This 1:24 scale wheel is a 16\(^\prime\) diameter wood wheel detailed from several wooden wheels. The overshot wheel is the most efficient of the three basic types of wheels - overshot, breast and undershot. It reaches up to 75 percent efficiency from the falling water.

The actual size is 8\(^\prime\) x 2 3/8\(^\prime\). It is Stoneworks' third wheel. The first wheel was 8\(^\prime\) x 1\(^\prime\). This resin cast wheel (plastic) appears and is still turning on almost 200 garden railroads. It was "highly detailed" and patterned after the 20\(^\prime\) Pickwick Mill wheel. It was discontinued due to the ever increasing costs of plastic resin, RTV molds and time to sand. Our second wheel is the famous Fitz Steel Overshoot waterwheel which was originally manufactured in PA in 1840. John Fitz's design developed more than 90\% efficiency when compared to the 60-75\% efficiency of the wood wheel.

This third wheel, the 2 x 8, is detailed with brass fittings, bushing and axle rod. Lasered in 1/16\(^\prime\) white styrene, it will last outdoors and is less costly. Due to the wider paddle of 2\(^\prime\), we've also developed a variety of universal 2\(^\prime\) sluice components. This allows you to create a long lasting "Cement Sluice" or one in wood. NOTE: Our six-year-old cement sluice prototype is shown below. Shown below-left is a half-breast sluice configuration that can also be used with the new wheel.

Above: The J.T. Lefler Mill at Life College in Marietta, GA. Middle: A log construction grist mill in Fowler Park Pioneer Village, Terre Haute, IN.

Below: The Gilbert Stuart Sawmill 815 Gilbert Stuart Road, Saunderstown, RI
Place 8 brass bolts through the holes in the center of the wheel. 
OPTION: If you want the smaller bolt head to appear on the outside of the wheel, then bolt placement must be through the engraved center section first.

Start attaching the inner section of wheel. Piece will bend towards the scribed side. Start in one of the inner slots. It requires some patience to get the tabs into the slots. Start at one end and work your way around. Attach the second section upon completion of first.

After the glue has dried from finishing the inner wheel, place the tab of the paddle or bucket board into the slot on one side of the wheel.

Once positioned in the slot, push the paddle to seat its other tab into the slot of the other wheel hub. A slight pressure or light tap of a small hammer sometimes helps to fully seat the tabs. Glue in place on both sides - inside and out.

Slide the 1/4" brass bushing through the center holes of the wheel. This is a snug fit. Should the center hub have been installed slightly off center, you may need to use a needle file to open. Align the bushing to protrude equally on both sides. This helps the clearance for the hub nuts to the journals on the wheel posts.
Spin the 8 nuts on to the bolts. They are quite small . . . we found that spinning with your finger gets them started.

Place 8 outside bolts through the back of the wheel and the corresponding spoke from the front.

Once completed, tighten all bolts and nuts on this side of the wheel. Tools shown: small hex wrench & needle-nosed pliers.

Next step: create the other hub. Begin at #1 to complete second wheel hub. See #11 for selecting the correct “side” with the paddle pattern to match your first side.

Before the final snap together of the second wheel hub, check to see that the slots for the paddle’s tabs go in the same direction and bolts line up as well. (Note arrows above.) Both engraved hubs with nuts should be on the outside. If OK, go ahead and snap on the second hub. Glue both inside and outside.

When styrene is cut with a laser, one edge on one side of the cut piece develops a “burr” due to melting. With the paddle pieces or bucket boards, this inhibits the tab of the paddle to easily snap into the wheel slot. A light sanding to minimize the burr makes it a lot easier to snap in the paddles.

Glue this inner section using a CA glue available in “thick” or “thin”. Also known as super glue, ACC or alphacyanoacrylate. Can be found at your grocery store, hobby or building center.

PAINTING: Most wooden wheels are natural and weathered in variations from greys to darker browns. Here are some colors we use over a grey primer:

- Rust-Oleum Exterior Brand
- Dark Taupe
- Multicolor textured - Autumn Brown (shown on cover)
- Walnut

This final step (before painting) is optional. You can “fill the slot holes” with CA glue and sand when dry (for stationary wheels). The "thicker" CA glue is excellent for this. The Dremel tool can also scribe a wood grain. If your wheel will always be turning, you won't see the slot holes. Darker paint also minimizes their appearance.
The average grist mill waterwheel revolved slowly about fifteen times a minute (rpm). Through many "gear ups", this resulted in the mill stones turning at 100 rpm.

Unlike the real mills that generated electricity, ground grain, sawed wood, the Stoneworks' 1:24 scale wheel uses a stationary axle extending through a brass bushing to allow the wheel to move freely. In the garden layout, wheel turn can be effected by leaves, algae, and other material. The rigid axle also permits the smallest amount of flow to create a turning wheel. This can be accomplished with a "fountain pump" to provide enough flow to operate.

A steady stream of water - about a pencil width in size - results in about 38 gallons per hour (gph). This produces about 64 rpm if the water is dropped near the center of the wheel. By moving the stream 2" off wheel center, the wheel will speed up to 78 rpm. You can regulate the flow of water with the use of a gate valve or sluice gate.

Once you have the wheel painted, give it a test run in the kitchen sink to determine the rate of turn that you like and to see where the placement of the journals on the wheel posts affects the rotation speed.

Decrease the flow of water and the wheel turns slower. This can be done by closing the rate of flow at the flow control gate or putting stones in the sluiceway.

Create DRAG on the wheel to slow its rate of turn. Allow raceway to fill with water. Create a dam in the tailrace, downstream of the wheel with stones.

When the water drops from the sluiceway tongue directly over the center of the wheel, this will be the "slowest" rate of turn. Move the wheel towards the source and this drops the water "further over the wheel" as it turns... the wheel turns faster.

Not shown above:
- 2 1/2" long 1/4" Brass Tube (wheel bushing)
- 6" long 3/16" Brass Rod (axle)

Actual Finished size (not including bushing and axle) 2 3/8" x 8" round

About Sluices . . .

One of the reasons for creating this 2x8 Wooden Wheel was the opportunity to create 2"-wide, universal, laser-cut sluice components for the "cement sluice" - that lasts. It uses the Stone & Cement technique with Vinyl Cement Patcher. Look for the How-To #7021 in late 2010.

The "wooden sluice" may last one or two years, but soon falls apart. This one is from the 90s.

"Cement sluice" above, lives outside for all winter & all weather. It's easily kept clean with water spray or chemicals. May require touch up painting every few years or so.