

Skylighter

Advanced Fountains

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How To Make Fireworks: Blue Steel Gerbs

Read and review these [Fireworks Safety Articles](#) before starting any fireworks project.

Learn how to make blue gerbs, also known as firework fountains.

Materials Needed

- [Ammonium perchlorate \(CH5005\)](#)
- [Bentonite clay \(CH8078\)](#)
- [Copper carbonate \(CH8087\)](#)
- [Fountain Tooling](#)
- [Hexamine \(CH8142\)](#)
- [Stearic acid \(CH8298\)](#)
- [Steel, fine powder](#)
- [Tubes, 3/4" ID, 1/4" thick \(TU1065\)](#)
- [Visco fuse \(GN1000, GN1001, GN1004\)](#)

This little gerb project is from [The Best of AFN III \(BK0011\)](#). It is part of a larger article entitled "Micro star Bursts-Without Micro stars." Thanks to Jack Drewes at AFN for letting us reprint it here.

An anonymous booklet of formulas from E. D. Chemco under "BLUE STEEL FOUNTAIN" refers to a "crackling titanium effect;" "crackling," eh? But the same titanium flakes mixed with Meal-D powder or whistle pyrotechnic compositions gave just "plain" sparks. Nor were micro star bursts seen with steel or aluminum. I don't know what variations in the red flame powder will do to the effect, or what I'd get with a choked case, or with solvent-dampened pyrotechnic composition. Presumably the incandescent titanium flake, without benefit of a cast micro star around it, rises through the flame and develops a crust derived at least in part from the powders or pyrotechnic composition products. Gas within this crust then explodes through. It's a pretty effect, simply produced. Following is from the booklet, "Formulas" by Ed Moore.

Blue Steel Fountain (Gerb)

Parts/Percent by Weight

- Ammonium perchlorate 65
- Hexamine 10
- Stearic acid 7
- Copper carbonate 6
- Steel, fine powder 12

The pyrotechnic composition is tamped lightly into a choked case, 1/2" ID with a 1/4" wall. If a small amount of titanium is added to a portion of the pyrotechnic composition and that pyrotechnic composition is charged into the tube first, then the regular pyrotechnic composition next, the effect is to change from a delicate steel to a crackling titanium gerb.

Gilliam's comments on this gerb

When I made these gerbs, I played with substituting all kinds of metals and percentages thereof. I eventually settled on coarse titanium flake as my spark of choice. But I also like the iron-to-titanium effect change, and also experimented with color changes. If you use iron or steel, try our CH8300 Sparkler Grade Steel.

Substituting barium carbonate to make green, or strontium carbonate to make red can change Gerb flame color.

I first made these gerbs using the same tubes hand cut from TU1065. I didn't have proper fountain tooling so I was using a dowel to ram a 3/4-inch-thick dry bentonite clay (CH8078) plug. Then I rammed the composition in, topped it off with another clay plug, and then lightly drilled (hand drilling, not electric) a 1/4" wide hole thru the clay into the pyrotechnic composition. I then just stuck a couple of inches of visco fuse into the hole, lit it and got back. Blew up every time.

What eventually worked was using a real, fountain tool. I surmise that the solution lay in the fountain tool's shaping of the venturi-like nozzle on the inside of the gerb. The clay plug is slant-shaped so as to direct the gasses and sparks toward the outlet. This is a pretty violent gerb, as gerbs go. After I switched to using real fountain tools for this particular gerb, my explosions went away. Well, almost went away. I was also successful at making them explode by increasing the titanium percentage to higher than 15%. So I reduced the titanium percentage back down to 12 and everything was cool again.

I also later re-read the article above, particularly the words "lightly tamped" regarding packing the pyrotechnic composition into the gerb tube. It would be safest if these gerbs were made with a press, using an arbor or hydraulic press. These gerbs are fun and make a spectacular quick and uncomplicated project.

--Harry Gilliam

Making Gerbs (Fountains)

Read and review these [Fireworks Safety Articles](#) before starting any fireworks project.

PGI Grandmaster Ned Gorski teaches you how to make, fireworks fountains known to fireworks makers as gerbs.

Materials Needed

- 1/4" Mesh Screen
- 3/4" Dowel, if making your own tooling
- 3/4" ID, 1/4" wall, 7-1/2" long tube ([TU1068](#) or [TU1065](#))
- 4" Disks Cut From 3/4" Plywood, if making your own tooling
- [40-Mesh Screen \(TL2004\)](#)
- Antimony Trisulfide ([CH8010](#) or [CH8011](#))
- [Charcoal, Airfloat \(CH8068\)](#)
- [Chinese Visco Fuse \(GN1005\)](#)
- Clay Nozzle Mix
- Coarse-Toothed Comb
- Denatured Alcohol
- FFg Sporting Black Powder, optional
- Kitchen Colander, Fine-Mesh
- [Magnalium, 200 mesh \(CH2073\)](#)
- Minwax Wood Hardener
- [One-Pound Gerb Tooling \(TL1110\)](#)
- [Potassium Nitrate \(CH5300\)](#)

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- Ramming Post
- [Rawhide Mallet \(TL4100\)](#)
- Sharpie Marker
- [Sodium Oxalate \(CH8280\)](#)
- Spherical Titanium ([CH3010](#) or [CH3001](#))
- [Sulfur \(CH8315\)](#)

Introduction

In Fireworks Tips #89 I wrote about [making nozzles and bulkheads](#). We'll be putting those lessons to work in this article.

