Build a Power Wheel from an Automobile Transmission
Vince Pitelka, 2020

This is adapted from my *Clay Times* "Tool Times Column" in July of 2001. I've clarified the text and added additional information, because there's a good story that goes along with this wheel.

Every potter who has been at it for a few decades knows some stories about interesting homemade or improvised power-driven pottery wheels. I've been at this for fifty years and the stories keep piling up. About twenty years ago, a student showed me a wheel made from an electric orange juicer - the kind with the rotating ribbed cone which reams out the juice and pulp. A small wheelhead was installed in place of the cone. It turned too fast and had only one speed, but it actually worked for throwing small things. In the 1980s when I was in grad school at U-Mass, someone brought in a wheel powered by a variable speed electric drill - not a permanent solution by any means, but it worked and had plenty of torque. More recently someone on the Clayart discussion forum directed me to a YouTube video of a guy who made a pottery wheel out of a ceiling fan motor mounted inside a five-gallon bucket. Apparently, the maker had a death wish. Water would accumulate in the bucket, eventually shorting out the motor, electrocuting the potter.

The late legendary Oregon potter and kiln/firing guru Nils Lou had a homemade power wheel built from a hydrostatic transmission salvaged from a garden tractor. The wheel was very heavy-duty and unstoppable, and had a fine speed range, but the noise would have driven me crazy.

My first power wheel was a beauty. I built it in 1970 from an old automobile transmission for a total price of around $40. You could conceivably build one today, but it will be harder to find an appropriate transmission, and needless to say, the cost will be much higher. Properly built, this wheel is practically indestructible and unstoppable, and a commercially-made wheel making those claims would cost several thousand dollars.

A long-time member of the Clayart Internet forum pointed out that the idea of building a power wheel from an automobile or truck transmission was first conceived by the late legendary California Funk ceramic pioneer Clayton Bailey, who came up with so many amazing original ideas for both eminently practical and outrageously wacky things. It is important to give him credit.

The only shortcoming of this design is that wheel speed is limited to three or four speeds, depending on the transmission you use. Mine was a three-speed. Third gear was great for centering. Second was ideal for early stages of throwing and for finishing small forms. First worked well for throwing and finishing large forms. Reverse was pretty useless, but you might find a need for it, especially in decorating processes. The wheelhead freewheeled in neutral, like a giant banding wheel.

If you are seriously considering building one of these wheel, before doing anything else, find an appropriate automobile transmission. When I built my wheel in 1970, old three-speed and four-speed stick-shift transmissions were abundant and cheap. You need the type with a single shift lever coming directly out of the transmission housing, and starting in the 1950s, almost all automotive transmissions had a linkage between the shift lever and the transmission. At the time I built mine, a friend built one with a linkage-type three-speed, and he had to move two levers on the side of the transmission and had to know the exact position of each lever to get the different speeds. He used that wheel for a while, but gave up on it pretty quickly.

Go to the funkiest, oldest junkyard or scrapyard you can find, and look for a stick-shift transmission with the gear-shift coming directly out of the transmission housing (instead of being connected with a linkage), and make sure it has a flat surface on the output shaft to accept the wheelhead. One kind of output shaft has a rounded cradle for the universal joint, but there are four flat surfaces with bolt holes. Another kind has a flat flange with four bolt holes. Either will work fine. An automobile three-speed or four-speed stick-shift is best, but in a pinch a heavier truck four-speed would work. It will just be heavier and bulkier, and you'd have to use a taller stool when throwing. When you find a likely transmission, spin the input and output shafts and run it through the gears. Make sure it shifts okay and that it runs smoothly in all gears (well, reverse doesn't really matter).

Once you have the transmission, unscrew the filler plug, drain out any remaining gear oil, and recycle it responsibly. With the transmission sitting so the filler plug is on top, pump a generous amount of chassis grease into the transmission with a grease gun while a friend spins the gears by hand, shifting between gears, making sure they are all well-coated with grease. Replace the plug and tighten securely. In the fifteen years that I used my wheel, I never added more grease, and none leaked out.

Scour scrapyards and appliance repair shops for a large V-belt pulley 14" to 16" outside diameter, such as can be found in older clothes dryers. In 1970, I got mine off an old clothes dryer at St. Vincent DePaul in Eureka, California for a dollar. Take the pulley to a machine shop or your local backyard machinist and have them bore the center hole to fit the transmission pilot shaft (the input shaft).

