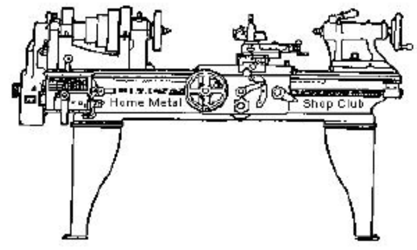
Home Metal Shop Club

# October 2005 Newsletter

Volume 10 Number 9




**Visit Our Home Page** **www.homemetalshopclub.org**

**Statement of Purpose:** *Membership is open to all those interested in machining metal and tinkering with machines. The club provides a forum for the exchanging of ideas and information. This includes, to a large degree, education in the art of machine tools and practices. Our web site endeavors to bring into the public domain written information that the hobbyist can understand and use. This makes an organization such as this even more important.* -- Founder - John Korman (deceased)

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## Next Meeting November 12, 2005

Dennis Borgman will speak on designing and fabricating a counterweight system for a professional observatory.

## Minutes of the October 10, 2005 Meeting

**by Steven Clay**

### Business Meeting

A well deserved scolding was given to the Secretary for not providing minutes from the prior 2 months. The Treasury balance as of 10-8-05 was $2,136.02. Further discussion of compiling a list of local new and scrap dealers friendly to small purchasers. The membership roster as of this coming December will be used for the annual member contact list.

### General Meeting

27 members attended the meeting along with two guests. Plaques were given to Dick Kostelnicek and Chuck West for their years of service to the Club.

Ron Blair gave a presentation about anodizing for the home shop. He discussed both large scale commercial methods and the methods advertised for home use.

The strengths and weaknesses of the various methods were given, the sources of the various chemicals required in the process listed, and talked about recommendations for power supplies and other hardware.

Dennis Borgman and Buster Wilson thanked the club for the information on fabrication methods of the counterweights for the new telescope being installed at the George Observatory. A private viewing session is offered to the club as thanks for the help.

An electric screwdriver was shown as a power feed for a mill.

Danny Bennett and Dirk Sumrall discussed their regulating valve stem design that prevents tire overpressure.


The novice SIG worked with parting tools and threading.

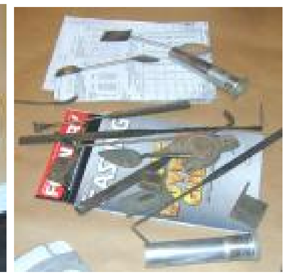
The foundry SIG mentioned that a mulling session will occur on a date to be announced.

**Prior Meetings**

On August 13, 2005 John Butler of Green Bayou Foundry gave an entertaining presentation on commercial iron casting methods.

He discussed various alloy mixes, the complete casting process, and the tools used. He discussed the pricing method used in calculating job costs. He also discussed his personal experience in casting in his back yard.

Particular emphasis was placed on mold design and construction.

## Articles

### Radius Machining on the Lathe
**by J. R. Williams**

The drawing describes a simple method of machining a Radius on a Lathe. The accuracy of the Radius is dependent on the making of the space Rod. The drawing shows the use of a "prick punch" mark being used to locate the rod but I have had success with the rod being sharp enough to push thru the paint and lightly mark the lathe at both ends. I have found the system to work well for the larger radii than my Holdridge unit will handle and easy to obtain the desired radius while being repeatable.

After the Show-n-Tell session I tried to describe this method to two club members and decided the best way was to obtain an original article from a Lindsay reprint Procedures in Experimental Physics, by John Strong.

