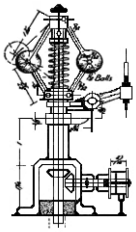

The NEMES Gazette

New England Model Engineering Society Inc.

No. 211 November 2013

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President's Corner

Victor Kozakevich

Our speaker this month will be Larry Corners. He will be talking to us about the old outboard collecting hobby. He will bring several small outboards to display and discuss. Larry will explain why each engine is of interest to him and to the collectors and he will give some history about the company that manufactured each. Larry will also discuss the Antique Outboard Motor Club and speak about their meets. As in most cases he will end the talk with a question and answer and discussion period.

A week or so ago, I was helping a friend's 20-something son with a car problem. In passing he showed me a recent acquisition, a mid '80s Italian moped someone had given him. He mentioned that it had no spark, so I did some web research for him.

I found a wealth of info at mopedarmy.com. The site owner also offered some moped history. With the oil embargo of 1974, dealers and manufacturers pressed the US government to alter the rules, and create a new import class called "motorized bicycle". Thousands were shipped from Europe between 1974 and 1985. The fad was pretty much over by 1985, due to safety concerns and falling gas prices.

With gas prices rising again, along with a decreasing enthusiasm in the younger generation for cars, there is growing interest in these antique 50cc two strokes. People are restoring and customizing the bikes.

While researching the ignition, I discovered that mopeds are made in the simplest way possible, but not always conventionally. US bikes needed to have a tail light, so one got added by putting it in series to ground with the

Next Meeting

Thursday, Nov 7st, 2013

Charles River Museum of Industry
154 Moody Street
Waltham, Massachusetts

Membership Info

New members welcome! Annual dues are $25 (mail applications and/or dues checks, made payable to "NEMES", to our Treasurer David Baker) Annual dues are for the calendar year and are due by December 31st of the prior year (or with application).

Missing a Gazette? Send a US mail or email to our publisher. Contact addresses are in the left column.

Issue	Contributions Due
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generator coil that powers the ignition. The bulb is turned off by shorting across it with the brake switch. The weird part is that if the bulb burns out, applying the brakes kills the engine

Mopeds have no shifter and a centrifugal clutch like a chainsaw. So, when starting one, you put it up on the stand, squeeze a handlebar lever to temporarily engage the clutch and kick a pedal down.

If you know anyone who collects mopeds or Italian scooters, it could make for an interesting talk.

Shop Tips

Bob Neidorff

All old machines and some new machines have mechanical power switches. Large industrial machines and many newer home machines come with a magnetic switch. This is also called a magnetic starter, electromagnetic switch, a contactor or a relay, but to the user, the magnetic switch has start and stop buttons while the mechanical switch has a toggle switch.

In the event of a power interruption, magnetic switches are safer than mechanical switches. A machine with a magnetic switch will turn off when power drops and remain off when power comes back on. The operator may get disoriented when power drops, because the room will be dark, and they may put their hand or other object in a dangerous location without knowing it. For example, a saw operator may be in the middle of cutting a part when power fails, so their instinct is to hold on to the part or withdraw the part from the machine. That motion may put their hand close to the saw blade, so if power comes back on and the saw could restart, the operator could get hurt. Tools with magnetic switches greatly reduce the risk of an accident when power comes back on. Because of this, magnetic switches are highly recommended for all power tools.

With that as background, let me tell you of a related safety problem where magnetic switches didn't prevent an accident. My surface grinder has an electromagnetic chuck. In other words, the work is held in place by a large electromagnet. I was grinding a surface with this tool and overloaded the grinder and in doing so tripped the circuit breaker in the grinder control box. The grinder motor lost power and slowed down. At the same time, the electromagnetic chuck lost power and the work was instantly free. Even though the grinder was slowing down at the time, the wheel still was spinning and had enough speed and energy to throw my work across the shop! Fortunately, no one was hurt and the part didn't get dinged up too badly, but it could have been much worse.

This experience taught me a few things:

1) When possible, avoid electromagnetic work-holding devices.
2) When you need to use an electromagnetic chuck, provide dependable power to the chuck independent of the grinder power source, so even if the grinder loses power, the chuck will still stay powered.
3) Never stand downstream of any power tool.

Bio Mechanics

Max ben-Aaron

There are many forms of animal locomotion. There are animals that walk, run, hop, glide, flap, flutter, float, and hop. Many swim, some slide, skate, paddle or oscillate. Occasionally, they may tumble head over heels or curl up into balls. The Namibian Golden Spider escapes from parasitic wasps by folding their eight legs into a planar "double swastika" and rolling at high speed down its native sand dunes. But not one multi-cellular animal rolls around upon a rotating body part: a biological wheel.

