SABBATICAL LEAVE REPORT

SPRING SEMESTER 1975

DON H. CERWIN

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I would like to express my gratitude to the Board of Trustees and the Administration of Mt. San Antonio College for providing the opportunity to travel and study alternate energy sources during the spring semester of 1975.

My original request to the Sabbatical Leave Committee was for a one year sabbatical. However, due to the large number of applicants, I was asked to consider a semester leave which I agreed to.

Our travels included Mexico, Florida, Hawaii, and the Pacific Northwest. I will try to discuss some of our experiences with particular emphasis on how they helped me to become a more effective teacher.

MEXICO

My wife, three children, and I arrived in Nogales, Mexico (approximately 60 miles south of Tucson) on March 16, 1975. My only prior experience in Mexico was an occassional visit to Tijuana, and I have always felt that this was not a typical Mexican city. We were, therefore, looking forward to a more extensive trip into the mainland of Mexico. My wife and I were especially anxious to mingle with the local people because we feel that in order to understand a new culture it is important to become a part of the "scene" rather than simply an observer. Our first stop upon entering Nogales was to a bakery or Panaderia to purchase some of the delicious hard, chewy Mexican dinner rolls. It was there that I fully understood the expression "culture shock". The

woman behind the counter could not speak any English, and I couldn't speak any Spanish. Somehow I assumed that the people in Mexico would be able to speak a few English words because all of the shop keepers in Tijuana could and Nogales is a border town as well. I stood in the middle of the store pointing to the rolls I wished to buy, and she smiled broadly and nodded. But that was all, smiling and nodding -- we were getting nowhere. I tried to show her I needed a bag to put the rolls in. It was like a game of charades by making gestures of putting objects into a container, but I think she thought I was harvesting grapes or tomatoes. In desperation I started picking up the rolls with my fingers. She immediately reached under the counter and gave me a bag and tongs. I nodded and went through the harvesting grapes routine again to show her what I had meant. We both had a good laugh over our awkwardness at communication. It's difficult to describe that moment when my attempt at communication was met with a blank expression and absolutely no response. I have seen that look on occas ion on the faces of some of my students in the classroom. Most of my students have not had any previous science courses, so when terms such as liters, grams, or Newtons are mentioned I might as well be speaking Spanish. The bakery experience has given me more patience and compassion for the beginning science student.

From Nogales we traveled south to Hermosillo. Along the way I was surprised to see many carcasses of cattle and horses lying

along the road where they had been struck by a passing vehicle. Vultures were picking at some of the remains. I wondered why a road crew had not picked up the carcass and found myself again comparing California to Mexico. I realized how protected we are from death -- even with animals. Witnessing death at such close proximity reminds us that death is a natural, inevitable end of life and gives one a greater awareness of living.

Upon arriving at Hermosillo, one of the larger metropolitan cities in Northern Mexico, we observed large numbers of the populace out for a leisurely evening stroll and large families sitting outside on crudely erected porches. It was readily apparent that the greater portion of the population was outdoors socializing with friends and family than indoors watching television. It seemed as though a food vendor with a cart full of fruit, hot dogs, or warm pastry was on every major intersection of the city selling their product to clusters of people gathered around them. The fact that the evenings seemed to bring people out of doors for socializing reminded me of my childhood, where before television, members of my family woudl spend seemingly endless hours of watering the lawn while socializing with passers by and neighbors. I do not know what the crime rate is in Hermosillo, but I noticed that the people, including single women, were not afraid walk the streets alone at night.

From Hermosillo we traveled south to Guaymas, an important fishing port. We found the dock area fascinating. It was in Guaymas where we had our first meal out on the town. We were expecting to find the traditional Mexican meal of tacos, enchiladas, etc., but to our surprise, and disappointment, found typical American entrees of chicken, shrimp, chops, etc., instead. We were told that only lower class restaurants serve the traditional Mexican meals.

In Guaymas we boarded a governemnt owned ferry in order to cross the Sea of Cortez to Santa Rosalia on the Baja Peninsula. We encountered high seas during the crossing which resulted in 90% of the passengers becoming sea sick . Because there were no sea sickness bags and a lack of sanitation facilities, people vomited literally wherever they were sitting or standing. We were again reminded about the differences in hygeine and sanitation standards between Mexico and our own country.

