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METHOD OF CONSTRUCTION OF A SIMPLE CLOUD CHAMBER

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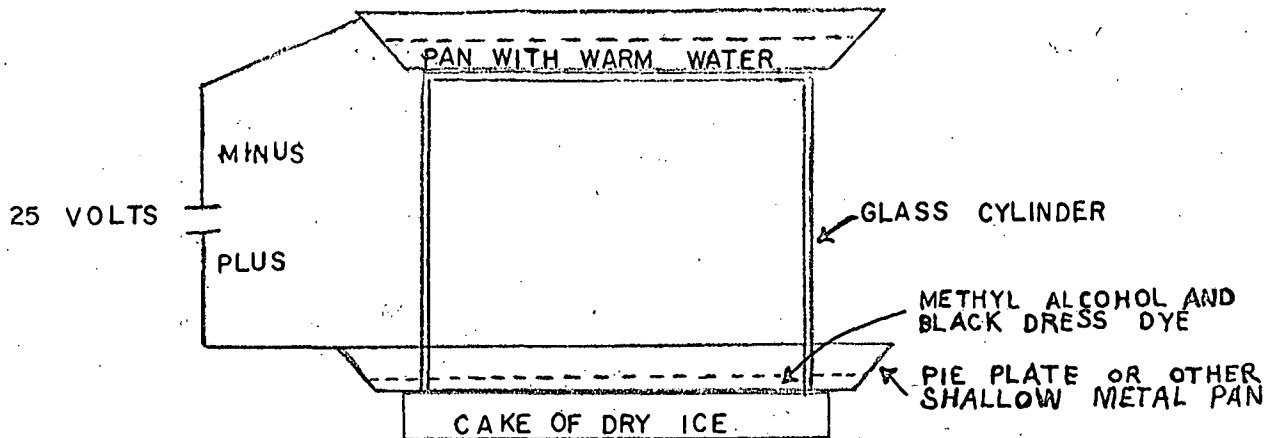
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METHOD OF CONSTRUCTION OF A SIMPLE CLOUD CHAMBER

Wilson M. Powell

August 16, 1953

A drawing of the construction of a simple cloud chamber is given below:

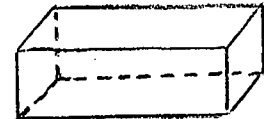


The hardest part to find is a glass cylinder which must be between 6 or 8 inches high, and more than 6 inches in diameter. The glass must be clear. The larger the diameter the better the setup works. We use 16 inch diameter cylinders. The wall thickness is not important.

One can use a large glass beaker. A pyrex coffee pot should work, though it is too high and too small in diameter to be much fun.



If you can't find a glass cylinder then you could use four pieces of glass to make a square box with no bottom but the corners must be tight. Linseed oil putty in the corners won't work because the oil poisons the chamber usually. However you might use this very rapid setting putty which gets hard quickly. The solvent evaporates very quickly.



The bottom should be a metal pan. Pour in about 1/8 inch of methyl alcohol. (Not ethyl alcohol) Put in a teaspoon of Putnam's black dress dye. This makes the alcohol black which gives a good black background (except for reflection) to observe the tracks against. The glass box or cylinder stands in the alcohol so that the alcohol stops all air leaks at the bottom.

On top of the box place a pan with luke-warm water in it. First stick some black or grey felt not more than 1/8 inch thick to the bottom of the pan and drench it with clear methyl alcohol.

Get a 25 volt battery (they are used in portable radios) and connect the positive terminal to the bottom pan and the negative terminal to the top pan.

For a light use a projection lamp or an automobile head light, or a 110 volt A.C. beam lamp (the kind they use to light up gas stations). The heat from the lamp spoils the tracks a little so that it is best to turn it on for a short while. It will work with the full light, but not quite so well.

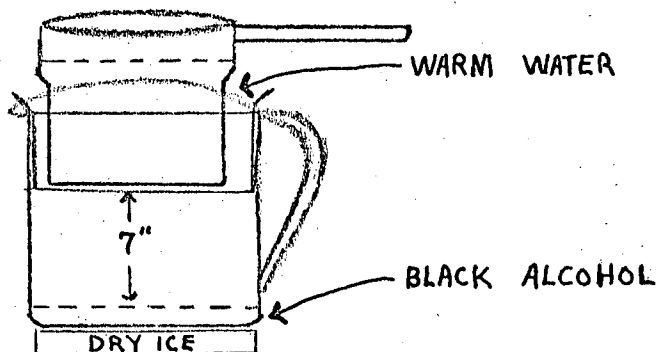
At first you see a heavy fog near the bottom and the drops are very tiny and fall slowly. Gradually the heavy fog falls out and after about 15 minutes the drops are much fewer in number and fall much faster. Then tracks begin to appear. If there are any drafts in the chamber sheets of drops form and where they form you can see no tracks. The tracks occur from 3 inches on down to the bottom so the light must skim the bottom. You will find that it makes quite a difference if you look into the chamber at certain angles.

A warning!! Start the chamber without any radioactive source in the room. You will see the tracks from cosmic rays, and there are about six of them in a 16 inch chamber at any time. If you bring up a source (say some pitch-blend) bring it up to the chamber very rapidly. You will see a burst of tracks and then all tracks will disappear. Then if you remove the source the tracks from cosmic rays will appear again after a short while.

The reason the tracks disappear immediately after you bring up the source is that so many droplets are formed that the vapor is all used up. Cosmic rays are not strong enough to use all the vapor up. Three times cosmic ray background makes the tracks shorter.

If you put sources inside the chamber on wires fished in under the pan on top be sure that they are extremely weak sources or they will stop tracks from appearing.

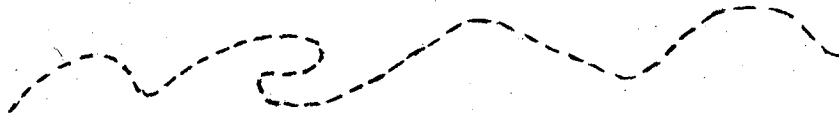
If you use a pyrex glass coffee pot then just set it on the dry ice with the black alcohol in the bottom. Fish the positive wire insulated so that the uninsulated end goes into the alcohol. If the pot is too deep (more than seven inches) then take a small metal pot and set it down into the coffee pot like this:



Tie the felt with a string around the top of the coffee pot and leave the felt loose enough so that the smaller pot can push it down till it is six or seven inches from the bottom. Sit the pot on the dry ice directly and connect the negative terminal of the battery to the felt where it is wet with methyl alcohol.

Occasionally you see a track about like this _____ which is much heavier than the rest and straight. It usually breaks up making a small cloud. These are alpha particles which come from Radon gas which is always present in room air.

This chamber is fascinating to watch. The fine tracks that wander like this:



are electrons. The fine straight tracks are fast electrons and positrons and mesons. The long straight heavy tracks which are quite rare are protons or alpha particles from cosmic rays. The short straight heavy ones are alpha particles from Radon. Once an hour or so an atom will burst apart making several heavy tracks radiating from a point

