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MBc Newbie

Full build details on my home-made friction drive

I would like to thank all of the members here because without this forum, my build would have been much more difficult.

I have just completed my build of a rack mount friction drive system. Everything except for the engine, bearings, hardware, and drive roller have been fabricated by myself in my machine shop at work. If I did not have access to these pieces of equipment (mill/lathe/buffer/sander/band saw) it would have been very difficult and very sloppy. All of my parts are machined to within .001" so vibration due to bad fitting components is non-existent. I made everything out of scrap material so it was free.


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Bike

First, I started with a bicycle. This bicycle started its life as a Huffy girl's cruiser. I modified the frame a long time ago so that it would look like an old straight bar cruiser. Basically, I cut off the top tube, welded it in a higher location, and welded a straight bar under that. I also added a smoother tire in the rear for better contact with the drive roller.

Which drive system to choose?

Initially, the plan was to put a HT motor in the frame. I bought a used Kings Motor Bikes kit from a friend. It actually worked out really well because the motor fit really tight in the frame and the tank fit between the top tube and the straight bar. It looked as though the motor belonged in the frame. I soon gave up on this idea because of the lack of time and the inability to get the sprocket centered.

I then decided to go to a friction drive system because of its simplicity and price. I looked into buying a Staton drive system but after looking at the kit, I decided that I could make something really similar for a lot cheaper. I studied various friction drive systems and watched some you tube videos on how to assemble a friction drive kit. Needless to say, I did a lot of research for this project.

Engine

I wanted to get good power at a reasonable price. I decided to go with a used string trimmer motor because of the relatively small package, power, and availability. I went on the hunt for string trimmers on craigslist. I found a 31cc Ryobi 720r for $20 that had the usual problems. It would not start because it was sitting for so long. The primer bulb was cracked so fuel leaked everywhere when you did try to start it. I got lucky on this one because I did not even ask the original owner if the trimmer had a clutch. Fortunately for me it did. To get it running all I did was disassemble and thoroughly clean every part of the engine including a rebuild of the carburetor and new fuel lines.

(Tip: Make sure you keep track of where the fuel lines go. I had to switch them up a bunch of times because I forgot. In a nutshell, the line from the filter in the tank goes to the bottom of the carb. The fitting on the top of the carb goes to the inlet of the bulb. The outlet of the bulb goes to the return hole in the tank. Just keep in mind that the bulb sucks fuel out of the carb instead of pushing fuel through it.)

All in all, I have approximately $40 in the engine including replacement parts.


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31cc
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Drive System

I decided that I wanted to keep the centrifugal clutch on the engine because I wanted the ability to idle. I decided to make a Staton-like design with a drive roller connected to the clutch drum supported by two bearings on either end. First, I had to get the clutch drum off.

(Tip: I removed the clutch drum by taking out the spark plug, filling the cylinder (at bottom of stroke) with cotton rope, then turning the screw (ccw) which is hiding inside the square shaft of the clutch drum.)

Most of the screws on my Ryobi motor are T20 which includes the screw inside the clutch drum. After looking at the clutch drum for a while, I had to make a decision as to how I was going to connect the clutch drum to the drive shaft. As many of you may know, the Ryobi clutch drum has a square shaft coming out of the end which was used to hook it up to the cable for the cutting head.

I decided to cut the square end off past the fillet to give me a round shaft on the end of the clutch drum. I saw that there was a bronze bushing on the inside of the clutch drum that had an inner diameter of approximately 5/16". What I did then was drill and tap the round shaft for a 3/8-24 thread on the lathe so that everything was concentric. This would allow me to attach it to a drive shaft with the same thread. I soon found out that the bushing was not actually attached to the clutch drum so I used set screws to anchor the bushing to the clutch drum. See picture below.

The modified clutch drum will not fit over the original clutch rotor with the roller drive shaft in place because there is an extension of the engine drive shaft where the clutch drum used to screw onto. I had to cut off this extension on the engine drive shaft so that the clutch drum would fit nicely over the clutch rotor.

Next I made the drive shaft. I decided to go with a ½” OD drive shaft with a 3/8-24 end which is a total of 6” long. I made it out of scrap drill rod that I found in my machine shop at work. I turned the drive shaft on the lathe so that all of the dimensions were exact. This is somewhere that you don’t want any eccentricities to cause excess vibrations.

