MAGNETS

Low RPM alternator tests with surplus hard drive magnets 9-13-99

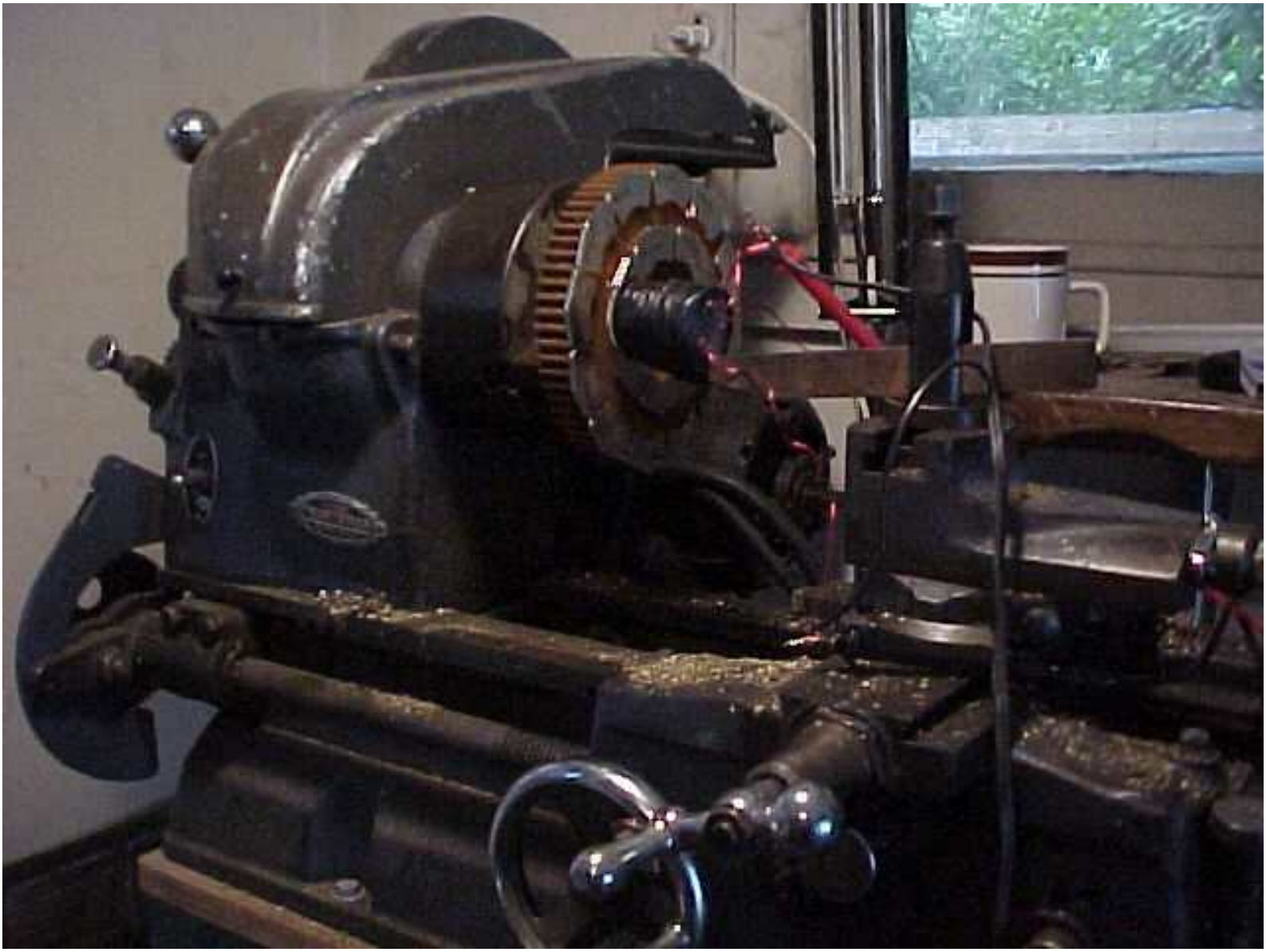
In the effort to build my own low RPM alternator for small wind/water power applications, these are some of the tests I've performed and their results. First step is the magnets. I used surplus hard drive magnets which I salvaged from scrap computer hard drives. These magnets 1.4" long, .80" high, and .090" thick. They are nickel plated Neodymium Iron Boron magnets of impressive strength. I sell surplus magnets on my web site. In this test used some of my smaller ones, due to their seemingly unlimited supply.

