# Oatmeal Box Pinhole Cameras

## For making your camera, you will need a few inexpensive supplies:

- a clean, 7-inch tall oatmeal box, in excellent condition (no tears, dents or holes)
- an aluminum soft-drink can
- old scissors to cut the aluminum with (please don't use good scissors for this!)
- flat black spray paint (not the glossy black kind)
- a #16 bead-threading needle (used to make the pinhole in the aluminum)
- a wood clothespin
- household epoxy glue (used for making the "pinhole drill")
- Q-tips to spread the epoxy glue
- a manila file folder
- plastic (electrical) tape
- light cardboard, such as the side of a breakfast cereal box
- a ruler to measure the paper shutter parts
- an Exacto knive or one-sided razor blade to cut the hole in the oatmeal box.
- emery cloth or very, very fine sandpaper
- two strong rubber bands to hold on the lid while outdoors taking pictures

"The thing about God is that He is often described as a God of Light.
One thing that science has yet to explain, is Light."

Fiona Robertson
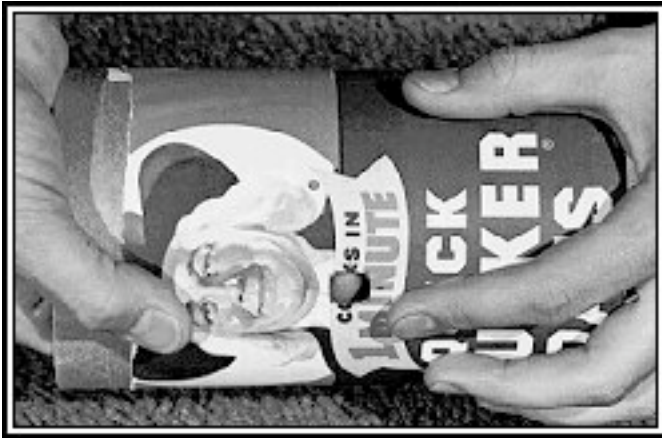
Draw a small box 3 1/2 inches from each end of the oatmeal box (in the center of the oatmeal box). Try to place the little box beneath the smiling Quaker's face.CAREFULLY cut out the small box with an Exacto knife or with a one-sided razorblade. After cutting the small square hole, clean out any paper left in the opening. This is the "pinhole window" where the pinhole will look out at the world. Can a tiny hole, which contains nothing but air, see things? We will find out later.

Use a damp washcloth to clean out any oatmeal dust inside the box. Spray paint the inside of the box, and both the inside and outside of the lid, too. Do this on newspapers. There is an art to spray painting with aerosol cans: it is best to not "soak" the insides of the oatmeal box with paint. Spray in short bursts from several inches away, and constantly shake up the can. Use as little paint as possible because you must wait for the paint to dry before the pinhole can be installed, and because excess black paint can become "dust" after it dries. Dust is the photographer's worst enemy--it causes white spots on the finished pictures which are hard to remove.
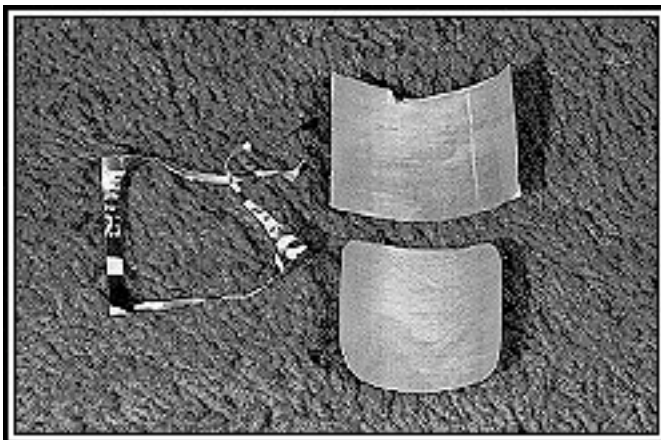




Carefully cut the ends off of an aluminum soft drink can. Cut a "pinhole plate", about 2 x 3 inches in size with rounded edges, from the aluminum can. The pinhole will be drilled in the pinhole plate.