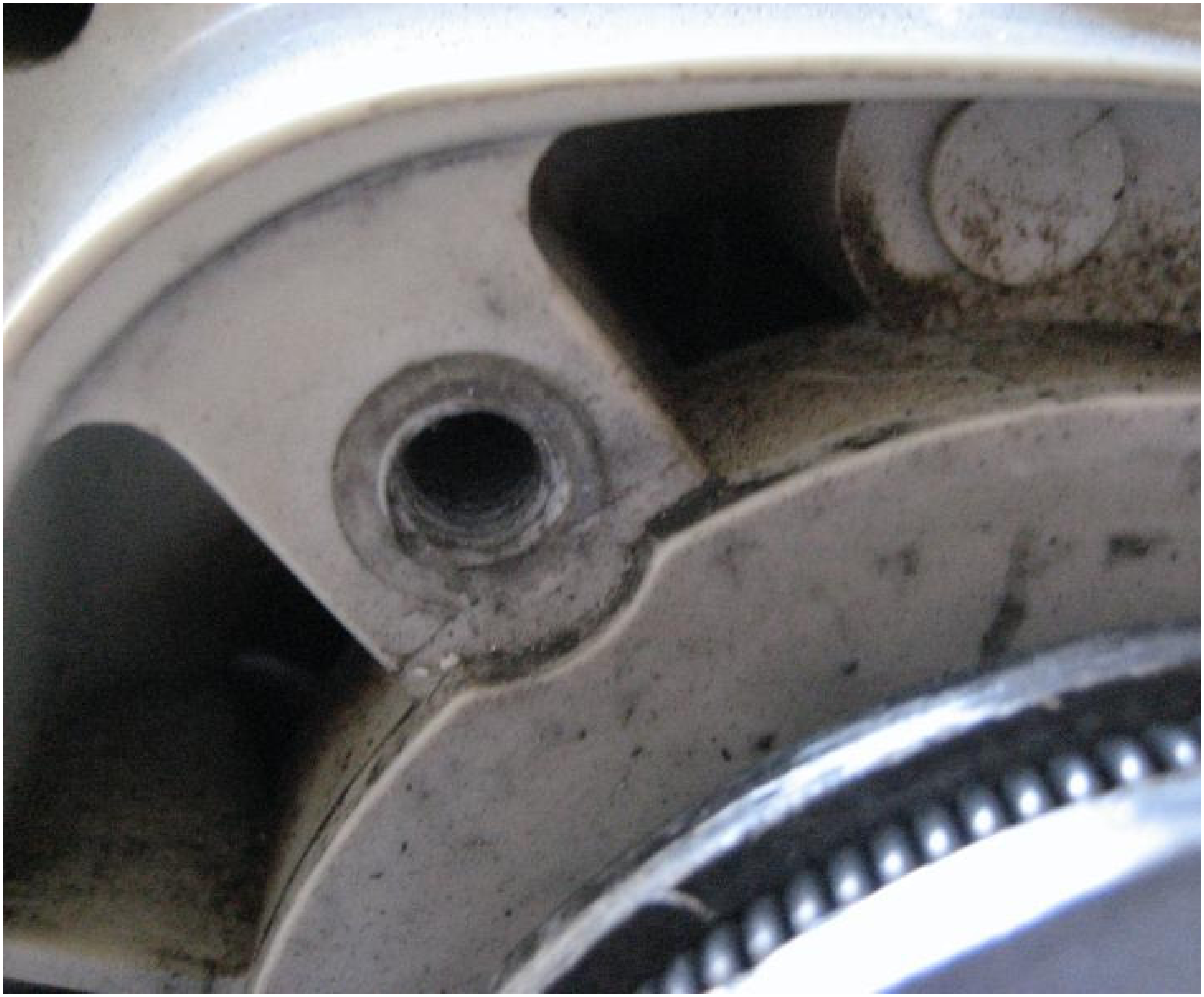
Next, I bought some components for the drive system including some bearings from motorbikeparts.com and a couple of drive rollers from industrialliquidators.com. The bearings measured ½” ID x 1 3/8” OD. The drive roller is approximately 1 ¼” OD with ½” ID and a one way clutch bearing on the inside. The clutch bearing allows me to freewheel at high speeds. If you are to let off of the throttle at high speeds, the wheel will be turning so fast that the clutch rotor will not have the opportunity to back off of the clutch drum. This will cause the engine braking and also lack of lubrication in the engine if continued for a long period of time. With the clutch bearing inside the drive roller, the wheel will be able to overrun the engine at any speed therefore eliminating engine braking.

I also made a couple of shaft collars to center the drive roller on the drive shaft.

