

BUBBLE WHEEL

Bubbles of a low boiling point propellant liquid within another hot liquid can be used in another entirely different way to produce mechanical energy. A device similar to a water wheel can be immersed in the hot liquid and the propellant introduced below the inverted cups - the buoyancy of the bubbles in the cups of the wheel produce a turning motion (see fig. 4). Although such devices do not achieve high efficiencies they are simple and require few expensive parts. There is a need for engines to open and close shutters, to pump liquid and to track the sun - which can be inefficient but must be cheap and reliable. An efficiency as low as .05% in the conversion of thermal energy to mechanical could be sufficient for many useful tasks in solar heating systems. For instance, a 4 sq. ft. collector which yields 1000 BTUs/hr. thermal energy would produce at .05% efficiency 389 ft. lbs./hr. or 1 ft. lb. every 10 seconds.

This .05% efficiency seems easily attainable for at atmospheric pressure it requires approximately 30 BTUs to vaporize the liquid to form a 1 cubic ft. bubble. If in a small bubble wheel the bubble rises through 1 foot of water there are then 60 f t. lbs. recoverable of the 30 x 778 invested for an efficiency of .25%. There are many ways to increase the efficiency, such as running the engine at negative pressure or having the bubbles rise through a greater height.

Next issue: Report on the meeting of the U.S. section of the Solar Energy Society in Cleveland.

I recently returned from the US Section meeting of the International Solar Energy Society. There I encountered most of the elements working in the field of solar energy, representatives of large corporations such as Exxon and Texas Instruments, swarms of scientists and professors - like enormous schools of minnows in a pond. And then of course the rest of us, crackpots, dreamers, small business people.

The first talks were by representatives of the National Science Foundation. The NSF has given A.D. Little \$200,000 to study the possible impact of solar technology on society. This is a nice far piece of the entire total that has been awarded to all aspects of solar energy research. If this kind of study is necessary I can't help wondering why they don't award A.D. Little another \$20,000 to study the possible impact of their report on the possible impact of solar technology on society. Evidently one can't be too careful. For whose benefit is this money spent? The consumer? Do we need to make sure the

energy crisis is not solved too quickly? A.D. Little has already received a large grant to study their scheme of orbiting a satellite which will collect energy in an enormous dish and beam it back to the earth in microwaves. I wrote about this project this spring. It not only seems a waste of money but also a clear danger to all of us for it certainly can be used as a weapon, if not by us, then by the Russians or Chinese - for they certainly would need their own orbiting energy collector once ours was in the sky. How can one organization be trusted to judge what is sensible for the government to spend money on when it so clearly has pressures to bias it? Perhaps they would reassure us that we have nothing to fear because all this work is being done by computers.

The pressures that steer those of us present at the meeting seem to work from great distances, for there were no villains present and certainly no heroes. If there has not been enough action in this most vital activity there is no one to blame. If the money is being given to the large companies with no prior experience and no real commitment to the technology, then we must understand the position of those in NSF. They can't give the money to kooks, they can't begin to follow unconventional paths.

Here is my recommendation - that the government stop subsidizing the education and research directly. Let the government promise to buy, at a high price, power from new power generating stations that use solar, wind, tides, geothermal energy. Let us agree that such power is worth more to us than power derived from burning oil and let us promise a market for electricity or other energy produced. Let us arrange it so that those who undertake these studies and construction projects are taking a chance - they can win or they can lose. There is nothing more discouraging than to see, at a time of crisis, money spent to subsidize lethargic pointless projects. Projects whose engineers are going to be paid whether they win or lose.

At the conference there appeared an excited middle-aged reporter from the Nation magazine who handed out questionnaires asking us how long we felt it would take to supply this country's energy needs by solar energy if there were unlimited funds. I felt discouraged to see this kind of question asked. My feeling is that if there were unlimited funds it would take an unlimited length of time. Those working on the problem would just keep working and working on it - why should they worry? They'll always have work and good pay - enough to buy the last gallons of oil.

Isn't this all very obvious? Our own dear Bob Stromberg from Sandia, as bright and likeable a gentleman as you would ever wish to meet, might really accomplish something if he and his crew had some good clear goals and the likelihood they'd lose their jobs if they didn't produce. The country seems to regard itself as the custodian to an increasing number of scientists and experts who are rewarded with grants and contracts and the avid attention of the rest of us every time they help us take a bum turn. If the captain of a ship has sunk it through negligence, better to throw him to the floor of the lifeboat and let the amateurs take a try at sailing than to help him to the tiller again.

What was interesting at the meeting? Exxon Corporation is selling small silicone

Report on the Meeting

cells, each one produces 1½ watts, they are about the size of a sheet of paper folded in half the long way. The cells are enclosed in clear polycarbonate and have an expected life of over 15 years. They are beautiful but terribly expensive. Each one costs \$30 or \$20/watt. The researchers would not guess about how cheap these might become in the future. They showed slides of these cells coupled to batteries on off shore oil rigs in the gulf where warning lights and fog horns must be supplied with energy. An interesting and vital part of these installations was the greasy rubber band they string above each panel of cells - sea gulls don't like greasy rubber bands and therefore perch elsewhere.

I was surprised that the solar cells could supply energy more cheaply than a small wind generator.

Horace McCracken from San Diego showed slides of the small solar stills he installs throughout the Southwest to provide distilled water.

Karl Boer talked about the Solar One house at the University of Delaware which produces heat and electricity from the sun. The house is operating now but is evident-

Harold Hay showed slides of his sky therm house in Atascadero - a one story house heated and cooled by enormous water beds on the roof which can be exposed to the night sky or the sun for either cooling or heating.

One particularly distressing talk was given by a young man from Texas - "Shaping Society to Fit Solar Energy." He had the hair-do of a rock star and as he adjusted the mike I expected to hear some unusual theories and proposals - but no, nothing of the kind. Instead it was like seeing a bird open its mouth to sing but there is no song, only the sound of an electric motor. The talk consisted of the description of a computer analysis of the possible design of solar power stations. Nowhere was there any mention of shaping society. Society was to be left to the side. In fact the plan called for an almost entirely automated system independent of people.

At the end of the meeting a man was outside sweating and laboring to set up a demonstration of a small solar powered steam engine - the concentrating collector consisting of two racks of shaving mirrors (some of the shaving mirrors with plain rims and others with gold culicue designs on the rims). The boiler kept running out of water, the mirrors had to be adjusted constantly as the earth turned. Scattered clouds blocked the sun periodically. The man wrestled with the device, explained it was a model of a large power plant he wished to build. It seemed wonderful that there on the neat lawn in front of the NASA Lewis research center, a kind of institute to make other institutes feel ashamed of their lack of guards, government limosines and dignity, there was a demonstration relying on hardware purchased at two different drug stores with different brands of shaving mirrors.