To see a Golden spider in action:
//www.ebaumsworld.com/video/watch/82572969/?autoplay=true

Migratory animals, birds, and insects use the equivalent of magnetic compasses; bats and dolphins evolved sonar; electric fish use electrical and magnetic fields to locate their prey; beaver build dams and ants practice agriculture. Most of the ingenious technical products that humans have invented were anticipated by Mother Nature millions of years ago, using the slow-but-steady process of evolution. Why not the wheel?

The eye needs a cornea, pupil, lens, retina, fovea, optic disc and optical nerve; each of these components is built by and of specialized cells and all components must function perfectly together, as a system, for normal vision. Compared with an eye, a wheel is the epitome of mechanical simplicity; nothing more than a cylinder able to revolve freely around a fixed axis. Yet the eye has arisen repeatedly in Kingdom *Animalia*, whereas an animal using wheeled locomotion has yet to be discovered.

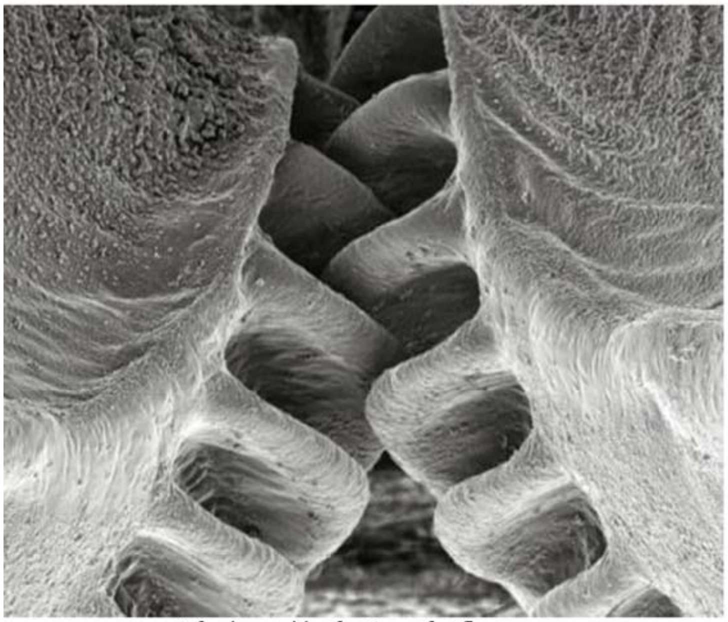
The limited utility of such systems in natural environments partly explains the absence of rotating systems in nature. In terrestrial environments, wheels are effective only over relatively flat, open terrain; they become less useful as the size of the wheel decreases. Constraints such as physiological problems of nutrient supply, elimination of waste products, inherent in biological systems, are of secondary importance.

So, it came as a complete surprise that a set of mechanical gears that mesh, just like those seen in moving instruments and engines, has been discovered in a small garden insect which uses them to kick its hind legs in perfect synchrony. It was thought that the idea was purely an invention of the human mind. This instance is the first time that the existence of a gearing mechanism in the natural world has been found.

The insect, called the *Issus leafhopper*, has a set of curved, cog-like strips of opposing "teeth" which inter-mesh with one another precisely when the young leafhopper uses its hind legs to jump into the air. Gregory Sutton of the University of Bristol, a co-author of the study published in the journal Science said: "We usually think of gears as something that we see in human designed machinery, but we've found that

that is only because we didn't look hard enough.

These gears are not designed; they are evolved - representing high speed and precision machinery evolved for synchronization in the animal world," Each tooth in the gears has a rounded corner at the point when it connects to the gear strip which is an identical feature of man-made gear and is designed to absorb the shock during movement so that the teeth do not shear off.



The 'gears' in the Issus leafhopper

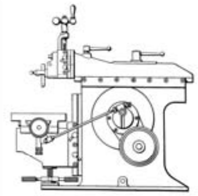
The gear teeth on the opposing hind-legs lock together to ensure almost complete synchronicity in leg movement. The legs always move within 30 millionths of a second of one another; this precise synchronisation would be impossible to achieve through a nervous system, as neural impulses would take far too long for the extraordinarily tight coordination required," said Professor Burrows, Cambridge University, who led the study. "By developing mechanical gears, the Issus can just send nerve signals to its muscles to produce roughly the same amount of force - then if one leg starts to propel the jump the gears will interlock, creating absolute synchronicity." In *Issus*, the skeleton is used to solve a complex problem that the brain and nervous system can't. This emphasizes the importance of considering the properties of the skeleton in how movement is produced."

Each gear strip in the juvenile *Issus* is around 400 micrometers long and has between 10 to 12 teeth, with both sides of the gear in each leg containing the same number – giving a gearing ratio of 1:1. The gears are only seen in juvenile *Issus* and are lost when the insect matures into its adult form perhaps because gears cannot be repaired if broken except during the "moults" of the juvenile stages when the entire skeleton is replaced.

