WATER MOTOR

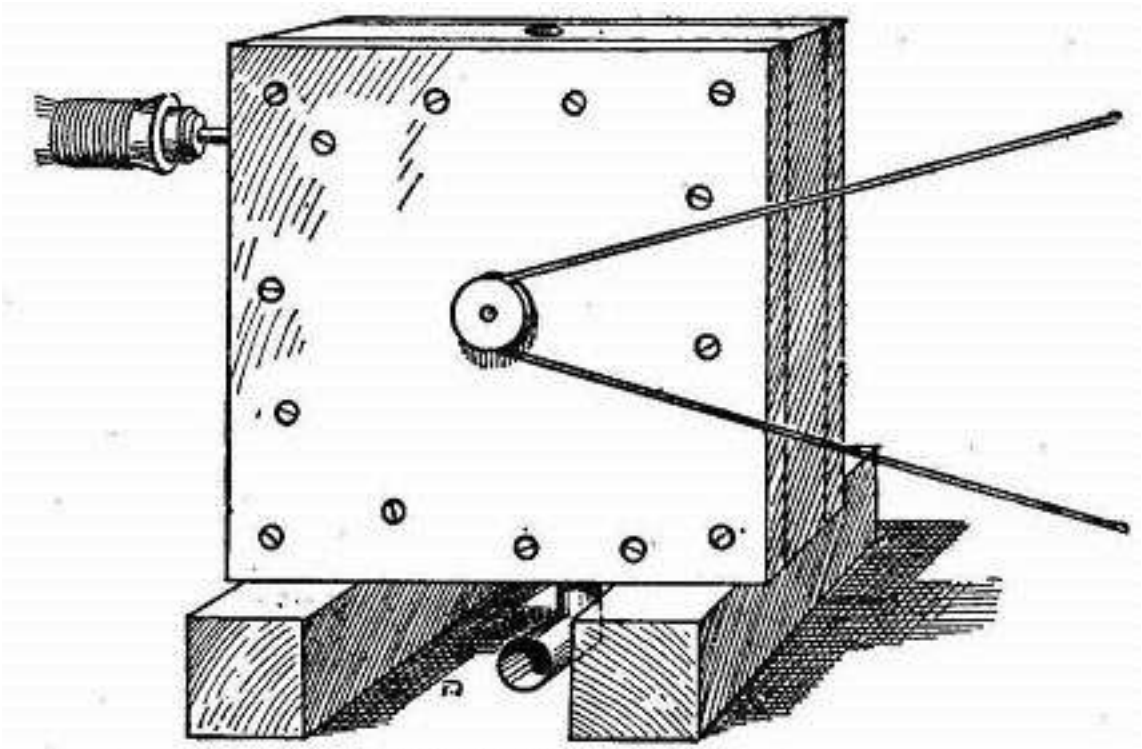

FIG. 105.—Simple water turbine.

Figure 105 is a perspective view of a simple water motor which costs little to make, and can be constructed by anybody able to use carpenter's tools and a soldering iron. It will serve to drive a very small dynamo, or do other work for which power on a small scale is required. A water supply giving a pressure of 40 lbs. upwards per square inch must be available.

We begin operations by fashioning the case, which consists of three main parts, the center and two sides, held together by brass screws. For the center, select a piece of oak 1 inch thick. Mark off a square, 7 inches on the side; find the center of this, and describe a circle 5 inches in diameter. A bulge is given to the circle towards one corner of the square, at which the waste-pipe will be situated.

Cut out along the line with a keyhole saw. Then saw out the square of wood. A 5/8-inch hole is now bored edge ways through the wood into the "bulge" for the escape, and in what will be the top edge is drilled a 1/4-inch hole to allow air to enter.

Cut out the sides, and screw them on to the center at the four corners, taking care that the grain runs the same way in all three pieces, so that they may all expand or contract in the same direction. Plane off the edges of the sides flush with the center.

The parts should now be separated, after being marked so that they can be reassembled correctly, and laid for a quarter of an hour in a pan of melted paraffin wax, or, failing this, of Vaseline, until the wood is thoroughly impregnated. Reassemble the parts, and put in the rest of the holding screws, which should have their heads countersunk flush with the wood.