Item #2 on my magnet web site

Next wound a coil from 23 gauge magnet wire. The coil is slightly under 2" long, and consists of 700 windings, with taps at 100, 200, 400, and 700 windings. The core for the coil is made from 20 2" long segments of enameled coat hanger wire, super glued together. This should reduce inefficiencies due to eddy currents through the core. I believe annealing the wire segments would probably improve performance, but I

skipped that step here. The spool on which the wire is wound are made from paper, poster board, and super glue. There are certainly better materials to use here, although paper and cardboard worked just fine. The alternator Im currently building will have spools made of phenolic sheet.

Next I took a gear, 5.5" diameter and placed two rings of surplus computer hard drive magnets on it. Each magnet has 2 poles on each face. 7 of these ones fit tightly together in a ring, having 14 poles. I placed two rings of magnets on the face of the gear, one ring containing 7 magnets(which fit together nicely), and the other ring containing 12 magnets(which don't fit as well). The inner ring of 7 magnets is a little over 3.5" diameter. The outer ring is a little over 5.5" diameter. I then placed the gear in a small metal lathe on which I performed tests at 3 different speeds.. I tapped the coil to a boring bar, so that I could adjust its position in relation to the two rings of magnets.



Next step was to turn it on, and test the different taps on the coil, at 3 different speeds. I used a 12 Volt, 5 watt light bulb as a load, and tested the voltage of each tap on the coil, at each speed, with, and without the load. The tests were done at 200, 400, and 600 RPM.

INNER RING(7 MAGNETS-14 POLES)
200 Windings

	200rpm	400rpm	600rpm
Light off	2.3 Volts	3.4 Volts	5.5 Volts
Light on	2.1 Volts	3.2 Volts	4.8 Volts

INNER RING, 400 Windings

	200rpm	400rpm	600rpm
Light off	4.4 Volts	7.3 Volts	11.3 Volts
Light on	3.8 Volts	6.1 Volts	9.1 Volts

INNER RING, 700 Windings

	200rpm	400rpm	600rpm
Light off	6.5 Volts	11.1 Volts	18.6 Volts
Light on	4.3 Volts	7.0 Volts	10.5 Volts

OUTER RING(12 magnets, 24 poles)
200 Windings

	200rpm	400rpm	600rpm
light off	3.2 Volts	5.5 Volts	9.5Volts
light on	3.1 Volts	5.1 Volts	9.1 Volts

OUTER RING, 400 Windings

	200rpm	400rpm	600rpm
light off	7.8 Volts	11.8 Volts	18.6 Volts
light on	6.5 Volts	9.9 Volts	14.6 Volts