While there are examples of apparently ornamental cogs in the animal kingdom - such as on the shell of the cog wheel turtle or the back of the wheel bug - gears with a functional role either remain elusive or have been rendered defunct by evolution.

Ed Note: Additional information, including videos of the gears in action, can be found at:

http://whyfiles.org/2013/got-gears-lets-leap-says-the-leafhopper



Metal Shapers

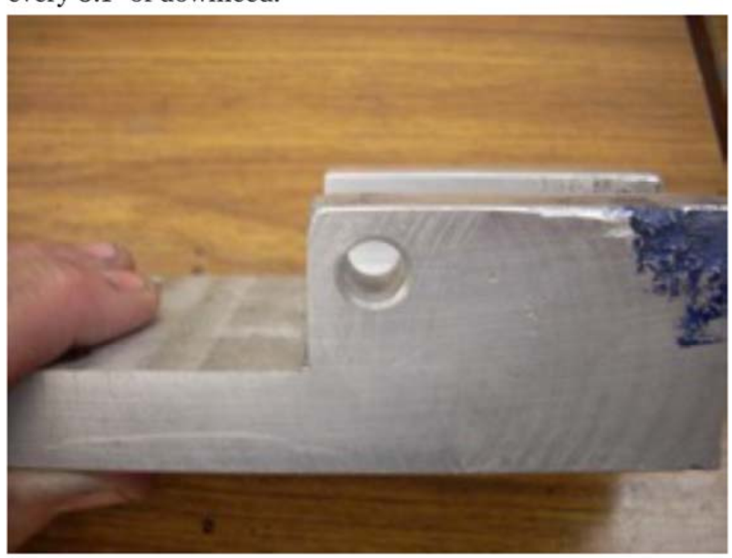
Kay Fisher

R. G. Sparber's Gingery Shaper - Part 42

Drilling Clapper   Photo by R. G. Sparber

The clapper box and clapper are secured to the table. The C-clamp is holding the clapper tight to the back of the box. This will insure that the clapper is snug against the back of the box during the cutting stroke. Any play would translate into a poor finish.

The long process of step drilling with all 22 drills begins. After the drills, I put the D reamer in the drill chuck and ran it at 120 RPM with lots of cutting fluid and cleaning of swarf every 0.1" of downfeed.



Clapper Box Result   Photo by R. G. Sparber

I couldn't believe my eyes! The hole is actually reamed nice and smooth. The chamfer was added after reaming.

Clapper Result Photo by R. G. Sparber

The clapper block came out nice and smooth too. The grunge you see came off of my fingers. The sides of this clapper were lapped nice and smooth.

Pin Fits Photo by R. G. Sparber

The pin is a snug fit in the clapper box and a sliding fit in the clapper. Also, since the pin was cut with the clapper clamped to the clapper box, there is a close fit between the two as can be seen above.

Pivots Nicely Photo by R. G. Sparber

The clapper easily swings up. It flops back down with a slight push. All that is left is to trim the pivot pin.

Blued Pin in Taper Photo by R. G. Sparber

As you can see in this picture, the pin is not seated all the way in. I was doing the final fit of my tapered pin yesterday and noticed that it would not go in the last $^{1}/_{8}$". At a taper of 0.027” per inch, this means there is a gap of 0.027/8 = 0.003” which is enough play to cause chatter.

Emery Pin Photo by R. G. Sparber

Before I did any damage, I blued the pin and wrung it in the hole.

There was one very small high spot on the pin so I put it in my drill press and lightly polished the pin with emery cloth. Still the pin would not go in all the way.

Pin Seated Photo by R. G. Sparber

It turned out that the minimum diameter of the pin was larger than the minimum diameter of the hole! A quick pass with a ¼" drill and the pin went in all the way.

I’m glad I didn't go crazy on the pin or hole before figuring this out. With the pin seated, the clapper and box both grabbed the pin.

One More Slight Ream Photo by R. G. Sparber

It was then a simple matter to use the reamer to gently remove a tiny amount from just the clapper's hole.

The straight part of the pin was cut off on the bandsaw and the end cleaned up with a file. Now I am really done with the tapered pin and hole.

If the pin moves when the shaper is operating, I can add a flat to the pin and a set screw on the box.