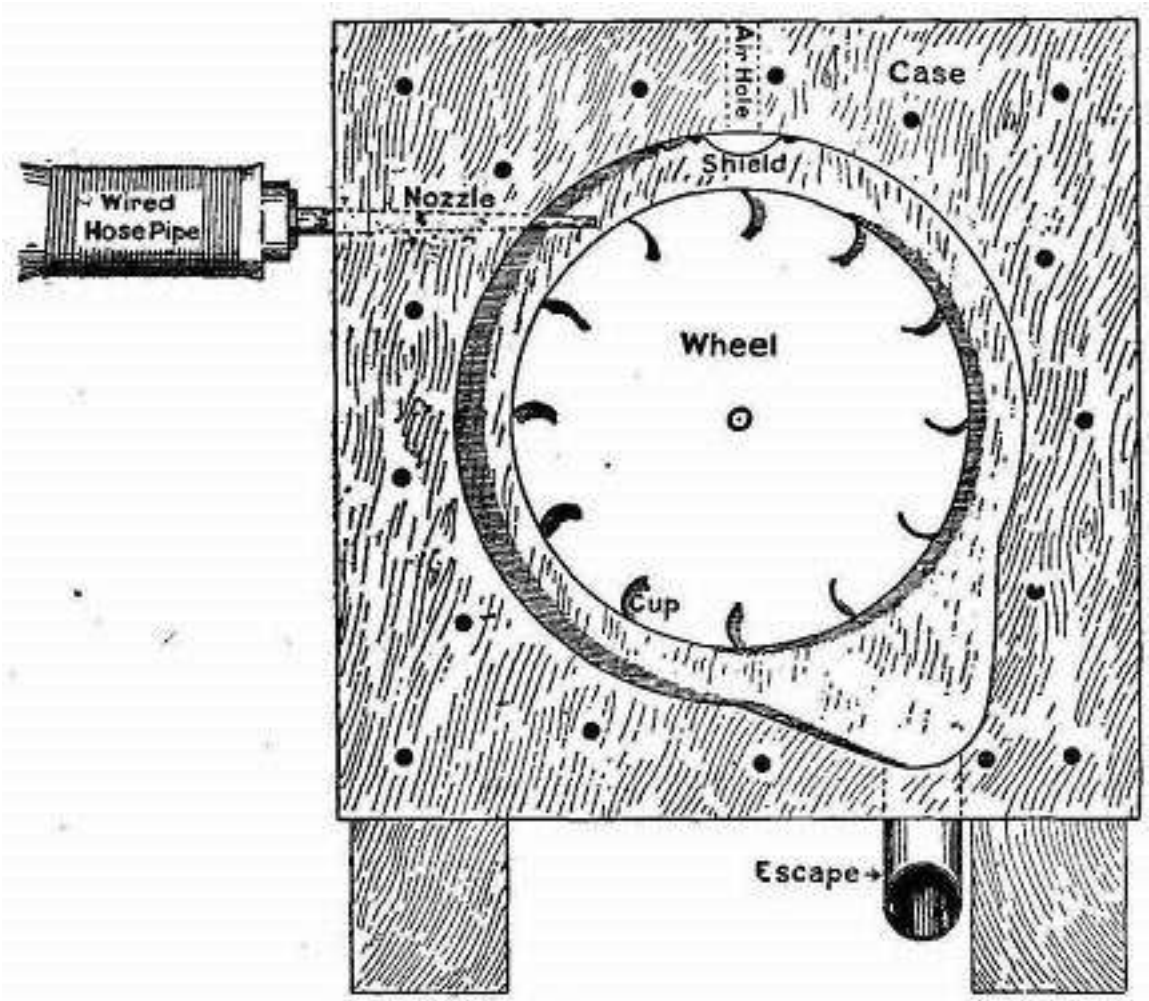

FIG. 106.—Water turbine, with pulley side of casing removed.

For the shaft select a piece of steel rod 5/32 inch in diameter, and 3 or 4 inches long; for the bearings use two pieces, 3/4 inch long each, of close-fitting brass tube. Now take a drill, very slightly smaller in diameter than the bearings, and run holes right through the centers of, and square to, the sides. Both holes should be drilled at one operation, so that they may be in line.

