

# Human-Powered Machines

A. Jagadeesh

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**I**n developing countries like India and China, and in other parts of Asia, Latin America, and Africa, human power is a great asset. To bring rural employment, our approach should be as Mahatma Gandhi put it, “Not mass production, but production by the masses.”

## Treadle Washing Machine

A human-powered washing machine is much cheaper than an electrically operated machine. My design uses a box that is 38 by 38 by 61 cm (15 x 15 x 24 in.), made from thick galvanized iron sheet. On the outside of the box, there is a 15 cm (6 in.) diameter aluminum pulley that is belted to the pulley on the sewing machine base. On the inside of the box, there is a 15 cm (6 in.) diameter fiberglass wheel. The inside wheel is made with a curvature that facilitates centrifugal motion.

The whole setup is mounted on the pedaling table of a treadle sewing machine. There is an opening with a cover on the top of the box to put in soap powder, water, and clothes. At the bottom of the box, there is a pipe that allows users to drain the used water. The upper portion and the sides of the machine are painted black. When the unit is placed in sunlight, it absorbs heat that can be used to warm the water for cleaning clothes.

## Operation

The box is filled halfway with water, soap powder, and about 2 to 3 kg (4–7 lbs.) of clothes. It is covered for half an hour, so that all the clothes can soak in the soapy water. Then the treadle is operated for 15 minutes for synthetic fabrics and 25 minutes for cotton fabrics. The used soapy water is then drained out.

The clothes are removed, rinsed, and dried in sunlight. After washing, the box can be removed to make the pedalling stand available for the sewing machine. The whole washing machine, except for the sewing machine, costs around Rs 500 (about US\$11), and can be fabricated locally.

