The NEMES Gazette

NEW ENGLAND MODEL ENGINEERING SOCIETY INC.

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Dues. It's that time of year again. Please bring your 2017 dues to the December meeting. Dues are $25 by cash, check or you can try out our credit card system. If you can't make the meeting, send the dues to NEMES, c/o Rich Baker, 288 Middle Street, West Newbury, MA.

NEMES Apparel. We have NEMES denim button down shirts, t-shirts, sweatshirts, and aprons for sale. They make great Christmas gifts. The aprons are $20, the denim shirts $35, sweatshirts $25, and the t-shirts $15. Contact Rich Baker at 978-257-4101 if you would like to own one. You can also purchase these items on-line at the NEMES Store, located Here.

NEMES Show. The 21st Annual NEMES show will be on February 18, 2017, at the Charles River Museum of Industry. The show flyer is Here. Please pass it along to your friends, and/or print it out and post it at your favorite hangout.

Cabin Fever. The Cabin Fever Show in January is also fast approaching. We will not be organizing a bus this year, but many of us will be there. Make your hotel reservations now.

Next Meeting

Thursday, January 5, 2017, 7 PM

Charles River Museum of Industry & Innovation

154 Moody Street

Waltham, Massachusetts

Directions are Here.

Speaker for January:

We will again have a poster session at the January meeting meeting. It is very difficult to find speakers during the Holiday season. In February we will have a talk about restoring an old Southbend lathe. In March, our own Dave Lefkowith will talk about Shapers.

At the January meeting we will also have a visit from Rudy Ruggles, the CRMII education outreach Director, who will speak briefly about the topic below.

"The week of February 20 is Engineers Week. The Charles River Museum is planning activities for the week and would love to highlight the work and skills of NEMES members, especially since the NEMES Show on the 18th will inevitably pique people's interest. Would you be interested in describing your work in more detail during an event that week? Showing how to create models? Helping with an engineering activity? If so, please contact me, Rudy Ruggles (rudy.ruggles@crmii.org; 617.633.6254) or talk with me at the Jan. 5th NEMES meeting.

Deadline for submitting articles is two weeks prior to the next meeting.

Table of Contents

Shop Talk

Max ben-Aaron

I had planned to write a second column about Edwin Armstrong, about the interaction between him and David Sarnoff, head of RCA Then, I discovered these two articles.

> ***www.rci.rutgers.edu/~shunsun/resource/Armstrong_Sarnoff_I.pdf***
>
> ***www.rci.rutgers.edu/~shunsun/resource/****Armstrong_Sarnoff_****II.pdf***

They are so well written and so comprehensive that I decided not to compete. I think that you will enjoy reading them.

I have long been a ‘history of technology’ buff, and I pride myself on my knowledge of the field. However, I was embarrassed to discover a huge gap in my knowledge when I chanced across the biography of H.J. Round, a great British radio pioneer.

Educated at the Cheltenham Grammar School, then Royal College of Science, (a constituent college of Imperial College London), Round graduated with a First Class Honours degree. He achieved a phenomenal amount in his life; and was known for his huge work output and the number of development "firsts" credited to his name.

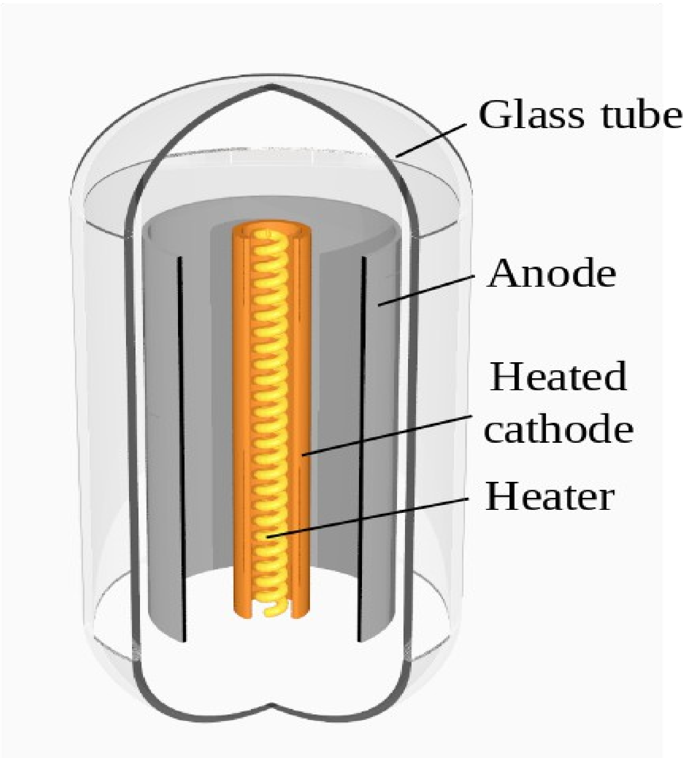
Round's work revolutionized the design of radio receivers of the day and he developed new vacuum tubes while moving thermionic technology forward. In addition to this he played a significant role in the technology used in two world wars. Round also had the distinction of being the first person to note the effect used today in light emitting diodes.