Check junk stores and scrap yards for an electric motor. Because of the combined speed-reduction provided by the belt pulleys and transmission in this wheel, a ¼ to ½ HP motor will give you more power than you will ever need. As a last resort, buy a ¼ HP 1725 RPM 120-volt electric motor for about $100 on amazon. Make sure the motor has a mounting flange on the side, rather than an end mount as is used on many appliances. Get a 2" diameter V-belt pulley to fit the motor shaft. Make sure it is the same "pitch" (cross-section shape and width of belt) as the big pulley.

Build a sturdy oblong ¾" plywood housing with a top but no bottom. The housing should be about 30" long, and wide enough to accommodate the large pulley inside with at least an inch of clearance between the pulley and the sides. The top of this housing should have two levels –

a higher level to accommodate the electric motor inside with the output shaft pointing downwards, and a lower portion upon which you will mount the transmission with the pilot shaft (input shaft) pointing downwards through a hole in the plywood.

If you want to get a little fancier, the end of the housing accommodating the electric motor can be quite a bit narrower than the end with the big pulley. The housing I built for my wheel was shaped like a short, fat coffin, which had a nice macabre quality. The wide spot in a classic old-style horror-movie coffin normally accommodates the shoulders. The wide spot in mine accommodated the big pulley. The taller section at the narrow end of my housing made it look like a coffin for a person who was mostly feet. I also bound all the corners and edges with strips of thin copper sheet, attached with plenty of small nails. It looked good.

Cut a hole in the top of the lower level of the plywood housing to accommodate the pilot shaft. Most transmissions of this type have an extended pilot shaft housing with a thick flange that attaches to the mounting face of the transmission. The hole you cut in the plywood might have to be large enough to fit the flange on the pilot shaft housing. That may be necessary in order for the transmission to mount flush against the top of the plywood housing.

Make sure that the hole you cut in the plywood is centered so that the large pulley, once mounted on the pilot shaft, will be centered inside the housing with at least an inch clearance from the side and end walls of the housing.

Once you cut the hole, mount the transmission with bolts and washers to secure it to the plywood. Mount the large pulley on the pilot shaft inside the housing.

The following will require some careful measuring, because you must ensure that the small pulley on the electric motor is at the same height as the big pulley on the pilot shaft. In order to maintain tension on the V-belt, you need a hinged mount for the electric motor. Purchase two door hinges or other similar sturdy hinges. Cut a piece of ¾" plywood about 10" square to serve as a motor mount. Drill appropriate holes in the plywood to fit the bolt pattern for the electric motor flange, but don't mount the motor yet. Attach the hinges right next to each other along one edge of the plywood motor mount and then attach the other half of the hinges vertically to the inside end wall at the tall end of the plywood housing. Again, measure very carefully to ensure that the pulley on the motor output shaft will be at the same height as the big pulley.

Once the hinged motor mount is securely attached, fasten the electric motor to the plywood mount with ¼" bolts. The sideways swinging movement of the motor on this mount will allow you to maintain tension on the V-belt. This is easily accomplished by installing two heavy duty cup hooks in the plywood end wall on either side of the motor mount about halfway along the height of the vertically-mounted motor. Once the V-belt is in place on the pulleys, attach an appropriate-length bungee cord to one cup hook, stretch it around the motor, and attach it to the other cup hook, pulling the motor away from the big pulley, creating adequate tension on

the V-belt. This might seem like a pretty funky solution, but it actually works very well. Needless to say, the bungee cord will have to be replaced occasionally as it loses its stretch.

Cut an appropriate opening in the plywood side at the desired location and install a single-gang surface mount box to accommodate a heavy-duty light switch. Cut the motor cord or wiring and feed the ends in through two ports on the box. Strip back the green and white wires and splice them back together with wire nuts. Connect the black wires to a heavy-duty light switch. Stuff the wires into the box, install the switch in the box, and install a proper cover plate.

To measure the V-belt length, swing the motor several inches out from the end wall, wrap a piece of 3/8"-diameter rope around both pulleys, mark the meeting point, and then measure with a tape measure. Take one of the pulleys with you to an auto parts store to make sure you get the right “pitch” (cross-section profile and width) of V-belt. Back home, try it out to see if the motor-mount adjustment will allow you to maintain tension on the V-belt. If necessary, take the belt back and get one slightly longer or shorter.

