Closeup of the water tank within the drum. The hot water is taken off the top of the tank - as hot water leaves, cold water replaces it at the bottom. The pipe that delivers the hot anti-freeze to the drum is just visible on the right.

12 RADIANT - AIR

This is a mat of expanded aluminum foil. Metal lath works equally well. It is placed behind glass and heats air which flows through it. The best arrangement for heating air is to have cool air enter from the top and be heated as it flows from top to bottom. In this configuration the outer layers of the mat are coolest and do not radiate so much heat to the protecting glass as they would if the air passed the other way.

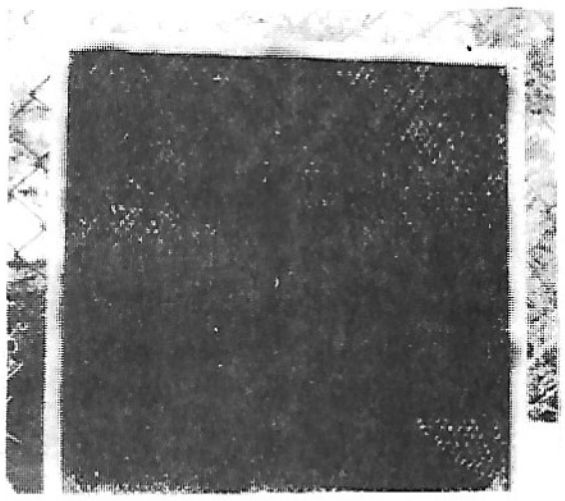

Photo #12

This concludes Chapter Three.

If you've missed any installments so far, all back issues of the Tribal Messenger are on file at Zimmerman Library, UNM, as well as on microfilm in fifty-six other libraries. Check your local library.

Proceed to Chapter Four on facing page.

HEAT Chapter 4 COLLECTORS & HOUSES

In the winter of '67-'68 we built a convective solar chimney in Placitas. The hot air rose up the heat collectors and then circulated between drums filled with water underneath the floor. We never insulated the dome properly - the dome was made of car tops and the heat loss through the metal was very rapid. The dome was very cold. Berry Hickman lived in the dome and gave an informative definition of solar heating:

You turn off all conventional heating means and then the house is solar heated- that's all there is left.

Every house that is exposed to the sun is partially solar heated. The earth itself is solar heated.

When you first start playing with heat collectors you are often impressed with the qualities of the heat collector which turn out to be its faults rather than its strong points. When something gets very hot it impresses you - later, when you are capturing heat and moving it somewhere or storing it you will continually strive to keep the collector temperatures as low as possible, while still having the heat be useful. High temperatures mean high heat losses.

A heat collector contrives to make the easiest pathway for the sun's heat to some substance where the heat is useful to you. The dirt that the sun strikes in the morning is an excellent heat collector, but the heat is given to the soil, itself, and the air in contact with it. We are so used to this and the resulting daily swing in temperature from the before dawn low to the afternoon high that we don't even think about it. What are the losses? Some of the light is reflected immediately back out into space, and the earth, itself, radiates heat into space. The rise and fall of temperature during the day is a good indication of the relative magnitude of the losses of the earth itself floating in space, and of the gains from the sun.

Generally the highest temperature during the day is recorded in the afternoon, but always the temperature begins to drop before the sun sets. The sun, when it drops below a certain angle, is unable to sustain the temperature. Evidently, the rate at which heat is arriving is not so great as its rate of loss.

Clouds act as blankets to retain heat. Clouds also act as reflectors to keep heat out. Cloudy days and clear night drop earth temperatures rapidly.

THE BEST HEAT COLLECTOR IS A WINDOW OR A SKYLIGHT

A window or skylight opening directly into a room and oriented south with the appropriate tilt is a very excellent heat collector.

The efficiency of a heat collector is judged by the percentage of the available energy that the heat collector absorbs. The losses, the percentage that is not captured, consists of the radiation that is reflected from the outside glass or the inside collecting surface back through the clear cover. The other main loss is the heat given off by the warm front glass or plastic (glazing). There are also losses from the back and the sides of the collector These losses are decreased by adding insulation to these surfaces.

You can judge a heat collector by seeing if there is a great deal of glare coming back out through the glazing and whether or not the front glazing is warm or cool. An efficient collector is dark and its outer glazing is cool. These are the only tests you need to make on a non-focusing collector. Your eye or a light meter can be used to measure the reflection, and, by touching, you can distinguish between the warmer of two exterior glazings if you are testing different collector designs by racing them side by side. This is often the easiest way to test heat collectors - race them.

STATIC TEST

In a static test you do not take the heat away from a collector that is, you do not store it in a large body of water or stone and you do not pipe it off in hot water or hot air. You let the heat build up in the collector and measure the temperature with a thermometer. This shows how hot the absorbing surface of the collector will get before the losses through the back and the sides of the collector and the front glass equal the incoming sunlight. Never expect the part of the collector you can touch to get any hotter than other objects in the sun around it. Because they are all doing the same thing - warming in the sun until they reach equilibrium - giving off heat as fast as they take it in.

A non focusing collector is hot on the inside, never on the outside.