Round joined the Marconi Company in 1902 and became personal assistant to Guglielmo Marconi, not long after Marconi had made his transatlantic wireless transmission. Sent to the USA, Round experimented with a variety of different aspects of radio technology, focusing on technologies such as powdered iron cored tuning inductors. He experimented with transmission paths over land and sea at different times of the day and also investigated direction finding technoques using a frame antenna.

Antenna Direction Finding with Loop

Round's main contributions to technology were improvements in thermionic valve (vacuum tube) technology and development of sonar. He was the first to report observation of electroluminescence from a diode, leading to the discovery of the light-emitting diode. (1907). He held 117 patents.

Heading Marconi's research program into thermionic tubes, Round made important contributions to development of the first vacuum tubes. at roughly the same time as Lee De Forest was developing the Audion in the US. He also developed a three-element (triode) amplifying tube and he discovered feedback (regeneration) in vacuum tubes independently along with Alexander Meissner and Edwin Armstrong, and built some of the first AM vacuum tube radio transmitters. Round patented the first design for an indirectly heated cathode, the type of cathode widely used in modern vacuum tubes.



Diode Vacuum Tube with Indirectly Heated Cathode

Later, in experiments with cat's whisker detectors, using a variety of substances, Round passed current through them and noticed that some gave off light – the first known report of the effect of the light-emitting diode. Round published his result in 1907 in *Electrical World*:

„To the Editors of Electrical World:

SIRS: – During an investigation of the unsymmetrical passage of current through a contact of carborundum and other substances a curious phenomenon was noted. On applying a potential of 10 volts between two points on a crystal of carborundum, the crystal gave out a yellowish light. Only one or two specimens could be found which gave a bright glow on such a low voltage, but with 110 volts a large number could be found to glow. In some crystals only edges gave the light and others gave instead of a yellow light green, orange or blue. In all cases tested the glow appears to come from the negative pole, a bright blue-green spark appearing at the positive pole. In a single crystal, if contact is made near the center with the negative pole, and the positive pole is put in contact at any other place, only one section of the crystal will glow and that same section wherever the positive pole is placed.

There seems to be some connection between the above effect and the e.m.f. produced by a junction of carborundum and another conductor when heated by a direct or alternating current; but the connection may be only secondary as an obvious explanation of the e.m.f. effect is the thermoelectric one. The writer would be glad of references to any published account of an investigation of this or any allied phenomena.
New York, N. Y.
H. J. Round

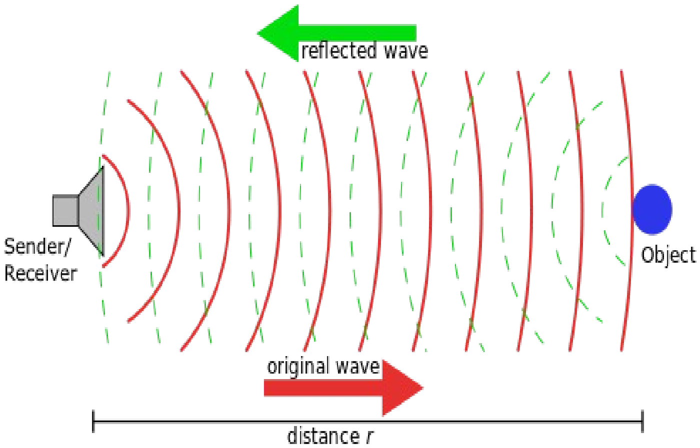
When World War I broke out in 1914, Round was commissioned onto the General List and seconded to Military Intelligence with the rank of captain. He set up a chain of direction finding stations along the Western Front, using his experience in direction finding. These stations proved so successful that another set was installed in England, in May 1916. On 30 May the same year, while monitoring transmissions from the German Navy at anchor at Wilhelmshaven. the stations reported a 1.5-degree change in the direction of the signals – suggesting that the ships were on the move. Alerted, the British Admiralty ordered the British fleet to set sail and engage the German fleet. The Battle of Jutland, the largest sea battle of all time, occurred the next day. Round's technology, detecting the movement of the German fleet in time left his indelible mark on history.