In Fireworks Tips #107 I explored [cutting, treating, and rolling paper fireworks tubes](#). These tubes will also be used in this project.

Homemade fountains, called gerbs by pyro-folks-in-the-know, are very versatile devices. They can be used as stand-alone fountains shooting sprays of sparks skyward, as drivers on wheels, as downward spraying tubes in a homemade waterfall, or as line rockets.

I'll be demonstrating those line rockets, sometimes called rats or pigeons, in the newsletter following this one, so stay tuned. I'll also be using these fountains as drivers on a fireworks wheel. I described using commercial cone-fountains to drive one of these unique [Chromatrope double-wheels](#) in Fireworks Tips #105.

Devices very similar to these fountains, employing a slightly faster-burning fuel and a somewhat different nozzle configuration, were what I described in the [end-burning rocket motor essay](#) in Fireworks Tips #95. In that article I showed how gerbs can be used to create a design, called a [gerb set-piece](#).



Gerb Set-Piece (Photo by Nancy Stewart)

Gerbs (Fountains)

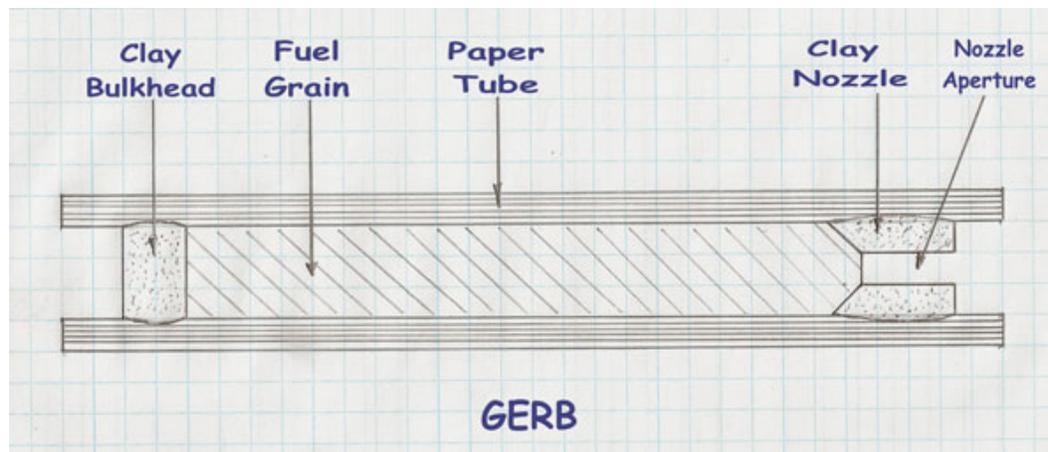
From Wikipedia: A gerb is a type of firework which produces a jet of sparks, usually from 15 to 60 seconds. It is a thick-walled tube filled with pyrotechnic composition and possessing a choke, which is a narrowing in the tube. Gerbs are often referred to as "fountains."

I don't know what the origin of the word "gerb" is, but I learned, while trying to find out, that there is a Star Wars race of the same name. Interesting.

The word is pronounced the same as "germ" but with a "b" instead of the "m." I wouldn't want to saunter up to a group of pyros, trying to appear experienced in the ways of fireworks, and say "gerb" as in "Gerber" baby food, now would I?

Gerbs are one of the most simple of fireworks devices, but they offer the opportunity to learn some basic fireworking skills, and also to get in the habit of practicing basic safety precautions.

Parts of a Gerb



Cross-Section of a Homemade Gerb/Fountain

Paper Fireworks Tube

I'll be using a 1/4-inch wall, 3/4-inch ID, 7-1/2-inch long, paper fireworks tube in this project: Skylighter tube [#TU1068](#), or cut from [#TU1065](#).

This size tube, 3/4-inch ID, and the rockets and gerbs that are made with it, are traditionally referred to as "one-pound" tubes and devices.

I have treated the tubes with Minwax Wood Hardener, and have allowed them to dry completely.

Clay Nozzle Mix

I have made some [clay nozzle mix, and also some bulkhead mix](#), as described in Fireworks Tips #89.

Fuel

In the [Skylighter Project Plans](#) article, [How to Make Saxon Fireworks Wheels](#) by John Werner, two fuel formulae are included. I have used these compositions for saxons, stars, and gerbs, and they are among my favorites.

I have slightly modified the two formulae so that they use only readily available chemicals.

Gold Glitter Gerb/Fountain Fuel

Component	Ratio	72-Ounce Batch
Potassium Nitrate	0.49	35.3 ounces
Airfloat Charcoal	0.12	8.65 ounces
Sulfur 0.06		4.3 ounces
Sodium Oxalate	0.08	5.75 ounces
Antimony Trisulfide	0.15	10.8 ounces
200 mesh Magnalium	0.10	7.2 ounces

(For the Antimony Trisulfide, either Chinese Needle or Dark Pyro may be used.)