# Making the "Pinhole Drill"

Instead of having a glass lens like "normal" cameras, the pinhole camera uses a tiny hole, a needle-sized hole, to form the picture inside the camera. The best size of pinhole for this camera body is one which is 1/100th of an inch in diameter. There is a fine needle which is that size--the #16 beading needle. Because the needle is small and difficult to handle, it must be glued into a handle to make a "pinhole drill." As illustrated below, the drill is easy to make, and once prepared, it can be used to make hundreds of pinholes in the soft aluminum stock cut from soft drink cans.
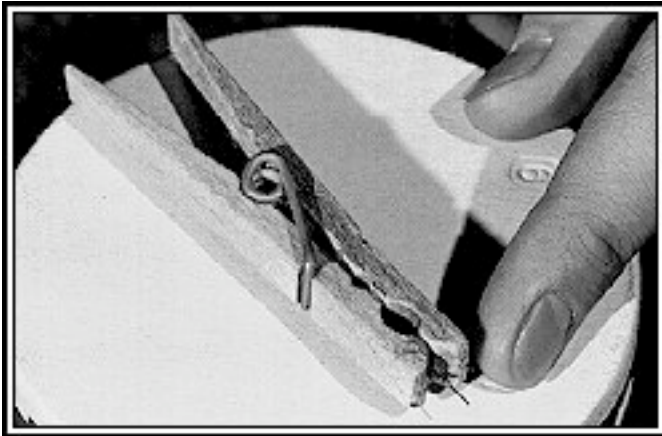
Mix the epoxy in the cut-off end cap of a soft drink can. Place epoxy in the mouth of the clothespin and insert the needle until it protrudes about 1/4 inch. You may have to cut the back of the needle off to make it fit into the clothespin. If the needle protrudes more than about a quarter inch, it will easily break off when used to drill pinholes.

The finished "pinhole drill" should look like this: notice the 1/4 inch length of the drill shaft.

Here you see the delicate task of drilling a pinhole in the aluminum plate. This is an important part of making a pinhole camera. It requires a delicate touch and a bit of patience. A fine pinhole will result in sharp photographs and will last for centuries! Following are the steps for using the "pinhole drill" to make a fine-quality pinhole lens.

# Drilling the Pinhole

Hold the aluminum plate as shown and carefully press and rotate the "pinhole drill" until the tip of the needle barely shows through on the other side.

When you see the tiny needle point sticking through the other side, stop drilling. Be careful to not push too hard on the "pinhole drill"--it must not stab completely through the aluminum on the first try.

Carefully sand the tiny hole made by the needle's tip. Then, drill again, carefully and slowly until the hole is a bit larger. Sand the hole again on both sides. Drill again, sand again. It should take three or four drilling and sanding steps to get a beautiful, round 1/100th-of-an-inch-in-diameter pinhole "lens"! Finally, clean the hole by running water through it and patting it dry with a clean paper towel. Try not to touch the hole because oil and dirt from your fingers may partially fill the hole and cause it to take less sharp pictures.

# Installing the Pinhole and Shutter



Installing the pinhole into the oatmeal box camera body.



Before placing the pinhole plate inside the camera body, Put electrical tape on two sides and make a circle of epoxy glue around the pinhole, without getting any glue on the hole itself.

