Potato Rocket Plans

The following plans have been excerpted from the book *Backyard Ballistics* written by William Gurstelle. This is a fantastic resource for a variety of easy-to-use plans and well written descriptions for a variety of combustion science experiments.

The following pages are taken from Chapter 2, The Potato Cannon, pages 7 – 22. This book is can be purchased directly through the webiste, www.backyard-ballistics.com or through Amazon.

Backyard Ballistics
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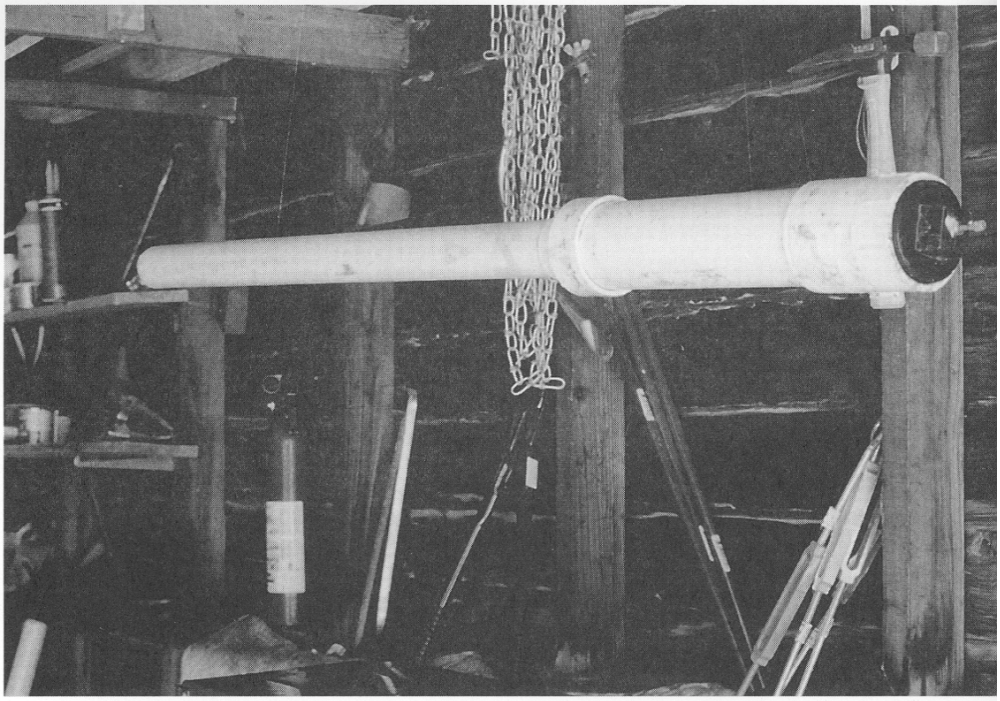
The Potato Cannon

The potato cannon, or spud gun as it is sometimes called, is nearly legendary in amateur science circles. You'll be amazed at how easy it is to make a working ballistic device out of materials readily available at your local hardware store. Don't worry, the potato cannon doesn't use dangerous gunpowder or rocket fuel to blast the potato in the air. Instead, the cannon takes advantage of the considerable energy contained within the aerosol propellant of common hairspray.

Thousands of people, from adolescent boys and girls to serious experimenters at Ivy League universities, enjoy shooting homemade ballistic devices like this. It's appealing for several reasons. First, the cannon is simple to build. Second, it really does work well. And finally, it's easy to understand. Unlike the complicated configuration of a computer's silicon chips, the average person can figure out (with the help of this book) the physics of the cannon.



2.1 Completed spud gun

People love making the potato cannon. Don't be too surprised if the hardware store clerk takes a quick look at your materials and says, "Making a spud gun, eh?" It happens to me all the time.

Building the Potato Cannon

Working with PVC Pipe

PVC pipe is the greatest home plumbing invention of the twentieth century. Unlike heavy steel pipe, the average persón can quickly cut, join, and fasten PVC pipe with a minimum of materials and a small amount of practice. This makes it the perfect spud gun raw material.