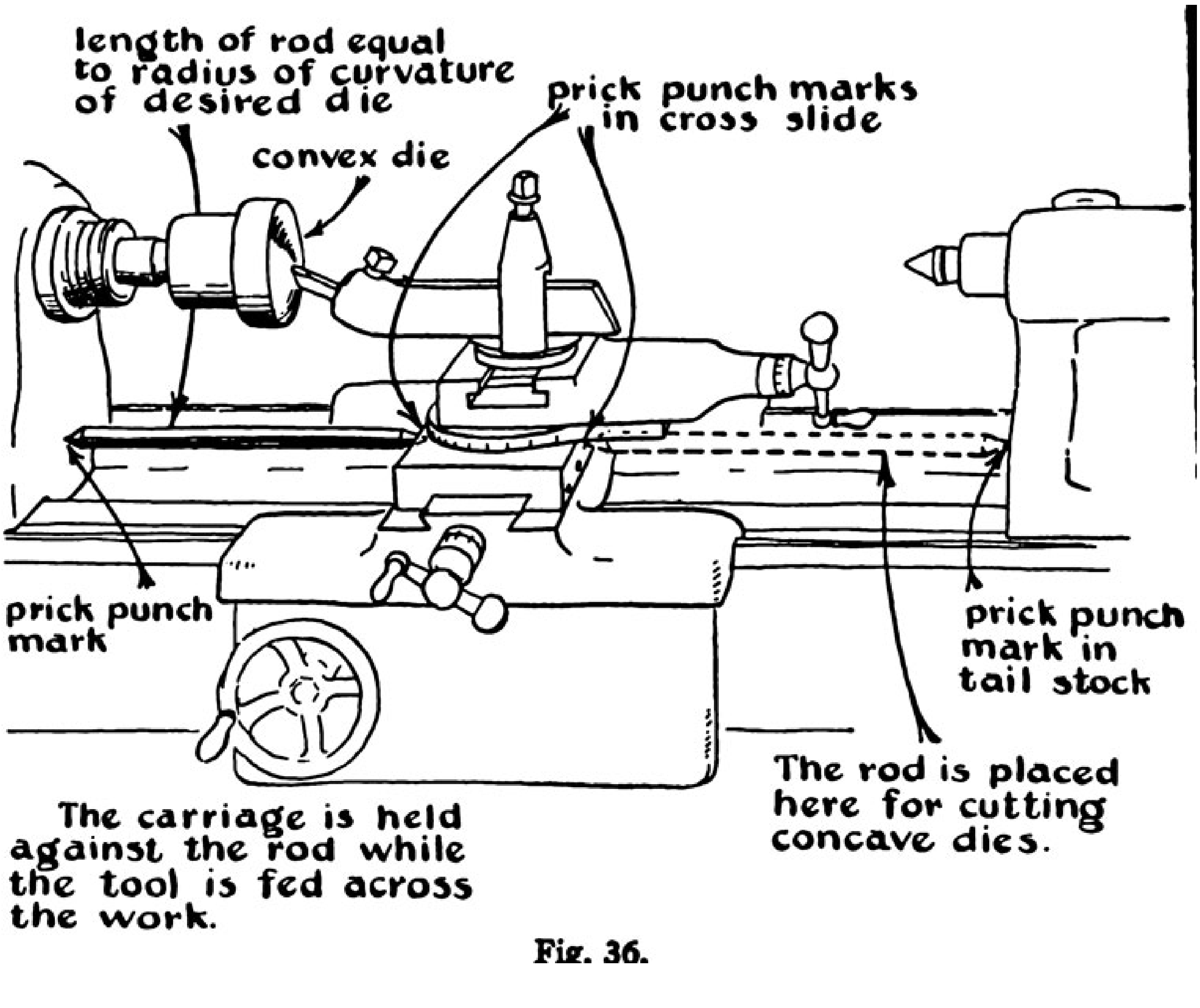



Fig. 36.

# Magnetic Drill
**by George Carson**

What do you do when you have to drill 170 holes in a big piece of 9/16" plate?

I built a worktable for the shop from a nice piece of 9/16" A36 steel plate. The plate is 36" x 72" and weights about 425 pounds. One of the things I wanted was a grid of 3/8-16 threaded holes for holding things to the table. Drilling all those holes was going to be a problem since the plate was too big for my Bridgeport, so I rented a Magnetic Drill Press from a local tool rental place. The machine was much larger than I anticipated. It must have weighted close to 100 pounds. It worked pretty well. It has a large electromagnet in the base that allows it to hold down to the plate with over 1000 pounds of force. I had center punched all the hole location beforehand, so it was just a process of dragging the machine in place, lowering the quill so that the point of the drill bit picks up the center punch. Then I turned on the magnet and started drilling. It took about 1 minute to locate and drill the hole, so it was less than 3 hours to drill all the holes. After I finished drilling the 5/16" holes, I drilled 8

more for tapping to ½-13 to hold the bench vise.
I tapped the 3/8-16 holes using a big Dewalt cordless drill and the ½" holes were tapped by hand. In both cases I used spiral pointed taps.

The Magnetic Drill cost about $50 to rent, but it was well worth it in the end.

# Measuring Tapers

**Dick Kostelnicek**

Determining the taper of a male shaft or a female socket can be challenging, especially when it must be measured insitu. Sometimes the tapered part can be chucked or mounted between centers in a lathe. Then, a dial indicator and longitudinal DRO ( Digital Read Out ) can be used to get the taper directly. My task was not so easy. I had a large skid-mounted gas engine with a tapered work shaft attached to the crank as shown in Figure 1. I needed to convert it to a straight keyed shaft by duplicating a female taper in a short length of round bar stock that would slip over the taper.

