



## Build This...

### 4" Mine w/Saettines



#### Summary:

Mines are among the quickest items to prepare and are ideal for disposing of old stars or leftover shell components that are taking up space in your shop. These pyrotechnic "shotguns" are simply bags of components with a small quantity of lift charge at the bottom, usually with a disk or piston between the lift and the components to help push them out of the mortar.

This article shows the construction of a simple 4" star mine containing saettine inserts, which are Italian salutes that use a clever combination of sawdust and black match to achieve delay after ignition.

#### Materials:

- ▶ (7) 2-1/2" x 7" long manila file folder paper
- ▶ (7) 4-1/2" x 7-1/2" 70lb kraft, grain short
- ▶ (7) 5" long single strand black match
- ▶ (7) 2" square scraps of 30lb kraft
- ▶ (3) 3-1/2" diameter 1/8" chipboard disks
- ▶ (1) sheet newspaper
- ▶ (1) 11-1/2" x 24" 40lb kraft
- ▶ 40g 2FA black powder
- ▶ 1-1/3 cup of stars
- ▶ quickmatch leader

#### Tools:

- ▶ 1" dia dowel rod
- ▶ rubber mallet
- ▶ glue brush
- ▶ 3-1/2" dia case former
- ▶ spiking horse

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**Unmeasured Materials:**

white glue, cotton twine, paste, sawdust, 70-30 flash

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## 4" Mine w/Saettines



Figure 1: Paper cut and ready to roll saettine cases.



Figure 2: Dowel even with tag board prior to folding the overhang.

### Making the Saettines:

Saettines, also spelled siatenes or citeens or alternatively called lambetti, are a type of small report used in shells and mines. What sets them apart from other types of reports is the method by which they achieve their delayed timing. The simple paper casings are only partially filled with flash powder, into which a single strand of good quality black match is inserted. The remainder of the space is rammed with sawdust or bran such that it surrounds the black match and prevents the gasses from shooting along the sides as in piped match. This creates a reliable delay that, while not as accurate as time fuse, does the job quite well when a random barrage of salutes is desired following a color break shell or colored star mine.

Saettines are quick and easy to make, since they require no special tubes, disks or time fuse. The ones described here will measure 1" diameter by 2-1/2" long. You will only need seven to complete the 4" mine for this project, but you might as well make a good number of them because you will find yourself wanting to use them a lot and of course in fireworks, more is always better!

The case for saettines are made by rolling two pieces of paper together at once. An inner liner is made from thin chip board or manila file folder paper measuring 2-1/2" wide x 7" long. This will give you two turns around a 1" diameter case former. One 14" legal size file folder will give you enough strips to make a dozen saettines. The outer strip of paper shown in Figure 1 is a piece of 70lb kraft measuring 4-1/2" wide by 7-1/2" long, with the grain running in the short direction. The liner is placed over the kraft so that it overhangs a few inches on the end you are rolling from. The kraft is glued at the edge and the two sheets are rolled up together.



Step 1: Making the triangle fold



Step 2: Second fold.



Step 3: Third fold.



Figure 3: Bundled and fused cases ready to load.



Figure 4: Packing in the sawdust for delay.

Both ends of saettines are closed by a simple fold known as the "triangle fold." The case former is slipped down so that it is level with the inner liner. Steps 1-3 above shows how the overhanging kraft paper is folded to form the bottom of the saettine. I like to apply glue after each fold to help the pleated paper stay down. After the last fold is made, place the bottom of the case on a table and rap the case former with a rubber mallet to make the end good and flat.

As you might guess, this folded end plug is not reliably gas tight. While some claim that proper construction results in a good seal, having your shells detonate from a gas leak in one single saettine is not the best way to verify this claim. There are two methods commonly used to guard against gas leaks setting off your saettines. One is to ram an initial scoop of sawdust into the bottom of the case prior to loading the flash. The other is to paste a small square of lightweight kraft over the bottom of the case after it is loaded. I personally prefer the latter method.

Begin loading your cases by bundling them together and inserting a 5" stick of black match in each one. The quality of your black match is important, since only one strand can be used. Using multiple strands will cause a fire gap between them that will ruin the delayed effect.



Step 1: First fold



Step 2: Second fold.



Step 3: Third fold.



Figure 5: Pasted paper over bottom protects against gas leaks.