Then carefully place the pinhole plate inside the camera so that the pinhole is in the middle of the cut-out opening. Press the pinhole plate inside the camera for a few minutes, until the epoxy glue thickens. A tight seal around the pinhole plate prevents any light from leaking into the camera. The other place where light likes to leak into the camera is around the lid.
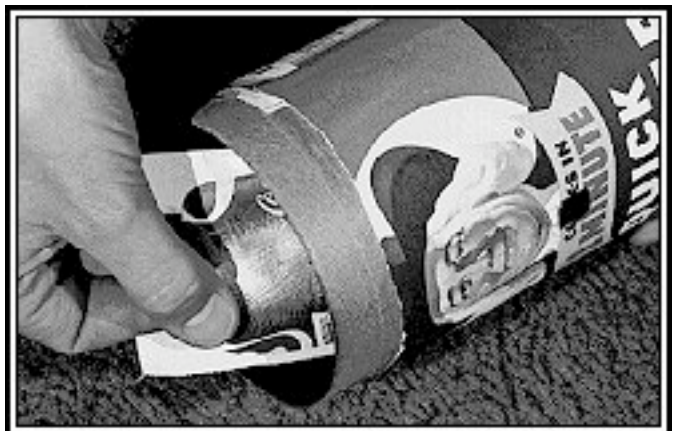
# Making the Shutter...
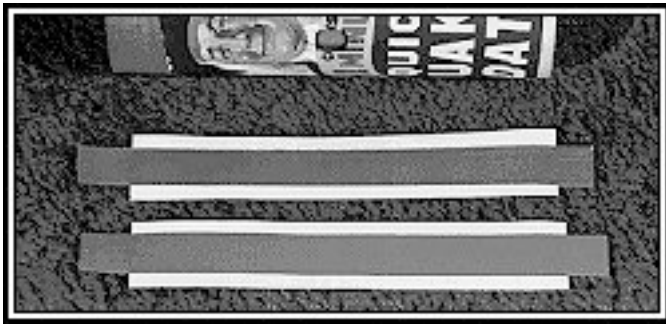
From a file folder, measure and cut out two strips, 1 inch by 7 inches each. These strips will become the shutter guides. Cut two 10-inch strips of electrical tape and stick them over the shutter guides, leaving about 1 1/2 inches of tape overhanging each end of the shutter guides.
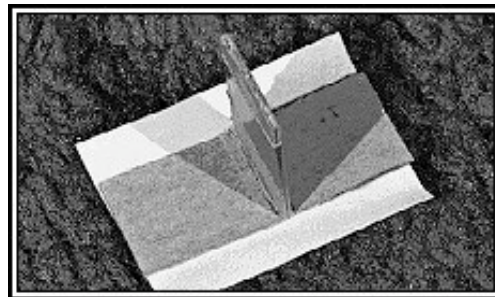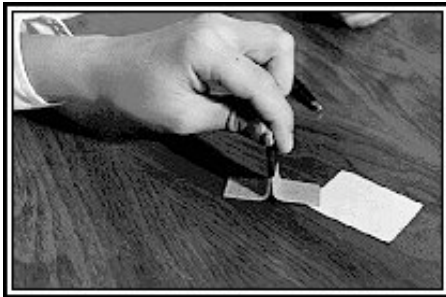
The shutter is made from two parts. Cut a 1 1/2 x 2 inch piece from the file folder. Also cut from either the file folder or from heavier cardboard (such as a breakfast cereal box) a strip 3/4 x 5 inches long. Fold the strip in half, then bend out the two "legs" as above, put a spot of glue inside the handle and wrap electrical tape around it. Finally, glue the shutter handle onto the shutter slide. Hold the shutter handle down until the glue hardens. The result: a pinhole shutter!
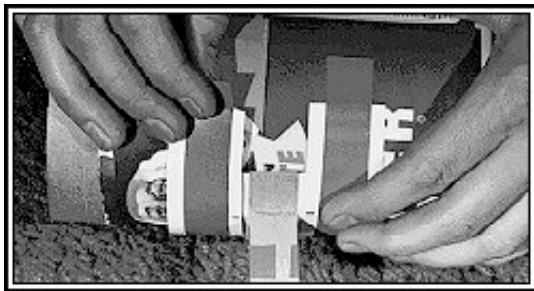
Place the shutter guides on the camera and align them over the pinhole box. Stick them down gently at first because adjustments will become necessary to allow the shutter to slide easily. Unstick one end of the shutter guides and insert the shutter. Realign the shutter guides as necessary to allow the shutter to slide easily (but not too easily!) while uncovering and covering the pinhole. Ready for the last step?

Finished! Notice the shutter handle sticking out from where the pinhole is located beneath the mark on the shutter guide. The smiling Quaker now is gagged; only his friendly eyes remain visible. This completes building the pinhole camera. Now it is time to set up a darkroom. Pinhole cameras must be loaded with film in a darkroom, and the pictures taken with them can only be developed in a darkroom. The drugstore wouldn't know what to do with film exposed in an oatmeal-box pinhole camera: this is a do-it-yourself process. Also, be sure to remember to strap on the lid with a pair of rubber bands before going outside into the bright sun. Most light leaks come from the camera lid.

