The NEMES Gazette

NEW ENGLAND MODEL ENGINEERING SOCIETY INC.

No. 235 | November 2015

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Dues. It's that time of year again. We will start collecting the 2016 dues at the November meeting. Please bring your $25 check or you can try out our credit card system.

NEMES Show

We received an inquiry from the Charles River Museum of Industry asking for the date of the NEMES Model Engineering Show. We traditionally have the show on the third Saturday of February, which is February 20, 2016. As a Club, we need to decide if we want to hold the show at the Charles River Museum of Industry, the Boot Mill in Lowell National Park, or at another location. The date is approaching fast, and we need to decide on the date and location at the November meeting.

Next Meeting

Thursday, November 5, 2015 7PM

Charles River Museum of Industry & Innovation

154 Moody Street

Waltham, Massachusetts

Directions are Here.

The November speaker will be Alan Sliski, speaking on restoring telescope mounts. Astronomical telescope mounts must position the telescope with a high degree of accuracy, so the telescope tracks the stars. Many of these were made by Warner and Swazey, the people who also built turret lathes.

Membership Info

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

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

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Editor's Desk

Dan Eyring

There are no local model engineering events in November. If you know of an event you would like to share, please contact Errol Groff so he can post it to the Club's web site.

Looking further into the near future, it will soon be Cabin Fever time again! Please read Norm Jones writeup below for all the details.

Finally, this month I'm introducing a new topic in the Gazette, to be called “From the Museum”. Having recently re-volunteered at CRMII, I'm having an interesting time researching the history of the machine tool exhibits there. I will be posting brief write ups about the exhibits, starting with the Museum's lathe collection.

Cabin Fever Bus Trip Jan 15-17 2016

Once again, Dick Boucher and I, Norm Jones, are organizing a bus trip to the Cabin Fever Expo. We have not been successful in having a bus trip since Cabin Fever moved to April, but now that it is back in January, we are going to try again! Show dates are Jan 16 and 17, 2016 at the Lebanon Valley Expo Center 80 Rocherty Rd Lebanon PA.

We will depart the Riverside “T” Station at 9:00 AM on Friday Jan 15 with possible pickup locations in: Sturbridge at the former site of “Roy Rogers” at exit 1 off Rt 84 , “Park and Ride” at exit 70 off Rt 84 (MA/CT), Hartford CT at exit 21 off Rt 91 Southbound, and Stamford CT at exit 8 off Rt 95 (Marriot Hotel).

There will be a lunch stop on the Garden State Parkway around 1:00 PM. Bring your own lunch or use any one of a number of fast food restaurants.

We will proceed to the Comfort Inn at 16 Marsanna Lane in Jonestown, PA for check in before drop off of displays at the Expo Center. NEMES has reserved a block of 25 double bed non smoking rooms at the rate of $59.00 +tax per night. (2 nights, Fri Jan15 and Sat Jan 16). Please call the hotel at (717) 865-8080 to make a reservation. Give the group account number of 2318549 to get the stated rate. Cut off date for reservations is Dec 18. You are encouraged to double up on rooms as we are offering this rate to those of you who wish to drive to the Expo on your own.

The bus will be stopping at a “Golden Corral” restaurant (similar to the Country Buffet in York) for dinner. Please register for the Expo and drop off displays as quickly as possible so that we can return to the hotel at a reasonable hour.

Please send a check for $170 per rider, made out to “NEMES” to: Richard Baker 288 Middle St. West Newbury MA 01985. This amount is based on a minimum of 28 participants. The bus has a capacity of 47. Talk to your friends! Lets fill the bus. You are not officially signed up until your check has been received by Rich Baker. The last day to sign up is Dec 15.