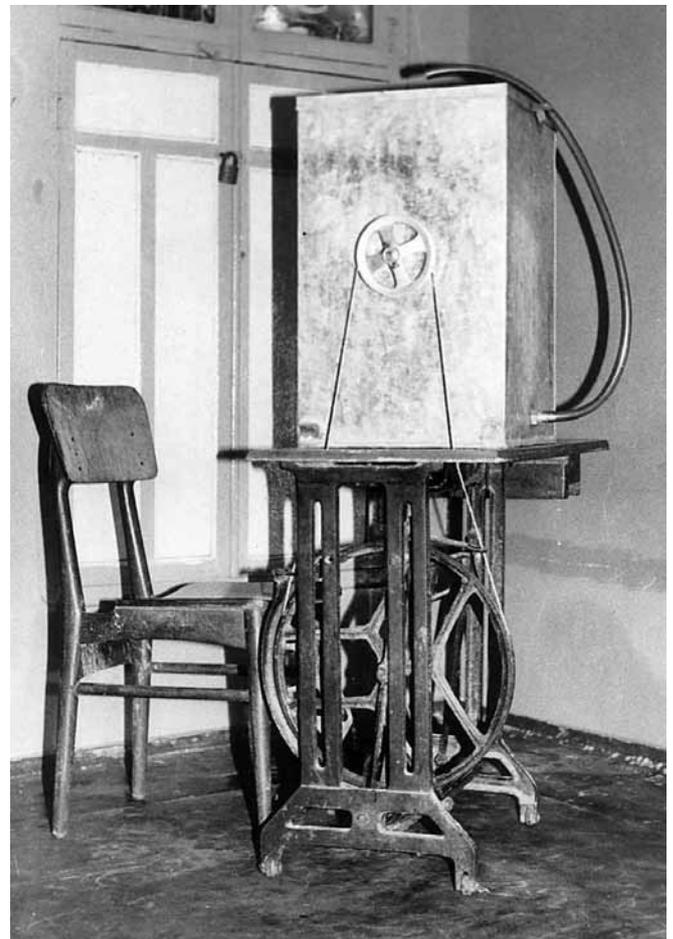
## Advantages

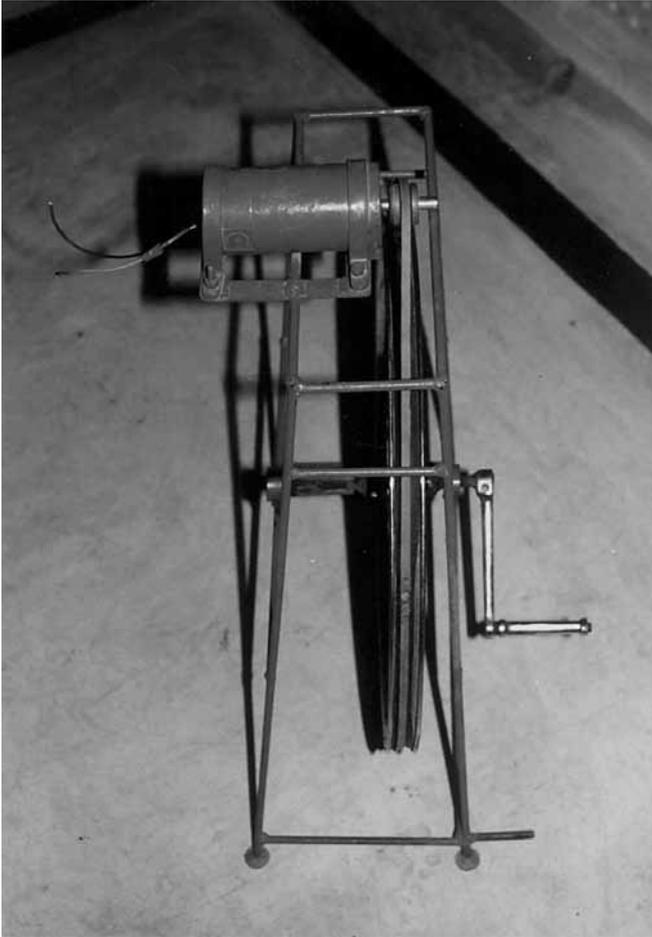
- The unit is cost-effective.
- The unit is mobile.
- The fabrication of the unit will generate employment, especially in rural areas.
- It helps to conserve energy.
- Men and women are already accustomed to operating sewing machines, and the operation of this pedal-powered washing machine is not strenuous.
- The life of the clothing is extended compared to hammering it on rocks.
- Operating the machine provides exercise.

## Hand-Operated Battery Charger

In developing countries, solar-electric modules to charge batteries for a television and one light are

**Loads of wash take between 15 and 25 minutes in Dr. Jagadeesh's treadle-powered model.**





The hand-operated battery charger utilizes a low-rpm generator, a bicycle wheel, and human power.

becoming more common. In Mongolia, wind chargers are widely used (over 150,000) to charge batteries for a television and one light. On average, a solar/wind battery charger costs Rs 30,000 (about US\$638) in India. And wind chargers can't be operated in all places, since wind is site specific and intermittent.

I designed a hand-operated battery charger. It consists of a bicycle wheel and a low-rpm generator that is mounted on a frame and driven by a V-belt. There is a handle attached to the system. The system also has a blocking diode to prevent reverse flow of current.

#### Operation

Three 12 volt lead-acid batteries are connected in parallel, and then to the battery charger. By rotating the wheel for six hours, the batteries can be charged. Since many of the sewing machines are hand operated (especially in Northern India), people are familiar with this sort of system.

#### Advantages

- The whole unit weighs about 5 kg (11 lbs.) and is mobile—it can be carried on the back.

- It provides employment to rural people.
- The unit is easy to fabricate, even in rural workshops.
- In most countries, generators are available, and if not, they can be imported. Many countries exempt renewable energy equipment and generators from customs duty. Alternatively, automobile generators can be used by changing the windings.
- The unit is inexpensive—it costs about Rs 7,000 (US\$150).
- It can be operated with either hand.
- It occupies little space.
- Women, as well as children, can operate the system.

#### Access

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## Pedal-Powered Washing Machines in the U.S. Urban Homebrew Machine

Laura Allen

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This pedal-powered washer was built in a day by two motivated people (Reuben and Laura). We used what we had: an old 55 gallon drum, an old bike, scrap wood, nuts, bolts, and one bale of hay (to lie down on). Anyone—especially you!—could build a washer like this.

The author using her homebrew washing machine.





**Inside the homebrew barrel-style washing machine.**

The barrel is cut into two pieces. A wooden paddle is attached to the front fork of the bike and inserted into the barrel. A chain attached from the pedals to the handlebars creates a back and forth motion of the paddle when you pedal. So simple and so effective!

The washer is filled using a garden hose, and drains out of hoses attached to the bottom. The water goes directly into the garden, so we must use biodegradable soap that doesn't harm the plants. This greywater enables us to have wetland plants in our yard. We water a beautiful bog, full of water irises, sedges, nettles, water parsnip, and other wetland plants. The water also goes to a fruit tree and a bed of garden plants.