# Taking Pictures with Oatmeal Box Pinhole Cameras



Negative and Positive Prints made with an Oatmeal-Box Pinhole Camera



The above photos show the negative image which appears on the "paper film" and the positive image, or "print". Here you see how the camera was set up. Notice the shoe placed on top of the camera to give it some weight so that a breeze won't move it while the film is being exposed to light. Both the camera and subject must remain very still during the approximately 20-second exposure time or the picture will appear blurred or fuzzy. In the next section we will learn how to develop and print oatmeal-box pinhole camera photographs, but first we need to load film into our camera so that we can take our first picture. Before we can load film into the oatmeal box camera, we need to set up a darkroom.



Pinhole cameras can only be loaded and unloaded in a darkroom.

# Taking Pinhole Pictures--The Darkroom

Here is an example of a simple pinhole darkroom set up at home. The first requirement is that the room be totally DARK when the door is closed and the lights turned off. Photographic film is sensitive to all except red/orange light and can be ruined in a fraction of a second if exposed to white light. The black trays will be used to develop the film after a picture is taken. For now all we need is a darkroom and a "safe light", plus some "paper film."

A few supplies are needed to load the pinhole camera in the darkroom. Besides a dark room, "paper film" is a must. What is "paper film?" Resin-coated 5x7 inch black and white photographic paper, medium contrast, is what we will use for film in the pinhole camera. Since photographic paper is coated on paper instead of transparent plastic, it is "paper film." It works exactly the same way as regular film, but is less expensive and can be handled with special light in the darkroom. The special light is called a "safe light" because its light is safe--it will not ruin the paper film. Photographic supply stores will have the photographic paper (5x7 resin-coated, medium contrast, in packs of 25 or 100 sheets) and the safe light. Safelights range from small bulbs the size of a nightlight to more expensive units designed for regular darkrooms. Be sure the safe light you get is really safe for the photographic paper you are using! Resin-coated photographic paper usually comes in both a glossy or a dull, matte finish. Either one will do just fine.

Once inside the darkroom with the lights turned off (except for the safe light, of course, otherwise you would be in total darkness), remove the lid from the oatmeal box camera and remove one sheet of paper film. Close the paper package before doing anything else, because someone may turn on the light or open the door and let enough light in to ruin all of your unexposed photographic paper! (You might do this yourself by accident.)

Next, check to be sure that the shutter handle is lined up over the pinhole marks. Determine which side of the paper film is the "film" side (its the most shiny side, and if you wet a finger, the side which is "sticky" is the film side), then slide the film in behind the pinhole as in the photo above, with the "film" side of the paper toward the pinhole. Center the paper film on the shutter handle. If the film is loaded "crooked", you will get off-center pictures, or parts of your subject will be cut off in the picture. After the film is loaded correctly, put on the camera lid, check the photographic paper again before turning on the room light, and carry the camera by the body, not by the lid because the lid may pop off outdoors and ruin your film! (Some photographers tape the lid on or put rubber bands around the camera to prevent the lid from accidentally popping off.) Now it is time to go outside and "take" a picture! (Photographers don't "take" anything but people's souls--they "make exposures" which hopefully result in good photographs.)

# Making Exposures ("Taking Pictures")





On the left is the "paper negative", which is the film from the pinhole camera after it has been developed. On the right is a "print", or positive, made from the paper negative. The exposure time for this picture was about 15 seconds. Because the camera was aimed toward the bright sky, it took less than the "normal" 20 seconds to expose the paper film.