As the boat pulled in to port we were met by sulfurous fumes from a nearby nickel smelter plant. The air was so polluted that we ran to the new air-conditioned terminal building where we found relief from the choking, poisonous air. Mexico is a land of contrasts- a sleek, modern terminal building(adjacent to a polluting industrial complex) complete with new, modern lavatory fixtures .....that don't flush.

The Baja Peninsula is quite beautiful in its desolation. Outside of the small villages, man has not yet changed what nature has taken a million years to form. The desert environment in Northern Baja is replaced by semi-tropical and tropical plants when the traveler journeys south of Santa Rosalia. The Baja Peninsula is in my opinion another new frontier. Because of the completion of a new road, tourists are arriving in ever increasing numbers to enjoy the numerous beautiful bays, snady beaches, and tropical emerald water. I hope the Mexican government has a master plan for the development of Baja so that it will not be raped by the money seekers.

We have found Mexico to be a harsh and unforgiving land. By our standards the cities we visited lacked potable water, adequate sanitation facilities, and other modern conveniences. Prices are high and the standard of living is low. The people were warm and friendly.

HAWAII

After resting for two weeks following our Mexico adventure, we flew to the Hawaiian islands -- our first visit. The contrast between Hawaii and Northern Mexico could not have been greater. We lavished in luxury hotels on the Kaanapali coast of Maui, the Kona coast of Hawaii, and the tropical beauty of the Coco Palms Resort on the island of Kauai. The restaurants were superb, and we found papaya for breakfast very habit forming. The island of Hawaii we found to have the greatest diversity of landscape from black sand beaches, endless miles of volcanic lava flows, macademia

nut orchards, vast sugar cane fields, and on the east coast some of the most lush valleys and waterfalls found anywhere. The Northern coast is known for its cattle industry. The most interesting day for me was spent at Volcano National Park. I teach geology in my physical science classes and to stand on the rim of a crater looking into the caldera of the volcano Kilauea was a thrilling experience. The slides of this area will be most valuable to me in the classroom as will the samples of lava and black sand that I brought back. Geologists at Volcano National Park are now investigating the possibility of using geothermal energy for the production of electrical energy. All of the fossil fuels must be imported. Therefore, electricity is very expensive in Hawaii. It was interesting to learn that 25% of the energy consumed for the purpose of generating electricity comes from the burning of sugar cane stalks.

FLORIDA

Shortly after arriving home from Hawaii, we flew to Miami Beach, Florida. My wife attended the National School Board Convention, and I inspected some of the solar water heaters that have been in use in Florida for many years. I also visited the University of Miami where I met Harold Gerrish, Assistant Professor of Atmospheric Science, and Professor Olson who is

involved in a program of Clean Energy Research. We spoke at length about several ways to utilize solar energy for heating and cooling buildings. Professor Olson is currently working on utilizing waste heat from air conditioning to heat water.

PACIFIC NORTHWEST

Our first stop of educational interest was a tour of The Geysers, a geothermal field located approximately one hundred miles north of San Francisco. We were given an extensive and exclusive tour of the complete facilities by Kon Zaharoff, a graduate student from the University of Berkeley. The information supplied in the pamphlet (see attached) generally sums up all of the data and technical information.[1]

In Coos Bay, Oregon, I met Mr. Henry Mathews, a retired carpenter, who now holds the distinction of being one of three homeowners on the entire West Coast who heat their homes with solar energy. He allowed me to come into his home and take pictures of the apparatus used to collect the sun's energy. The University of Oregon has installed monitoring equipment throughout his home, and he is cooperating by phoning in the data each day. Ninety percent of his heating comes from the sun. Very briefly, it is a system where water flows through black pipes that are heated by the sun. The warm water returns

1. see Appendix I

to an 8,000 gallon holding tank in his basement. The heat from the metal tank radiates up to warm the house.[1]

From Oregon we continued north to Washington and Orcas Island in the San Juan Islands where we camped for several days. The city of Victoria on Vancouver Island was most interesting. We especially enjoyed the Provincial Museum where a series of dioramas depicted early scenes of mining, fishing, farming, etc. Some of the scenes were amazingly life-like with kettles boiling on stoves, aromas of cinimmon and other spices in the air, and wind blowing the curtains of a nearby window. Also on exhibit in the Archives Gallery was the Provinicial Collection of Contemporary Art.

