# **PROJECT - WHISTLE**

#### Lathe Project

The Purpose...

In this activity you will use the Milling Machine, Drill Press, a Machine Lathe, and a Buffing Wheel, to fabricate a whistle.

You will learn how to cut out stock, mill, drill, face, centre drill, and taper.

#### **READ THESE INSTRUCTIONS THOROUGHLY BEFORE YOU BEGIN!**

#### BEEP THE QR CODES TO GO TO EACH VIDEO SECTION ightarrow

For this activity you will need the following:

• 1/2 x 4" Aluminum rod	Single-cut file	
• 1/4 x 5/8" Wood dowel	<ul> <li>Sandpaper in various grits</li> </ul>	
• Ruler	Demonstrated safe use of Milling Machine	
• Scriber	Demonstrated safe use of Drill Press	
<ul> <li>Centrepunch</li> </ul>	• Demonstrated safe use of Machine Lathe	
• Hammer	<ul> <li>Demonstrated safe use of Buffing Wheel</li> </ul>	





#### CONSIDER ADDING UNIQUE AND AWESOME DESIGN FEATURES AS YOU GO!



#### SAFETY

You should wear eye protection ANY TIME you are working in the shop.

Get some now.



#### STOCK BREAK OUT & LAYOUT

Use a HACKSAW to cut a piece of 1/2" diameter aluminum rod to 3" (75mm) long



Use Soft Jaws to protect the metal from the vice



Mark a line 5/8" (16mm) from one end



Ruler Not To Scale





This locates the start of our cut

### MILLING

The Milling Machine can do many things, but mainly it is used to make things very flat. We will use this machine to cut a flat notch in the end of the Whistle.

The machine looks big and scary, but it actually is one of the easiest machines to use. It is BIG and STABLE, and gives a nice cut because it won't VIBRATE.

Set the Milling Machine Dividing Head to  $20^\circ$ 





Insert the Aluminum Rod into the chuck, sticking out about THREE FINGER WIDTHS (and **TIGHTEN** the chuck!!!)



My kid helped me machine some engine parts on a Mill when he was 8 years old. You got this.

Use the HAND CRANKS to position your project so that the RIGHT EDGE of the Milling Cutter can JUST TOUGH the the 5/8" mark



Move the table towards youto clear the cutter, raise the TABLE HAND CRANK 1/4 turn, then move the table SLOWLY away from you, into the cutter, until you have cut a wee notch in the metal, then bring the table back towards you.

Raise the table another 1/4 turn at a time and take another cut, until the LEFT edge of the cutter JUST touches the work.

The goal is to have a 5/8" cutter cut a 5/8" wide cut in your aluminum. **NO DEEPER!** 



The NOTCH must be the SAME WIDTH as the CUTTER

A 5/8" (16mm) cutter MUST make a 5/8" (16mm) wide notch

Look at it, and make sure!

### **CENTER PUNCHING**

Center Punching makes a wee dent in the metal for the drill bit to follow. Without it, the drill bit will go heaven knows where, but not where YOU want it to go. Center Punching is ALWAYS done before drilling

Centerpunch the location of the keyring hole 3/16" (5mm) from the non-milled end

*Use the sort-of rounded part at the back of the vice – it holds round metal super sweet* 





The hole we drill hole should be PARALLEL with the slot

Look at the drawing on the front page

You want a fairly DEEP and MEANINGFUL center punch mark. If it's too tiny, the drill bit will wander off, bend, and probably break.





Be Safe! Safe! Always wear Eye Protection!

### DRILLING

The Drill Press does a sweet job of putting holes in things

Clamp the Whistle into the Drill Press Vice

....With the center punch mark at the ABSOLUTE TOP

....With the center punch mark on the whistle in the MIDDLE of the vice jaws

....With the vice CLAMPED DOWN to the drill press table

Drill with a 1/8" bit, all the way through, and <u>lighten up</u> your pressure near the end! (Drill bits breaking through, like to break off)



#### DO NOT DRILL THE VICE!



## FACING on the LATHE

"Facing" is making one side perfect. In the case of the lathe, we will make one end perfectly flat.



Insert your work into the Lathe Chuck, sticking out no more than a Thumb Width (16mm).

Place and adjust the cutter as shown in these SIDE and TOP view.