Again the negative is on the left, the print, or positive, on the right. When light strikes a particle of silver nitrate in the photographic paper, something happens to it which causes it to turn into a tiny speck of silver when the paper film is developed. That is why the sky is black in the negative: lots of light passed through the pinhole and struck the paper film in the sky part of the image. When developed, billions of tiny particles of silver were formed which make the sky look black.
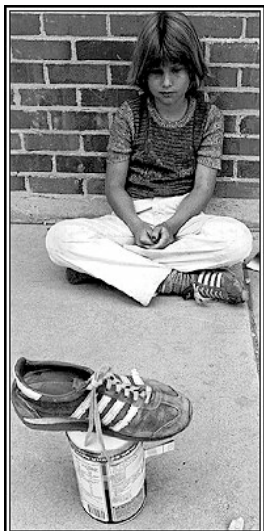


When making an exposure ("taking a picture"), it is important to decide what you want the picture to include. Remember, the background will probably take up most of your photograph, so consider the background as well as the "subject" of the picture, which usually is in the foreground. In other words, the subject usually is closest to the camera. Also, because the exposure time averages about 20 seconds on a bright day, the camera cannot move while it is "taking" a picture. This means that the camera must be set on something, usually the ground. You cannot hold the camera still for 20 seconds--if you try you will get a fuzzy picture or no picture at all! The girl above has placed her shoe on top of her camera to help keep the camera steady for the 20 second exposure time. She Is making an exposure of herself, and she knows that she cannot move for 20 seconds. She opened the shutter and then "froze", silently counting off "one-thousand-one, one-thousand-two, ..." up to a count of twenty seconds. Only then did she move--to close the shutter.

# Developing and Printing Pinhole Photos
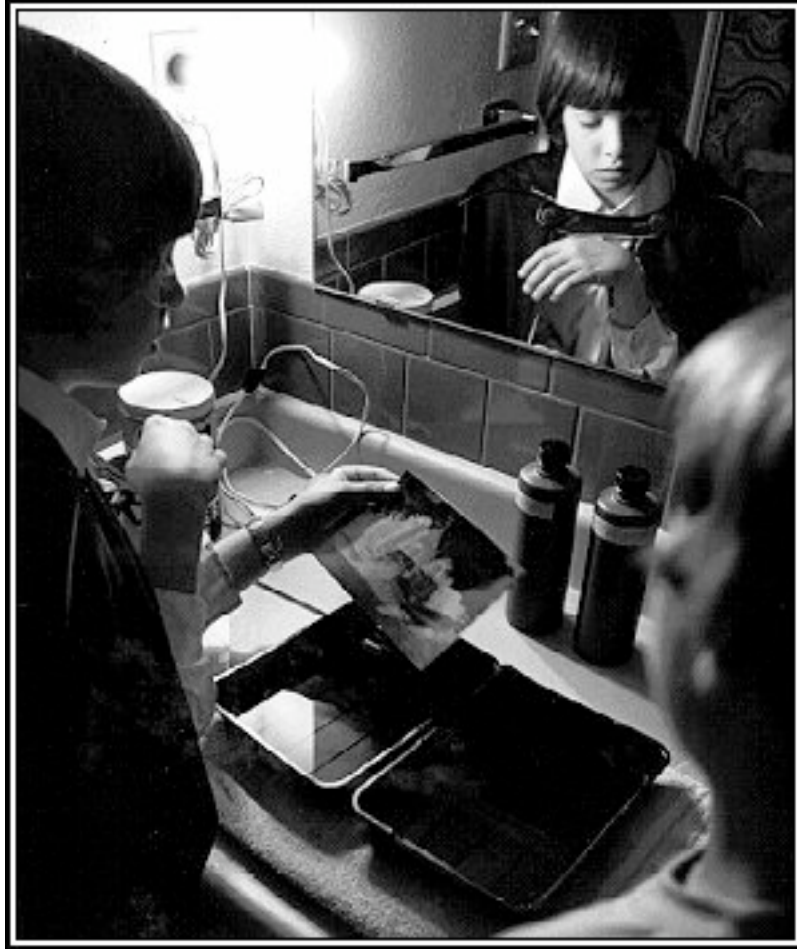


Most of the fun with oatmeal-box pinhole cameras happens in the dark. The actual photographs are made in the darkroom, and they are 5 x 7 inch prints, not little wallet-sized pictures! A few supplies are needed for the darkroom.