Shop Talk

Max ben-Aaron

ELECTRICITY

While browsing the Internet I stumbled across this site: *http://raconteur.net/infographics/the-greatest-inventions-of-all-time.* What interested me about his site, was that it never mentioned the invention of the battery (‘Voltaic Pile’) in 1800, by Alessandro Volta. Look around you. The modern world is dominated by the exploitation of electricity in all its forms, and all this stems, essentially, from Volta’s invention which, for the first time, provided a convenient, reliable, source of current electricity. I propose that the invention of the battery is tantamount to the invention of the modern world.

SIDEBAR: Two archaeological discoveries never cease to astonish me. First, the “Antikithera device’ (a navigation computer?) from ancient Greece, and second, the ‘Parthian battery’, an object that dates back to the *Parthian* period about 2000 years ago .

While building a railroad near Baghdad, in 1936, workers found what appeared to be a prehistoric battery, a clay jar, filled with a vinegar(?) solution. An iron rod surrounded by a copper cylinder was ensconced in the jar. If you were to construct a device to these specifications, you would have a ‘battery’ that produces 1.1 to 2.0 volts of electricity.

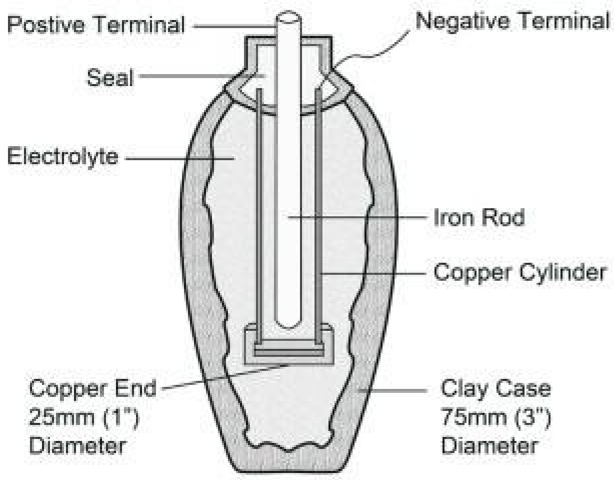


Figure 1: Parthian Battery.

Archeological evidence suggests the Babylonians were the first to discover and employ a galvanic technique in the manufacturing of jewelry by using an electrolyte based on grape juice to gold plate stoneware. There is evidence that the Egyptians are said to have electroplated antimony onto copper over 4,300 years ago, so not everybody accepts that the Parthian Battery was a source of energy, making it more likely that the device was used for electroplating, adding a layer of gold or other precious metals to a surface. (End of Sidebar)

Scientists In the late 18th century were fascinated with electricity. Ben Franklin's famous kite experiment, drawing electricity from lightning in 1752, had demonstrated that lightning is an electric phenomenon. Leyden jars, invented in 1746, could store charge and produce a spark of electricity. Charlatans were 'treating' patients with electric shocks for all sorts of ills.

Further research on electromagnetism and any practical use of electricity awaited a source of continuous current. In1800, Alessandro Volta's invention of the first modern battery, the 'Voltaic pile', opened the portal to the modern world.

Within a few weeks of the announcement of the invention of Volta's battery, William Nicholson and Anthony Carlisle, in England, had discovered electrolysis, how to use an electric current to split water molecules into their constituents: hydrogen and oxygen.

Hans Christian Ørsted, a Dane, accidentally discovered the connection between electricity and magnetism, while lecturing on electric effects. On 21 April 1820, during the lecture, Ørsted noticed that a compass needle was deflected from magnetic north when an electric current from a battery was switched on and off. This serendipitous observation confirmed a direct relationship between electricity and magnetism, a discovery that, however, was not due to mere chance: Ørsted had been looking for a relation between electricity and magnetism for several years. As Louis Pasteur remarked much later, 'Fortune favors the prepared mind'.

After more intensive investigations Ørsted established that an electric current produces a circular magnetic field as it flows through a wire. The special symmetry of the phenomenon was possibly one of the difficulties that retarded the discovery.