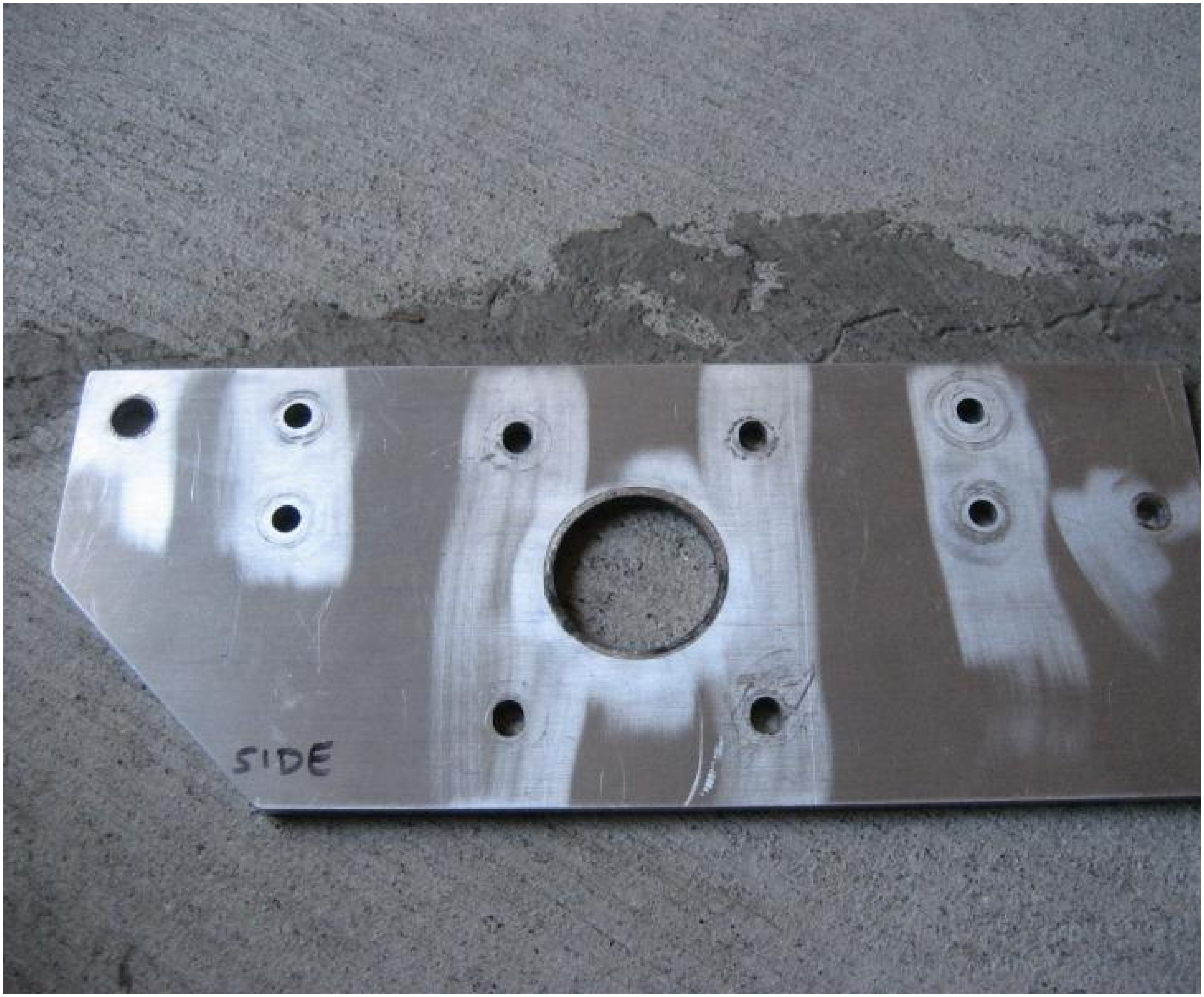
Engine Mount

Now for the heart of the setup: the engine channel. Taking the Staton unit as an example, I wanted to use a U-Channel to mount everything on. Since I do not have aluminum extruded u-channel lying around at work, I had to improvise. What I came up with was a 4 piece design that is very similar to a u-channel. There are two side plates and two inner supports. The side plates were made from .200” aluminum plate and the inner supports were made from 1/2” aluminum plate.

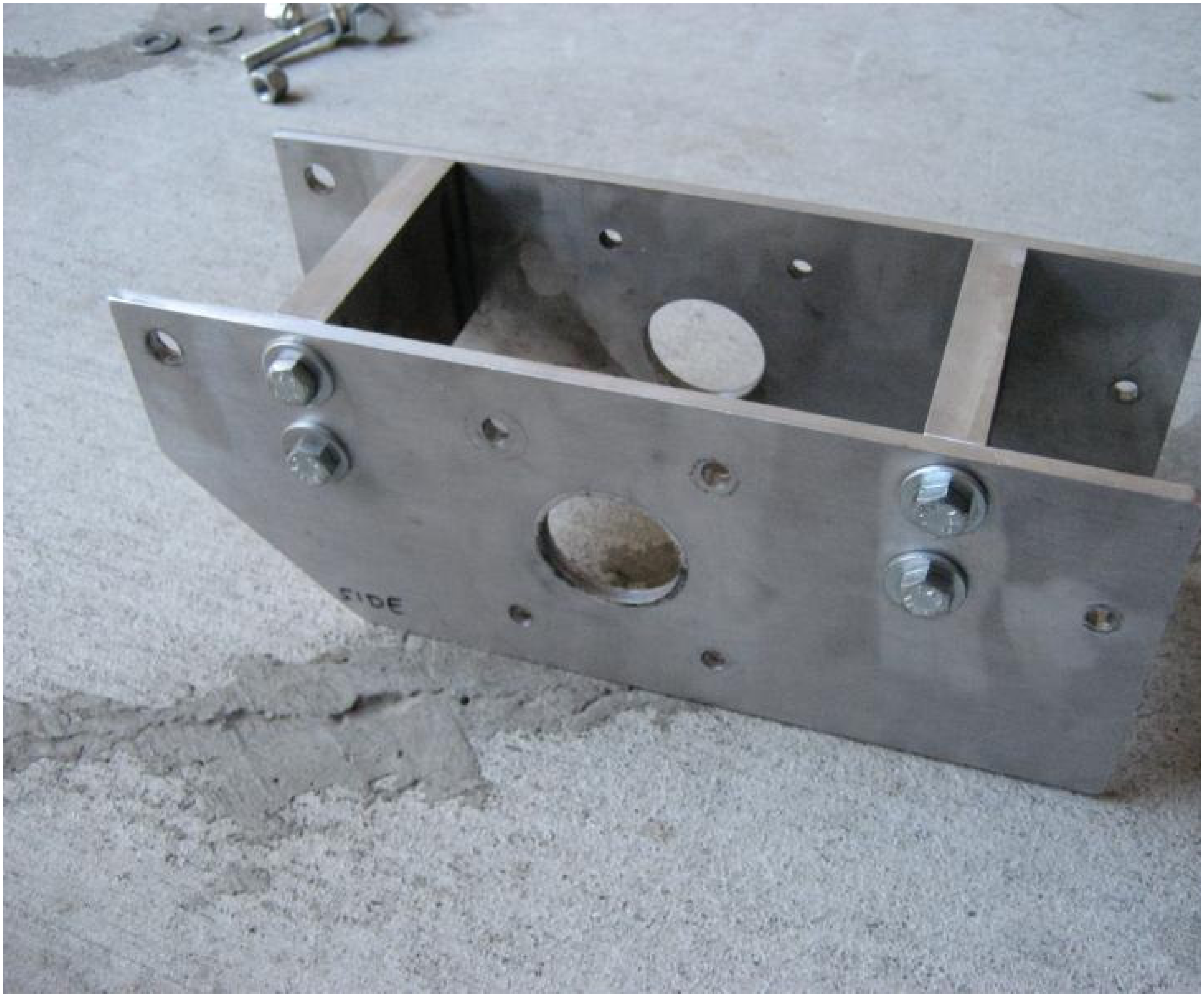
First thing I had to do was measure the mounting holes on the plastic engine housing where the old shaft for the cutting head used to attach. I noticed that the holes were pretty small so I drilled and tapped them to ¼ - 20.