- three 5x7 developing trays
- developer (Kodak Dektol - comes in quart and larger sizes)
- stop bath (optional - clean water may be used instead) (Kodak Indicator Stop Bath or Acetic Acid)
- fixer (very important-Kodak Fixer is least expensive, comes in quart and larger sizes)
- sheet of plate glass large enough to cover 5 x 7 paper--must have edges ground so they are not sharp
- white light (a 15 watt bulb on a cord with a line switch is recommended. The room light can be used, but it is usually more difficult to control. Test it out first--you will probably want to use the 15w. bulb instead
- clean towels, but not "Mom's best"

# Developing the "Paper Film"



Here you see the negative of a hand in a pile of leaves as it develops in the developer tray. Under the safe light, remove the exposed film from the camera and place it in the developer tray. Gently rock the tray so that a wave of developer washes back and forth across the film. When it looks dark enough, pick the film up by one corner and let it drip for a few seconds. Then place it in the second tray, the stop bath (or water, is so desired.)

Again, rock the stop bath tray for about ten seconds (this is called "agitating"), lift up the negative and let it drip, then place it in the fixer tray. Agitate the fixer tray for at least two minutes. Fixing the image is very important: the fixer dissolves out any silver which hasn't turned black, so that years from now, the picture won't turn yellow or some other unwanted color. Sometimes improperly fixed photographs just fade out, as if they were bleached by time. After a minute of agitated fixing, it is OK to turn on the room light--after first checking to see that the photographic paper is covered!





The last "wet" processing step is to wash the photographic paper in clean, room temperature water for about four minutes. This step is very important, too, because if any fixer is left in the paper, it will act like a bleach and cause the photographic image to fade over time. Room temperature water is important because water which is too hot or too cold can damage the layers which make up the photographic paper. Last, pat the paper dry with paper towels or with a clean cloth towel and set the paper on a clean space where it will quickly dry.

# Printing the Paper Negative
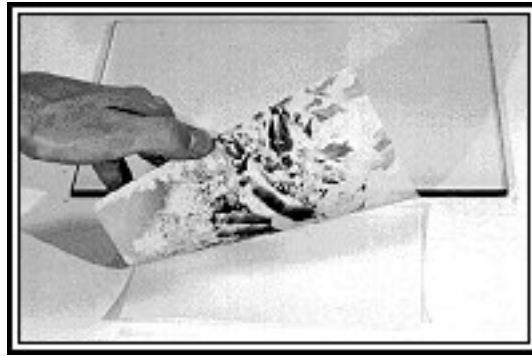


When we show a photograph to others, we are showing a print of the original photograph, which is a negative. Fortunately, it is easy to make prints from our negatives. As shown here, simply make a sandwich of the negative (always on top) and an unexposed piece of "paper film" (always on the bottom). Be certain that the light-sensitive side of the unexposed photographic paper is facing up, or you will not get a print but will ruin a sheet of paper. Remember, the light-sensitive side (called the "emulsion" side) of the photographic paper is more shiny than the back, and if touched with a damp finger, will feel sticky. Place the plate glass over the sandwich to hold the two sheets of paper in tight contact with each other, and expose with light from the 15w. bulb held about three feet above the glass for a couple of seconds. Count the seconds because, if the first print is too light, you will have to try again using a longer exposure time. If the first print develops quickly and becomes too dark, make another print using less exposure time. What happens when making a print (called a "contact print" when done this way) is that light passes through the light areas of the negative, exposing the paper below. When developed, those areas become dark. Dark areas of the negative block the light, so the corresponding areas on the print develop to be light. You are making a "negative" print of a "negative" from the camera, so the end result is a negative of a negative, or a positive, a photographic print. Thousands of prints can be made from a negative, but there can only be one original "negative" photograph actually exposed inside the pinhole camera. Take care of your negatives, for each is unique, truly one-of-a-kind.



After exposing the contact print, develop, stop bath, and fix it exactly as you did with the original paper film from the camera. Wash and dry the print the same way, too. It is convenient that the same photographic paper can be used both as "paper film" inside the camera to produce negatives, and to make contact prints from the negative originals. Another word for a contact print is a "photograph", or a "picture". Or, an "oatmeal-box pinhole camera picture!"