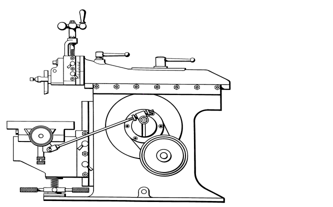
SIDEBAR: Italians sometimes claim that Italian Gian Domenico Romagnosi was the first person to find a relationship between electricity and magnetism, about two decades before Ørsted. Romagnosi's experiments showed that an electric current from a voltaic pile could deflect a magnetic needle. His researches were published in two Italian newspapers but were largely overlooked by the scientific community. (End sidebar).

The phenomenon that Ørsted discovered was studied both for its own sake and as a means of measuring electric current. Johann Schweigger at the University of Halle reported the earliest galvanometer in 1820. (André-Marie Ampère also contributed to its development). The effect of the magnetic field, generated by the current was increased by using multiple turns of wire, so the instruments were at first called "multipliers". The term "galvanometer," in common use by 1836, was derived from the surname of Italian electricity researcher Luigi Galvani, who in 1791 discovered that electric current would make a dead frog's leg jerk.

Originally, the instruments relied on the Earth's magnetic field to provide the restoring force for the compass needle. These were called "tangent" galvanometers and had to be oriented before use. Later instruments of the "astatic" type used opposing magnets to become independent of the Earth's field and could operate in any orientation

In 1821, the German–Estonian physicist Thomas Johann Seebeck discovered that a conductor, subjected to a thermal gradient, will generate a voltage. This is now known as the *thermoelectric effect* or *Seebeck effect*. Measuring this voltage necessarily involves connecting another conductor to the "hot" end so the additional conductor experiences the same temperature gradient and also develops a voltage, which normally opposes the original. The magnitude of the effect depends on the metal in use, and so a nonzero voltage will be measured if two dissimilar metals are used. After carefully calibrating the temperature-voltage dependence for a given pair of metals, these metals can be used as a thermometer.

In 1825/1826 George Ohm did his work on resistance and published his results in 1827 in the book *"The galvanic circuit investigated mathematically."* I have often wondered why it took so long to discover a relationship so fundamental – E = IR. Interestingly, it shows up the difficulties of his experiments, Ohm initially used voltaic piles, but inconsistent results drove him to switch to thermocouples as a current source, because they provided a more stable voltage source in terms of internal resistance and constant potential difference. He used a galvanometer to measure current, and knew that the voltage between the thermocouple terminals was proportional to the junction temperature.