Jellicoe, the British Admiral, has been criticized for his cautious strategy; the stakes were enormous, the pressure immense, so his caution is certainly understandable. His judgment might have been that even 90% odds in his favour were not good enough to bet the British Empire. The former First Lord of the Admiralty, Winston Churchill said of the battle, that Jellicoe "was the only man on either side who could have lost the war in an afternoon."

After the war, Round returned to civilian life and became involved in radio transmitters and was heavily involved in the first broadcasts made in the United Kingdom. He became Chief Engineer at Marconi's Wireless Telegraph Company in 1921, but some years later he left to set up his own consultancy.

When World War II broke out in 1939, Round was again called on for his services. This time he was involved in ASDIC (Anti-Submarine Detection Investigation

Committee) which is known today as sonar.



Principal of Active Sonar Technology

Round was awarded two main honours. In the First World War - the the Military Cross for his efforts mainly on direction finding and then in 1951 the coveted Armstrong Medal by the Radio Club of America. Despite these two awards and the huge impact of many of his developments, the name of Captain H.J. Round is not widely known and he is very much an unknown genius.

Round died in August 1966 after a short illness.

From the Gazette Archives

The Big Dig

From March 2000

The main speaker for the night was Dan Wood. Dan works for the Federal Highway Administration as a structural engineer. He's been with them for twelve years, the last 4 and a half here in Boston working on "THE BIG DIG".

His job here is mainly focused on tunnels. He's been in transportation for his entire career and was focused on bridges mostly before coming here.

The project here in Boston involves building 8 miles of Interstate Highway, which is a total of 160 lane miles. The initial central artery was completed in 1957 as a major collector road. It was designed for 75000 vehicles a day and used no federal money. Today there are 190000 vehicles a day that travel on it. It has four times the national average accident rate, and there are 14 to 16 hours of gridlock on it each day.

Then he showed us a map of the major arteries into and through Boston. What it showed was 38 lanes of major highway merging into the 6 lanes of the Central Artery. The Central Artery is 1 3 / 4 miles long - with 27 on and off ramps in that distance. Sixty per cent of the traffic on the artery wants to go right through the city, but the on and off ramps slow it all down.

What will the project do? The Mass Pike will extend another two miles east to Logan Airport, completing Interstate 90 which will then run from coast to coast as originally planned. (Logan is the only Major Airport in the United States that is not connected to the Interstate Highway System.)

The Ted Williams Tunnel is open but there is no access to it other than from local streets. The Haul Road used by construction vehicles to avoid overloading the local streets during con-struction was an old railroad bed that had been unused for years. It now has five separate typesof bituminous pavement on it under test. The vehicles on it are of known load, and are counted.

The Ted Williams Tunnel was built using Immersed Tube Technology. The sections of the tunnel were built up from steel and brought to Boston by barge. Each section is 45 feet tall, 85 feet wide, and 325 feet long. One section a month was constructed and floated to the site of the tunnel. The road inside the tunnel is con-crete, and was built in place within the steel sec-tions. Each section has two parallel tubes, one for each direction. The flat roadway is part way up the cylinder, with the ceiling part way down. This leaves room for a large rectangular plenum both above and below the roadway. These plenums are used for forced ventilation, with air being pumped into the bottom plenum and out of the top one. All of the tunnels in the project have forced ventilation - some of the tunnels are up to 2 miles long.

The tunnel sections were removed from the barges they were floated in on and supported by pontoons. Bulkheads at the ends of each section kept the inside of the tunnels free of water and the inner construction was carried out. Each 325 foot long tube had a full size concrete truck in it for the construction. They stayed in the tubes till they couldbe driven out of the completed tunnel. With the sections floating from pontoons the inner structure was carefully built up in sections to keep the balance correct so the section would stay level and right side up.

The completed sections would be carefully adjusted to 1 or 2 per cent from negative buoyancy, then when they were ready to be lowered they'd add water to tanks inside the tunnel sections to bring them about half a per cent negative buoyancy and they would be lowered into trenches dug into the harbor floor to receive them. The largest dredge in the world was used to dig the trench to hold the tunnel sections. The trench went 60 feet below the bottom of the Harbor Channel.

Global Positioning System sensors, lasers, and other instruments were used to make sure that the tunnel sections were located where they were supposed to be. The position tolerance for the tunnel is 3 / 8s of an inch. When the sections of the tunnel are placed they are lined up with a 16 inch thick gasket in contact with the two sections. The water between the two bulkheads is then pumped out, which compresses the gaskets down to between 3 and 4 inches thick as the water pressure squeezes the two sections together.