THE PIPE

PVC pipe is made of a polyvinyl chloride plastic. Manufacturers make these pipes in various thicknesses. You specify the thickness by referring to its "schedule." For our experiment, we need schedule-40 PVC pipe. It also comes in a variety of diameters: 1-inch, 2-inch, and so on. Buy it in 8-foot lengths and cut it to the size you need with a hacksaw.

THE CONNECTORS

PVC pipe manufacturers make a variety of connectors to join pipes in the way plumbers (and spud gunners) need. Couplings join pipes of similar sizes. Threaded couplings have female pipe threads cut into at least one end. Reducing bushings join a pipe of one size to a pipe of a smaller size. End caps simply cap the end of the pipe.

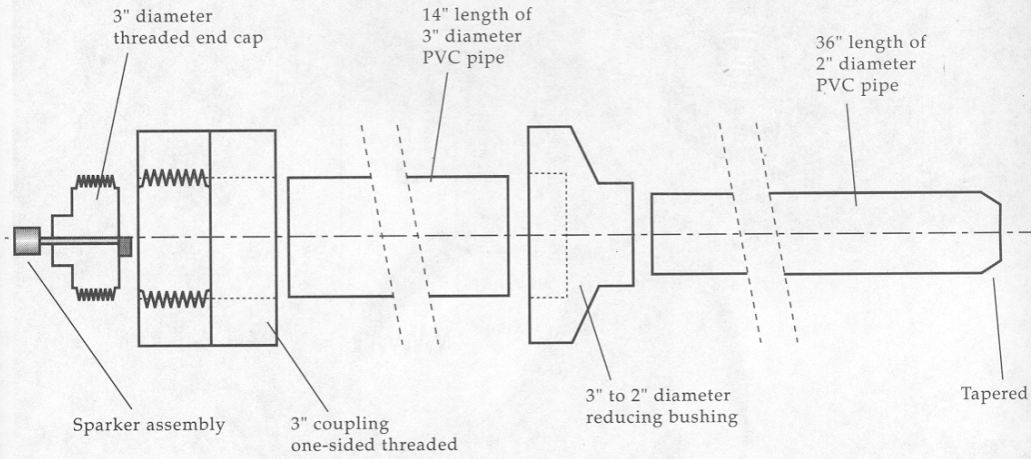
JOINING THE PVC

The insides of the connectors are either smooth or cut with screw threads. Sometimes we'll want to join two smooth pieces, which can be "solvent welded" together using special PVC cement. (Note: Always use special-purpose PVC cement on PVC pipes and connectors. Regular glue won't work.) Other times, we'll want to join two threaded pieces that can simply be screwed together.

Go to the local hardware store's plumbing section and ask the clerk to help you find the items on page 12. Yes, the big commercial hardware stores usually have all of these items (except the lantern sparker and hairspray). However, I recommend going to your local hardware store because the clerks are usually much more helpful. Sometimes, they will even cut the pipe to size for you and not charge you for a full 8-foot piece of pipe.