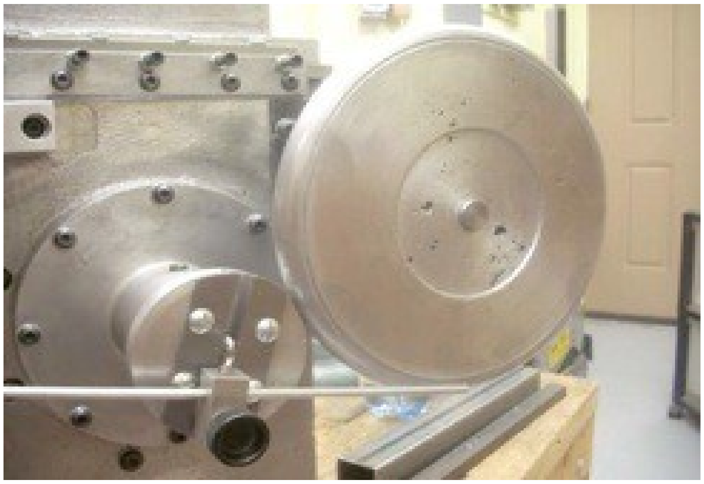
Metal Shapers

Kay Fisher

R. G. Sparber's Gingery Shaper - Part 67

Machining The Handwheel

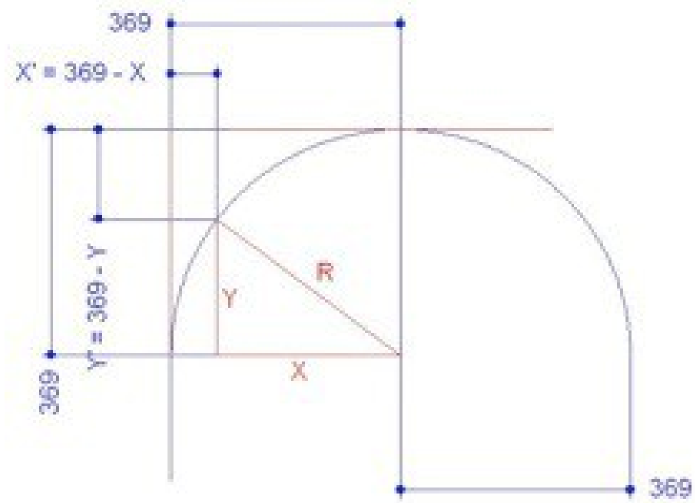
Gingery does not call for a handwheel but does mention the need to manually advance the shaper before running under power. A key feature of any handwheel that will spin under power is that it must not have openings that can catch fingers or hands.



Handwheel Mounted   Photo by R. G. Sparber

I have temporarily mounted the finished handwheel on the right side of the machine but this is not a good place for it. A finger can easily get caught between this spinning handwheel and the automatic feed mechanism.

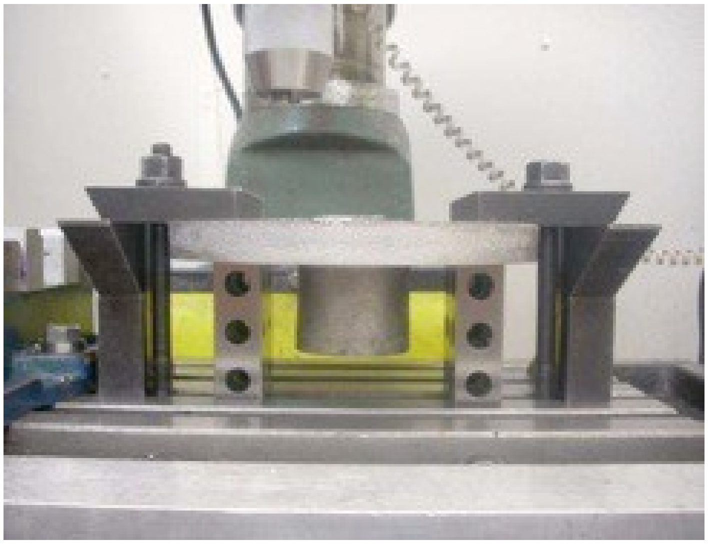
The perimeter is rounded and polished. The goal here is to have no spinning sharp edges. I could have rounded with a file but it would have taken a long time. Instead I employed a technique called Manual Numeric Control to cut this perimeter. This involves taking a series of 0.1” steps to rough out the shape and then going back and taken 0.01” steps. A file is then used to remove the remaining metal.



Equation   Drawing by R. G. Sparber

The first step is to find an equation that describes the shape I want to cut. Above is a cross section of the form to be cut as viewed from above. I measured the rough casting and see a width of 0.738”. My half circle will therefore have a radius of 0.738”/2 = 0.369”. Any point on this half circle can be defined by X and Y coordinates (shown in red). The trick is to reference those coordinates to a practical point. I have chosen the upper left corner. As viewed in front of my lathe, this would be the front right corner of the rough casting defined by the right face and the perimeter. I place the cutter at this corner and then zero both X and Y dials. My X dimension is along the lathe bed and is noted above as X'. My Y dimension is along the cross slide and is noted above as Y'. By moving X' in steps of known value, I will get a series of corresponding Y' values that tell me how much to feed in my cutter. All of this was done on a spreadsheet. If the math interests you, please contact me directly at **rgsparber@AOL.com**.