Silver Titanium Gerb/Fountain Fuel

Component	Ratio	72-Ounce Batch
Potassium Nitrate	0.51	36.7 ounces
Sulfur 0.10		7.2 ounces
Airfloat Charcoal	0.09	6.5 ounces
Spherical Titanium	0.30	21.6 ounces

(For the Titanium, either the fine ([CH3010](#)) or the coarse ([CH3001](#)) metal may be used. Each one will produce its own unique effect. The fine will produce a short, dense spray of small sparks. The coarse will produce a longer spray of fewer, large sparks. In this project I am using the coarse titanium.).

Each gerb will use about 3 ounces of fuel, and I plan on making about 24 of each type of gerb for use in these projects. So I am going to make 72 ounces of each formula.

To make smaller batches, simply multiply the ratio amount of each component by your final batch size to determine how much of each chemical to use. For example, if I want to make a 12-ounce batch of the gold glitter comp, I determine how much potassium nitrate to use by multiplying 0.49×12 and get 5.88 ounces (which I'll round off to 5.9 ounces).

Starting Fuel

The two fuels above will be all I need if I am using tooling which forms the nozzle aperture as I ram the gerb. But, if I am using tooling which forms a solid nozzle in which I then make a hole with a twist-drill for the aperture, I want to ram a first increment of fuel which has no metal included in it. This eliminates the possibility of creating sparks with the drill.

I only need a small batch of this starting fuel because I'll only be using one increment of it in each gerb.

Starting Gerb/Fountain Fuel

Component	Ratio	8-Ounce Batch
Potassium Nitrate	0.73	5.85 ounces
Sulfur 0.14		1.10 ounces
Airfloat Charcoal	0.13	1.05 ounces

Mixing the Fuels

After weighing out the individual chemicals for one of the fuels, I screen the potassium nitrate, sulfur, and charcoal together through a 40-mesh screen, four times. I never put any chemicals like the antimony sulfide, magnalium, or titanium through my good screens because the metals will clog the holes in my screens, and future compositions that get screened could end up with some of the metals in them.

Then I put the screened composition into a bucket for which I have a lid. I screen the remaining chemicals through a fine-mesh-screen kitchen colander, allowing them to fall into the bucket, too.

Then I put the lid on the bucket and shake it for awhile to thoroughly mix the ingredients.

I add enough denatured alcohol (available in the paint department of stores like Home Depot) to form a workable putty with the consistency of bread dough. The glitter batch required 20 ounces of the alcohol by weight. The titanium batch required 16 ounces, and the starting fuel batch took 2.4 ounces. No water is used when making these dampened compositions.

The putty is then screened through a 1/4-inch mesh screen onto a kraft paper lined tray. I've made a framed screen which fits nicely into some kraft-paper-lined metal cookie sheets.

After granulating the putty through the screen, I spread the granules out evenly with a coarse-toothed comb and allow them to dry thoroughly.



Granulating Fuel through a 4-Mesh Screen onto Kraft Paper



Note: This alcohol-granulation step greatly reduces the dust that gets produced during the following ramming operation. It produces soft, relatively dust-free granules which will crush easily during the ramming to form a densely consolidated fuel grain.

Tooling

Skylighter sells one-pound gerb tooling, #TL1110. I have a set of gerb tools that is very similar to that one.

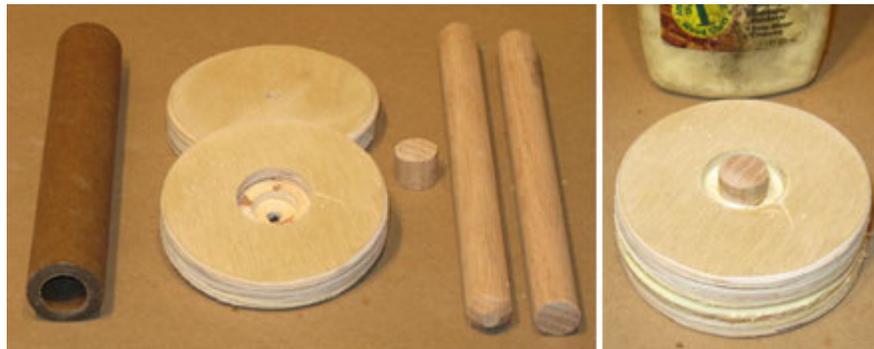


Skylighter One-Pound Gerb Tooling, and My Tooling Set



Note: You can see the rubber o-rings that I keep on my rammers. These keep dust from easily fluffing out of the tube as the rammer is inserted.

It is possible to make your own gerb tooling. I start out with two, 4-inch diameter discs cut out of 3/4-inch plywood (or these can be square). I also cut some lengths out of a piece of 3/4-inch diameter oak wooden dowel.



Paper Fireworks Tube and Homemade Gerb Tooling

I started by drilling a 3/4-inch hole, 1/2-inch deep into one of the plywood discs. Then, using the same centering hole, I drilled a 1-1/4-inch wide, 1/4-inch deep, recess in the disc.

The two plywood discs are glued together, and a 3/4-inch piece of the dowel is glued into the hole of that same size. This assembly is allowed to thoroughly dry.

I've cut two 9-inch lengths of the dowel to make the rammers. I leave the one rammer flat-ended, with the ends sanded smooth. I bevel the end of the other rammer at a 45-degree angle except for the center 1/4 inch, using my belt sander.