**Converted Wringer Washer**

Amy Preuit and CCAT staff

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Human power motorizes the washing machine at the Campus Center for Appropriate Technology (CCAT) at Humboldt State University (HSU). The CCAT washing machine is hooked up to a pulley system and connected to an exercise bicycle, so all the energy that runs the machine is from pedaling a bicycle.

The project itself is not that difficult to set up; it just takes a little elbow grease and patience. We used an old Maytag wringer washer that needed no special conversion. The biggest job was taking out the washing machine motor and setting up the connecting parts.

The bike uses a chain-driven flywheel, with a belt attaching the flywheel to a pulley, and another belt attaching the pulley to the driveshaft. The driveshaft was originally powered by the washer motor, but it is now spun by pedal power.

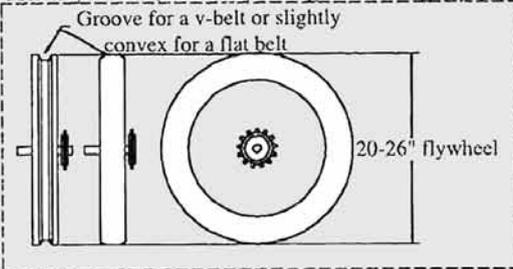
With this machine, you can wash your clothes, and with a flick of a switch, hook up the wringer to squeeze most of the water out—all from the seated position of the exercise bike. For more detailed information on the machine, see the CCAT Web site.



**Forget that membership to "the club"—pedal your way to health and clean clothes.**

Flywheels store the energy of your pedalling.

A heavy wheel (30-60lbs) with good bearings is best.



**Close-up view of Gearing under the Maytag**

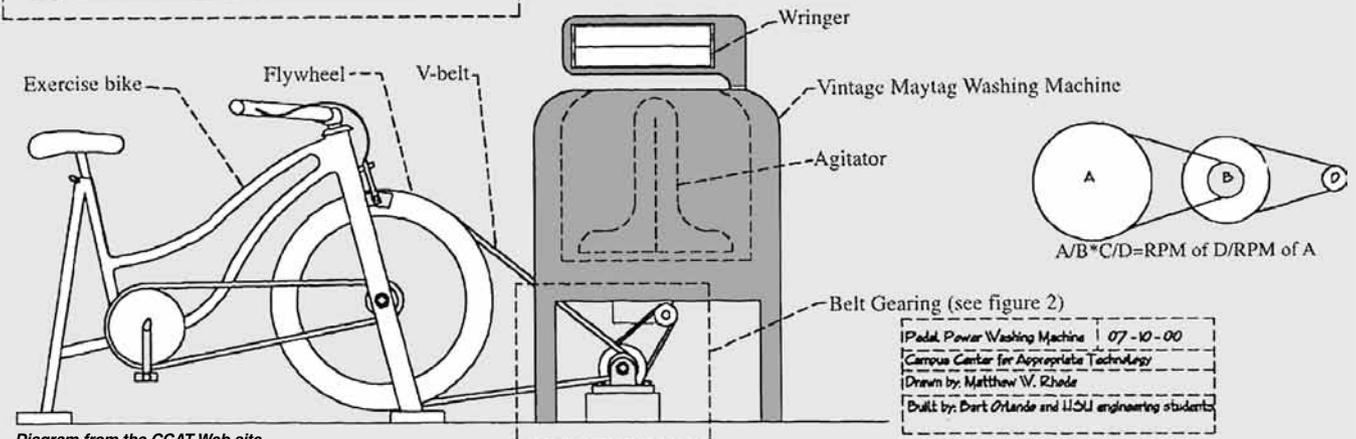
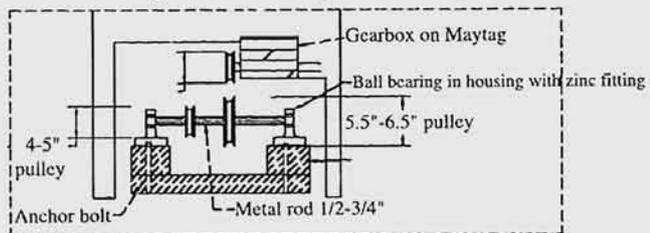


Diagram from the CCAT Web site.