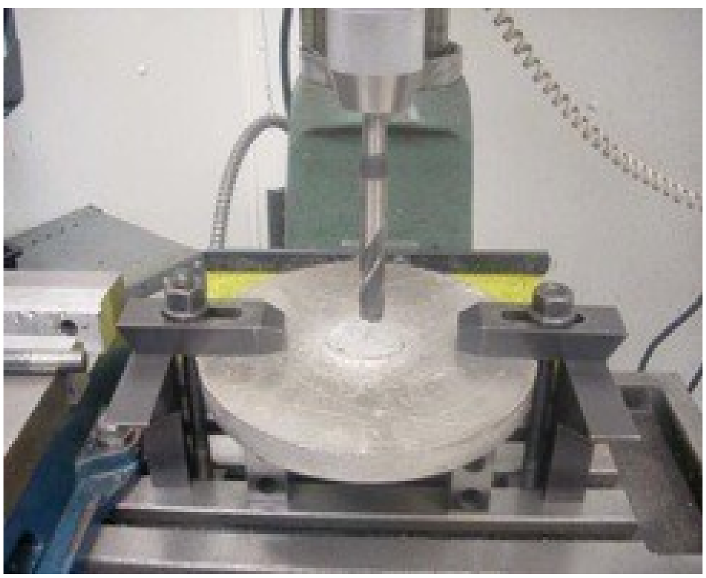
Although this is tedious work, it does go fast. I only had to make 4 cuts on each side at 0.1” per step. The 0.01” steps are more numerous but less metal is removed so they go quickly too. With the above drawing plus my spreadsheet in hand, it is time to make chips.



Casting on Mill Photo by R. G. Sparber

This rough casting is a second copy of the pulley pattern. A nice side benefit is that the mistakes I made on that pulley can be rectified this time.

I started out the same way by marking the center of the disk and drilling a hole for the mandrel.



Drilling Wheel   Photo by R. G. Sparber

Last time I went for a bored hole that was a nice sliding fit on the mandrel. This was not a good idea since the mandrel distorted slightly and jammed in the hole. This time I'm simply step drilling with a ¼", ½", and finally a $^5/_8$" drill. This is fast and produces a bit more room in the hole.

Mandrel Mount Photo by R. G. Sparber

This time I'm using a mandrel secured by screws but will only face the end of the hub and turn the perimeter of part of the hub true. I would have cut more of the hub but my ¼-20 grub screws have not arrived from Enco yet. Those bolts sticking out are not "cutter friendly". In fact, they aren't knuckle friendly either.

Cutting Hub   Photo by R. G. Sparber

I now have a surface on the hub that is true with the bore.

Hub Mounted   Photo by R. G. Sparber

I can now securely hold the hub in my 3 jaw chuck.

I have chosen a right hand cutter held in a boring bar. It was the only way to reach the entire perimeter of the casting. Here I have the cutter touching the right front corner and my X and Y dials are zeroed.

Cut in Steps   Photo by R. G. Sparber

This is not the best picture but maybe you can see the right half of the perimeter has been rough cut with 0.01” steps.

After rough cutting the right side, I moved the cutter over and cut the left side. Here you see the perimeter cleaned up with a file. That groove on the left is where I got confused and turned the dial the wrong way.

Finish Work   Photo by R. G. Sparber

I followed the file work with 220 grit paper, a 3M pad, and finally 0000 steel wool.

After Facing   Photo by R. G. Sparber

I trued the outer face. The recess came from machining an area with a fair amount of shrinkage. I didn't want to remove more metal to have it completely flat. Who knows, maybe I'll glue in a curved arrow in this recess to remind me which direction to turn the handwheel.

Finished Handwheel   Photo by R. G. Sparber

All in all, it came out very well.

Hub Side View Photo by R. G. Sparber

For reasons I can't explain, the uncut face looks fine so I won't mess it up by machining it.

This handwheel is rather heavy so should also act as a small flywheel. I'll mill flats in the axle so the two set screws securely hold the wheel.

Stay Tuned for part 68 from R. G. Sparber next month.

Keep sending me email with questions and interesting shaper stories.

