In this instructable I will describe how to make a flame cannon out of PVC pipe. It is a simple project and all parts should cost under 10$, however it requires the use of the products of three of my other instructables. 
the gunpowder [http://www.instructables.com/id/EEXOON4E1HEPA8KQNM/](http://www.instructables.com/id/EEXOON4E1HEPA8KQNM/)

This project is a cumulation of sorts, of all my other projects.

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**step 1: Parts list**

Parts:

1. 2" PVC pipe roughly 19" long
2. Can of purple PVC primer
3. Can of PVC cement
4. 2" threaded socket coupler (Just make sure it fits on top of the pipe, and the end cap can be screwed in)
5. End cap
6. 1/4" drill bit with drill
10. Plastic drinking straws
11. Duct and electrical tape
12. Scissors
13. Gallon sized plastic bags
14. Lighter fluid, gasoline, dentured alcohol, or some other flammable liquid
step 2: Building the cannon

Construction is very simple, as it only requires one connection to be made using the PVC cement. Before you use the cement make sure the ends of the pipe are smooth, clean, and level, if not rub with sandpaper until level and smooth, then wipe with a damp cloth to clean.

Steps:

1. Apply the PVC primer to the last inch of the 19” pipe, and the inside of the coupler. (Follow the directions on the can of PVC primer and cement, for application as they might be different then mine)
2. Apply the cement to the outside of the pipe and inside of the coupler, and press the coupler down onto the pipe, and either weight it down, or hold it down until the cement dries enough so the coupler stays in place.
3. Wait however long the can of cement tells you to.
4. Using the drill and 1/4” drill bit, drill a slanted hole into the pipe about an inch and a half above the coupler. When drilling the hole keep in mind the goal is to have a line of sight through the hole into the end cap, it doesent have to be exact but as close as possible helps. If you are having problems drilling a slanted hole, you can drill a hole straight down with a smaller bit and then use that hole to guide the 1/4” bit when you drill at an angle.
5. Check to ensure that the end cap can be screwed on completely.
step 3: Preparing the cannon

This is the hardest step, because it has the most opportunities to screw up, and you won't even know you made a mistake until you do the countdown and it doesn't fire. I use a lot of tape in this step, not only to hold the parts down, but to make sure that a bridge between two of the wires can't occur.

Steps:

1. Take a plastic drinking straw and cut off about 3 inches. Put a piece of the homemade fuse into the longer section of the straw.
2. Insert the straw through the hole on the side of the cannon, pushing it down far enough so it will reach into the end cap, however making sure there is still at least an inch on the side.
2a. Take the gallon sized plastic bag and something thinner than the pipe, like a broom handle, and put the bag on the end of the handle making sure not to puncture the bag. Then push the broom handle into the end of the cannon (not the side with the end cap), stopping when there is only a few inches of the bag left on the outside of the pipe. Fold over the remaining parts of the bag around the rim of the cannon and use the duct tape to hold them down to the sides. The bag will be used to hold the flammable liquid that you will be shooting, so it can't have any holes in it, or else it will drip onto the gunpowder.
3. Take the end cap, fill it with gunpowder, and level it off.
4. Screw the end cap on, while holding the pipe vertical. As you screw it on make sure the fuse inside remains in contact with the gunpowder. (From this point on try to keep the pipe vertical as much as possible, to avoid spilling the gunpowder)

(WARNING: FROM THIS POINT ON THE CANNON IS LIVE AND FOR NO REASON SHOULD YOU OR ANY PART OF YOUR BODY EVER CROSS IN FRONT OF THE BARREL)

5. Give one push on the straw and fuse on the outside, to make sure it is as far down as it will go, and then secure the straw to the side of the pipe with a piece of electrical tape.
6. This step is hard to describe so check the picture, it should make sense of things. The diagram shows the view as if you were looking in the hole in the top of the straw. Using the scissors cut down about a centimeter on opposite ends of the straw. Split the 2 strands of the fuse down to where the the cuts on the cuts on the straw end. Put a piece of nichrome wire between the two strands and pull it down, once you reach the straw pull the ends of the nichrome wire through the two cuts you made on the straw.
7. Put a piece of electrical tape over the straw, covering the straw, nichrome wire, and end of the fuse. Make sure the contacts for the nichrome wire are still visible.
8. (Warning: do not have the power supply connected to the ignitor when you do this) Attach the alligator clips from the electrical detonator to the pieces of nichrome wire. The wires off the alligator clips should run up the side of the tube.
9. Make sure the alligator clips, or wires aren't touching and wrap a piece of duct tape over everything and around the tube. To ensure the clips don't shift I press down the duct tape between them, holding them in place.
step 4: Setting up and firing

Take the cannon outside to where you will fire it. Make sure there is nothing flammable around: gasonine, propane tanks, relatives.

To hold the cannon up (and protect me from lethal PVC shrapnel if it exploded) I dug a 10 inch deep hole 2 inches wide in my backyard (I actually just took the part of the 2 inch pipe that I didn't use and hit it in the ground a few times, when I pulled it out the dirt came with it and I had a perfectly fitted hole). The hole should be narrow enough so the pipe will not tilt, but wide enough so you don't have to force the cannon into the hole because that could mess up the alligator clip connections.

Push the cannon into the hole, as far down as it will go. Unravel the wire until you are a safe distance away (20 ft) and place the detonator on the ground. Go back to the cannon and pour the desired amount of the flammable liquid you are using into the bag in the mouth of the cannon. (I will explain what type and how much later)

The reason you have waited until now to pour the liquid in is so that you spend the least amount of time in the vicinity of the cannon when it is fully loaded. Say the cannon had accidentally gone (extremely unlikely, but always best to be safe) off when you were unraveling the wire, you would be unharmed (unless you were standing over the cannon). However, if the cannon had the liquid in it, and accidentally went off, you could end up well done.

In the video (http://video.google.com/videoplay?docid=4467958846444278260) the last 2 shots are the ones that used my flammable liquid system (the others used a mixture of cornstarch and flour which didn't work out too well). The second to last shot is about half a snapple bottle of lighter fluid, and the last is 3/4ths a snapple bottle of gasoline. As you can see in the video the gasoline didn't separate enough or burn fast enough so it wound up falling back on the cannon. I plan to experiment with other liquids in different amounts and so should you, just remember to always use a small amount if it is the first time you are using a particular liquid.

Once the liquid is in the bag, go back to the detonator, plug in the power supply, arm it, countdown, and press the button. It should go off.

If it fails to ignite, unplug the power supply, wait 20 seconds, walk over to the cannon and check all the wiring, try again.