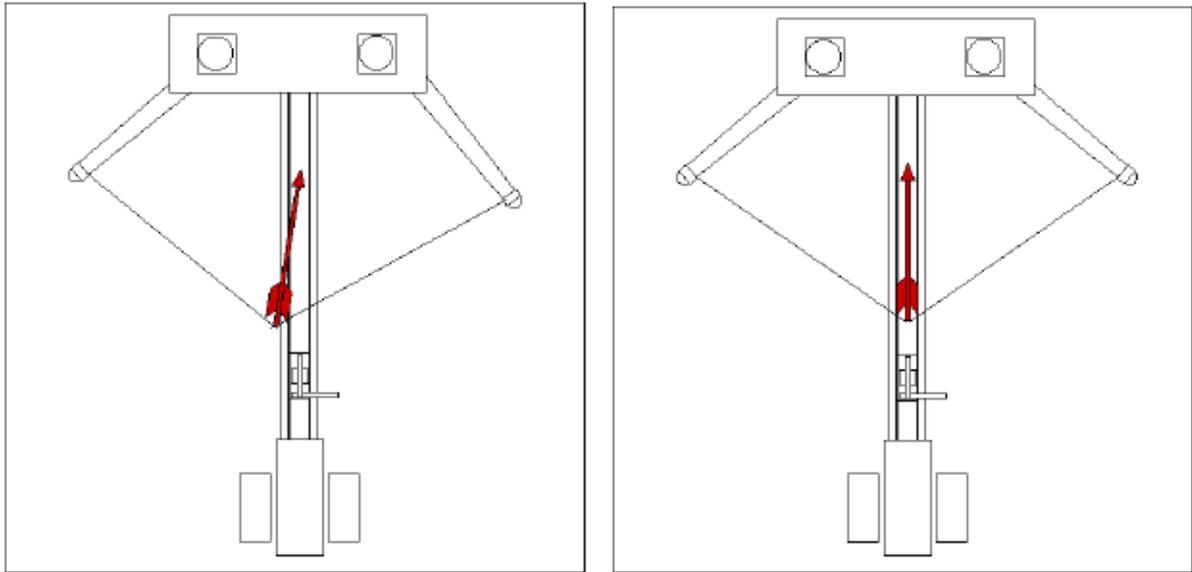
The big one is danger areas. The best not to lose bits to the machine is to not put your bits in those places. They are;

- In the arc of the throwing arms
- In front of the machine
- Behind the tensioned throwing arms (if they fail they'll go backwards)
- Inside the bite of the string
  - This would be the worst one and the one most commonly violated. NOTHING human gets put inside the string when it is being tensioned or held under tension. A powerful ballista will be mildly inconvenienced by passing through your fingers when misfiring, not much else will happen except the quiet plopping of you severed fingers on the ground and whatever noise the operator may make.
  - This includes loading the weapon!
  - **DO NOT LOAD A BALLISTA UNDER TENSION**

## Tuning

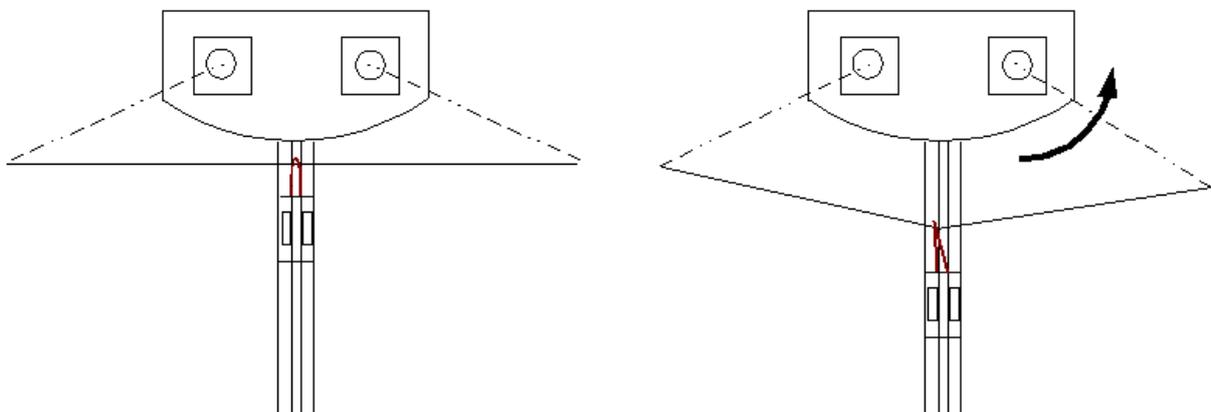
Tuning is one of those often unconsidered things but essential to successful operation of a ballista. Tuning was described by one ancient historian as being carried out by striking the torsion skein to produce a note then altering the tension on the other until it made the same note. This is a fantastically useful source as it teaches the budding historian not to be impressed with what someone said just because they died 2,000 years ago. Anyone can be a complete idiot.