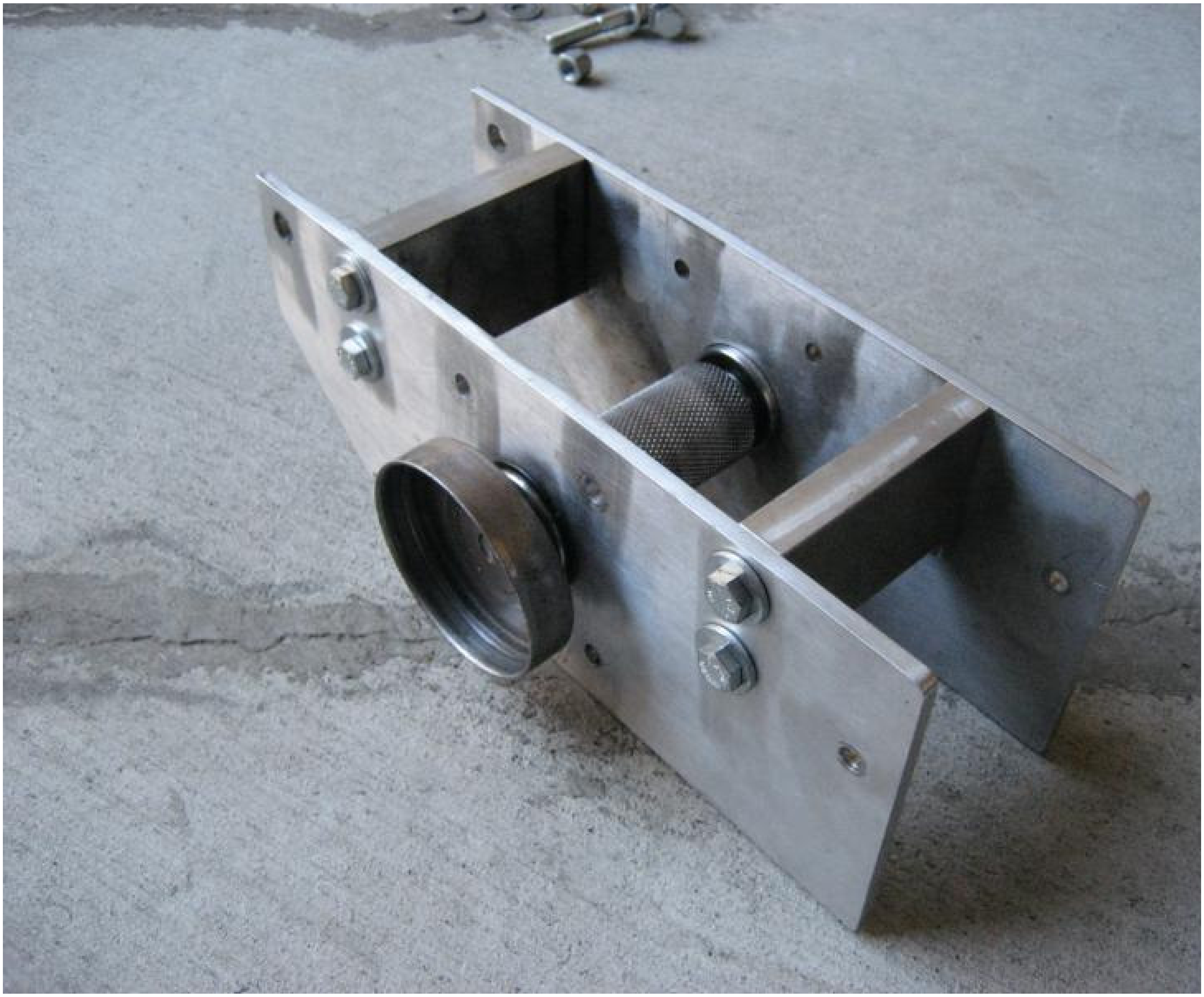
The same mounting hole pattern as the plastic engine housing was transferred to the side plate for the engine channel. I centered the engine mounting holes around a hole for the bearing. There are 4 holes for bolting the side panels to the inner supports. There is a hole for a front pivot and a hole for the quick release. The picture below shows the engine side plate.