OUTER RING, 700 Windings

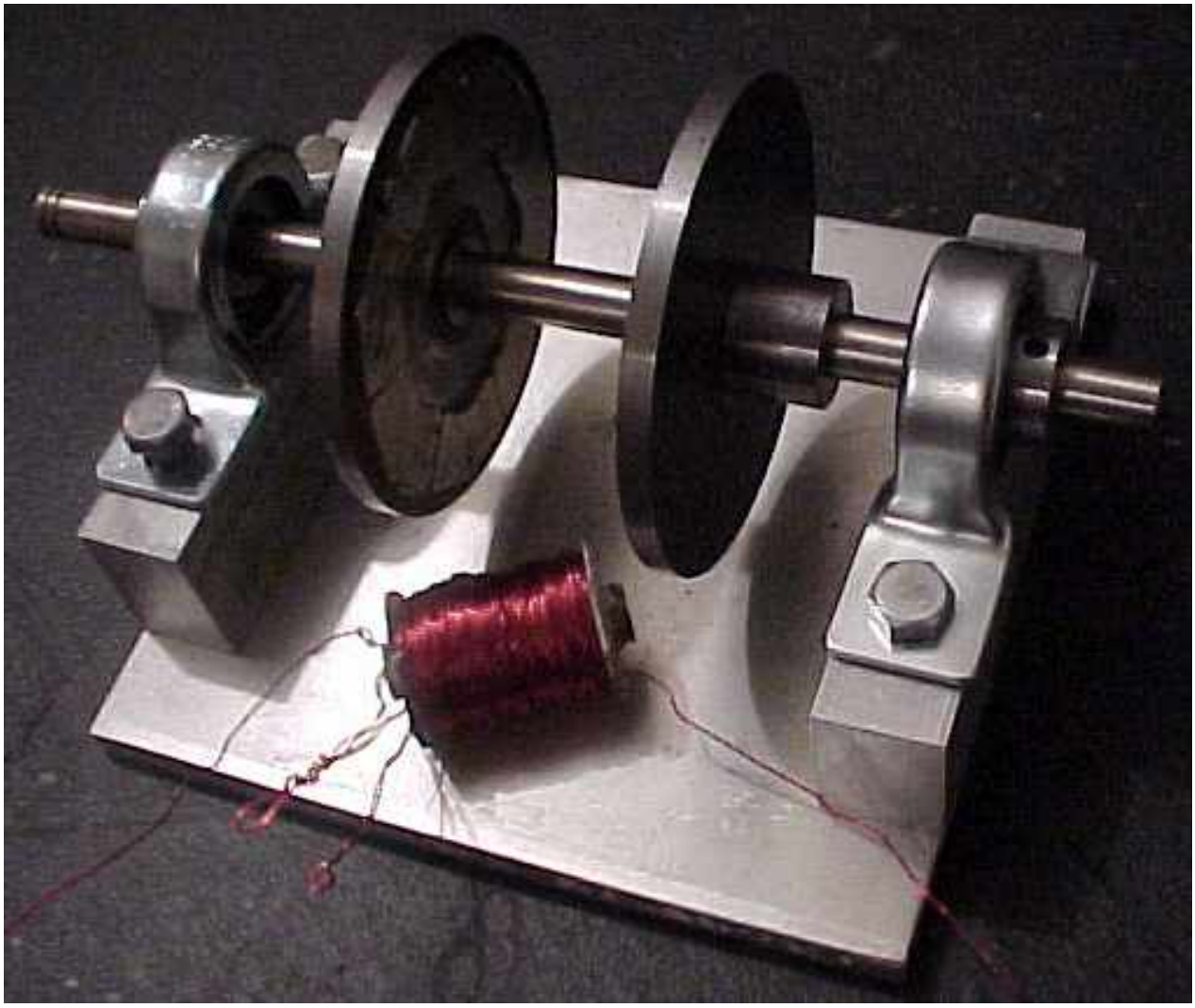
	200rpm	400rpm	600rpm
light off	13.9 Volts	19.2 Volts	30.9 Volts
light on	9.3 Volts	10.8Volts	14.6 Volts

Considering this data, Its my guess that 400 windings is closest to ideal for charging 12 volt batteries. It surprised me, that in every test performed, the lightbulb did light-

though it was rather dim on some. 1 problem with the test, is that the coil was tapped to a boring bar, attached to the compound rest of a rather cheap, old, and worn out lathe. As the machine ran, the coil would creep towards the magnets. Although I tried to keep the gap between magnets and coil consistent, I know this varied some throughout the testing. A slight change in gap has a causes a significant change in voltage. In another test, at 600 RPM with the light on and 700 windings used, output was at 18 volts. It was interesting, to be able to move the coil front/back, and side to side while observing the output voltage.

IMPROVEMENTS?

There must be many improvements. I have no doubt a better iron core could be used. The length of the coil, I chose 2" off the top of my head, I doubt its perfect, but I'm using that because I am building an alternator that will employ two discs, each with a ring of magnets, on opposite sides of the coil. 2" seemed like a good distance. 23 guage wire was convenient, and seemed like a good starting point, though I have a feeling that fewer coils of thicker wire might work better. Stacking magnets? I didn't double up the magnets for fear of the lathe launching them like bullets off the gear. I'm sure that this would have a good effect though-but-it would add to the cost of an alternator. More coils-the coil is exactly big enough such that 7 of them could fit nicely in an alternator using the small ring of 7 magnets. At this point, seems to me like an alternator built with 7 coils hooked either in series or parrallel-(or a combination) would perform reasonably well at low rpm. I have no idea yet what the effect of adding a second spinning ring of magnets to the back side of the coil will be, but I'm sure it will be significant. Although already somewhat obsolete, (because of the base/bearing arrangement) you can see my current alternator project in the picture below. I intend to finish this one, and test the output. The next one will have a much improved bearing arrangement, larger discs, and more coils.



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SOME INTERESTING LINKS!

Surplus agnets for sale on my Forcefield website
Homebrew Electricity this is a site currently under construction about homebuilt, dirt simple-or antique power systems that may, or may not work!
Matt's magnetic levitation page shows a quick simple way to demonstrate magnetic levitation with a spinning aluminium disc.
Pico-Turbine - a great site offering books, plans-and valuable information on home-built alternators.
Home made lightplants and generators - another interesting site about homebuilt

alternators.

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