The point of tuning is to get the throwing arms to swing in unison. If they don't, hijinks can ensue.



On the left an out of tune ballista will push to one side of its missile. This missile will arrive at the frame on an angle and possibly strike the frame with 100% of the velocity the machine can produce. If you are lucky the damage will be limited to the spectacular destruction of the arrow. On the right a tuned ballista will drive its missile in a perfect line out of the machine and down range to spread its message of good will and cheer to all in an atheistically pleasing arc without wobbles.

To carry out a tuning check the operator hooks on to the string using a short loop of string and puts the string under tension. If the machine is out of tune the string will pull unevenly and move off centre as shown below.

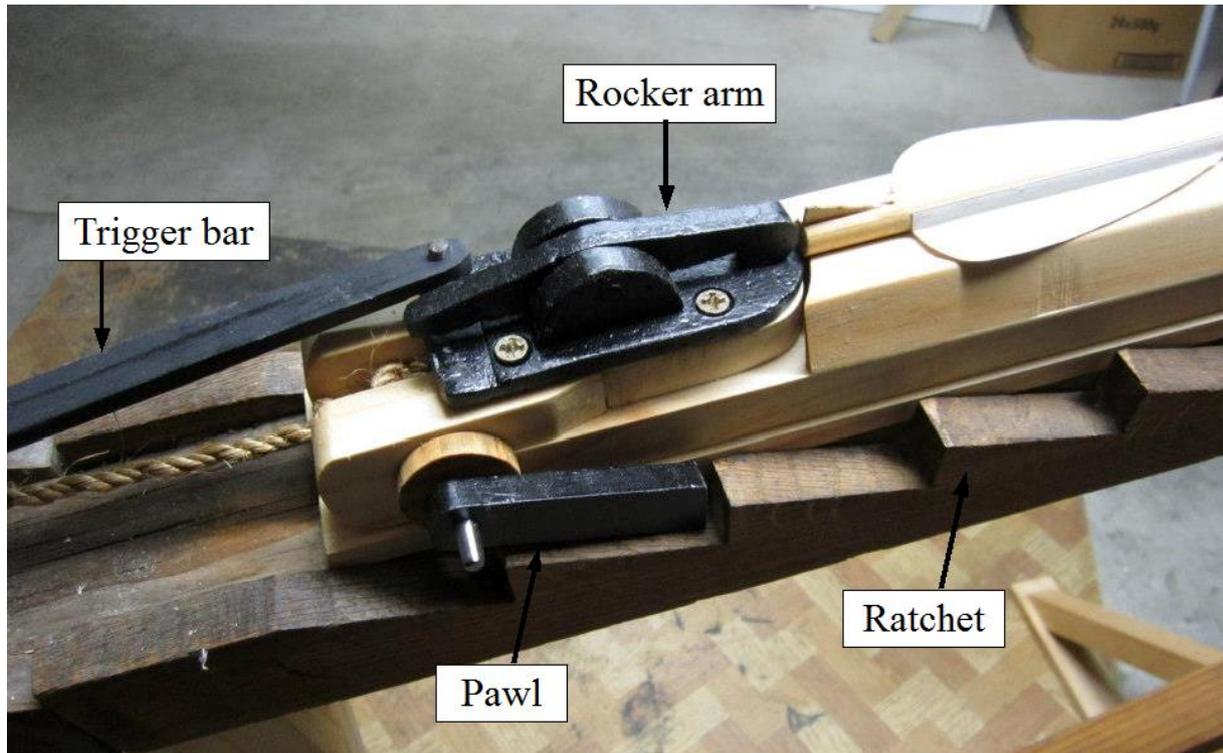


The ballista can then be adjusted by tightening the opposite washer forward until the string can be put under tension without pulling to one side.

## The Firing Cycle

Just like a modern weapon the ballista has a firing cycle. The succession of actions that repeats resulting in multiple shots being launched. In this case the weapon is manually loaded each time. As noted with zero subtlety above the ballista is not to be loaded when under tension. This is the single most common safety violation with these machines. Firstly it's important to know what is being described.

Depending on what design your machine is you should have a winch with a ratchet and pawl and a trigger assembly with a rocker and a trigger bar as shown below. In this case the ratchet is a lateral Greek ratchet.



The trigger should be mounted on a slide which moves forward and back in the frame and has a groove for the arrow. The arrow sits in the slide and travels with it. There is no reason to be attempting to load the arrow when the weapon has been tensioned.



*The ballista shown with the slide forward in the position of loading*

## **The firing cycle:**

1. Unhook the ratchet pawl
2. Push the slide forward
3. Hook the rocker arm over the string and swing the trigger arm into place locking the rocker arm
4. Load the arrow
5. Hook the pawl on to the ratchet
6. Wind the winch to pull the slide back into firing position
7. Swing the trigger bar smoothly back with an even pull to release the arrow