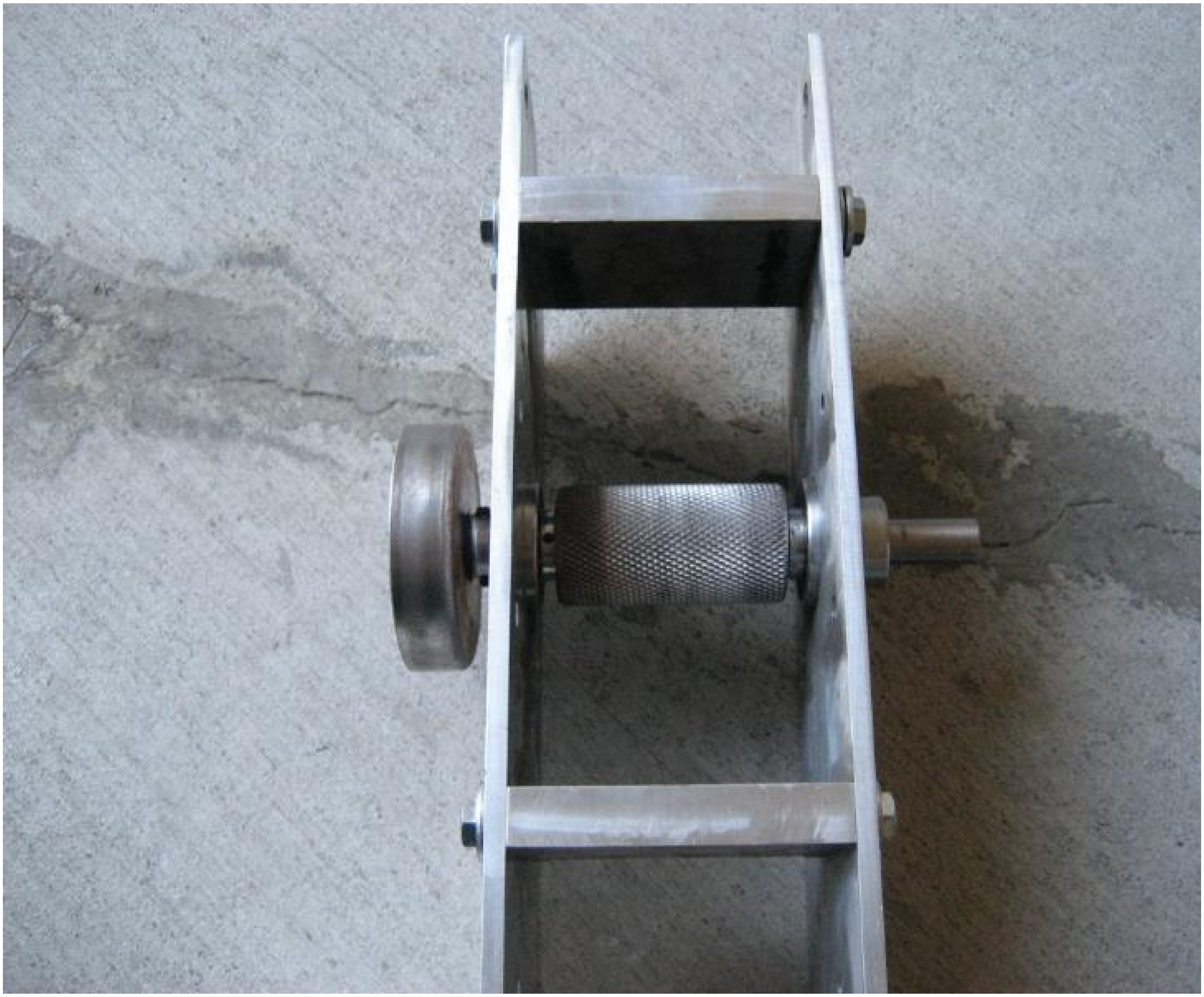


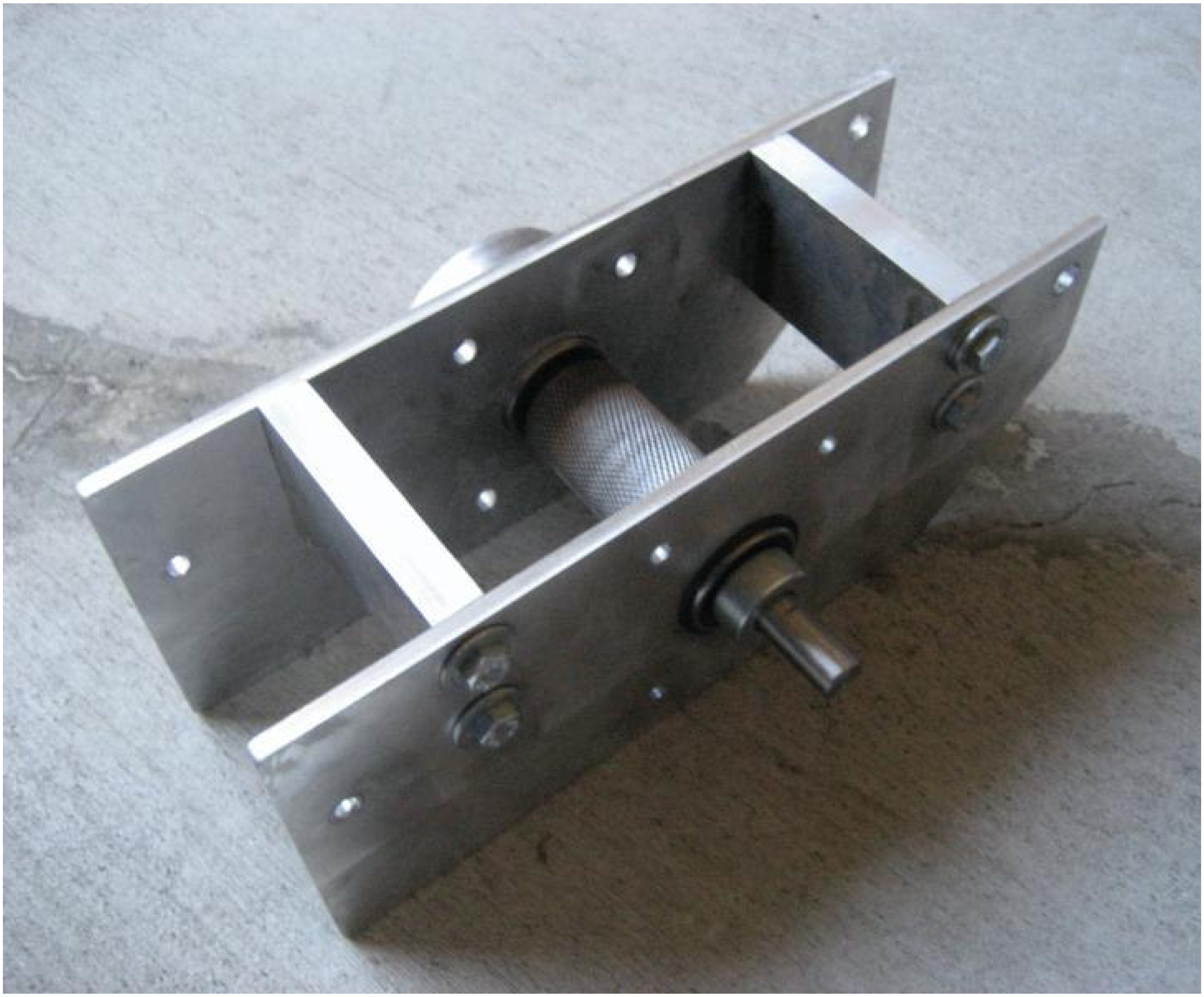
After cutting everything out on the mill, I put the engine channel together using some ¼” bolts. Notice that I made the engine channel a bit narrower than the Staton engine channel. The Staton channel is 4” wide and mine is 3.5” wide. I made it narrower so that the engine would not come out as far. By moving it in ¼”, it would decrease the torsional force that is produced by having load on one side.