Rough-cut an oversize wheelhead from 3/4" exterior plywood and mount it on the transmission output shaft with flathead machine screws in countersunk holes. Start the wheel, put it in low gear, stabilize your arm, and mark the circle for the diameter of the finished wheelhead. Mine was 12”, but you might want 14”. Turn off the wheel, leave it in gear, and make the final cut with a saber saw. Start the wheel and sand and slightly bevel the outer edge of the wheelhead. Finish it with several coats of marine spar varnish.

Heat up the gearshift lever with an oxy-acetylene torch and bend it upwards at a convenient angle for changing gears. Shorten it if necessary.

If you want a splash pan, adapt a plastic oil-drain pan, or figure out a way to mount a proper Brent splash pan. The Brent pans are high quality and easily adaptable. There are plenty of extra mounting holes on any transmission, and with a little ingenuity, you can create brackets to support a small platform for the splash pan.

Paint the whole wheel assembly industrial gray or green. Or pink.

Don’t laugh. If you need a very heavy-duty pottery wheel for a bargain price (dependent on finding an appropriate transmission), this baby will make you smile. The transmission clunks and rattles quietly as the wheel comes up to speed when you shift into gear, but there is no strain at all on the teeth or bearings compared to the job it was intended for. It will last for centuries. It makes a reassuring soft rumbling sound when operating under any load. It will never let you down.

When I started Railroad Stoneware, my studio in Blue Lake, California in 1974, I initially stuck with the transmission wheel. But after a few years I wanted a variable-speed wheel. I really liked the Shimpo RK-1s I used at Humboldt State, so I purchased the steel drive cone and rubber drive rings from Shimpo and built a clone. I kept the transmission wheel, mounted a big old

grindstone on the wheelhead, and used it for smoothing the bottoms of fired stoneware pots. In 1985 we shut down Railroad Stoneware, and my wife, son, and I moved from Blue Lake to Amherst, Massachusetts, where Linda and I attended graduate school. Before leaving Blue Lake, I gave the transmission wheel to someone, but I do not remember who. I wish I knew if it still existed. It would make me very happy if someone was still using it.

Postscript

About fifteen years ago, we were discussing weird pottery wheels on the Clayart Internet forum, and I described my transmission wheel. At that time, Utah potter Joe Bennion (Horseshoe Mountain Pottery) was active on Clayart. After I described my wheel, Joe was amazed, because he had once worked on a wheel that sounded identical to my transmission wheel, right down to the coffin shape and the copper trim on the edges and corners. That just seemed impossible – I couldn't imagine that there would be another transmission wheel just like mine. Joe lived in Utah and I was in Northern California.

In 1971 I graduated from Humboldt State College and was hired by the City of Arcata, California as a mechanic. My wife Linda and I bought a funky little house in Westhaven, north of Arcata. I had no studio or workshop, we had a new baby, and I was working full-time, so I loaned the transmission wheel and some other equipment to my friend Mike Selfridge, a fine potter up in Crescent City, just south of the Oregon border. Mike installed my wheel as a spare in the studio he shared with Harley Munger, and they used it for trimming, and for use by guest potters.

Meanwhile, Joe Bennion was bored with his first year of college in Utah. He took a break from school and hitchhiked out to California, intending to get a job as a logger in the redwoods. He ended up in Crescent City, where no one was hiring loggers, especially a squeaky-clean Mormon kid from Utah with no logging experience. Unsure what to do, Joe wandered around Crescent City and happened upon two hippie potters working in a studio on a back street, and it was Mike and Harley. Joe already had quite a bit of pottery experience at the time, and asked Mike and Harley if they needed any help. So they took him on for a while, fed him, and provided a place for him to stay. He helped out, and they let him work on the spare wheel – my transmission wheel.

There's always something comforting about that kind of synchronicity, and it reminds us that studio ceramics is actually a pretty small world.

But wait, there's more. My wife Linda and I became fans of Click and Clack and Car Talk on NPR. One day in the early 2000s I was listening to the show, and some guy called in saying that he'd read an article in a ceramics magazine about building a pottery wheel from an automobile transmission. Of course, it was my Tool Times column in Clay Times magazine, all about the transmission wheel. The guy asked Click and Clack if you could really do that – build a pottery wheel with an automobile transmission serving as the gear-reduction unit. To tell the truth, I was a bit offended by that question. I mean, I loved those guys, but they're not potters. How would they know if it would work? I tried to call into the show, but it turned out to be a rebroadcast. I emailed them, but no response. Oh well.