

A Power Wagon

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My power wagon.

Almost entirely made with stuff from the dump & my junk pile. A 3-1/2hp lawnmower engine, a transaxle from a riding lawnmower, some bicycle parts, I forget what the rear wheels are from. I did buy a 20' piece of 1" square tubing for the frame.

There was no machining involved. The only fabrication processes were cutting, drilling, and welding. And a little casting.



This is the DR Powerwagon - it was my inspiration. In other words, it was the one that I copied because the actual DR was much too expensive. Actually, I would have made my own even if the DR was reasonably priced. Where's the fun in buying one?



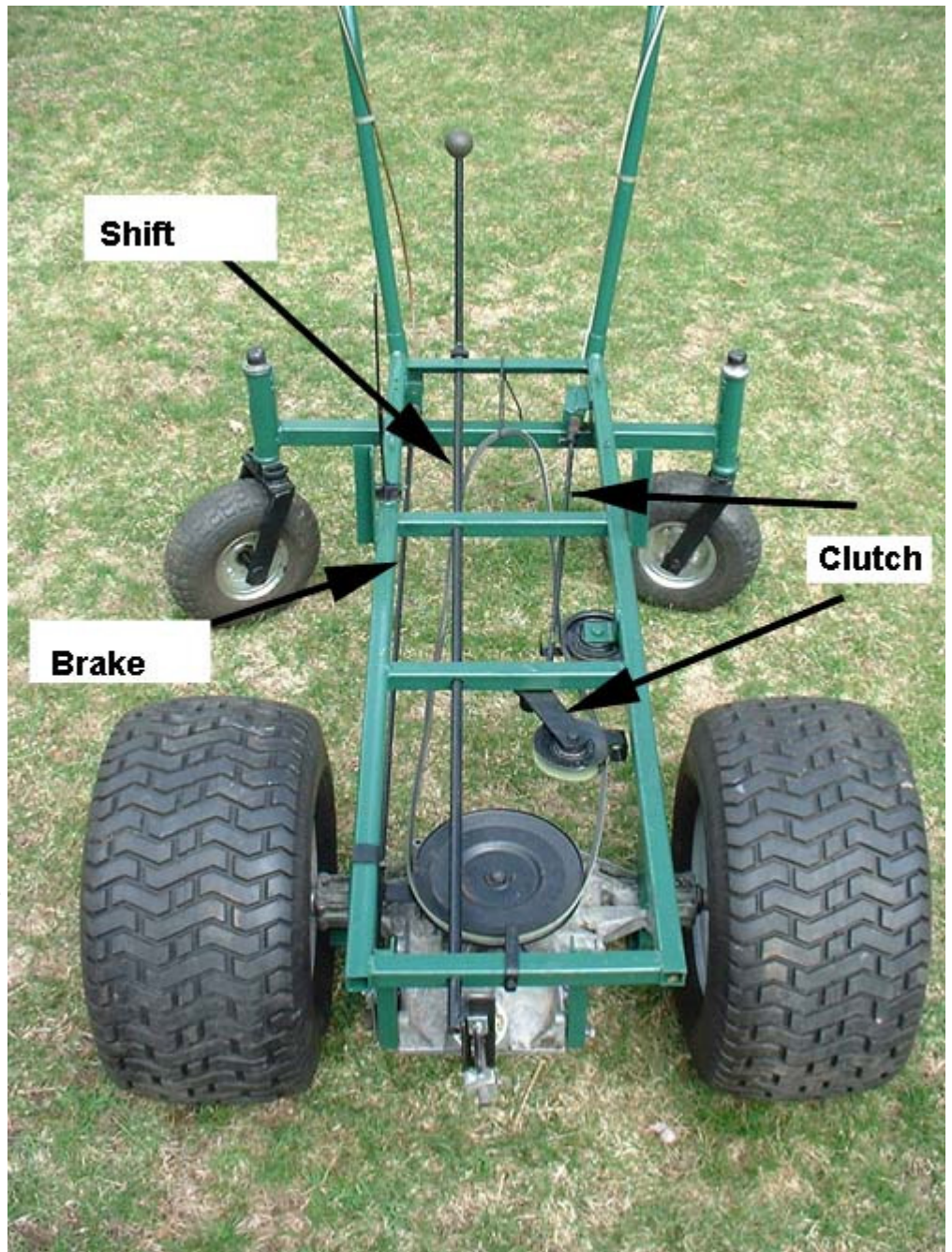
The frame without the bed and engine.



The controls. The clutch is a slack belt which is tightened by a pulley on a swing arm. The transaxle has a built in disk brake that just has to be pulled on. The clutch & brake are actuated by rods which are actuated by the cables from the hand levers. If bicycles had longer cables on their hand levers I wouldn't have had to use the rods.