The convergent angle that is formed on the top of the nozzle by this beveled former helps direct the hot gasses out of the aperture and reduces burn-through of the tube side-wall.

I use aluminum foil duct-tape to cover the flat top of the base nipple and the end of the flat bottomed rammer so that they don't stick to the clay or fuel as they are being rammed.

It is also possible to make longer-lasting rammers out of aluminum rod.



Finished Homemade Gerb Tooling, With Aluminum and Wood Rammers

The only additional tools I'll need for this project are a solid post on which to pound the gerbs, a rawhide mallet, a funnel, and some measuring spoons. I'll also use a drill bit to hand-twist-drill the nozzle aperture.

I ram devices on a 6x6x36-inch piece of treated pine, which absorbs the shock nicely without bouncing.

A [rawhide mallet](#) transfers all of its force to the rammers, whereas a rubber hammer would bounce off and would not be nearly as effective.



Tools for Ramming Gerbs

Let's Make Some Gerbs

The first step in the actual process of making gerbs is to place the paper tube onto the tooling base, and ram the nozzle clay. I place a mark on the nozzle end of the tube because once the completed gerb is rammed it will be difficult to tell the nozzle end from the bulkhead end.

As you can see in the sketch of the gerb, I want the actual throat of the nozzle to be about as high as the tube ID, or 3/4 inch in this case.

I mark my nozzle-forming rammer with a Sharpie at the point where the top of the tube will be when the rammer is inserted far enough to be sitting at the top of such a nozzle.



Marking the Nozzle Rammer, and Ramming Clay to Form Nozzle

Then I experiment with introducing and pounding enough clay to form that 3/4-inch tall nozzle. In this case, 0.5 ounce (a flat tablespoonful) of the bulkhead clay created just the right nozzle thickness once it was rammed.

I used 16 moderate blows with the mallet to ram/consolidate the clay. A very slight bulge in the tube where the nozzle is pressed is good; you can see in the sketch that perfection is when you ram the nozzle and bulkhead so that they slightly bulge the tube wall. This locks them into place and helps them withstand the extreme gas pressures of the burning gerb. But obviously I don't want to apply so much force that the tube is damaged or splits.

I've been pounding nails with a hammer just about all my life, so it comes naturally to me. It pays to take some time to practice swinging the mallet smoothly and with consistent blows, and it is an acquired skill which will pay off handsomely once it is mastered.

If I am forming a solid nozzle that I'll have to drill into to form an aperture, I use the bulkhead clay mix which has no grog in it. Any grog in the mix would prevent me from being able to do such drilling.

If I am using tooling which forms the aperture (no drilling required), then I use

nozzle mix which has the grog in it. This mix is less susceptible to erosion during the burning of the gerb.

Now I want to press my fuel grain in the paper tube on top of the formed nozzle. I place a mark on my flat-ended rammer where the top of the tube is when that rammer is inserted all the way to the top of the nozzle's beveled edge. Then I put more marks on the rammer every 1/2 inch below that first mark.

The last mark is 1 inch from the lower end of the rammer. That marks the top of the last fuel increment.



Marking the Flat-Ended Rammer for Increments of Fuel

I want to ram the fuel in half-inch increments so that they are very solidly consolidated. Very slightly rounded half-tablespoons-full of the fuel produces increments of that size in these tubes.

If this is a gerb in which I'm going to have to drill the nozzle aperture, then the first increment of rammed fuel is made with the [starter mix](#) which has no metal in it.

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Note: I measure out about 3 ounces of the fuel into a paper cup, and this is the only exposed composition in my work area as I work. I keep the rest of my compositions in tightly capped containers. Minimizing this kind of exposure can save my life in case of an accident. I wear safety glasses while I work. I consider it to be safe to hand-ram the fuel with the spherical titanium in it, but I would not do so with a rougher, sponge-type titanium.

After that starter increment, I ram increments of the [standard fuel](#) until I reach the last mark, which leaves a 1-inch empty void in the tube. I use 8 moderate blows of the mallet to consolidate each increment of the fuel. Again, I try and repeat these blows with the same force each time in order to produce consistently burning gerbs. If I don't, my gerbs will burn with differing degrees of power—sometimes producing a high spray, then dropping down lower. I want all my gerb's to burn the same.

I now ram one increment of the bulkhead clay, which fills 1/2 inch of that void, and leaves the last 1/2 inch of the tube empty.