Figure 6: A clove hitch made with pasted cotton twine secures the ends.

Next load the flash powder into each case, leaving anywhere from 20% to 50% unfilled depending on how much delay you want. The unfilled space is then loaded with sawdust and tamped down to form a tight seal around the black match, which should run down the side of the case as seen in Figure 4. Note that while this consolidates the flash, it does not effect the performance of the salute. This reality is contrary to the belief sometimes held that salutes should contain only loose flash with some air space around it.

The next series of photos above shows how the triangle fold is made around the protruding black match, only this time no glue is used. Figure 5 shows the pasted kraft paper gas seal around the bottom of the loaded saettines. Omit this step at your own risk!

The saettines are finished by looping a clove hitch around the case to hold the ends down. Cotton twine wetted with wheat paste makes a good cinch when tying them off. Allow them to fully dry before loading them into any mines or shells.

**WARNING:** saettines are only to be used as components of other shells or mines and should never be used as hand held ground bombs. Salutes of any type using black match as the ignition method should never be lit by hand, especially when holding them!

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## 4" Mine w/Saettines

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Figure 7: Pleating the bottom of the mine bag.



Figure 8: Piston made with wadding between two solid disks.



Figure 9: Loading the saettines.

### Assembling the Mine:

Mines are nothing more than bags of components that are blasted from a mortar with a small lift charge. Since the container and components do not have to withstand the violent forces of being fired from a mortar while remaining intact, the construction of a mine can be quite flimsy. I've seen 12" mines made with nothing more than a grocery bag with a pound or two of 2FA in the bottom, a pizza disk over that and a whole-lotta pyro piled on top!

This mine is a bit longer than the average 4" star mine due to the inserts being used in addition to the stars. Cut a sheet of 40lb kraft that is 11-1/2" wide and 24" long, then roll it up over a 3-1/2" diameter case former just as if you were making a shell. A chipboard disk is dropped into the end while the case is still on the former, and the overhanging paper is pleated down as seen in Figure 7. You can use tape, gummed paper or glue to hold down the pleated paper.

Next slide the case off the former and load 40g of 2FA lift charge into the bottom. This is all you will need to hurl your goodies high into the air.

The next component has a lot of variations with various theories as to it's effectiveness. A piston device is placed above the lift charge, on which the rest of the mine contents will rest. The purpose of this piston is to give the list gasses a platform to push against and more effectively use the lift charge to launch the components higher. Some builders use nothing but a single chipboard disk. Some believe that this single disk is subject to rotation during lift, allowing the lift gasses to slip by and lose some height reached by the mine contents. Various methods can be used to make a thicker disk that will be less likely to rotate in the confines of the mortar. Figure 8 shows the method that I prefer, which is to sandwich a wadding of newspaper between two disks and hold them together with a few pieces of tape.

Mines are typically ignited by sending the passfire to the stars first in order to insure that they are lit before the lift charge ignites. Some builders run raw black match all the way down into the lift charge and up through the star chamber. Many people punch holes in their disks or notch the edges, believing that this is required in order for the fire reach the lift charge once the stars ignite. These holes then further require the lift charge to be contained in some sort of bag to prevent it from migrating out the holes and into the star chamber during shipping and handling.

However, none of this extra work is necessary and you can simply use solid disks without any problems. It is always far more difficult keeping hot gasses out than allowing them to get in, and even the slightest hair thin gap around your disks would allow for easy ignition. The reality is that the entire inside of the mortar becomes a high pressure inferno and the thin outer wrap splits away in the first fraction of a second, easily allowing the lift charge in the



Figure 10: Finished mine ready to fire.

bottom to ignite.

After dropping the piston into place over the lift charge, add about 1-1/3 cups of round or cut stars on top. This should give you a 2" high column of stars. The saettines are loaded in right on top of the stars. Some builders suggest that placing the saettines fuse end down will reduce the likelihood of a gas leak detonating one of them accidentally. However, if you have prepared the bottom end of your saettines as previously mentioned in order to make them gas tight, it should not matter how you orient them in the mine.

Run your leader down between the saettines so that the bare match rests on top of the stars. The remaining paper is simply collected around the leader and tied off with a clove hitch.

The effect should be a burst of colored stars with a delay before seven loud flashes of white light appear over top of the star column. 🔥