There will be seven ventilation buildings when the project is finished, making it the largest mechanical ventilation system in the world. Twelve foot diameter squirrel cage fans will push fresh air in and draw exhaust out. For fires there is a plan on how to adjust the ventilation system to keep things as safe as possible. All the fans are reversible and the operators have manuals to tell them how to change the airflow. The idea is to keep the air moving in the direction of the traffic. For a big fire the trucks would go down the adjacent bore. Then hoses would be pulled through the connecting passages to fight the fire.

We are now in the middle of the peak construction period of the project - it is invoicing three million dollars a day to keep up the pace. At this point he showed us some pictures of the artery from the south. The old road and the new road are in the same place. The alignment of the new artery and the old one are the same. Only two buildings needed to be taken for the entire project.

As part of the project a $4 million dollar bridge was built to allow shifting the traffic around so that the new, larger road structure can be built where the old road was. These temporary structures are modularized so that they can be reused as much a possible.

Work is being done to with stand category B seismic activity. This is better than the old artery was, but is not as robust as it would be for California, where things need to be able to deal with category C or D activity.

Segmental prestressed concrete sections are assembled with a gantry into larger post tensioned spans and put into place. On most interstates the north and south sections run side by side. Here they don’t always, because one of the prime directives of the project is that the city cannot be shut down. Existing traffic flows have to be maintained. Construction needs to be done while the normal life of the city carries on around it. The current raised Central Artery is going to be replaced by a tunnel. The way that this is being done is by cutting a slot and filling it with concrete down each side of the future tunnel.

These slots serve five purposes:

1. They will be the wall of the tunnel.
2. They cut off water (which means they go down to bedrock - up to 140 feet in someplaces.)
3. They support the ongoing construction.
4. They support the surface street. What looks like a solid street from the top is often a cover over an enormous hole.
5. They support the existing Central Artery bridge, which is still carrying traffic although not necessarily still on it’s original foundation.

These walls are known as “Slurry Walls” because of the way they are constructed. Since the area where the tunnels are going is mostly fill there is no way that you could dig a 42” wide trench up to140 feet deep without some sort of shoring. Slurry is what is used to shore it up. As the trench is dug out the soil removed is replaced with a slurry that is heavier than water,and is higher in the trench than the water table. This keeps the trench open. Two types of machine are used for excavating the slurry wall trenches. One is a hydraulically operated clamshell bucket. The other is the Hydromill. It has two large counter rotating cutters that grind up the spoil from the trench and pump it up to the surface where they filter the crud out of the slurry and put the cleaned slurry back into use.

Slurry wall techniques have been used for years in Europe, so as a result many of the personnel working on them here in Boston are from Europe because of the learning curve involved with the process.

The slurry walls can’t be plain concrete, they need reinforcing. Soldier Piles are the answer. They are large steel sections that are bolted together vertically and lowered into the full depth trench a section at a time as they are bolted together. They are located at 4 to 6 foot centers as required along the slurry wall. With the piles in place cement is pumped into the trench from the bottom, displacing the slurry upward where it is collected from the top for reuse.

With the slurry wall in place on both sides of the future tunnel excavation can begin. Temporary struts are used to span the space between the two slurry walls as the material between them is excavated to keep the pressure outside them from collapsing them inward. The excavation goes down to the bottom of the base slab for the tunnels. The base slab runs from slurry wall to slurry wall and can be up to 25 feet thick.

Once the excavation has gotten as far down as it is going to go they start at the bottom building up the tunnel. They try not to use tie downs to keep the tunnel down where it should be, because they can leak and cause problems. So, they use massive base slabs to provide the mass to keep the tunnel from moving up from buoyancy effects in the ground water.

After they have built the tunnel up from the bottom to the top they still have a bunch of empty space above it. It will all be back filled, but not with the stuff they took out when they dug the hole. The soils taken out will all go to Spectacle Island in Boston Harbor, which will be a park eventually.

When they get done with the Central Artery Tunnel there will be less on and off ramps than there were with the elevated artery. There will also be 4 traffic lanes and a fifth lane in each direction for acceleration and deceleration. The extra lane each way, combined with less on and off ramps will provide greater capacity for the new artery.

In front of South Station they are having to take out bedrock to get down 120 feet so that the road can go under the Red Line. The Red Line is the first subway built in the United States, and the tunnel is unreinforced concrete. So, the construction around it must be careful not to disturb it. The answer here is to use conventional underground mining techniques to build a bridge underground that will hold the existing Red Line tunnel up over the new tunnel being built. Shafts will go down, then galleries will be tunneled outfrom them. Eventually the galleries will be filled with concrete and post tensioned using epoxy coated steel cables. (The epoxy coating is for corrosion resistance.) The concrete will contain fly ash for increased durability. The steel wire will go into tubes which will be grouted to fill the holes after the wire has been stretched for the post tensioning.