My email address is:
KayPatFisher@gmail.com

Kay

CHARLES RIVER MUSEUM OF INDUSTRY & INNOVATION

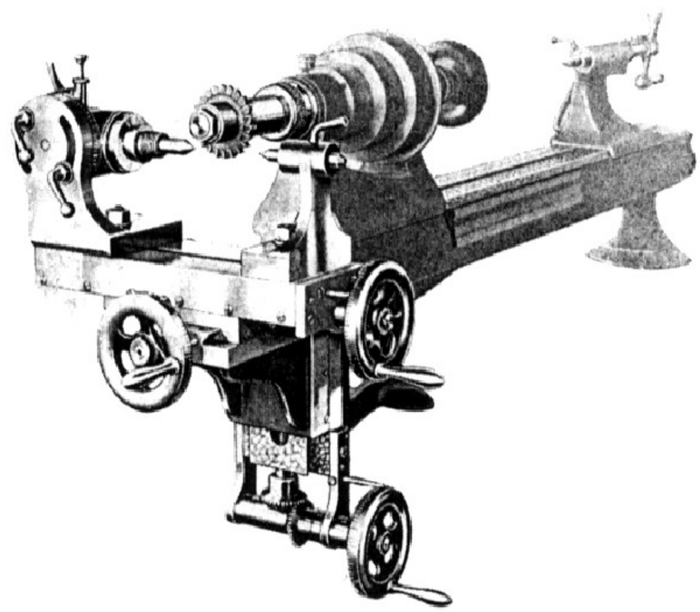
From the Museum

Dan Eyring

Stark No. 4 Precision Bench Lathe

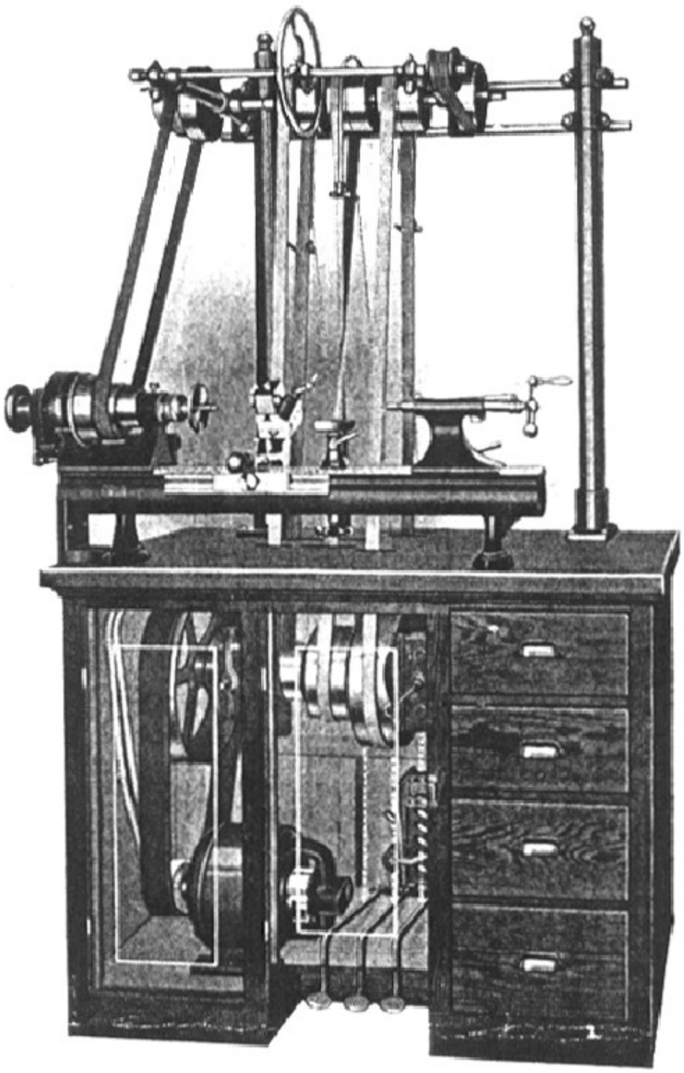
Stark Tool Company – Waltham, Massachusetts

The exhibit displays an example of the No. 4 Stark Precision Bench Lathe, put into production circa 1900. This early version of the No. 4 lathe includes a small table setup for use as a horizontal milling machine complete with a swivel dividing head and tailstock - with the cutter carried on an extension of the headstock spindle. The bevel-gear operated elevation control is a particularly compact and well-executed design.