Materials

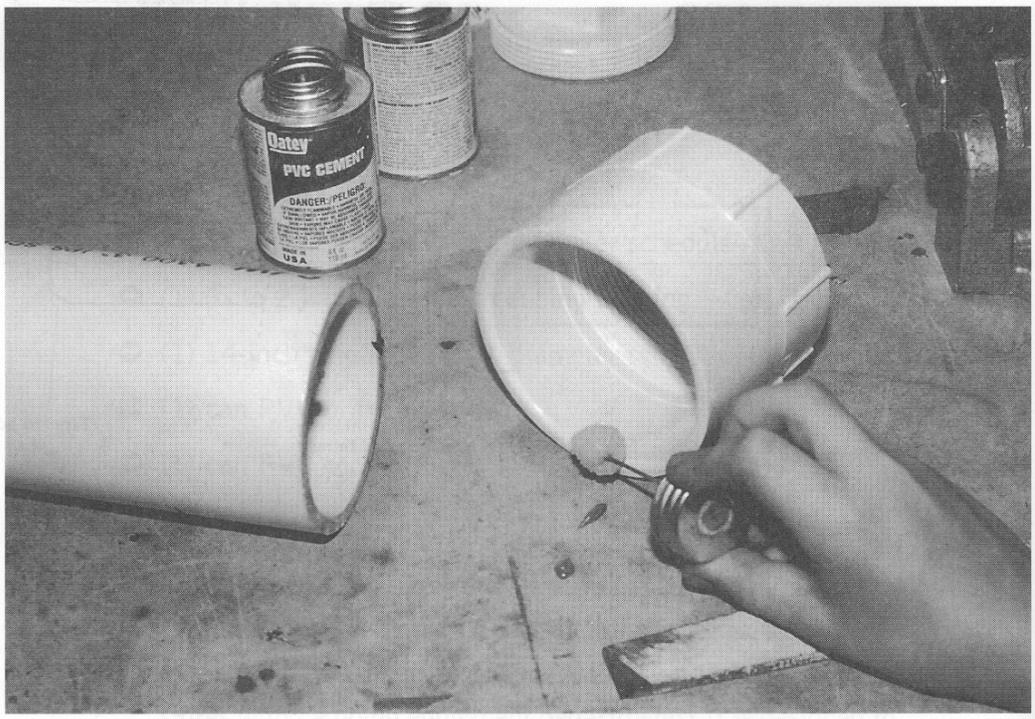
- Hacksaw
- Shaping file
- (1) 36-inch length of 2-inch diameter schedule-40 PVC pipe
- (1) 3- to 2-inch diameter reducing bushing
- (1) 14-inch length of 3-inch diameter schedule-40 PVC pipe
- (1) can PVC primer
- (1) can PVC cement
- (1) 3-inch coupling, one side smooth, one side threaded
- Electric drill with 1/8-inch drill bit, 5/16-inch drill bit
- (1) flint and steel lantern sparker. (This small device is widely available at most camping goods stores and large discount stores with camping equipment departments. It is designed to ignite the mantles of lanterns. It consists of a steel wheel that is rotated against a flint by means of a knurled brass handle. It generally retails for less than five dollars.)
- Large adjustable wrench
- Duct tape
- (1) 3-inch diameter threaded PVC end cap
- (1) 4-foot length of 1-inch diameter wooden dowel or broom handle
- Hairspray in a large aerosol can (Be sure it's an aerosol can and not a pump spray. Spud gunners typically buy the most inexpensive brand of hairspray. Our interest is in its hydrocarbon propellant, not its holding power or scent.)
- Protective gear including safety glasses, earplugs, and gloves
- Bag of potatoes



2.2 Assembly drawing

Place all of your materials and tools in front of you. Crafting a spud gun from raw materials takes at least two hours of filing, cutting, and drilling. You may need an extra pair of hands to hold things in place while you are gluing. After the pieces are put together, you'll need to let the PVC cement cure overnight.

