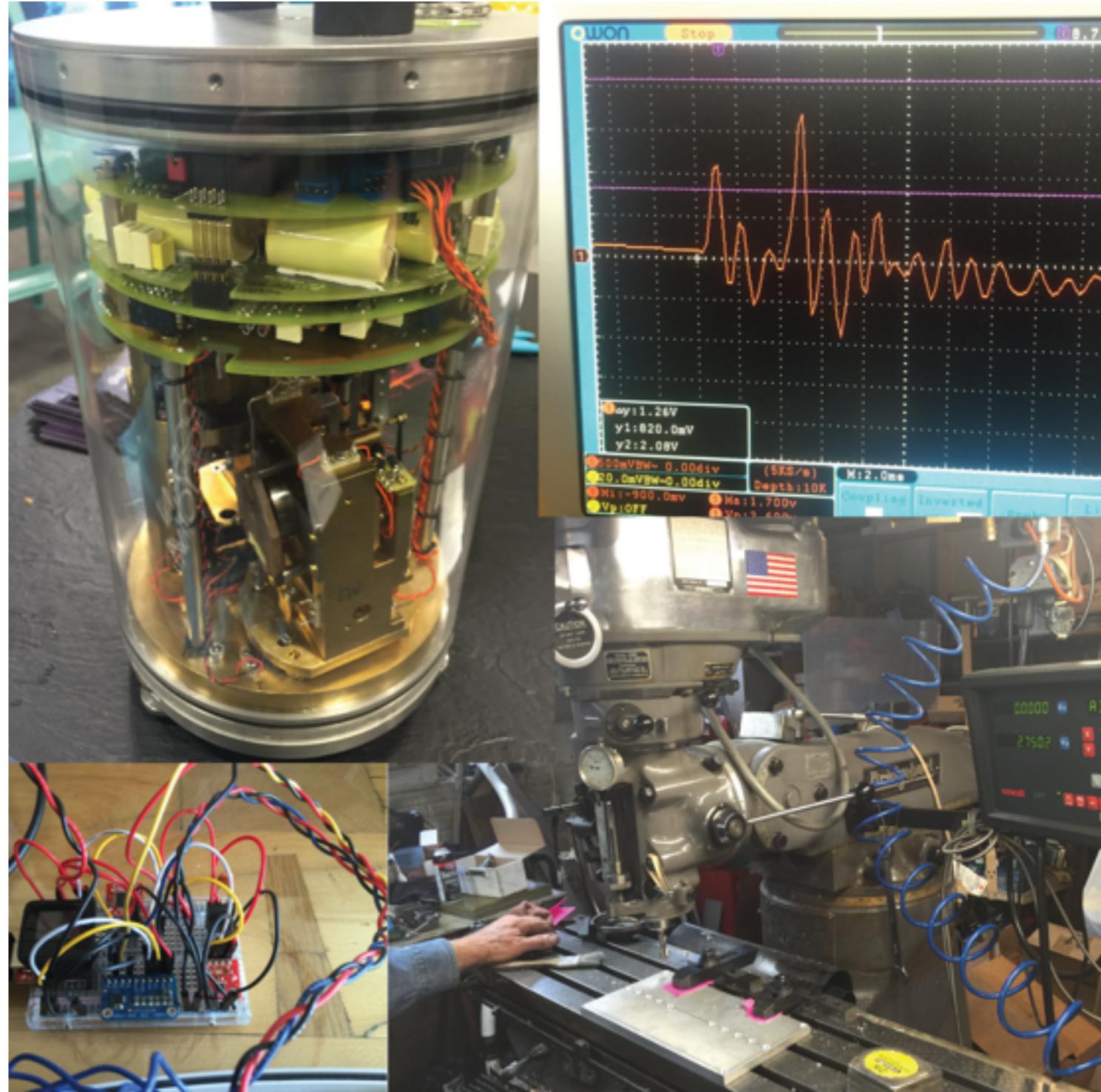


Tools and Shop Processes

J.R. Leeman and C. Marone

Techniques of Geoscientific
Experimentation

September 1, 2016



Checkout this section of the course website

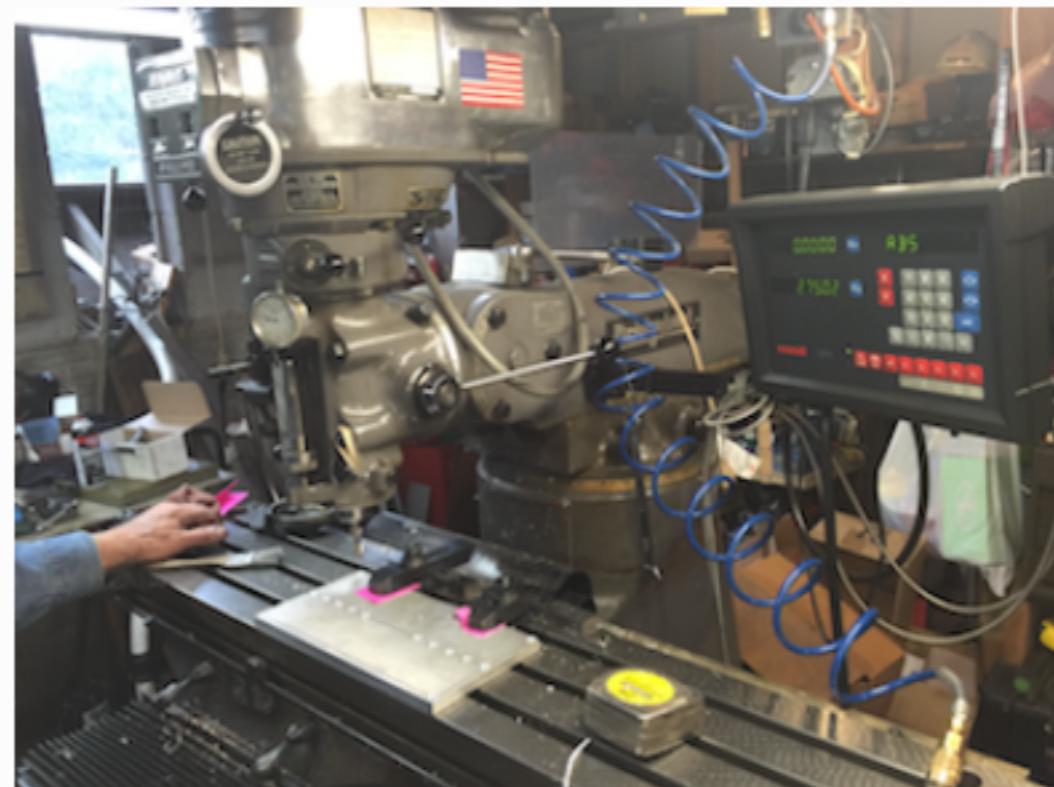
[Docs](#) » Shop Tools and Practices

[Edit on GitHub](#)

Shop Tools and Practices

This course involves making things to accomplish scientific tasks. Making things necessitates the use of tools and mechanical/electrical workspaces.

Learning which tools are used for certain tasks, how to use them safely, and how to care for the equipment are essential for success in the shop. In this section we introduce you to the basic tools that you will encounter and how to go home with all of the fingers and eyes you came to work with.



Contents:

- [Hand Tools](#)
- [Machine Tools](#)

