

A CREMORA®-FUELED PYROTECHNIC ALTERNATIVE

Adam J. Dahl
Yale School of Drama

Shown in Figure 1 is the non-pyrotechnic flash we produced after discovering it would cost over \$7,000 to hire a licensed pyrotechnician for the 4-week run of *The King Stag* at The Yale Repertory Theatre. The high cost of bringing someone in led to the decision to explore using an air cannon to fire Cremora® non-dairy creamer into the air and allow it to drift down into a flame and ignite, as suggested in Steven A. Balk's *Technical Brief* "Remote Controlled Flash Effect".

Balk's article focuses on the remote control aspect of the device rather than the nature of the flash. During tests, we discovered that while his effect worked as described, it did not reliably produce the large, fast flash this production needed. In this case, widely variable air currents in the space caused the airborne Cremora® to drift away from the flame, causing misfires. With the modifications described in this article, the size and speed of the flash are governed solely by the air pressure and amount of Cremora® used: the higher the pressure, the taller the flash; and the greater the amount of Cremora®, the wider and brighter the flash. The flash shown in Figure 1 used 85 psi and less than $\frac{1}{8}$ cup of Cremora®.

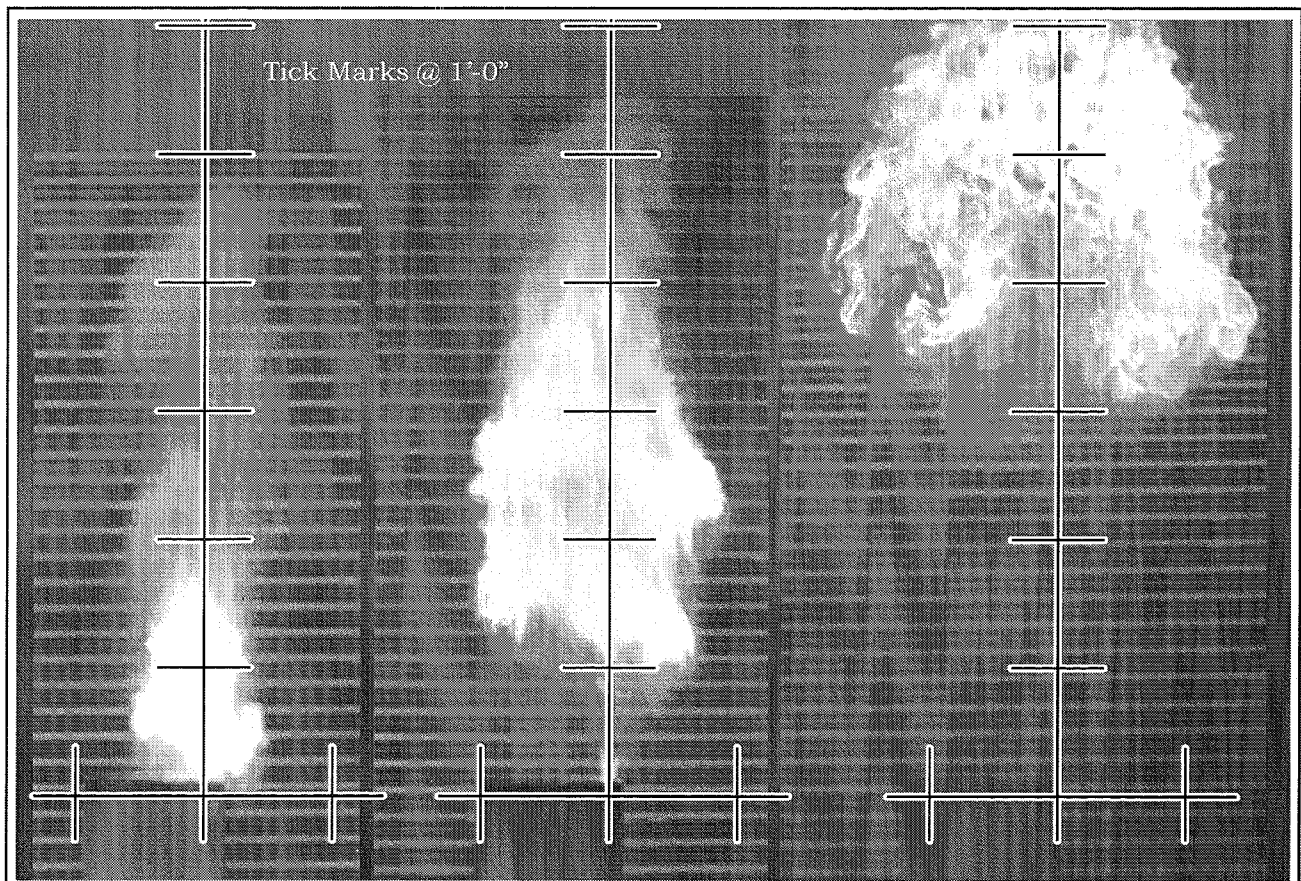
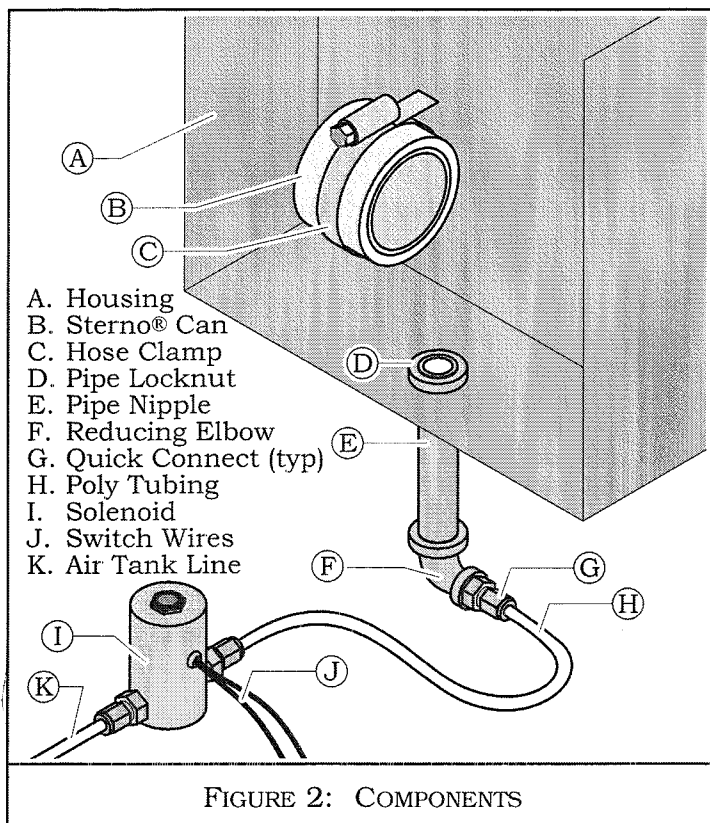