There are 250 contracting companies involved in the Big Dig. About 12 are big companies that are the prime contractors.

Boston has been here for over 200 years,and all that time utilities have been putting pipes, conduits, wires, etc. into the ground. The first step in the process of digging a big trench through the middle of the city had to be getting the utilities that were in the way straightened up and organized so that the city could continue to have the utilities it needed. Over the years things had become chaotic. There were cases where a conduit was found that no one was willing to claim ownership of. So the only way to find out what is was was to cut it and see who complained about service going out. He showed us a map of the utilities before and after. Before was a real rat's nest. After actually looked organized. As a result of the utilities reorganization Boston now has all fiber optic cables and has the most modern telecom facilities of any city in the world.

To the north end of the tunnel will be the new cable stayed bridge. It will be the widest cable stayed bridge in the world when it is completed.

The Fort Point Channel is in an area that was filled with anything that they could find to build up the land. As a result the soil is particularly bad there. 600000 cubic yards of soil is being stabilized by adding cement through a soil mixing process. Since the rail traffic to South Station can't be interrupted and the tracks run over this especially bad soil the approach for the tunnel to go under the tracks is to freeze the soil to provide stability during the tunneling process. The ground is frozen. Then the pits for the ramps to the tunnel were dug. Forty foot high, eighty foot wide tunnel sections were then cast in place in the pits. Each section is then jacked forward under the tracks until the tunnel is com-pleted. The jacking is done with 52 500 ton hydraulic jacks. Eighteen inches is dug out of the frozen ground in front of the tunnel section and the jacks push it forward. Then another 18"is dug outand the push is repeated until the tun-nel is all the way under the tracks.During this entire process the ground stays frozen and the tracks 8 feet above the top of the tunnel are continuously monitored to insure that the are not disturbed.

The simplest way to get across the Fort Point Channel would have been to fill it in, but the EPA says it's a wetland so you can't. So it has to have a tunnel under it. The tunnel will be built using the immersed tube technique, but because of the low bridges in the way steel segments cannot be barged in as with the Ted Williams Tunnel and concrete tubes were cast on site. The first tube for the tunnel was floated into place in December 1999. There isn't room for pontoons to hold the concrete tubes up while they are being lowered into place, so they will be maneuvered into place while neutrally buoyant and then water will be added to them to lower them into position.

Cut and cover construction will be used to connect the Fort Point tunnel to the Ted Williams tunnel with a tunnel. There will be a section open to the sky where the current access ramps into the Ted Williams tunnel are. Only emergency vehicle access will be allowed at this open to the sky section, the current ramps will be gone.

At the airport end there will be all new ramps. Straight ahead out of the tunnel will go onto Route 1A. When will it all be done? It comes in pieces. In October 1999 the Storrow Drive bridge opened. In 2001 the extension of Interstate 90 to the Ted Williams tunnel will be open. Mid 2002 should see the Cable Bridge completed, with north bound traffic using the bridge then. In 2003 the bridge should open to south bound traffic. Then in 2004 it should all be done.

And now a few words from International Electrician, Peter Sevier, who will tell us how many Englishmen it takes to wire an Italian cantina ....

Wiring the Cantina

Peter Sevier

A cantina is a cellar in Italy, and the one that is the subject of this story is in a rabbit-warren-like house in the small medieval town of Calvi dell'Umbria, about 70 km NNE of Rome. This is the region of the Papal States, when for defensive purposes, towns were mainly built on the side or top of steep hills, and the streets and alleyways were consequently very steep. The cantina is at the lowest point of the house, almost below a small living room, and access to it is through a door on a narrow path adjacent to the house, which is so steep it consists of sloping steps. The house belongs to my nieces, Alessandra, who lives in Cornwall in the UK, and Francesca, who lives in Calvi dell'Umbria.

For several years they had wanted electricity in the vaulted stone rooms of the cantina, but could not afford to get a contractor to do the job as they required, and that was the major problem. The requirement was that the wiring job had to look as if it were done in 1900 (but with modern materials, and meeting current electrical code requirements), that being the current "hot" fashion in upgrading your cantina.

About 2 years ago a friend gave Francesca the wiring components for the job; 3-wire twisted-flex conductor (to safely replace the original 2-wire silk-covered wiring), boxes of porcelain posts to support the exposed wiring, and ceramic outlets and switches. These are not only very high- quality and expensive, but are difficult to find.

