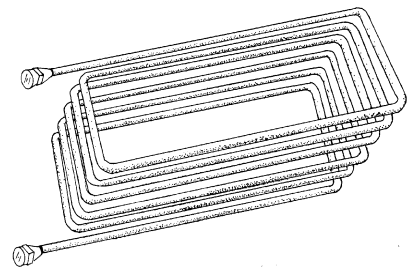
Here's a low-cost, low-tech refrigerator that really works

By J.D. Hooker

A friend was recently preparing to shell out well over $1000 for a kerosene-fired refrigerator. While these are useful and valuable devices in many circumstances, I didn't think he needed one.

He had a 4-inch, 200 foot deep well to supply the water needs for his household and livestock. After he examined my water-cooled refrigerator closely, he built himself a duplicate the same weekend.



Fashion cooling coils from copper or plastic water line. Even garden hose would work.

For inhabitants of many rural areas, a similar owner-built unit can offer the same cost savings and reliability they do for our households. There are no moving parts, no chemicals like freon, almost no maintenance, no operating cost, nothing to wear out, and they can be put together from salvage material in only a few hours.

Cold well water needed

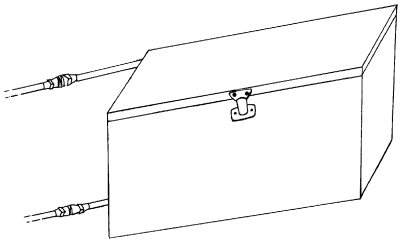
The only real requirement is a deep well water supply, with a steady water temperature between 35° and 50° F.

In most of the country, deep wells have become a necessity for those outside the public water supply lines, due to lowering water tables, ground water pollution in shallow wells, and similar circumstances.

Check your water temperature by allowing the water to run for several minutes, emptying the lines and tank. Then fill a bucket with fresh water and insert a thermometer. If your water temperature is above 50°, you are probably one of the people who should look into a kerosene or LP gas refrigerator, or stick with electric.

It's simple

Really, the whole idea is extremely simple. At the point where the water supply enters your dwelling, the incoming cold water is routed through a coil of pipe or hose installed inside an insulated box before it goes anywhere else. Whenever water is used for dish washing, laundry, showering, flushing the toilet or whatever, fresh cold water circulates through this coil and cools the interior of the insulated box.

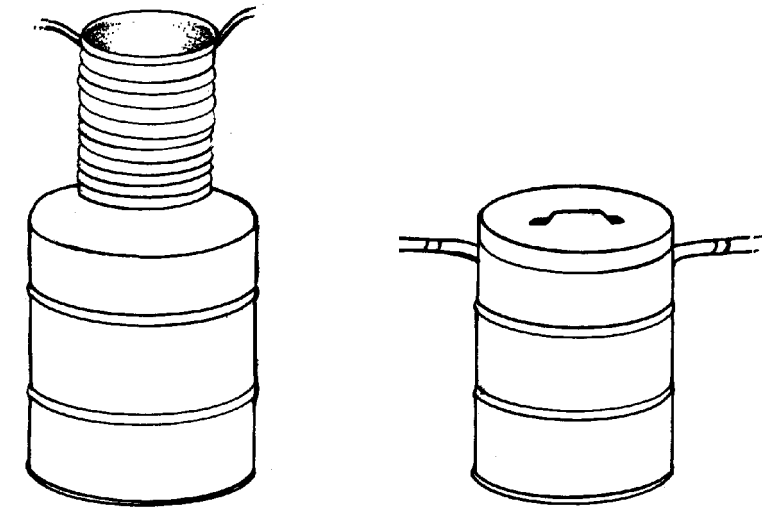


Install the cooling coil in an insulated box and hook it up to household plumbing. An old, worn-out chest-style freezer is ideal, but any sort of insulated box will work.

Construction

Any sort of well-insulated box will serve. Depending on your tastes, abilities, and what is available, you might opt for anything from an ultra-fancy oak and brass ice-box replica to something rigged together from plywood and sheet metal scraps.