FIGURE 1: THE CREMORA® FIREBALL AT 0.25-SECOND INTERVALS

CONSTRUCTION AND ASSEMBLY NOTES

As Figure 2 illustrates, the modified device has 3 main components: a housing, an air cannon, and a Sterno®-can cradle. We built a steel housing measuring 6" x 12" x 12", but other materials and dimensions can be used as long as the housing keeps the flame away from other objects, contains any Sterno® that might spill from the can, and shields the Sterno® flame from audience view and variable air currents.



THE AIR CANNON

First drill a $\frac{3}{4}$ " hole into the base of the housing and use two locknuts to secure the pipe nipple. Attach the reducing elbow with a quick-connect fitting to the other end of the nipple. Attach quick-connects to each port of the solenoid, connecting one end to the air supply and the other to the nipple assembly. Connect the solenoid to the switch and the switch to a power supply and the air cannon is complete.

THE STERNO®-CAN CRADLE

The cradle, a hose clamp attached to the side of the housing, holds the Sterno® can sideways and offset from the pipe nipple so that the flame is directly over the air cannon. We brazed the center of the clamp to the housing, $\frac{3}{4}$ " back from the nipple and $2\frac{1}{2}$ " above the base of the housing, but that location may need to be adjusted for other installations. The objective is to center the flame over the nipple.

In addition to centering the opening of the Sterno® can over the nipple, the cradle must allow the can to be slid closer to or farther away from the nipple. Adjustability is important because the position of the flame determines whether the air cannon will shoot Cremora® directly through the flame giving the desired result, or past it – putting the flame out. The correct placement is best found by trial and error.

FIRING THE EFFECT

Fill the air tank and load the measured amount of Cremora® into the pipe, light the Sterno®. Stand back and depress the firing switch. The amount of time the switch is depressed will affect the amount of air released to the air cannon and, consequently, the height and spread of the Cremora®-fueled flame.

SAFETY REMINDERS

The flame this effect generates burns fast but it also burns hot enough to singe hair and ignite paper. The use of open flame onstage is governed by several codes, and permission to use this or any similar effect ultimately depends on local authorities. Even with approval, users are reminded to take all proper precautions, including keeping as much distance as possible between the performers and the effect and having an attended fire extinguisher nearby and ready for use.

MATERIALS

Quan	Part	Part #	Unit Cost	Other Information
McMaster-Carr				
1	Medium Duty Solenoid Valve (NC)	4809k112	\$99.44	5 psi min-150 psi max
4	gray acetal $\frac{1}{4}$ " pipe to $\frac{1}{4}$ " tube male pipe adapter quick connects	51055k12	\$1.37	230 psi max
—	Ether Based Polyurethane tubing	5648k25	\$0.33/ft	148 psi max at 75°F
1	22 mm panel cutout metal momentary pushbutton switch (SPST-NO)	8382K21	\$23.13	
Home Depot				
1	4 $\frac{1}{2}$ " x $\frac{1}{2}$ " Schd 40 Black Pipe Nipple	N/A	\$0.97	150 psi max
1	90° Black Pipe Reducing Elbow $\frac{1}{2}$ " to $\frac{1}{4}$ " (female to female)	N/A	\$1.58	150 psi max
2	$\frac{1}{2}$ " black pipe locknuts	N/A	\$1.23	
1	5" Dia Worm Drive Hose Clamp	N/A	\$3.50	
Others				
1	Sterno [®] Can (7oz)	N/A		
1	Cremora [®] non-dairy creamer (32oz)	N/A	\$2.15	

NOTES

Making the Sterno[®]-can cradle a separate stand would increase the adjustability and most likely the effect's reliability in the long run. This effect's adaptability for repeated use might be improved by having an ignition source that could be turned on and off, rather than a constantly burning Sterno[®] pilot light.

SOURCES

The Sterno[®] MSDS is available at http://www.sterno.com/sterno/sterno_retail/msds.aspx
 Balk, Steven A. "Remote Controlled Flash Effect" *Technical Design Solutions for Theatre, Vol. I* ed. Bronislaw J. Sammler & Don Harvey. Boston: Focal Press, 2002.

