

---

# How To

---

## Simple Solar Appliances

---

by Dan Dorsey

---

As I hike along a ridgeline in the Tucson Mountains, I feel content, knowing that I'll have dry clothes, hot water, cooked food, and a warm house when I return home. And because I use solar energy, my cost will be nothing, and the cost to the environment is nothing. For these same amenities, my neighbor will work tomorrow at a job he doesn't like to earn money to pay a corporation for electricity or natural gas. That energy will be produced at a coal-fired generator one hundred miles away and brought to him through an intricate grid of pipes and high tension lines. The production of that energy damages the environment and ties up enormous resources. My neighbor thinks I'm the eccentric one, but if in the future this complex system cannot deliver energy to his doorstep, or if he can't pay for it, he may be out of luck.

Despite the abundance of solar energy, many of us in dryland regions are in the same situation as my neighbor. Yet for little money, we can build solar water heaters and solar ovens, and insulate our homes, cutting our energy bills 50% to 90%. This two-part series discusses my experience building and using a simple solar water heater and a solar oven.

This past year, I built a simple solar water heater for under \$25.00 using a salvaged refrigerator and a salvaged water heater tank. The water tank went inside the refrigerator and pipes were attached to the tank through holes drilled through the refrigerator. Detailed plans are given on the next page.

I now have a passive, pressurized solar water heater. I open the door of the refrigerator in the morning, and the water

---

*Dan Dorsey lives on 2.5 acres of land near Tucson, Arizona, where he has been experimenting with permaculture techniques for the last 2 years. He is the contact person for Tucson Permaculture Guild, an informal association of people doing permaculture work in the Tucson area. (See ad, page 23.)*

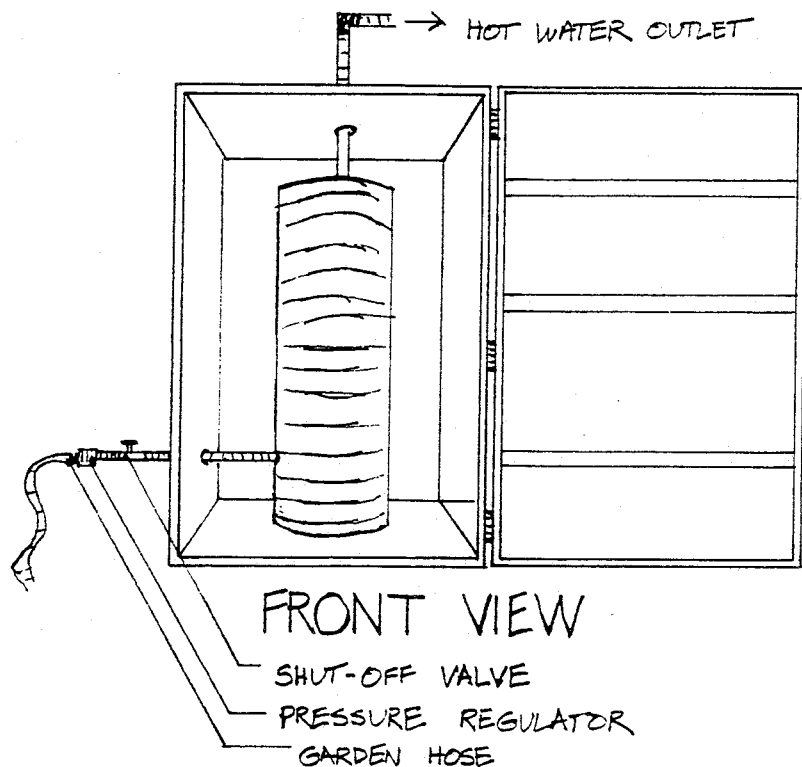
heats all day. In the evening I shut the door tightly to retain the heat into the night. This appliance alone caused my monthly gas bill to drop by 30%, and the system paid for itself in three months. Although I went three days between baths a few times as storms blew through the area, the solar heater provided all of my hot water last year.

In any permaculture design, each component has more than one function and each function is served in more than one way. A door can be cut into the refrigerator, and racks placed on either side of the tank could be used to dry food and even cook it. The heater is then a solar food dryer and oven as well.

The north side of the refrigerator creates a cool, moist microclimate. Edible plants that need some extra shade during the day can be put there. Since the refrigerator is tilted back, a small water runoff area is created, and this water runs back onto the plants.

As for supplementary sources of hot water, a stove will serve on cold, rainy days.

Building a simple solar water heater is something almost all of us can do in our own backyard as a contribution to a cleaner, greener, more decentralized society. When such simple solar appliances are in widespread use, we will all breathe easier, cause less damage to the environment, and have more free time.