After taking the ferry from Swartz Bay, Vancouver Island to Tswassen, British Columbia, we were fortunate to make contact with Mr. Eric Hoffman of Surrey, British Columbia on the outskirts of the city of Vancouver. He is the owner of another solar heated house. He too allowed me to take pictures of his home as he showed me around. The method of collecting heat is similar to the Coos Bay house, but the storage capacity is not as great being only 800 gallons.[2] Fifty percent of his heating for the year is provided by the sun. He invented a device which automatically shuts off the water pump once the incoming water is cooler than the water in the storage tank. This is more efficient than a timer system.

The slides of both solar homes and the geyser area will be very useful in the classroom when studying energy.

1. see Appendix II
2. see Appendix III

The following is a summary of how this sabbatical leave has helped me as a classroom teacher.

1. I have a much better understanding of how solar energy can be used to heat a house and will use this new knowledge in my teaching.

2. My students are very interested in geothermal energy. The tour of the Geysers was one of the most informative trips we have ever taken. I plan to show the slides of this area in connection with discussions of alternate energy sources. As a side note: we also visited the Crater Lake area, and I plan to use the slides I took there in my earth science classes.

3. The trip to Hawaii and Volcano National Park was particularly interesting. The information I gained, along with the slides of this famous geological area, should enhance my lectures on vulcanism. I brought back numerous geological specimens which will help the students learn to recognize some of the various types of lava, cinders, and ash.

4. The trip to Mexico has exposed me to a new culture. I believe it will help me to relate better to the students of Mexican heritage in my classes.

SUMMARY

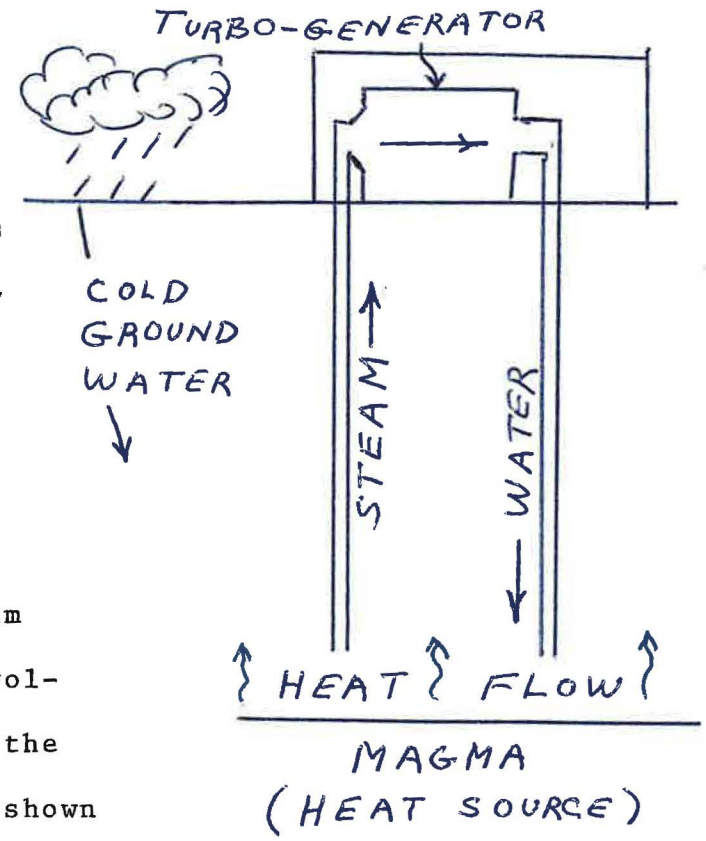
We covered 7,269 miles in our camper from Mulege on the Baja Peninsula to Vancouver, British Columbia. We flew East to Miami Beach, Florida and West to the Hawaiian Islands. The sights, sounds, and smells of these places will remain with us a long time. In addition, the time a sabbatical leave provides allowed me to review textbooks and other scientific and educational literature. This past semester was a period of significant growth and enrichment for both me and my family. I know I will be a more effective teacher for having had these experiences.