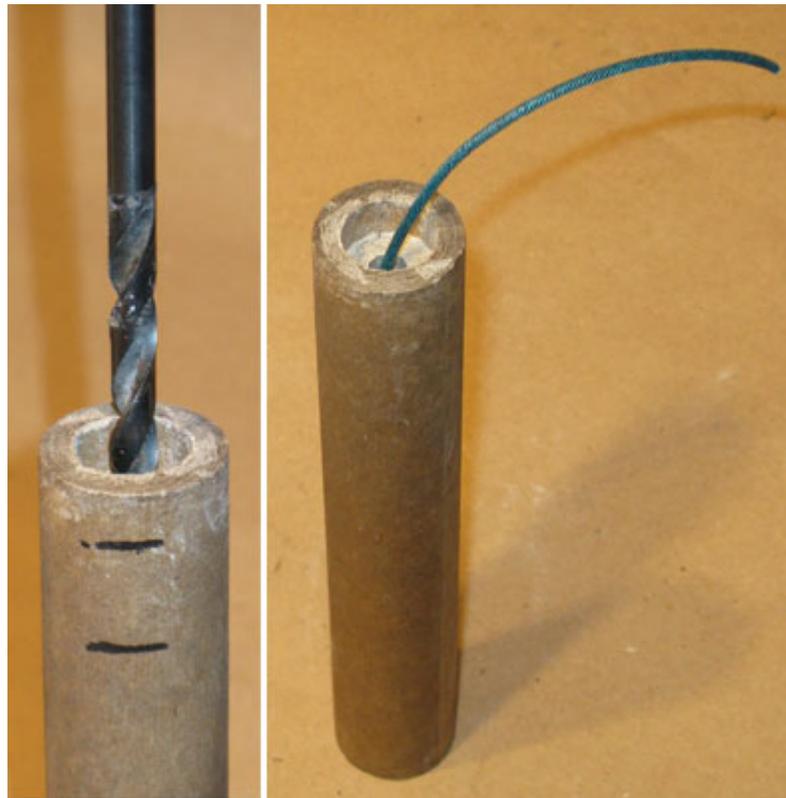
Note: One secret to really effective gerbs is to ram about 1/8 inch of black powder, similar to FFg sporting grade powder, in between the final fuel increment and the clay bulkhead. When the gerb burns to that point, the black powder burns almost instantaneously, producing a "bounce" which finishes the gerb off dramatically, leaving no doubt that it's done.

The commercially made gerb tooling that I have automatically forms a 5/16-inch nozzle aperture. If I have pressed a solid nozzle with homemade tooling, I use a 5/16-inch drill bit, gently twisted into the nozzle by hand, to form the hole in the rammed nozzle clay. I let the drilled-out clay fall back into my tub of clay mix because it's just fine to re-use it. I drill until the bit is just through the clay and into the starter fuel.

As you'll see a bit later in this essay, it is also possible to use different size drill bits to vary the size of the nozzle hole. This also changes the thrust of the gerb, the height of the spray of sparks, and other aspects of the effect.

I then take some Chinese Visco fuse, double over about 1/2 inch of it, making a little "V" on one end of it, and insert that doubled end into the nozzle hole. I like the Chinese Visco, as opposed to the American, for lighting rockets and devices like these gerbs because it throws out a tremendous amount of sparks as it burns. As a result, it lights things very reliably.

The gerb is now ready to be stuck in the ground, taped to a stake, or inserted into a wood base with a drilled recess, ready for ignition.



Drilling the Nozzle Aperture and Fusing

Final Results

These gerbs, made with either fuel, burn for 20-25 seconds. The glitter fuel produces a graceful, soft, golden spray of popping glitter globules. The titanium fuel produces a forceful, bright spray of silver sparks.

I have to say that even after almost 20 years making fireworks I still get excited when I make one of these devices, take it out into the field, and light the visco, waiting to see how it performs. I suppose it's the one activity I've never lost interest in.

I won a PGI gerb competition a few years back with a pair of 1-1/2-inch ID gerbs. I carefully weighed out alternating increments of the glitter and titanium fuels, so that the pair burned with simultaneous pulses of the bright titanium sprays alternating with periods of the soft glitter plumes. Then I ended both gerbs with dramatic "bounces." I was very pleased with the fountains and apparently so were the judges.

Experiments

The final resulting pressure at which a gerb burns is determined by the power of the fuel and the size of the nozzle aperture. With a given fuel, the pressure and height of the spray can be adjusted by changing the size of the hole in the nozzle.

A large hole, or no nozzle at all, will result in a low pressure, short spray, and the fuel will burn relatively slowly. When these fountains are hung in a line, upside-down, to create a waterfall, this sort of slow, graceful, low pressure burning is desirable.

A smaller aperture will result in high pressure, tall spray, and faster burning of the fuel. Too small a hole will result in the strength of the nozzle or tube being exceeded, and the tube will violently rupture or the nozzle will be blown out of the tube.

So within certain limits the size of the drill used to make the nozzle aperture can be adjusted and the burn of the resulting gerb can be observed and noted.

This is all just part of the fun of fireworking. In my playing around, I found that the glitter gerbs work very well with 1/4-inch to 5/16-inch nozzle apertures, burning for 25 seconds. With a 3/16-inch hole, the gerb burned 3-5 seconds faster with more thrust, and the glitter effect was almost completely lost.

The titanium gerb results were: 5/16-inch aperture - 20 second burn with about an 8-foot tall spray; 1/4-inch aperture - 20 second burn with a 10-12-foot tall spray; 3/16-inch aperture - 16 second burn with an impressive 16-foot tall spray.



1 Gold Glitter and 2 Silver Titanium Gerbs

Here's a link to a [video of a glitter gerb](#), a titanium gerb, and a pulsing gerb.

A 1/4-teaspoon "bounce" increment of FFg sporting black powder produced a very impressive final "thwump" at the end of the gerb's burn.

Using Homemade Gerbs Creatively

PGI Grandmaster Ned Gorski teaches you how to use your homemade gerbs as waterfalls, wheel drivers, set pieces and line rockets.