Designing the clutch was a balancing act: disengaged it has to be loose enough to slip without creeping & engaged it has to be tight enough to not slip under the biggest load. And, the hand lever only a limited amount of throw. There is some adjustment where the cable is attached to the lever & where the cable is attached to the rod.

The shifter is a story in itself, to be told shortly.



With the bed and engine. The bed supports are actually fastened to the transaxle with a pivot point below the axle. That was necessary to clear the tires when the bed is dumped. It also means that the frame doesn't carry much of the load - the load sits directly on the axle.

The engine is a 3-1/2hp lawnmower engine. Without the blade as a flywheel, it sometimes snaps back when pull starting it. I suppose that I could add a flywheel easily enough. There is a hinged cover over the engine to keep debris off it.



The bed dumped. Note that the supports are very near the center of the bed, making the load balanced and easy to dump.



The bed sides in place. They are fastened to stakes which fit in sockets on the bed frame. This allows the wagon to be used without the sides, or different sides to be used. See the pix of its use as a hay wagon & leaf vac.



The rear wheel mounts were made from bicycle fork bearing assemblies. The wagon originally had 3 wheels, like the DR. It was unstable like that & I went to 4 wheels, with the rear wheel track as wide as the front wheels.



The hand levers have latches on them. The clutch can be latched for long hauls when holding it would be tedious and/or tiring. Latching the brake makes it a parking brake (very secure). The latches engage automatically: squeezing the lever pushes the latch back & gravity swings it forward under the lever. It is disengaged by squeezing to remove tension & with the little finger pushing it back.

The handles on the wagon are larger diameter than bike handlebars & the hand levers didn't fit. So I cast new mounts for them.

The throttle lever is a bike gear shift lever.



The bed latch was problematic. There is a catch on the bed & one on the lever. The lever is spring loaded forward. To release, pull back. Lowering the bed back down pushes the lever back & it re-catches. That actually worked well. What didn't work was staying latched while bouncing along. Flex between the frame & bed, as well as the inertia of the lever led to false dumps. VERY irritating! So, the loop was added to capture the lever. This worked pretty well. But even with the loop it released 3 times with a single load of firewood and something else was needed.



The bed lock. Very secure! The funny angle is due to the low pivot point of the bed. The capture piece on the bed is actually radial to the pivot point.



The gear shift mechanism. This was the toughest challenge. The transaxle has 3 speeds forward & 1 reverse, in an H-on-its-side pattern. 1st & 2nd are right & left on the bottom with 3rd & reverse on the top. The problem comes from the fact that on the riding lawnmower, the transaxle is behind the rider, with the shift lever between his legs. On the wagon, the transaxle is in the front, with its shift lever forward & the operator at the rear.

The shift rod slides back & forth and rotates a little. The sliding back & forth moves the transaxle lever up & down. Rotating right or left moves the lever right or left. The ball joints and link were necessary to accomodate compound movement. E.g., up and to the right. There was quite a bit of bench experimenting to get it just right. The ball joints were made by annealing, drilling, & tapping bearing balls. The rod is really a piece of 1/4" schedule 40 pipe. It turned out to be too flexible, with its twisting giving a mushy feel to shifting.



To size the motor pulley, I used the transaxle 3rd (high) gear ratio, the tire size, the maximum motor speed, and the maximum ground speed desired (5 mph, IIRC). In use, 2nd gear is the most practical. 1st is really slow & just used for maneuvering & 3rd is too fast for most moves.

As a hay wagon. The sides were removed and poles stuck in the sockets. This use was my primary motivation for building the wagon. Our lot is hilly and I grow hay for mulch in the lower part. Getting that hay up to the garden was a pain (I dragged it on a tarp!). The power wagon makes that a pleasure.



With a leaf vac & box mounted. Sweet! The vac does some grinding of the leaves and they compost faster. The front of the box is a door for dumping the leaves. It holds a lot of leaves. Replaces a tarp that I used to haul leaves in (many, many, many trips!).



When the tree is down the hill & I need to bring the firewood up to the house, the wagon is really handy.

Also handy for hauling mulch that's been delivered in a pile in the driveway, around to the gardens in back.

The biggest load so far has been about 500lbs of bricks. No problem. The 3-1/2hp engine was quite enough. Power has never been a problem, even on hills. The problem has been traction. DR offers weights that bolt on the frame under the bed. I tried that - I made 250lbs of lead ingots & bolted them on. Any improvement was not significant. The solution to traction on a hill is to go up backwards! The load has a high center of gravity and going up backwards puts it right over the wheels. BTW - I just sold those lead weights as scrap for \$.50 a lb!



The power wagon was the only project that I designed on paper. Usually it's just a matter of "That looks about right", as I go along. But getting the geometry right to dump the bed, and being sure of clearances for the belt & control rods called for a paper design. There would have been just too much rework trying to get it right as I went along.