Appendix I

The Geysers is the largest geothermal field in the world and the only commercial geothermal power facility operating in the United States. The Geysers is located 90 miles north of San Francisco in Sonoma County. Three companies, Union Oil, Magma, and Thermal, do the drilling and are in charge of producing the steam. They, in turn, sell the steam to the Pacific Gas & Electric Company which produces the electricity. There are eleven generators currently operating, producing a total of 502 Megawatts. By 1977 four more generators will bring the electrical output to 908 Megawatts. This is greater than the total of all other geothermal plants in the world today.

More than 100 wells have been drilled at the Geysers, ranging in depth from 600 to 9,000 feet. Heat from magma sources at great depths drives steam temperature up to $500^{o}F$ and pressures of 100 psi. This steam is rather unique because it contains very little free water mixed with the steam (a gas) and also very small amounts of dissolved solids. This type of geothermal resource is called "vapor dominated" and is rare. Any particles of rock or dust in the steam is removed by separators before

reaching the blades of the turbines. After the steam passes through the turbine, it is sent to cooling towers where about 75% of its moisture is evaporated and 25% is reinjected as water back into the earth. One interesting problem is that the source of water for the steam is unknown. Experiments involving radioactive tracers in the reinjected water have never shown up in the steam, indicating that no reinjected water is being converted to steam at great depths. When will the steam "run out" is anybody's guess! I should mention that although there was a slight odor of hydrogen sulfide in the air, it was not nearly as obnoxious as that found near the electric generating plants of the Los Angeles Basin or the hydrogen sulfide one encounters at Yellowstone National Park. We must also remember that the H_2S has been there ever since the birth of the first fumaroles and steam vents, many years before man. In my opinion, the ecological problem related to geothermal energy at The Geysers is insignificant.



Appendix II Coos Bay House

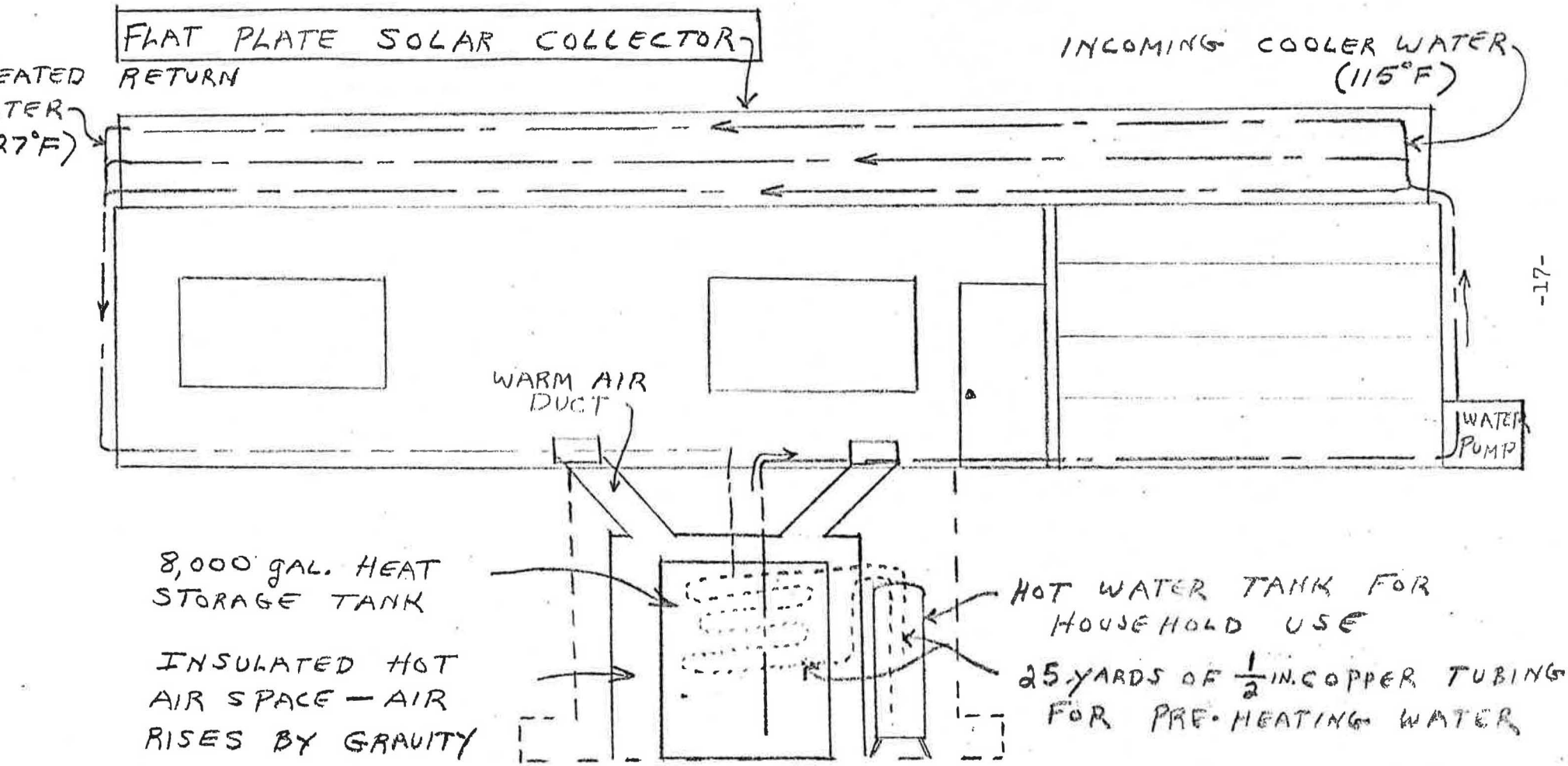
The Coos Bay house was built in 1966 by the owner. The solar heating system's materials cost less than $1,000 and took Mr. Mathews three months to build, including the 8,000 gallon tank.

