

Waterwheels Resource

There are 3 types of waterwheels: undershot, breastshot and overshot, there are also water turbines.

- Undershot wheels have paddles which dip into the flowing water causing the wheel to rotate, they require a large constant flow of water to work well, but do not need dedicated waterways constructed to get the flow above its natural level.
- Breastshot wheels are a development of undershot wheels where the water enters the wheel chamber part of the way up the upstream edge of the wheel. This design will get more energy from a smaller flow of water than a straightforward undershot wheel, and wastes very little of the water.
- Overshot wheels have buckets which the water is directed into by a specially constructed watercourse (or a watering can!) They require less water flow to get energy from the water as they get energy from gravity as well as flow.

Water turbines usually operate at much higher speeds and water pressures than traditional water wheels and are thus much more suited to the generation of electricity. They came into use more recently than waterwheels, and they are more complex mechanically.

How to create overshot and undershot waterwheels

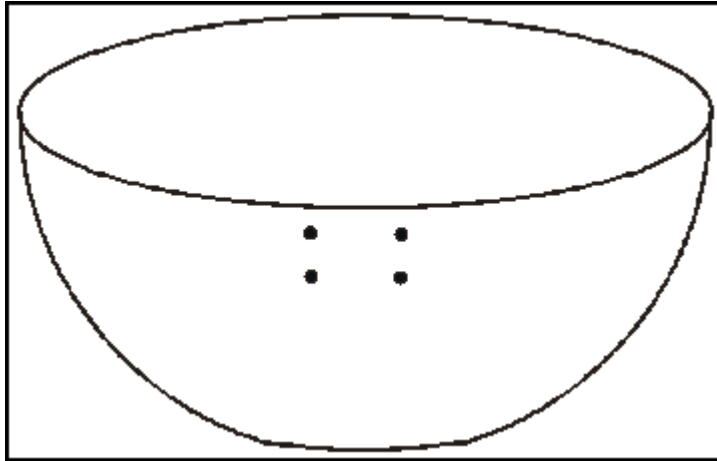
Overshot wheel with bowls

Materials required

- Spoked wheel, possibly a large buggy wheel.
- 10 to 30 plastic bowls, depending on wheel diameter.
- Twice as many cable ties as bowls.

Method

1. Make sure that the wheel rotates freely i.e. that the bearings are good.
2. If there is a tyre or inner tube on the wheel remove it!
3. There need to be enough receptacles for a stream of water aimed at the wheel to always fall into one and they need to be evenly spaced, probably one at each spoke or every second spoke. You could use a variety of different receptacles on a single wheel or lots of the same sort. The important thing is that when it is assembled the wheel is balanced i.e. that it does not always come heavily to rest at the same point when left to freely rotate. A balanced wheel is much easier to turn, so if different objects were used they would be best arranged in pairs opposite each other on the rim of the wheel.
4. Drill 4 holes in each bowl in a square pattern as below. The width between the holes should be about the same as the width of the rim.



5. Secure each bowl with 2 cable ties, one over and one under a spoke to hold the bowl still on the wheel. The cable ties can be crossed over each other on the inside of the bowl if this makes the attachment more stable.
6. Hold the wheel by the axle and pour water onto one side as shown.

Possible developments of the above project

- The frame of the buggy could be incorporated as a mounting for the wheel or you could find some metal tubing or even bamboo to mount it on.
- There will probably be a brake of some sort on the hub of the wheel, this could be adapted by putting a pulley (maybe from a washing machine) onto it to allow a drive belt to take rotational power from the wheel.
- The hub brake could also be used to attach a wooden cam* so that a reciprocating motion could be achieved.
- If an old bicycle is used then it could just be turned upside down and a movement taken from the pedals. The difficult part of this idea is getting receptacles small enough to pass through the forks of the bike.

* a cam is "A projection on a rotating part in machinery, shaped to impart reciprocal or variable motion to the part in contact with it".

Basically it's a lump on an axle which rubs against another object causing it to wobble!

Undershot water wheel

This is basically a development of the overshot water wheel, but using paddles instead of bowls.

Materials required

- Spoked wheel, possibly a bicycle or buggy wheel.

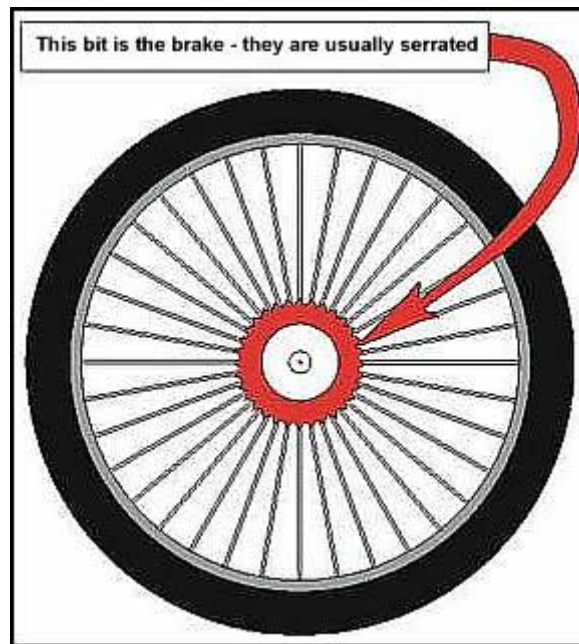
- 30 to 50 paddle forms, they could be spoons, spatulas, plastic joke shop tongues or any other suitably sized flat(ish) object.
- Twice as many cable ties as paddles.

Method

1. Make sure that the wheel rotates freely i.e. that the bearings are good.
2. If there is a tyre or inner tube on the wheel remove it!
3. There need to be enough paddles for there to always be 2 or 3 immersed in the water when the wheel is suspended in a stream and they need to be evenly spaced, probably one at each spoke or every second spoke. As with the overshot wheel it needs to be balanced in order that it is as easy as possible for the water to turn it.
4. Attach the paddles to the circumference of the wheel using cable ties. The attachment method will depend on chosen objects, but for example with spoons or spatulas the handles could be attached directly to the spokes.
5. Dip the wheel in a stream and it should rotate.

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- The brake on a push chair wheel is normally a serrated plastic disc attached to the wheel hub. You could attach items to it using lots of glue or car body filler.



The 2 wheels referred to are one and the same wheel, this being a push chair wheel used as a base for a water wheel. The reason for attaching anything to the hub is that it would enable power to be taken from the wheel in order to drive something.