I then assembled the engine channel with the drive system.





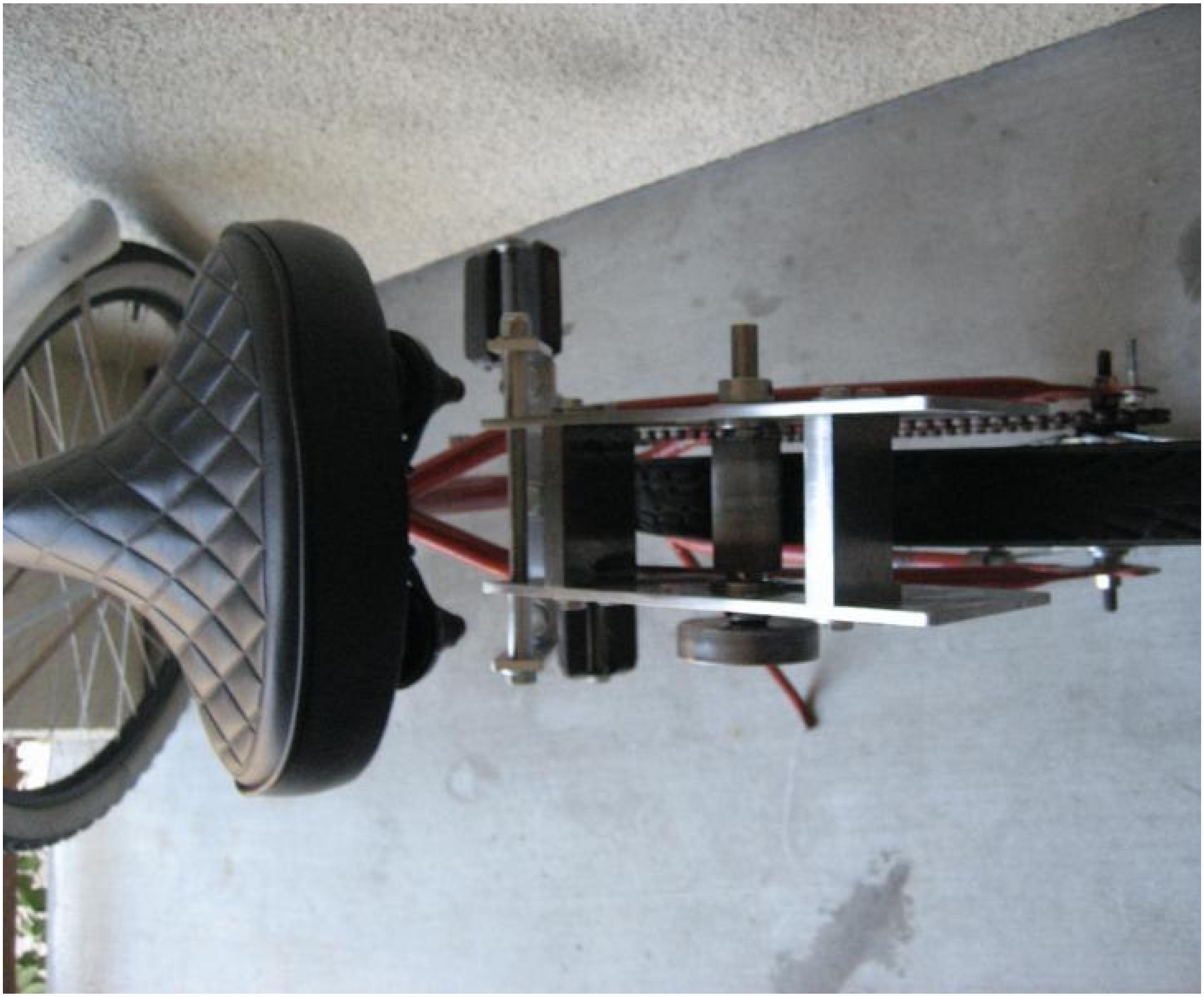


Front Support Bracket

Next, I made the front support bracket. The front support bracket is what allows the engine to pivot away when not in use. It consists of two pieces which sandwich the seat stays. It is secured using three 3/8" bolts, the center of which goes through the hole used for the rear brake. I started with some 1" x 1" x ¼" thick aluminum angle iron. I cut off one side to make it into 1" by ¼" aluminum bar. I cut them to length, drilled some 3/8" holes and bent two 90º angles to make it into a C-shape.