With a wooden mallet drive the bearings, which should be tapered slightly at the entering end, through the sides. Push the shaft through them. If it refuses to pass, or, if passed, turns very unwillingly, the bearings must be out of line; in which case the following operation will put things right. Remove the bearing on the pulley side, and enlarge the hole slightly. Then bore a hole in the center of a metal disc, 1 inch in diameter, to fit the bearing; and drill three holes for screws to hold the disc against the case. Rub disc and bearing bright all over.

Replace the bearing in its hole, slip the disc over it, and push the shaft through both bearings. Move the disc about until the shaft turns easily, mark the screw holes, and insert the screws. Finally, solder the bearing to the disc while the shaft is still in place.

The wheel is a flat brass disc 4 inches in

diameter. Polish this, and scratch on one side twelve equally spaced radii. At the end of each radius a small cup, made by bending a piece of strip brass 1/4 inch wide and 1/2 inch long into an arc of a circle, is soldered with its extremities on the scratch. A little "Tinol" soldering lamp (price 1s. 6d.) comes in very handy here.

To fix the wheel of the shaft requires the use of a third small piece of tubing, which should be turned off quite square at both ends. Slip this and the wheel on the shaft, and make a good, firm, soldered joint. *Note.* -- Consult Figure 107 for a general idea of the position of the wheel, which must be kept just clear of the case by the near bearing.

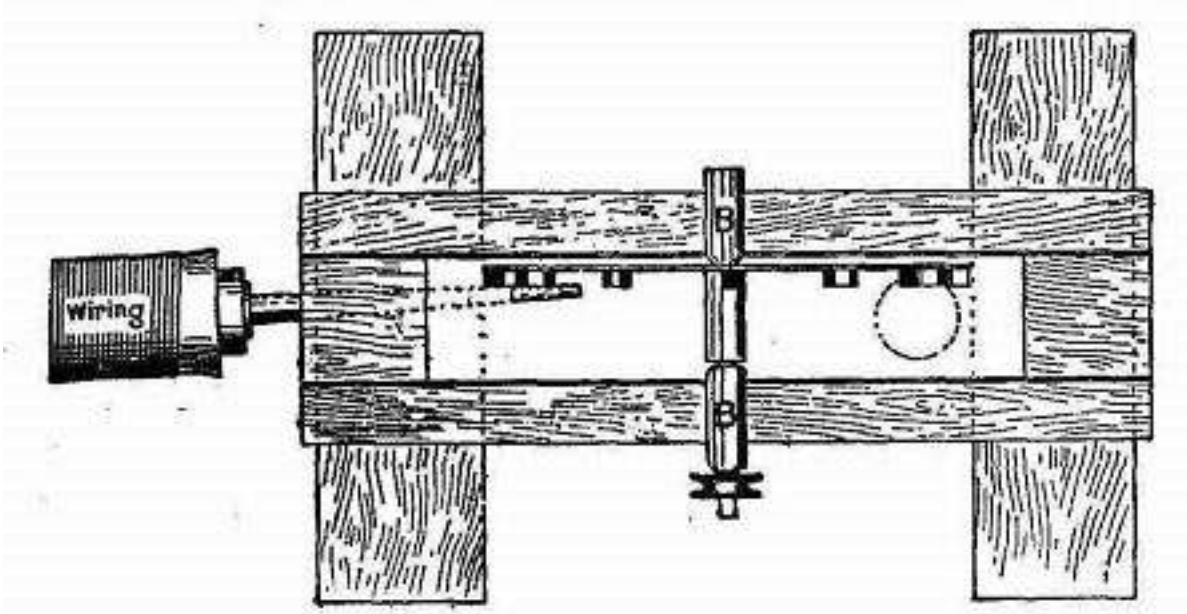

FIG. 107.—Plan of water turbine, showing arrangement of nozzle.

The nozzle should be a straight, tapered tube of some kind -- the nose of a large oil can will serve the purpose. The exit must be small enough to allow the water to leave it at high velocity; if too large, the efficiency of the wheel will be diminished. To the rear end of the nozzle should be soldered a piece of brass tubing, which will make a tight fit with the hose pipe leading from the water supply. A few small brass rings soldered round this piece will prevent the hose blowing off if well wired on the outside.