For Stage I, in 2015, I brought 240 VAC power from an outlet in the living room down the outside wall on the alleyway into a terminal box inside the cantina adjacent to the door. The wire was in flexible plastic conduit to protect it from the weather, and the major problem was getting the wire out of the living room and into the cantina through thick stone walls which were probably built in the 1600's or 1700's. The narrowest point was under the living-room window, and the stonework there was still about 12 inches thick.

In the USA this would be a major problem, because long-reach carbide-bit drills are expensive. In Calvi however, things are different. All the houses are constructed of volcanic tuffa stone, and because everyone has the problem I encountered when installing wiring, the necessary drill bits are surprisingly cheap. The local hardware store, Ferramento Germani, had drill bits of the correct type (if only they could find them in their cave-like emporium), and they were so cheap I could hardly believe it!

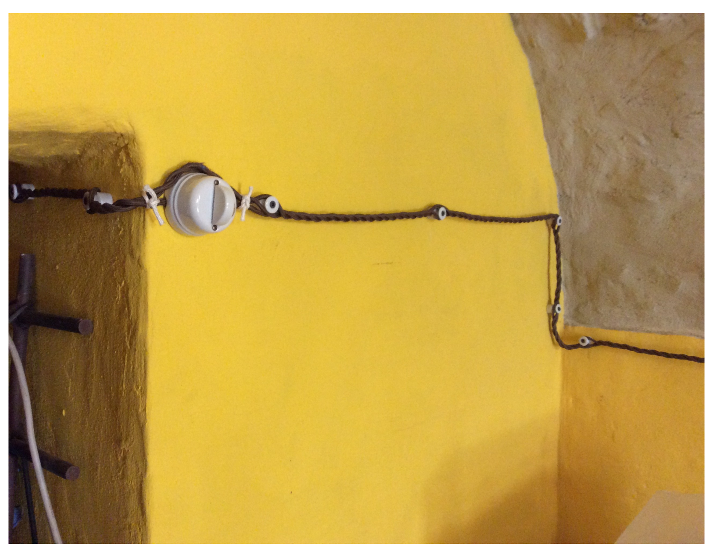
Tuffa is a comparatively soft stone, but you still require a carbide tool to drill a deep hole. The hole was easily bored with the household Bosch drill on low speed, and soon after, Stage I was complete.

Stage II, the internal wiring of the main room of the cantina, proved to be much more difficult than Stage I, and was done in May 2016. The stonework and occasional bricks in the vaulted ceiling were all clearly visible, and did not present any difficulty when the porcelain posts supporting the wiring were installed, because sound surfaces could easily be visually selected before holes were drilled.

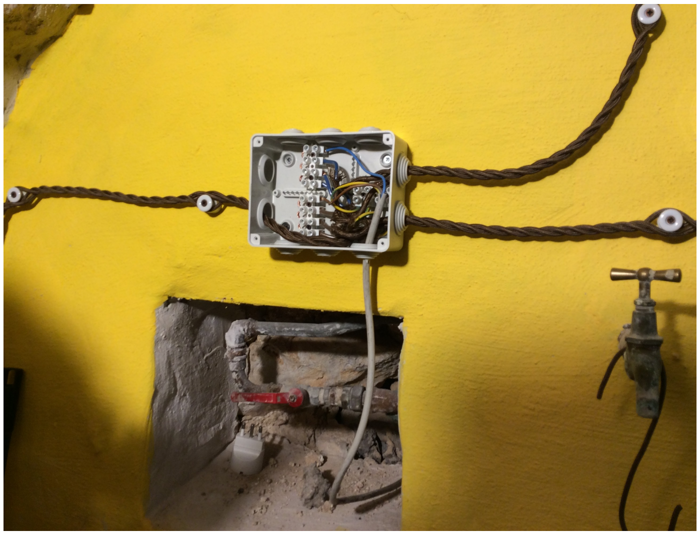
The wiring to the power outlets at the lower level, and power to the inner room of the cantina, however, proved to be an entirely different matter. From waist-level to the floor, Francesca had had a contractor mortar the joints in the stonework, and then had painted the lower part of the walls yellow. It looked nice, but you could not see any of the joints in the stonework, and the top of the yellow-painted region was where she wanted the wiring and outlets to be situated.

The nightmare began with the first 3-terminal porcelain outlet. It was secured to the wall by 4 screws, which fitted into small holes in the porcelain. These screws were 3-mm diameter and 35-mm long, so there was little room for error if you wanted the outlet in the desired position on the wall. Worse, you had to prewire the outlet before attaching it, that being the way it was designed. What are the chances of hitting a void or soft mortar in the wall below the painted surface, just where you want to put a screw ? Pretty high, as I soon found out.