Water is pumped up to the solar collector where it passes slowly through many 1/4 inch copper pipes. These pipes, which are spaced six inches apart and painted black for maximum heat absorption, are soldered to a metal base plate which is also painted black. The plate and tubing is covered by panes of glass which helps to keep the heat in and thus provide some additional conduction from the pipes. Depending on the season, the incoming water is about 115°F. After passing through the collector, it is heated to about 127°F. From the collector, it returns to the storage tank. The house is heated by allowing the metal tank to radiate its heat to a surrounding air space. The warm air, being less dense, rises up through ducts to the rooms above. (See Plate I)

The hot water for household use is a closed system whereby 25 yards of copper tubing is coiled inside the storage tank. This preheats the water and an electric hot water heater brings the temperature up to 140°F or so.

COOS BAY HOUSE
HENRY MATHEWS - OWNER
RT. 3 BOX 768
COOS BAY, OR. 97420

PLATE I



Appendix III Eric Hoffman House

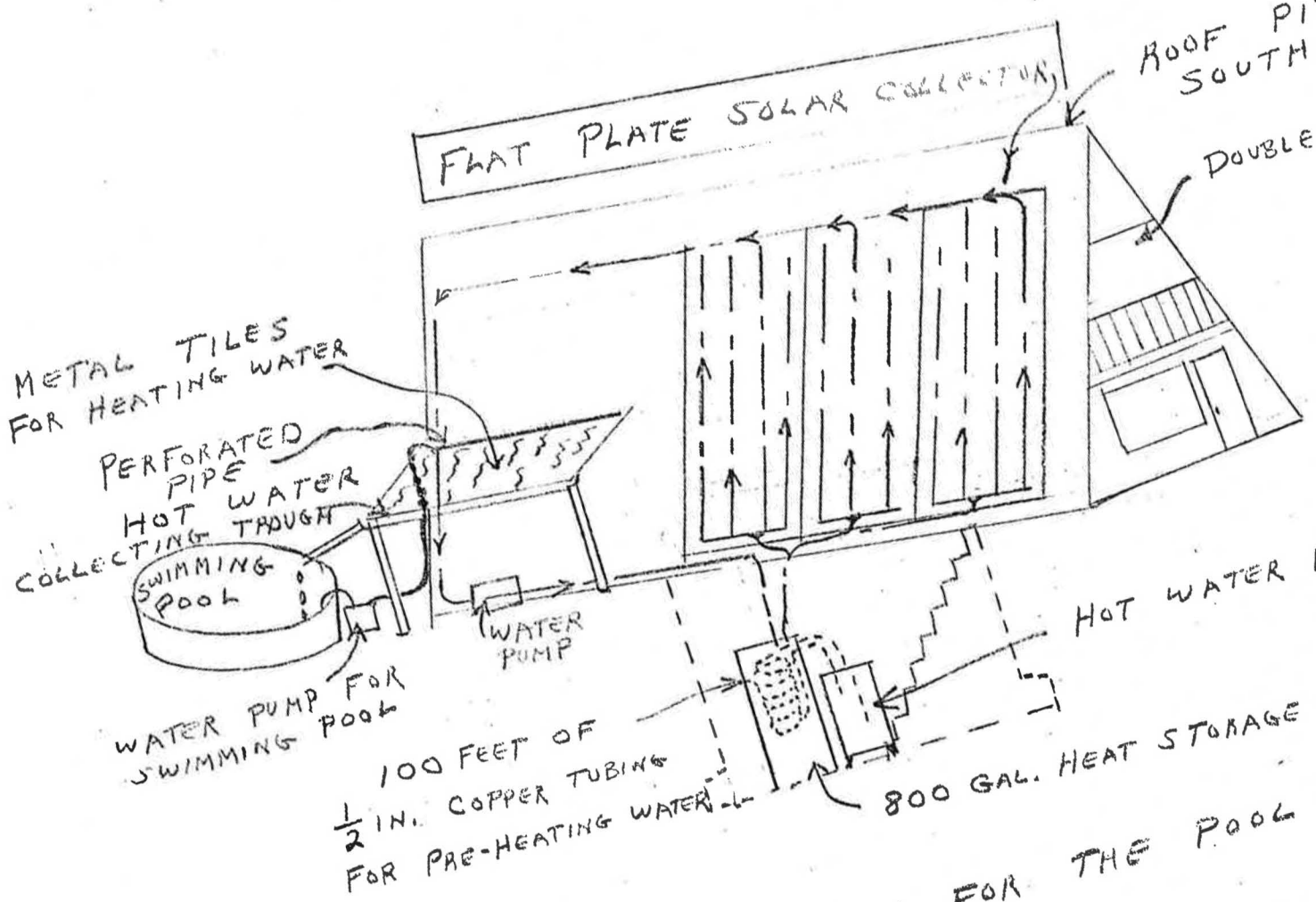
This A-frame type house is situated so that the collecting portion of the roof is facing south. The collectors run vertically, enabling the heated water to rise naturally, thereby needing only a small pump for circulating the water. The black painted copper plates (.005 inches thick) have 1/4 inch black copper pipes fixed to them at 6 inch intervals. Two panes of glass 3/4 inches apart help to retain the heat within the collector. On a sunny day the water temperature can reach as high as 170°F. (See Plate II)

Heating the house is extremely simple. The heat storage tank is located in an insulated room in the basement. When heating is desired, the door to the room containing the heat storage tank is opened and the warm air rises up the stairs and throughout the house. Supplemental heating is supplied by electric heaters found in all rooms. Mr. Hoffman manufactures the solar collector himself and sells them for $4.50 per square foot.

Hot water for household use is accomplished by having 100 feet of 1/2 inch copper tubing coiled inside the 800 gallon storage tank. Only rarely does the supplemental electric hot water heater go on.

Mr. Hoffman also installed an experimental pool heater where water from the pool is pumped up to the top of a dark colored metal tile roof. As the water runs slowly down the

HOFFMAN HOUSE
128th ST.
REY, B.C. CANADA



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HEATING SYSTEM FOR THE POOL IS SEPERATE FROM
HEATING.
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roof, heat is transferred by conduction from the tiles to the water and consequently back to the pool. It was only recently installed, so no data on the efficiency of this system is available.