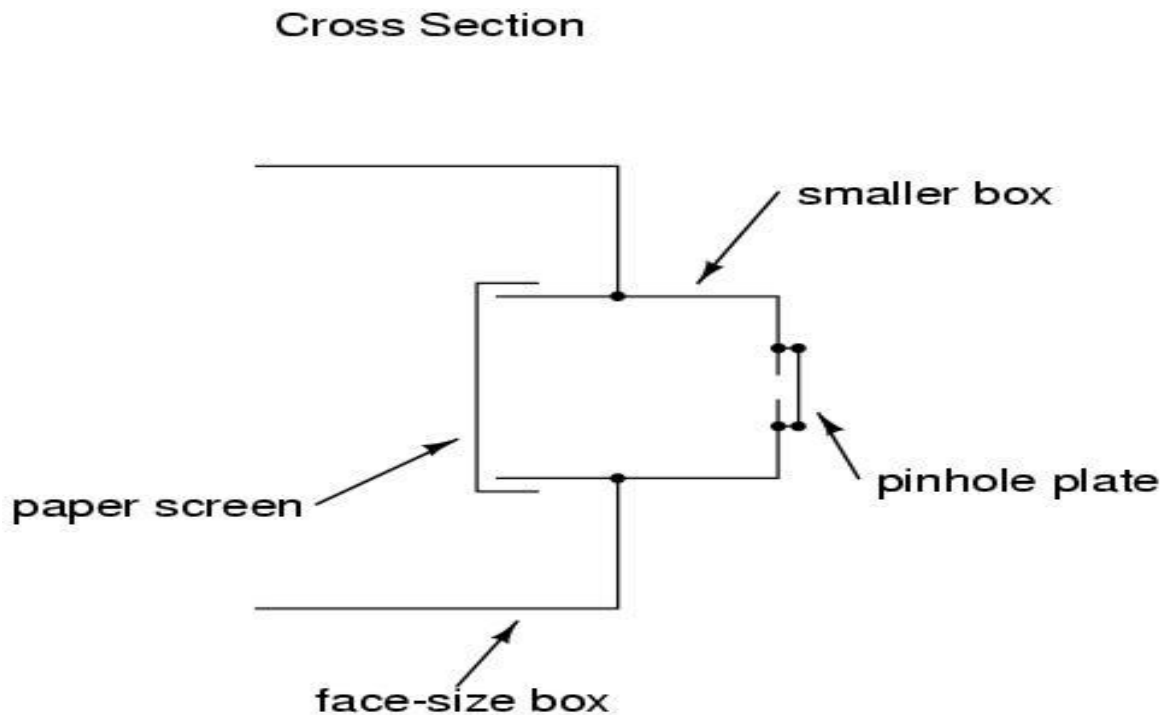


Pinhole Projector

I just threw together this little camera obscura for fun. It demonstrates pinhole optics well, and doesn't require film and developing, so it is very quick from build to demonstration. It might be useful for science education purposes?

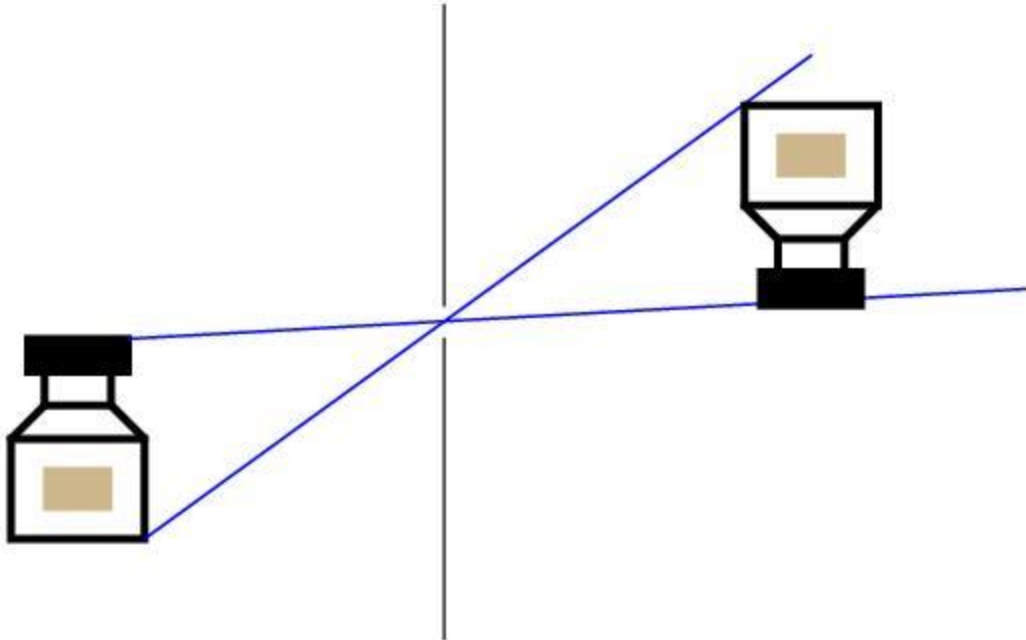


Other than a teaching tool it has little real purpose other than a fun diversion for a few minutes on a lazy weekend. You can replace the screen with a piece of film and add a shutter to take real pictures if you like, but you'll need to carefully seal all light leaks.

In my implementation I used a small piece of Aluminium roof flashing for the pinhole plate. The hole was drilled carefully with the smallest needle that my girlfriend could find in her kit. The larger box was added after the the smaller box proved the concept, but also demonstrated the need for a light shield to give enough contrast to view even bright scenes. The projection screen is greased kitchen wrap paper.



The pinhole is about 0.5 mm in diameter and the smaller box is a 100 mm cubic shape, so the effective lens f-number is 200. A fantastically slow lens compared to glass optics, but fairly fast for a pinhole camera. You can enlarge the hole further if you wish to improve the brightness, but the resolution will suffer. Although the image is quite dim, it is acceptable for average daylight scenes out a window. Throwing a piece of dark cloth over your head to seal light leaks around your face helps a lot. You might wish to tack a piece of cloth to the box as a permanent feature.



The geometry of the optical path means pinholes reverse and invert the image. The image will also be less bright at the edges than at the centre. All flat-plate pinhole cameras suffer from this problem. You can curve the screen to compensate for the exposure problem, but the image will be distorted. You can make a panoramic viewer by using a rectangular box with the large direction held sideways, but you will likely need the curved screen to get even brightness at the sides. The exposure 'problem' effect can be quite artistic!

An alternative to a rear-projected screen might be to use a piece of mirror to reflect the image onto a white sheet of paper. This would offer brighter images and clarity approaching the optical limits of the pinhole. The device could be built like a periscope to achieve this, but many arrangements are possible. The disadvantage is greater complexity of construction.

Source: <http://www.vk2zay.net/article/32>