Now, tapers are designated as the change in diameter per unit length along a shaft. This is twice the value of the trigonometric tangent of the angle between the shaft's sloping side and its axis of rotation. A typical taper might be called out as 3/16 inch per inch or equivalently 1-1/4 inches per foot. Just remember when turning a taper, the angle that the cutting tool's path makes with the lathe's axis of rotation is half the full taper's angle.

Most tapers on commercial machinery are of reasonable value, such as so many sixteenths of an inch per foot. In order to determine my taper, I wrapped and then pasted together a paper pattern around the shaft. The result was a tight fitting conical template as shown in Figure 2.

Figure 1

Figure 2

The paper template was removed from the shaft and flattened by placing it under the weight of a book. Figure 3 shows how I measured the angle between the two edges of the flattened cone. The formula for determining the shaft's taper from the flattened cone angle in degrees is shown in the upper left corner of Figure 3. I measured an angle of 16.7 degrees, The taper was calculated as 0.1864 inch per inch. It is a sure bet that the taper of the engine's shaft is 3/16 inch. per inch = 0.1875.

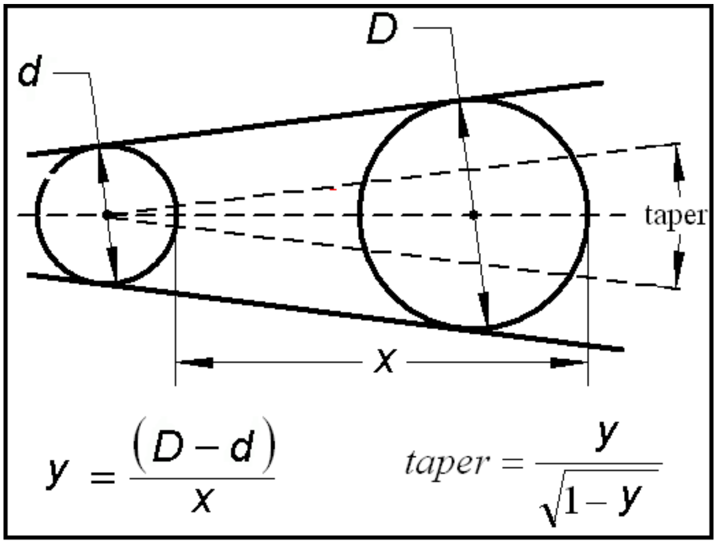

Figure 3

A mating female taper for the engine shaft was on the armature from a close coupled electrical power plant as shown in Figure 4. The two ball method was used to measure this internal taper. Figure 5 shows the measurement of the depth to which a ball penetrated into the tapered hole. Then, a second larger ball's depth was measured and the differences in depth for the two balls was recorded. Make sure the balls are in full contact with the tapered surfaces and not bottomed out in the hole.

Figure 4

Figure 5

Figure 6 shows the equipment needed to measure the ball's depth of penetration into a tapered socket. Drawing 1 illustrates that the taper is calculated from the ratio Y equal to the differences in ball diameter D - d = 0.1565 in. (in my case) to the differences in depth of penetration X = 0.910 in. The calculated taper was 0.1890, nearly the suspected shaft taper of 0.1875.




Drawing 1

Figure 6

Figure 7

Figure 7 shows a taper-to-straight shaft adapter that I made to slip over the engine's shaft. The adapter is secured by a bolt that threads into the end of the engine's shaft (see Figure 1). The female taper was turned at 3/16 inch per inch with the lathe's compound slide. This makes for a full taper angle of about 10 degrees, just right for a self holding taper in steel. The outside of the adapter was turned without rechucking the part. Doing the two operations together insures concentricity of the taper and outer shaft diameter. The keyway was cut with an end mill.

Author's Note: If you're familiar with tin smithing, you'll recognize that the formula shown in Figure 3 relates a cone's angle of revolution to the angular sector of a circle needed to cut out a funnel from a flat sheet of metal. The formula shown in Drawing 1 is just a recasting of the two-disk method for determining a taper as shown in Machinery's Handbook,. There, the separation of the ball centers is used. However, that is not what is measured directly. So, I wrote the formulas in terms of the differences in depth of penetration of the ball's top surfaces into the tapered hole.