Materials Needed

- [Charcoal, Air float \(CH8068\)](#)
- [Dextrin](#)
- [Homemade Gerbs](#)
- Kraft Paper
- Plastic Baggie
- [Potassium Nitrate \(CH5300, CH5302\)](#)
- Quickmatch (GN3001)
- [Sulfur \(CH8315\)](#)

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- [Super-Fast Paper Fuse \(GN1205\)](#)

Introduction

In Fireworks Tips #108, I made some [homemade gerbs, also called fountains](#), using either a gold glitter composition or a silver titanium one. These fountains create nice effects, either fired one at a time, or in a "front" with the gerbs in a line, spaced 8-10 feet apart.



Homemade Silver Titanium Gerb

One of the things I really love about handmade gerbs is their versatility. In this article I will show you how to incorporate these fountains in some other creative devices:

I'll mount some gerbs on a frame to create a waterfall.

I'm going to show how to make a very simple, beautiful, color-changing wheel.

I'll recreate the [Chromatrobe wheel](#) that was described in Fireworks Tips #105, using homemade fountains to drive it.

I'll show how to make a simple set-piece in the shape of a star, using two different types of titanium in the silver formula.

And a simple line rocket will be assembled.

Making the Gerbs

I totaled up the number of the glitter gerbs and the titanium fountains I need for all the projects I have planned, and I rammed them as described in Fireworks Tips #108, [Making Fountains Quick and Easy](#).

I drilled 1/4-inch nozzle holes in all of them except the four titanium gerbs that I have planned for the sample waterfall. I made 3/8-inch apertures in those nozzles so that they spray the silver sparks out more gently.

Also, the glitter gerbs are going to be used in pairs with the titanium ones. The glitter gerbs will burn, and then they will passfire from their bulkhead ends to the nozzle end of the Ti ones. So, I've drilled 1/4-inch passfire holes through the bulkheads of the glitter fountains.

When they are going to be used individually, I fuse the gerbs with Visco as shown in the photo above. But when they will be used in devices such as the ones I have planned for this project, I fuse them differently.

I cut some 4-inch lengths of thin blackmatch from [Quickmatch](#) or [Super-Fast Paper Fuse](#). This match is doubled and inserted into the nozzle holes of the gerbs.



Lengths of Thin Blackmatch, Cut, Doubled, and Inserted into Gerb Nozzles

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I screen together, through a 40 mesh screen, a black powder prime composition, consisting of:

Component	Ounces
Potassium nitrate	1.5
Air float charcoal	0.3
Sulfur	0.2
Dextrin	0.1

In a paper cup, I add enough water to the prime powder to create a slurry with the consistency of jam. This slurry is put in a plastic baggie, the top of the baggie is twist-tied closed, and the excess plastic is cut off. I clip a very small corner off of the baggie, and pump the prime into the nozzle holes until they are full.

I finish this priming/fusing off with a dusting of fine black powder granules, and the prime is allowed to dry for a couple of days.



Priming the Gerbs with Black Powder Slurry

This combination of blackmatch and black powder prime ensures a very positive ignition when the flame from quickmatch fusing reaches the ends of the gerbs.

Now I install paper buckets on the fused ends of all the gerbs, and on the passfire ends of the glitter gerbs. These buckets consist of 4-inch by 9-inch pieces of 40-pound kraft paper glued and rolled onto the ends of the paper tubes, resulting in a double walled bucket.



Installing Paper Buckets on Gerbs

Making a Waterfall

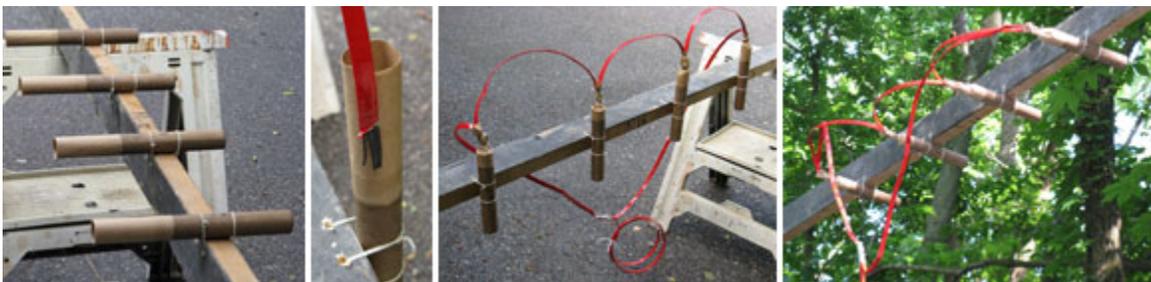
Traditional waterfalls use thin-walled paper tubes filled with a [potassium perchlorate and aluminum composition](#), and hung pointing downward. The waterfall I'll be making with these silver titanium gerbs will be a little different than that.

I was watching a special on Niagara Falls the other day, and I noticed that the water projects horizontally off of the rock river-bed and then gradually arcs over and starts to fall vertically. I started to wonder if something like that could be done with these Ti gerbs.

So, as an experiment, I'm going to mount four Ti gerbs, with the 3/8-inch nozzle apertures, horizontally on a board, 12 inches apart. I'm interested in seeing what sort of effect that produces.



Note: In past articles I've shown how [Super-Fast Paper Fuse](#) or [Fast Yellow Visco](#) can be wrapped with aluminum foil duct tape to produce quickmatch if one does not have access to that fuse.