(Tip: I heated the area to be bent with a heat gun for a few minutes before I started whacking it with a mallet. This will allow it to be bent more easily and prevent it from fracturing.)


SIDE



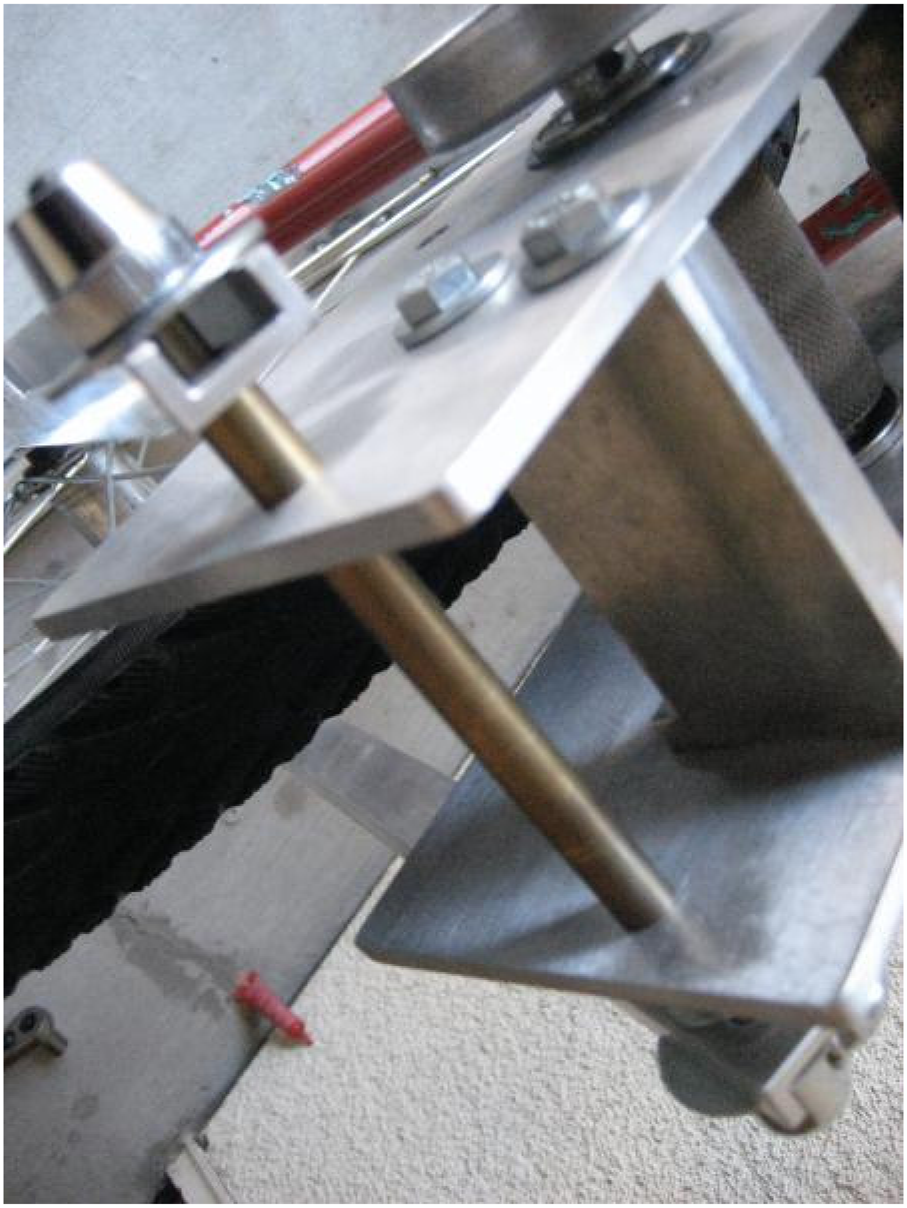
The picture above shows the front support bracket mounted to the bicycle. Notice the low profile of the bracket. The Staton front support bracket makes the engine channel sit up a bit taller than mine. The shorter front support bracket makes it more stable and less susceptible to bending.

Rear Supports

Next I made some rear supports for the mounting system. They are made from ¾" aluminum c-channel. They are 16" long with a ¼" hole in the bottom for mounting to the frame and a 3" long slot cut into the top for the quick release skewer. Notice that I had to cut a relief into the rear support bars where the slot is located. The reason for this relief is because the quick release skewer that I bought was not long enough.