For me, the best solution was to use a worn out chest freezer. I knew my



For a smaller cold storage space, wrap a 30-gallon drum with garden hose and insert it into a 55-gallon drum. Fill the space with insulation or very dry sawdust. Make a lid from styrofoam or other insulating material.

wife would never go along with this project if I didn't end up with something that looked like a normal and attractive household appliance. The chest type is superior to upright freezers because all your cool air won't spill out when you open the door.

The very first thing I did was cut off the power cord. The next step was to repaint the unit with appliance enamel. Then I cut a hole in the bottom and installed a PVC sink drain in case of spills or condensation.

Using a conduit bender, I then formed ½" soft copper tubing to match the interior dimensions of the compartment. Hard copper and sweat-on fittings—or even plastic pipe—would probably work just as well. I already had the soft copper tubing, so I used it.

After putting the unit in place, hooking it into the water line, and checking for leaks, we had to wait almost two days for the inside temperature to drop to 42°. Since then it has held that same reading for almost five years.

Cold water refrigeration is not a new concept. Nor is it adaptable to each and every situation. If, however, you are already drawing your water supply from a deep well with a fairly constant water temperature, why would you want to keep throwing your hard earned money away for electricity, kerosene, or any other fuel when you can refrigerate for free? Δ

The care of lead acid batteries

By Larry Elliott

Storage batteries are used in just about every independent energy system. The lead acid storage battery is a familiar sight in your car. Usually these batteries give years of trouble-free service and the average driver rarely has to be concerned about the chemistry of the battery, cycle life, or charge/discharge rates. The lead acid batteries used in an independent energy system are another story. If there is one item that is least understood or abused in these systems, it's the battery. If you follow the list of do's and don'ts outlined below, living with the storage battery will be a lot easier and less costly.

Rule 1. This comes as a shock to most people, but a 12-volt lead acid battery is almost dead when the voltage at rest (no loads or discharge) is 12 volts. Less than 25% of the battery's capacity remains. The voltage of a 12-volt lead acid battery will vary between 11.6 and 12.6 volts discharged and fully charged. This one volt range can be used as an approximate indicator of the state of charge and illustrates the need for an accurate digital voltmeter.

Rule 2. In order to obtain long life from your batteries they should be discharged to no more than 50% of capacity. This is not easy to accomplish, especially in a solar electric system in winter. A backup generator or, if you have the wind, a wind generator, can make this a lot easier to do reliably. Hydroelectric systems don't usually have this problem.

Rule 3. Don't use car batteries in an independent system. They are not made to be deep-cycled and will have an early death when used in this way. A good golf cart or forklift battery like the Trojan L-16 is a much better choice.

Rule 4. Never let a lead acid battery sit in a discharged state. Recharge as soon as possible. Every time you let them set for any length of time (even a few days) you will begin to accumulate lead sulfate on the plates that reduces their capacity.

Rule 5. If you live in a cold climate, be sure and provide insulation or a warm area for your batteries. The useful capacity and the batteries' ability to deliver power are greatly reduced in cold temperatures. Your batteries can also freeze when in a discharged state, so keep them warm.

Rule 6. Never draw large amounts of current from your batteries when in a discharged state. Damage to the plates can occur.

Rule 7. Batteries should have an "equalize charge" at least every other month or sometimes once a month depending on how severe the service. An equalize charge is a form of controlled overcharge that helps to place all the cells at an equal voltage. Large currents are needed to equalize, so once again you can see the need for a backup generator. An ideal method of equalization is to purchase an inverter with a built-in battery charger and an equalize function.

Rule 8. Never attempt to adjust the electrolyte level in the battery. Raising or lowering the specific gravity not only voids the warranty, but can ruin the batteries or pose an unhealthy risk of acid burns. Adding distilled water when needed should be as far as you go.

Rule 9. Always keep battery terminals and the tops of the batteries clean and free of corrosion. The batteries can self discharge rapidly, and badly corroded terminals can cause electrical problems, especially when drawing a lot of current.

Rule 10. Do some follow-up study on charge and discharge rates for your batteries. Consult a reputable battery dealer or the supplier/designer of your system as to the best way to treat your batteries. Nothing can kill a good set of batteries faster than improper charging and discharging. Δ