Constructing a Waterfall with Homemade Silver-Ti Gerbs



Four-Tube Waterfall

I was not completely thrilled with the effect this falls produced. Many of the silver sparks burned out flying horizontally before they started to fall vertically. Even with the 3/8-inch nozzle aperture the gerbs still had too much thrust.

The next day I decided to make one gerb without any nozzle at all. I just pressed silver-titanium comp into the tube, and burned it. I was happier with the unchoked tube and would use gerbs in that configuration in the future. The waterfall effect would have been better with 16-foot vertical supports instead of the 12-footers that I used this time.



Single-Tube Waterfall (No Nozzle)

Making a Simple Color-Changing Wheel

For the wheel frame, I took a 4-foot piece of 1x2, and mounted a threaded tube through a hole in the center of it. I will later use a 1/4-inch lag bolt to mount the wheel to a vertical support post.



Then I drilled a pattern of holes in the ends of the 1x2, through which I'll tie on the gerb drivers.



I use waxed string to tie the glitter gerbs to the outer end of the 1x2, nozzle end pointing out. Then the Ti gerb is tied on next to it facing in the same direction. These drivers end up staggered so that the glitter gerb's sparks do not ignite the fusing of the Ti gerb.

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A quickmatch passfire is tied into the passfire end of the glitter driver and over into the thrust end of the Ti one.

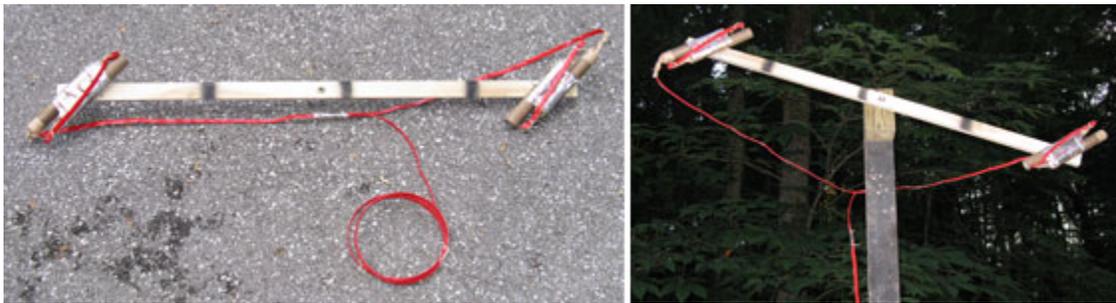
I tie the pair of gerbs together to further improve their stability. Additionally, I covered the string ties with aluminum foil duct-tape so that there would be no chance of the ties burning through when the passfire ignites.



Note: In the past, to attach drivers, I've used plastic zip-ties, or iron wire, which are both less susceptible to flame damage, but this time I wanted to use the string, which is simpler, less expensive, and lighter.



The completed wheel is now ready to mount to a support post. There is a wood block at the top of the post to space the wheel out and away from the support to keep the wheel from hitting it.



Completed Wheel with 2 Pairs of Glitter and Titanium Gerb Drivers

When I am attaching the quickmatch drop-leader to a device which is designed to move, such as a rocket, girandola, or wheel, I always install a "positive disconnect" section. A "positive disconnect" is simply a section in the quickmatch which is designed to burn through and fall away. This is done by exposing, and overlapping bare blackmatch from the ends of two pieces of quickmatch and wrapping with clear packing tape. I then tie the packing tape bucket to secure it in place.

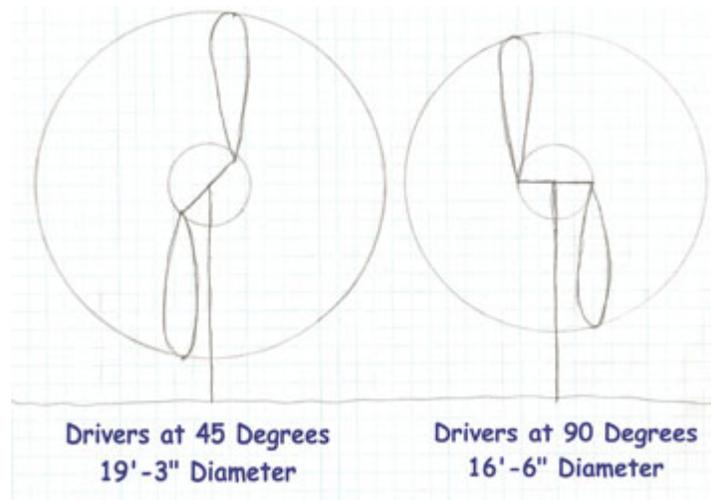
This disconnect ensures that the plastic-and-paper match pipe and the blackmatch string actually detach from the device. I have had moving devices fail to move due to the incomplete detachment of the quickmatch leader. This is a bad thing.



Positive Disconnect Section Constructed in Quickmatch Leader



Note: Mounting the drivers at a 45-degree angle to the 1x2, instead of at a 90-degree angle increases the final wheel display's diameter. It also decreases the thrust that the drivers impart to the wheel, thereby slowing its rotation and making it appear more graceful.