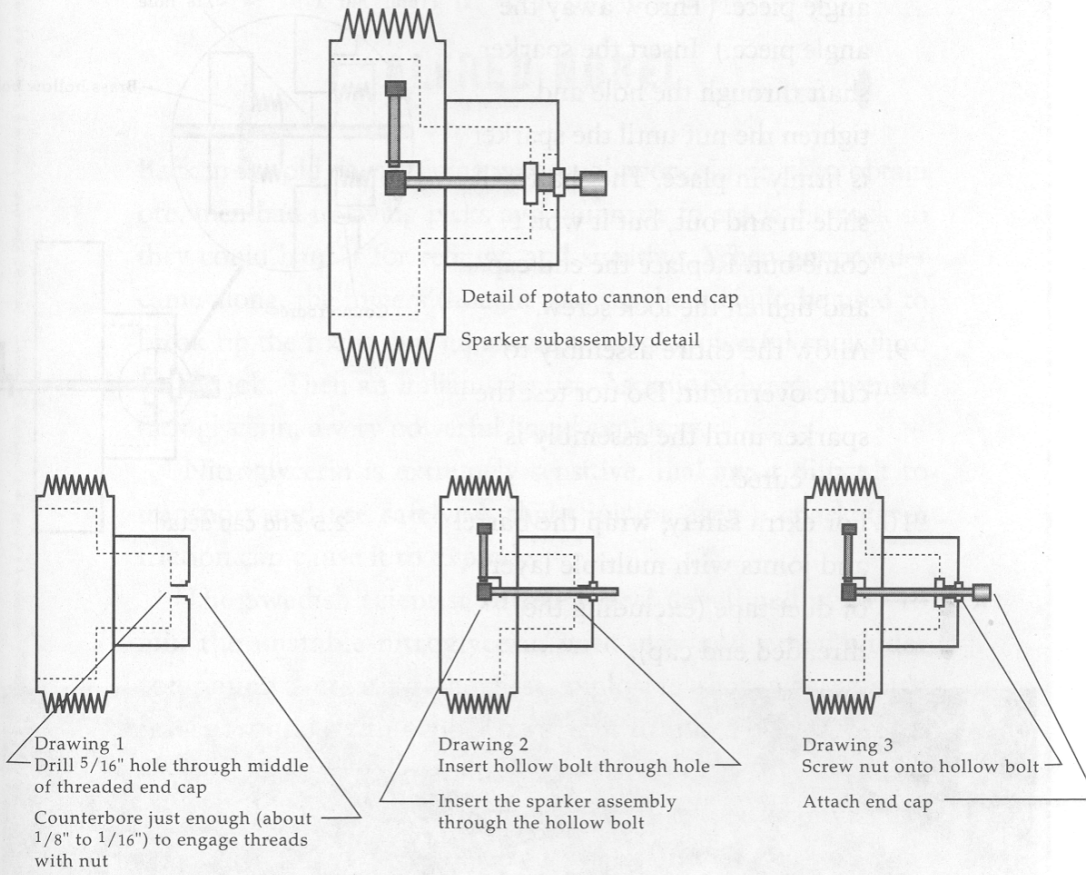
1. Use the hacksaw to cut the PVC pipes to the desired lengths.
2. Use the file to taper one end of the long, 2-inch diameter pipe section so it forms a sharp edge. The edge will cut the potato as it is rammed into the muzzle of the gun.
3. Use PVC primer before cementing. Attach the 3-inch side of the 3- to 2-inch reducing bushing to one end of the 3-inch pipe using the PVC cement. Be sure the joints are clean and that you apply the cement according to the directions on the can. Don't forget to observe the



2.3 Applying the PVC cement

directions for curing times. You MUST let all the connections cure overnight in a well-ventilated area.

4. Carefully cement the smooth, unthreaded side of the 3-inch, one-sided threaded coupling to the 3-inch PVC pipe. Do not get any cement on the exposed pipe threads. If you do, you won't be able to screw the end cap into place.
5. The 36-inch long, 2-inch diameter pipe is the muzzle of the potato gun. Cement the untapered side to the 2-inch side of the reducing bushing.
6. Carefully drill a hole large enough for the sparker (usually ¼ inch or 5/16 inch, but match the twist drill you use to the diameter of the sparker's hollow bolt) to snugly fit through the middle of the 3-inch threaded end cap.



2.4 Detail for mounting sparker inside the end cap

7. Take the hollow, threaded bolt assembly from the sparker and insert it through the hole made in step 6. Depending on the type of sparker you have, you may have to drill (counterbore) a 3/8-inch diameter depression on the outside surface of the end cap. Make it 1/16- to 1/8-inch deep in the PVC. You just need to reach and engage the hollow bolt's screw threads with the nut. (See diagram 2.5.)
8. Mount the sparker by unscrewing the knurled end cap from the shaft. Be aware there is a spare flint inside the end cap, so watch for it. Unscrew the nut and remove the metal