I pointed out to Francesca that it would be much easier to first screw a wood base to the wall, where I could find secure mounting, and then secure the porcelain outlet to that. She was horrified at the suggestion; nobody did things like that- fittings must be mounted directly to the stone walls, just as they were in the 1900’s. So I soldiered on, and it was truly difficult, but the job was finally done, and looked authentic 1900.



I was really glad to get the wiring to the end of the first room of the cantina, and through the narrow doorway into the second room, where I terminated it in a modern, molded-plastic distribution box.



Originally, the outer , main room of the cantina had a stall for the family donkey, and the second room was probably for wine and the olives that are the regions major agricultural crop. I wonder what the donkey would have thought about electricity coming to his domain?

Making Cam Action Edge Clamps

version 2

By R. G. Sparber

01/15/2008

The idea of making these clamps came from Brian Lamb. They work great. If you have more money than time, they can be bought commercially but expect to pay big money. No doubt they are superior to what is made here but I enjoyed making these clamps and certainly enjoy spending the money on other things.

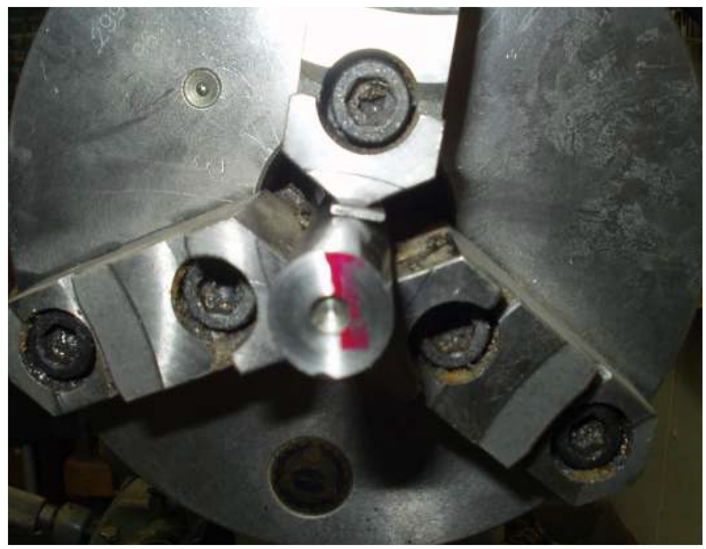
The basic idea is to build a clamping system that can hold a piece of metal in such a way that it is solidly clamped while providing full access to the top surface for machining.

Along the top you see a set of cup like washers. They have a ridge around their perimeter that can cut into the metal being held. The screws started as button headscrews but have been machined so the heads are eccentric. These screws have a hex hole

in the top and are driven with an Allan key. After people read version 1 of this article, they suggested that I put a small O-ring on the threaded body of the screw to hold the washer in place. It was an easy modification and I'm sure has improved the design. When one of these screws, fitted with a cup washer is threaded into a block, we get both a horizontal force from the cam action of the eccentric and a downward force from the threads. Together they grab and pull the metal to be machined down to the table.

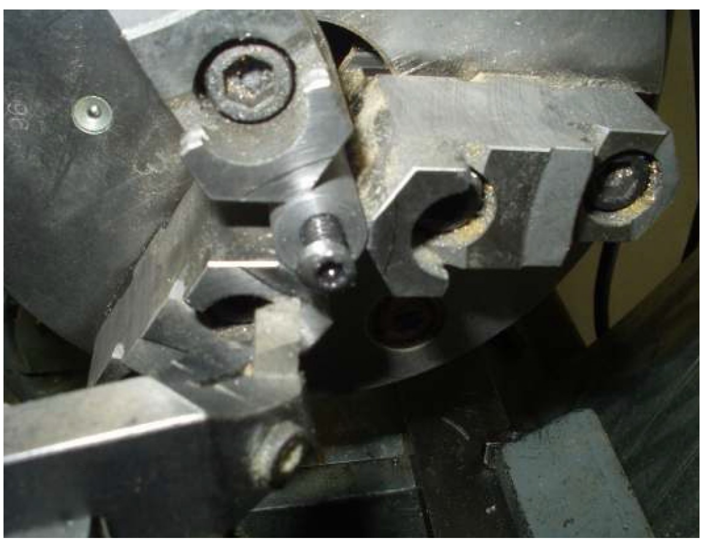
Making the Eccentric Screws

I chose to make a fixture to hold the screws for machining.



I started with a piece of 12L14 bar stock in my 3 jaw chuck. Note the 50 thou spacer between the top jaw and the bar. This provides me the 50 thou offset that will later enable me to cut the screw heads eccentric. I faced off the bar, drilled it 13/64” for 1” and then followed with 1/4” for 1/2”. The tap will just scratch the 1/4” hole and tap into the 13/64” hole.