Drawing of Drivers Mounted at 45-Degree and 90-Degree Angles



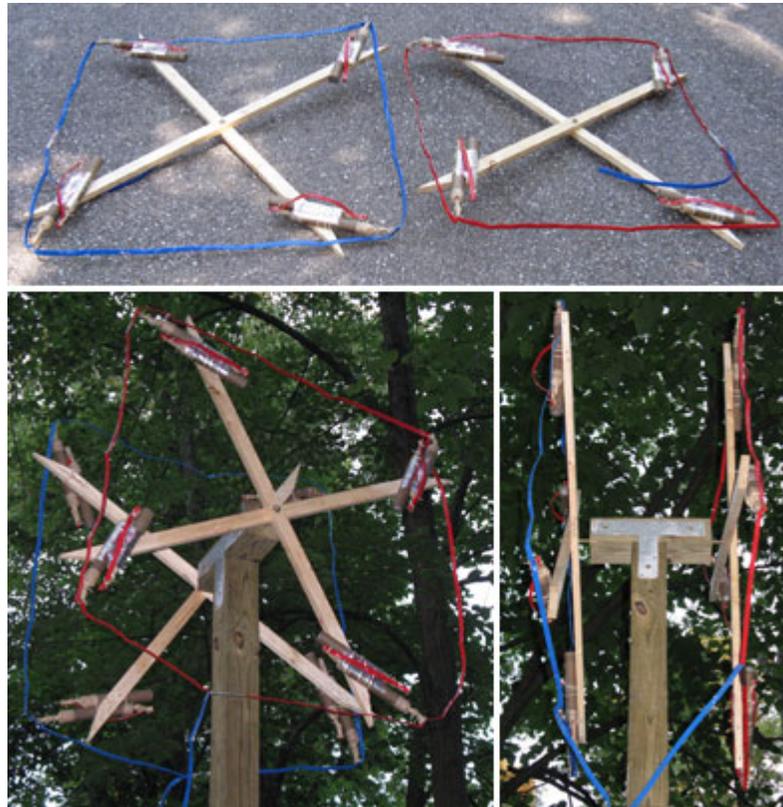
Note: As I was constructing the wheel, I was constantly thinking through the ignition and burn sequences, and imagining all the possible things that could go wrong and could be avoided. The aluminum foil over the string ties was such a counter-measure. In even this small wheel there is a lot of time and effort and I'd really like it to work well. There's a huge difference in the feeling I have when something works as designed, as opposed to disappointment I feel when it crashes and burns.



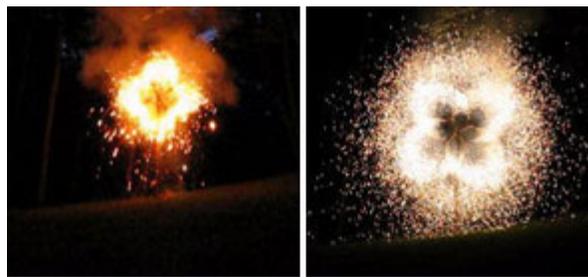
Simple, One-Armed Color-Changing Wheel

Making a Homemade Chromatrope

I also remade the Chromatrope wheel, this time with homemade gerb-drivers. The ends of the arms on the two wheels will have pairs of gerbs mounted on them in exactly the same manner as the simple wheel above. One wheel will rotate clockwise, and the other will move counterclockwise.



Assembly of Chromatrope Wheel



Chromatrope Wheel with Homemade Drivers

Making a Star Set-Piece

Homemade fountains can be arranged in a multitude of ways to create a set-piece, forming letters, a word, or any other design.

I decided to create a simple, 5-fountain, star set-piece to illustrate what can be done with these gerbs.



Star Set-Piece and Driver Shim

I used 12-foot 1x4's to make the framework, and mounted the gerbs with zip-ties and a shim under the nozzle end to slightly point the exhaust out away from the frame. The shim is simply a section of a 1.25-inch ID paper tube.

For this little project I made 5 gerbs with the [coarse spherical titanium \(CH3001\)](#) and 5 with the [fine spherical Ti \(CH3010\)](#). The two effects were dramatically different.



Star Set-Pieces Using Coarse and Fine Spherical Titanium

The star on the left, using the coarse Ti, could have easily been made twice as large, and the one on the right with the fine Ti could have been made slightly smaller.

Line Rocket

With one last little bit of creativity, I assembled a couple of line rockets. The first one had one driver (this type of rocket makes a nice effect flying into a bonfire as the fire is lit). The second one had two drivers in opposite directions, one burned then passed fire to the other, produced a back-and-forth flight.

In both cases, the gerbs were taped to a piece of PVC plumbing pipe which has the same OD as the fountain tubes.

The pipe is installed on a length of iron wire as the wire is strung tightly between two solid supports, like trees.

In this case, in order to develop enough thrust with the Ti gerbs, I drilled the nozzles with a 3/16-inch drill.

Advanced Fountains



Line Rockets

In his book, [Introductory Practical Pyrotechnics](#), Tom Perigrin has some fun ideas for other creative variations on the line-rocket theme. Rat Packs, Jeweled Rats, Pigeons: So many experiments, so little time.

Conclusion

So there you have it. Plenty of ideas on ways to put simple homemade gerbs to use. They don't make much noise, they are relatively safe, their effects last a long time, they make for instant gratification, and they offer endless opportunities for creativity.

Have fun and stay safe,

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