The lathe is mounted on the manufacturer's superb iron-framed oak cabinet stand with self-contained drive system. The countershaft inside the stand carries three wide pulleys of different diameters with each driving up to its own fast-and-loose pulley on the overhead countershaft. The right-hand outer pulley within the stand provides a fast speed range, the outer left-hand pulley a slow range. The central pulley, mid-way in size between the outer pair, are arranged to provide a reverse drive - by the traditional means of putting a 180-degree twist in the belt. Any of the drives can be instantly engaged and disengaged by treading on one of three pedals which are connected, by wires, to the belt-shifting forks on the overhead countershaft.

Besides the lathe spindle, the countershaft also powers - via a 2 : 1 flat-belt pulley system at its right-hand end - a parallel shaft designed to provide a high-speed drive to milling cutter and grinding attachments held in the lathe's toolpost.



As was the case for all early model Stark lathes, the lathe design is based on a bed with beveled edges and a single central T slot that located the headstock, tailstock and fittings such as a compound slide rest. However, at the heart of the lathe's accuracy was a superbly-made, high-speed headstock spindle and bearing assembly based on a design already standardized for watch maker lathes wherein a hardened, ground and lapped spindle runs in glass-hard steel bearings - a system which represented the very best use of the materials and manufacturing techniques available in the late 1800s. The spindle and bearings were originally advertised as being manufactured from "*English steel*" - almost certainly a reference to crucible steel. The headstock design continued unchanged until the late 1920s when the option of precision ball bearing spindles was offered, at first to special order - and then only recommended by the makers for applications where very high speeds had to be sustained for long periods.

Stark's claim to be to be the originator of the precision bench lathe was bold and unequivocal (and printed on all their sales catalogs), with the first examples being built by John Stark personally in 1862, well before any of his competitors - who were also mostly from the Waltham area. The company was also famous for their watchmaker's lathes and also built a wide range of specialized machinery and tools for use in watch and clock-manufacturing and repair plants.

Although the Stark Tool Co. has now disappeared, the American tradition of very high quality precision plain-turning lathes is continued into the 21st century by both the Derbyshire and Levin companies.

[Source - http://www.lathes.co.uk/stark/]

If you would like to learn more about the fundamentals of lathes and the different kinds of lathes, please try out some of the links bellow:

What is a lathe?

https://www.youtube.com/watch?v=gIH6SAXWR5A

http://www.technologystudent.com/equip1/mlathe1.htm

What are the parts of a lathe?

http://www.lathes.co.uk/latheparts/index.html

What kinds of lathes are there?

https://en.wikipedia.org/wiki/Lathe

What are the origins of the lathe?

http://www.turningtools.co.uk/history2/history-turning2.html

What is a Bow Lathe?

https://www.youtube.com/watch?v=pDrdTC7qg2s

What is a Spring Pole Lathe?

https://www.youtube.com/watch?v=XEibt31OlCA

What is a Treadle Lathe?

https://www.youtube.com/watch?v=ASwxEfevJTk

For Sale

From Norm Jones:

For Sale: 1/2 HP 6" Carbide Tool Grinder,Import copy of Baldor grinder. Brand New! I have had it for a number of years but never set it up.

It also includes two brand new diamond wheels (fine and medium) and a cast iron pedestal stand.

Current retail value is approximately $500. I'm asking $325.

Call Norm Jones at (978) 256-9268