In this way I am not working so hard doing the tapping yet the screw is fully supported and secure. The bottom threads are not fully formed and I did not want the screws to jam in place. To prevent this hassle, I screwed a 1/4-20 set screw down the hole. The screw to be machined then bottoms out on the set screw where the threads of the hole are fully cut. After drilling and tapping the bar, the 50 thou shim is removed and the bar re-chucked in the 3 jaw. The hole is now off center by 50 thou.



These button head screws have a hex hole in the top. I turn the screw into the fixture until it bottoms. The cutting force keeps the screw solidly against the top of the setscrew.

The head of the screw has been cut and you can see the eccentric that forms. These screws came from Enco and were very easy to machine.

Machining the Cup Washers

It is best to use drill rod for these washers but since I am only clamping aluminum and was in a bit of a hurry, I chose to use more of my 12L14.

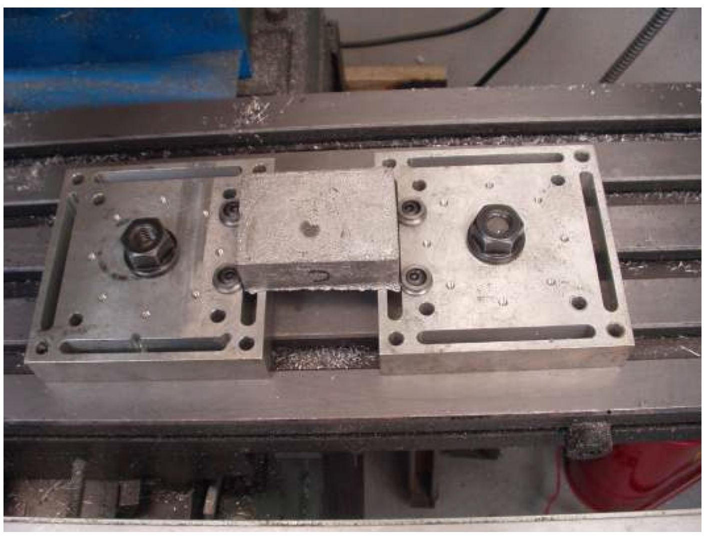
I started by drilling a through hole 5/16”. This permits the washer to freely move on the screw body as it clamps the block being machined. Since I'm making 6 of these washers, it was most efficient to just drill as deep as possible.

To form the cup, I put a 3/8” 4 flute end mill in the drill chuck. I went in about 1/8”.

Forming the outside cutting edge was simple. I started by positioning my cutter as shown above. Then I measured over 1/8” from the edge. The lathe was started and I fed in just enough to make a line. The cutter was then moved to the right and fed in about 50 thou. I then fed in until I reached the line. The cutter was backed off and the lathe stopped. For even better grabbing of the block to be machined by these washers, you can cut a series of ridges similar in cross section to teeth as found on a saw blade. The top of each ridge is horizontal and the bottom is angled at about 45°. In this way the clamping force will tend to push the block down on the table.

I moved the cutter so it was now 1/4” from the end.The lathe was started and I again fedi n about 50 thou. This time I cut towards the tailstock until the cutting edge was fully formed. I then changed to a cut off tool and parted the washer off. As long as there was enough of the 5/16” hole down the center, I could just run in the end mill to form the cup and then use the cutter to form the ridge. Switch to the parting tool and the piece was done.

One Example of How to Use These Eccentric Clamps



Four of these eccentric screws have been used to hold this casting. It was a simple matter to drill and tap the two 1” thick plates of scrap aluminum. The casting is not square yet this fixture still solidly holds it. The first step is to tighten the hold down nut on the left. The two screws in this left plate are turned so their lobes point to the left. The two screws on the right plate are turned so their lobes point to the right. The right block is then pushed against the casting. You may be able to see that this right plate is not perfectly lined up with the X axis of the table but it is a good fit to the casting. The right hold down nut is then tightened. I then turn each of the screws to dig into the casting and pull it down onto the plates. It is held solidly. My fly cutter now has unobstructed access to the top face of the casting.

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Coming Events

Errol Groff

January 13-15, 2017 Cabin Fever Expo
Show Flyer HERE
LEBANON VALLEY EXPO CENTER
80 ROCHERTY ROAD LEBANON, PA 17042
http://www.cabinfeverexpo.com/

January 28-29 Amherst RR Society Annual Show
The Eastern States Exposition Fairgrounds
1305 Memorial Avenue
West Springfield MA. 01089
Show Flyer HERE
http://www.railroadhobbyshow.com/index.php