Now comes the boring of the hole for the nozzle. Figure 106 shows the line it should take horizontally, so that the water shall strike the uppermost bucket just below the center; while Figure 107 indicates the obliquity needed to make the stream miss the intervening bucket. A tapered broach should be used to enlarge the hole gradually till the nozzle projects sufficiently. If the line is not quite correct, the tip should be bent carefully in the direction required. One must avoid distorting the orifice, which should be perfectly circular; clean it out with a small twist drill of the proper size.

A brass elbow, which may be purchased for a few pence, should be driven into the waste hole, and a small shield be nailed under the air hole. A couple of screwed-on cross pieces are required to steady the motor sideways and raise the elbow clear of the ground.

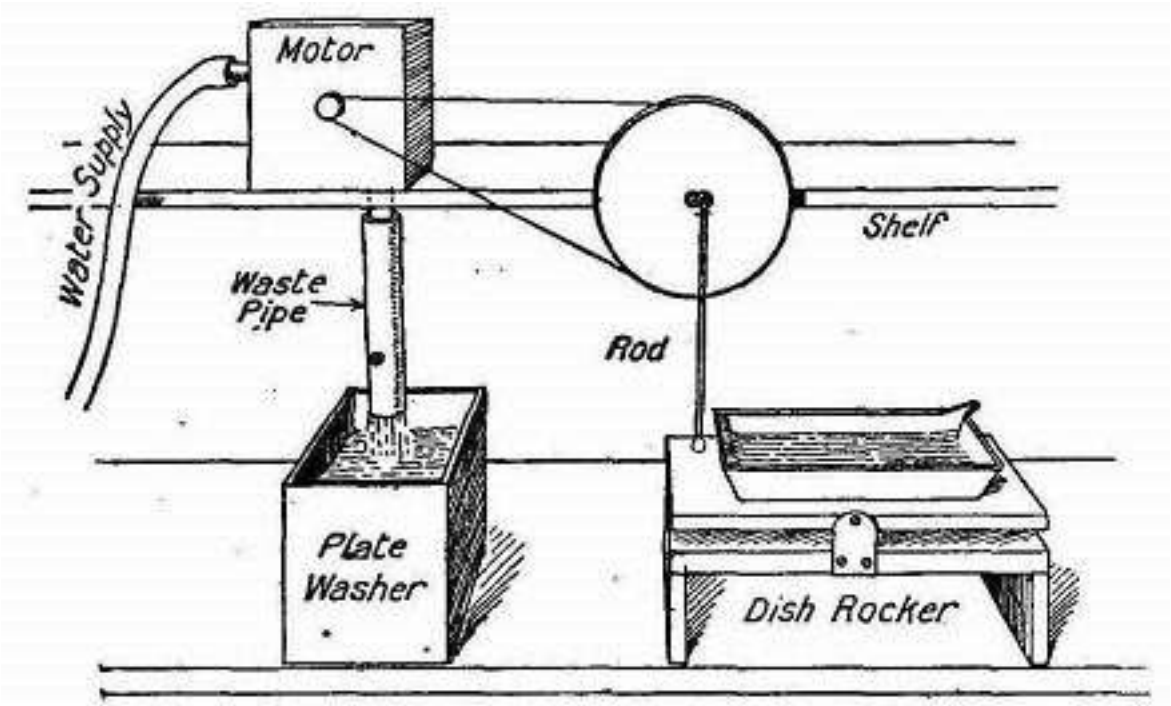

FIG. 108.—Water motor working a photographic dish-rocker.

The motor may be geared direct to a very small dynamo, if the latter is designed to run at high speeds. If a geared-down drive is needed, a small pulley--such as is used for blinds, and may be bought for a penny --should be attached to the shaft, and a boot lace be employed as belt. Avoid overloading the wheel, for if it is unable to run at a high speed it will prove inefficient.

Lubrication

The water will keep the bearings cool, but the bearings should be well lubricated. The most convenient method of effecting this is to bore holes in the bearings, and from them run small pipes to an oil reservoir on the top of the case (as in Figure 70), where they are fed on the siphon principle through strands of worsted.

Alternative Construction

If an all-metal case is preferred, the reader might utilize the description given of a steam turbine elsewhere in this series. The details there given will apply to water as well as steam, the one exception being that a nozzle of the kind described above must be substituted for the steam pipe and small ports.