Spacers

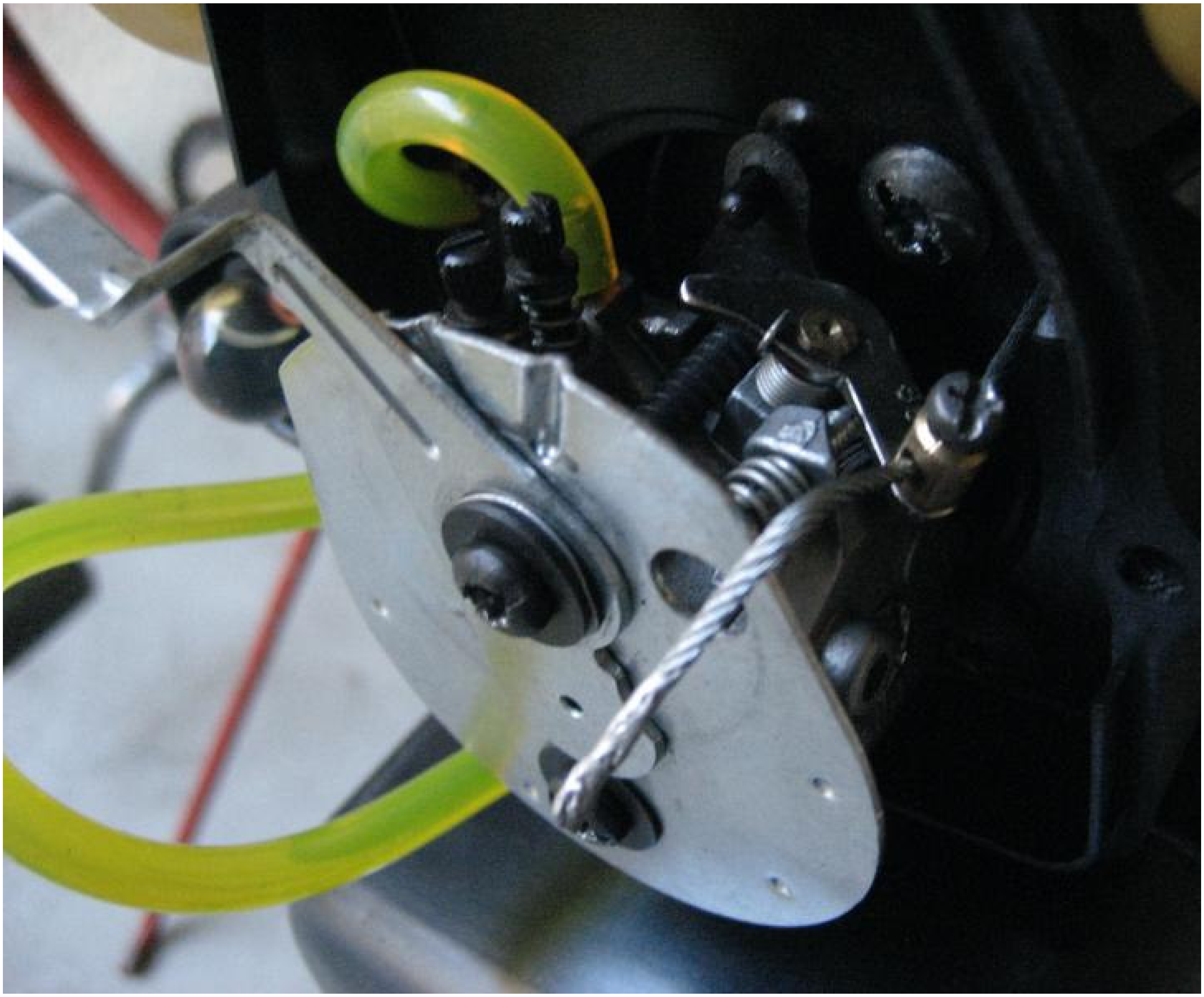
There were many spacers that went into this project. The reasons for the spacers were to make up for the gaps between all of the mounting positions and to center the engine channel over the tire. I had to make some engine spacers to get the engine away from the engine channel to clear the clutch drum. There was a gap between the engine channel and the front support bracket. I made two spacers 3/8" ID spacers to fill this gap. There was also a gap between the rear support brackets and the engine channel which were filled with two ¼" ID spacers. Finally, I had to make a spacer for in-between the engine channel where the quick release is located to prevent crushing of the engine channel.



Miscellaneous

I had to buy some other things to complete this project. I bought a quick release hub skewer from a bike shop. I bought my throttle lever and handle from motorbikeparts.com. I bought a bunch of hardware from OSH.

(Tip: The throttle cable that I got was pretty thick. The cable would not fit into the throttle lever on my carburetor. What I did was drill out the hole on the throttle lever of the carb. I cut the throttle cable to length and then soldered the end of the cable to keep the end from fraying. Now it is easy to come in and out.)



Conclusion

Overall, I am very pleased with my finished product. The mounting brackets that I made are very robust and seem as though they will last for a very long time. I took it for a test drive and it works very well. There are no excess vibrations. The motor kicks on after a few pedals and has good torque. The bike tops out at approx 30 mph. In total, I have approximately $100 invested in this project.

In the future, I plan on upgrading the clutch drum and rotor to a 78mm because I don't think the string trimmer parts are going to last very long. I found some parts on the Staton website that would work perfectly with my setup. The clutch drum and rotor both have threaded ends for 3/8-24 which will match up with my engine drive shaft and my roller drive shaft. With new clutch drum and rotor, I will probably have to make new engine spacers. If the engine ever gives out I will try to fix it but won't spend more than $20 to do it. If the cost of fixing it exceeds the $20 limit, I am just going to upgrade to a Mitsubishi TLE33 from vizamotors.com. I will drill new holes in the engine channel to accommodate the new engine. I also plan on adding a chain guard and a rear fender. I am going to be posting a you tube video as soon as it gets processed.

Again, I would like to thank everyone on this forum. This project could not have been completed without the very useful information on this site. I figured that I took so much info from here that I had to give something back.

It's great to be motorized…

johnnyboy805

here is one of the youtube videos: http://www.youtube.com/watch?v=0uGJre2TWVU