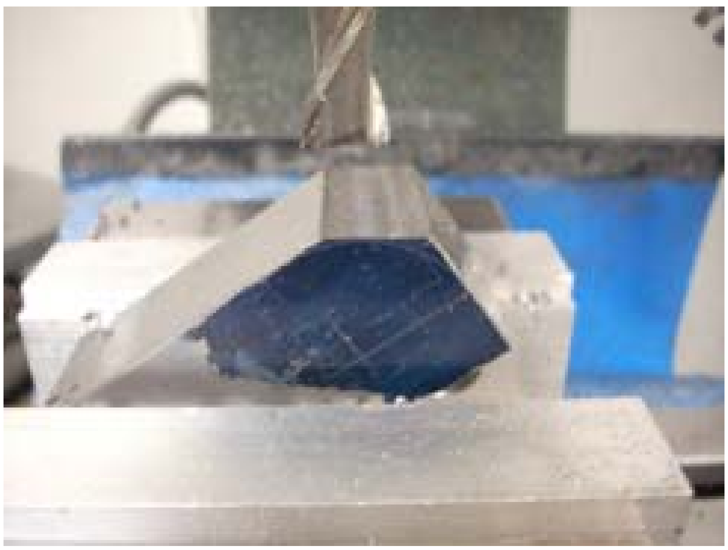
Radius Markup Photo by R. G. Sparber

I just realized that I forgot to mention how I cut the radius on the clapper. This radius provides relief so the clapper can swing out without hitting the back of the box.

The center of the radius was marked out on my surface plate. A divider was then used to scribe the radius.

Milling Radius Photo by R. G. Sparber

I scribed a few tangents and then used my end mill to remove most of the excess corner.



Most Milling Done Photo by R. G. Sparber

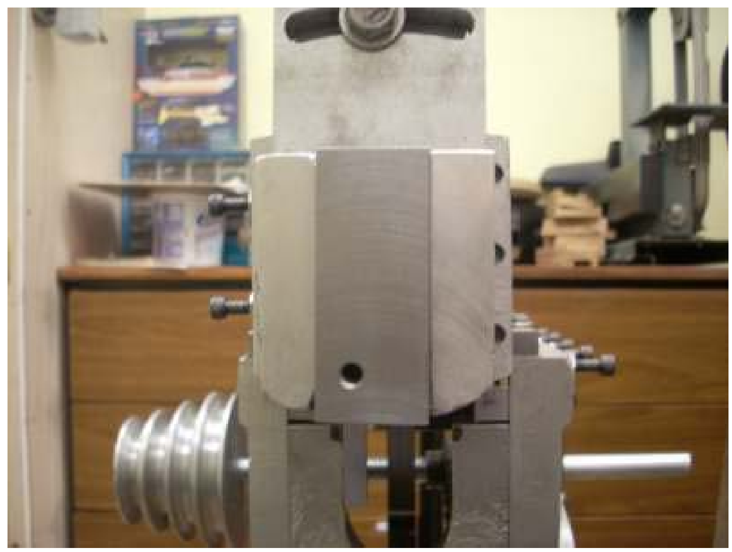
There is very little metal left to be removed now.

Radius Result Photo by R. G. Sparber

With a little time on a disk sander, I've got a decent radius. The milled flats were square with the block so it was not hard to retain that alignment during sanding.

Radius Result 2 Photo by R. G. Sparber

A little more work is needed before this clapper is done. I followed the design by Rudy Kouhoupt detailed in "The Home Shop Machinist, January/February 1998".



Clapper Set Screw Hole Photo by R. G. Sparber

His design places the cutter on the center line of the pivot pin in order to minimize chatter.

The hole in the front of the clapper contains a ¼-28 set screw. It locks in a piece of ¼" HSS that will later be shaped to a cutter. I offset the hole to leave room for both a smaller cutter blank and for a bar that can hold a cutter on the end. It will be used to cut inside slots.

Clapper Right Side Photo by R. G. Sparber

Clapper Left Side Photo by R. G. Sparber

Stay Tuned for part 43 from R. G. Sparber next month.

Keep sending me email with questions and interesting shaper stories.

My email address is:

KayPatFisher@gmail.com

Kay

Editors Desk

George Gallant

I would encourage all members who have access to the internet to arrange to get the Gazeet via email. It will reduce the work load on the publisher and save the club the cost of printing and mailing.

We are always looking for articles. Email in MS Word docx is preferred, but we accept almost everything.

David Baker would like to remind everyone that the annual dues are due!!!! $25.00 cash or check. Make checks out to NEMES. You can pay at the meeting or mail to:

David Baker
288 Middle St.
West Newbury, MA 01985

Upcoming Events

Bill Brackett

To add an event, please send a brief description, time, place and a contact person to call for further information to Bill Brackett at:

thebracketts@verizon.net or 508-393-6290.

Nov 7th Thursday 7PM
NEMES Monthly club meeting
Charles River Museum of Industry 781-893-5410
Waltham, MA
http://www.neme-s.org

Nov 1st – 3rd World Championship Punkin Chunkin
East of Bridgeville, Delaware
http://www.worldchampionshippunkinchunkin.com/

Dec 5th Thursday 7PM
NEMES Monthly club meeting
Charles River Museum of Industry 781-893-5410
Waltham, MA
http://www.neme-s.org

Jan 1st New Years day run
Waushakum Live Steamers
Holliston MA.
http://www.waushakumlivesteamers.org/