# A Solar Water Heater for Less than \$25

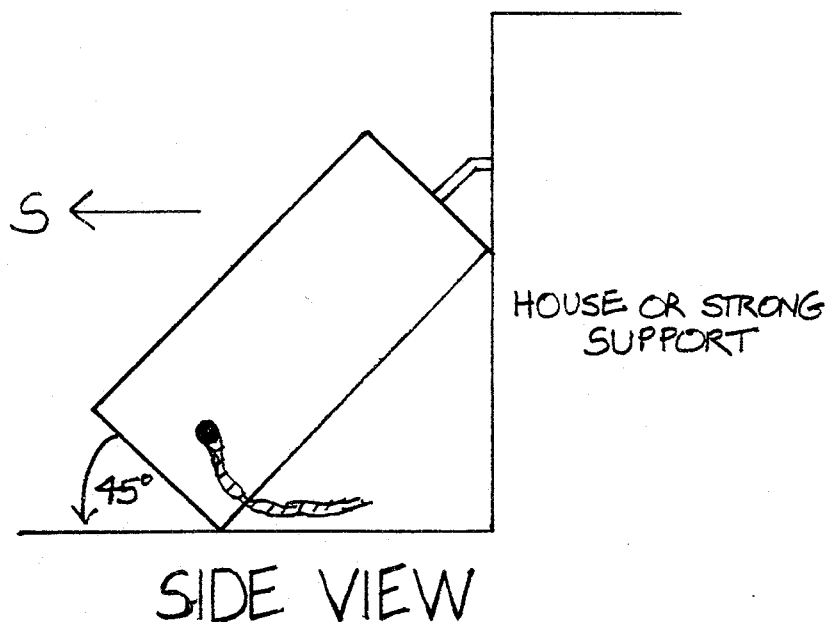
## Materials needed:

- salvaged water heater tank\*
- salvaged refrigerator (must be large enough to hold the water heater)
- high temperature black paint
- 3/4 in. galvanized plugs
- teflon tape
- 3/4 in. galvanized pipe, about 1 ft.
- shutoff valve
- pressure regulator (optional)
- garden hose
- galvanized pipe or CPVP, enough to bring water into house and connect it to existing plumbing or place where desired
- sheet of clear fiberglass plastic
- caulk

\* Because the natural gas burner unit at the bottom of a water heater tank usually breaks down before the tank wears out, hundreds of good tanks are thrown out daily and end up in landfills. Make sure the one you use is free of leaks.

## Tools needed:

- Drill (or other way of making a hole through metal)
- Pipe wrench



Illustrations: Dan Dorsey

**Step 1.** Salvage an old refrigerator or freezer and strip off the motor, wires, and tubes, leaving the box and door intact. Clean the interior and paint it with a high temperature black paint.

**Step 2.** Site the refrigerator by leaning it against a support at about a 45 degree angle, facing south. This angle is a good compromise between winter and summer solstice in the southwestern US. Heat gain can be improved slightly by adjusting the angle seasonally, although I found this unnecessary in southern Arizona.

**Step 3.** Salvage an old water heater and strip off the outer insulation, leaving just the tank. Make sure beforehand the tank will fit inside the refrigerator.

**Step 4.** Plug holes in the water tank with galvanized plugs, leaving one hole toward the bottom for a cold water inlet and one hole on top for the hot water outlet. Wrap threads on plugs with teflon tape for a tight seal.

**Step 5.** Drill a hole in the refrigerator to correspond to the cold water inlet hole in the water tank and screw in the footlong galvanized pipe. Attach a shutoff valve to the pipe so the system can be shut off on freezing nights.

**Step 6.** To insure an even flow, attach a pressure regulator to the shutoff valve.

**Step 7.** Connect a garden hose to the pressure regulator and attach the other end of the hose to an outside faucet.

**Step 8.** Drill a hole in the top of the refrigerator corresponding to the outlet hole and attach galvanized pipe or CPVC. Connect the pipe to existing plumbing or a conveniently located spigot in the house.

**Step 9.** Cover the front of the refrigerator during the day to retain heat. Clear plastic is a temporary expedient, but the best material I've found is a clear sheet of fiberglass plastic, the kind used for greenhouses. It is less expensive and tougher than tempered glass. I put a sheet of fiberglass over the refrigerator and sealed around the edges with caulk. Before caulking, make sure the door of the refrigerator will close completely, to seal in heat at night.

**Step 10.** Caulk around the pipes coming out of the refrigerator.