The Lathe can do many things, but it is best used to machine round things. We will use this machine to cut the ends of the Whistle FLAT and TAPER them, as well as DRILL a hole for the reed.





#### TOP VIEW



Make sure the lathe is set to 630rpm. The gears are moved when the machine is OFF.

SET SPEED LEVERS LIKE THIS

With the machine OFF, rotate the chuck BY HAND to make sure nothing is going to hit.

With the cutter taking off only a sliver, turn the CROSS-FEED slowly to machine a nice, smooth, flat end. This is "Facing." Face **BOTH** ends.



# TAPERING on the LATHE

"Tapering" (AKA "Chamfering") is making something get smaller at an angle.

Set the **COMPOUND REST** to **20°**.

Adjust the TOOL HOLDER so it's holding the CUTTER at 90° to the direction of travel.



You will be cutting using the **COMPOUND FEED ONLY** (shown).

You will be using the cutter **TIP** to cut (*the corner, not the flat side*).

**ONLY** use **COMPOUND FEED** to cut.

**ONLY** use the tip of the cutter, **NOT** the flat.

#### DO NOT USE THE OTHER WHEELS TO CUT

Cut a taper until you have 1/4" (6mm, roughly HALF) of the flat faced end remaining.

Taper **BOTH** ends.



The Compound Rest can be rotated once you loosen the two big nuts that hold it down (one shown in this picture). Lock it down TIGHT!





### **CENTER DRILLING on the LATHE**

Place a Chuck and Center Drill in the tail stock

Set the Lathe Speed as FAST as it will go (too slow, and you risk breaking the drill).



Drill HALF-WAY UP THE DRILL TAPER ONLY - NO DEEPER! -

Drilling Speeds are like Sumo Wrestlers – the bigger they are, the slower they run



Center Drills are **DOUBLE-ENDED** so that when you break the tip you still have another tip.

In English, this is called "foreshadowing."



## **DRILLING on the LATHE**

Replace the Center-Drill with a **15/64" drill** ("fiftheen-sixty-fourths"). It must be EXACTLY this size.

CHECK AND MAKE SURE! DON'T TRUST THAT ANYONE PUT IT BACK PROPERLY!



Drill this as 2-1/4" deep - do not **BURY** the **FLUTES** (the spirals that the chips come out of). USE CUTTING OIL (brown can), and BACK the drill out several times to clean the chips out as you go. NOTE: The tailstock has a RULER on it for measuring drilling depth!!

The deeper you drill, the whistle will toot a LOWER pitch; the shallower you drill, the whistle will toot a HIGHER pitch.

If you don't let the chips out, the chips will jam, break the drill bit off in your project, and you start over.

I will likely laugh at you for not following directions.





### **MAKING the REED**

Cut a piece of 1/4" wood dowel to the same length as the end of the whistle to the notch.

It *should* be 5/8", but stranger things have happened.





**FIRMLY** hold dowel in **FINGERS** (not a vice) and file one side flat to <u>exactly 5.5mm width</u>. Not 5mm, not 6mm, 5.5mm exactly. If you cannot find "mm" on a ruler, ask a friend for help.



Just like your finger is rounded so it can fit up your nose, ROUND the edges of one end slightly



Align the FLAT of the reed with the FLAT of the Whistle, and press the reed into the open end of the Whistle



Give it a test toot, and adjust the reed location if necessary. You want it to be loud, with minimum effort.

# POLISHING

Clean up any burrs, nasty edges, and gouges, with a single-cut (smooth) file.

With 400 grit sandpaper and water:

"sand it 'till yo can't stand it no mo"

More time sanding, means less time polishing. Trust me.



Polish on the Buffing Wheel to a lustrous sheen on the bottom of the wheel so it doesn't catch and hit you in your own face with your own project. Bet you wish you had eye protection on now, eh?

If the surface isn't total bling eye candy, you need to SAND IT MORE.

#### Polishing scratches just gives you polished scratches.

FILING removes CUTTINGMARKS.

> SANDPAPER removes FILE MARKS

POLISHING removes SANDING MARKS

GOOD WORK equals HIGH MARKS



HAND IN YOUR AWESOME, PERFECT, POLISHED, WORKING WHISTLE, FOR HUGE MARKS!!!

#### AS PER PLANS: "B" ADD COOL EXTRA LATHE DETAILS: "A"