<http://tge.geoscience.tech/en/latest/content/shop/index.html>

Safety is the most important thing when working in the lab or shop



Always wear appropriate clothing in the lab or shop



Never work alone



Protective eyewear should be worn at all times



Wear hearing protection when necessary



Gloves are valuable or harmful depending on the process



Never touch a rotating part or blade, even if it is moving slowly



Image: 4x4earth.com

Never stand in front of a grinder

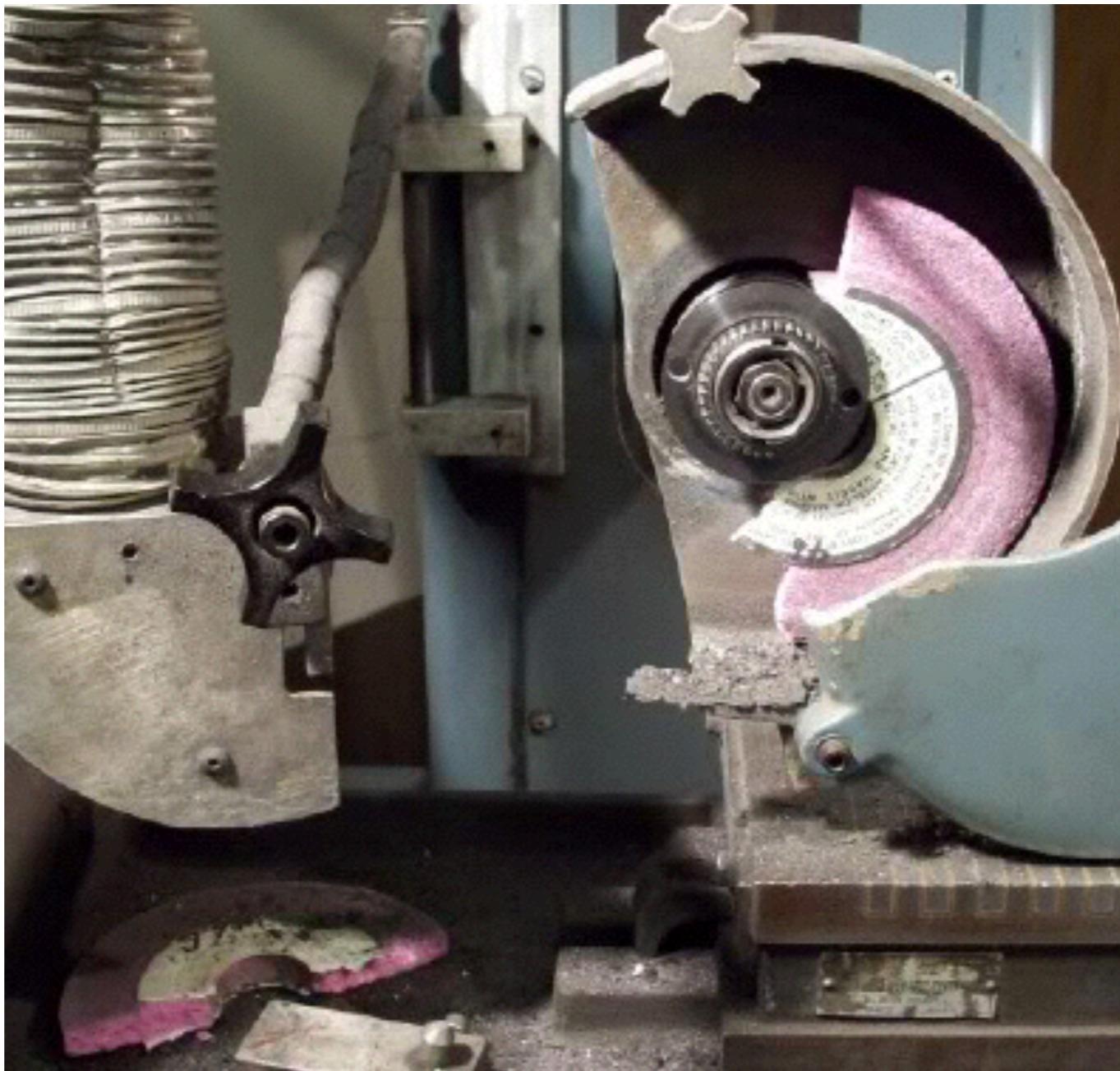


Image: homeshopmachinist.net

Always think ahead



There are many ways to fabricate parts

- **Machining**
- **Casting**
- **Sheet Metal**
- **Welding**
- **Printing**

Machining removes material from a stock metal



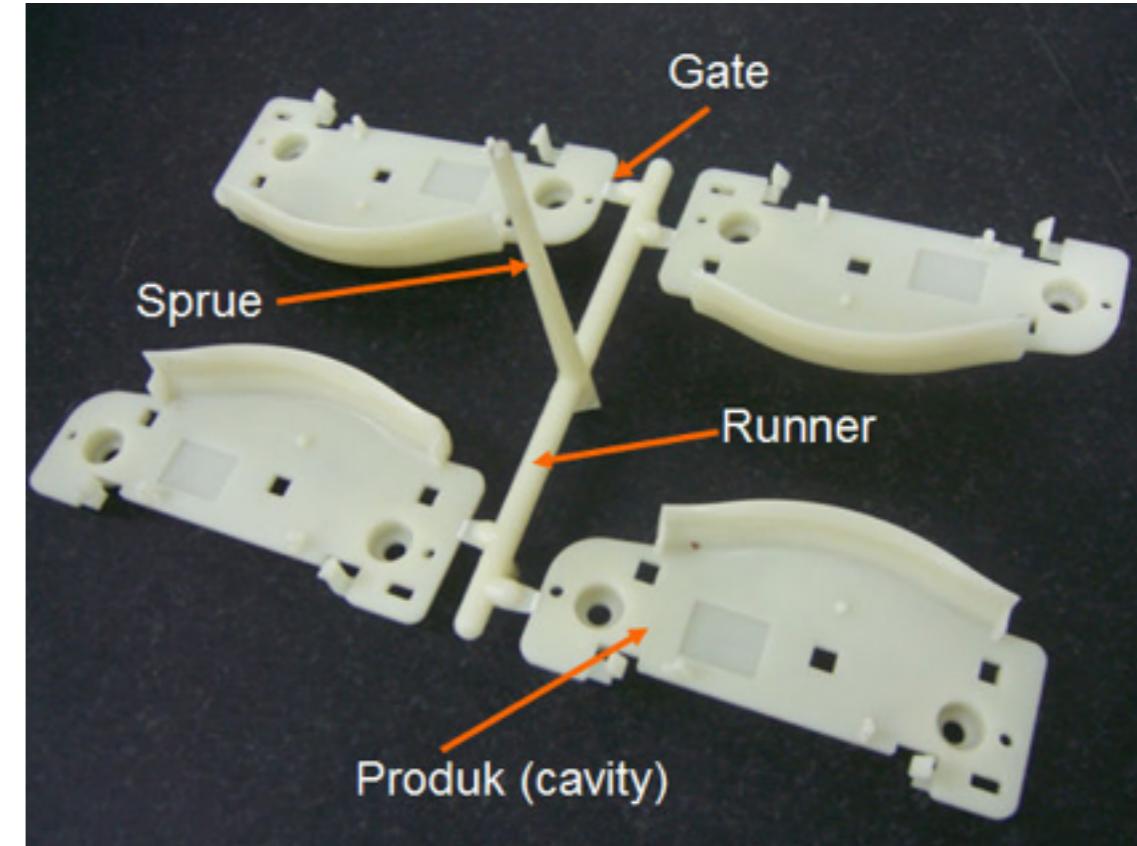
Casting and molding create a part from a pattern out of plastic, metal or other materials



Images: [wikipedia.org](https://en.wikipedia.org)



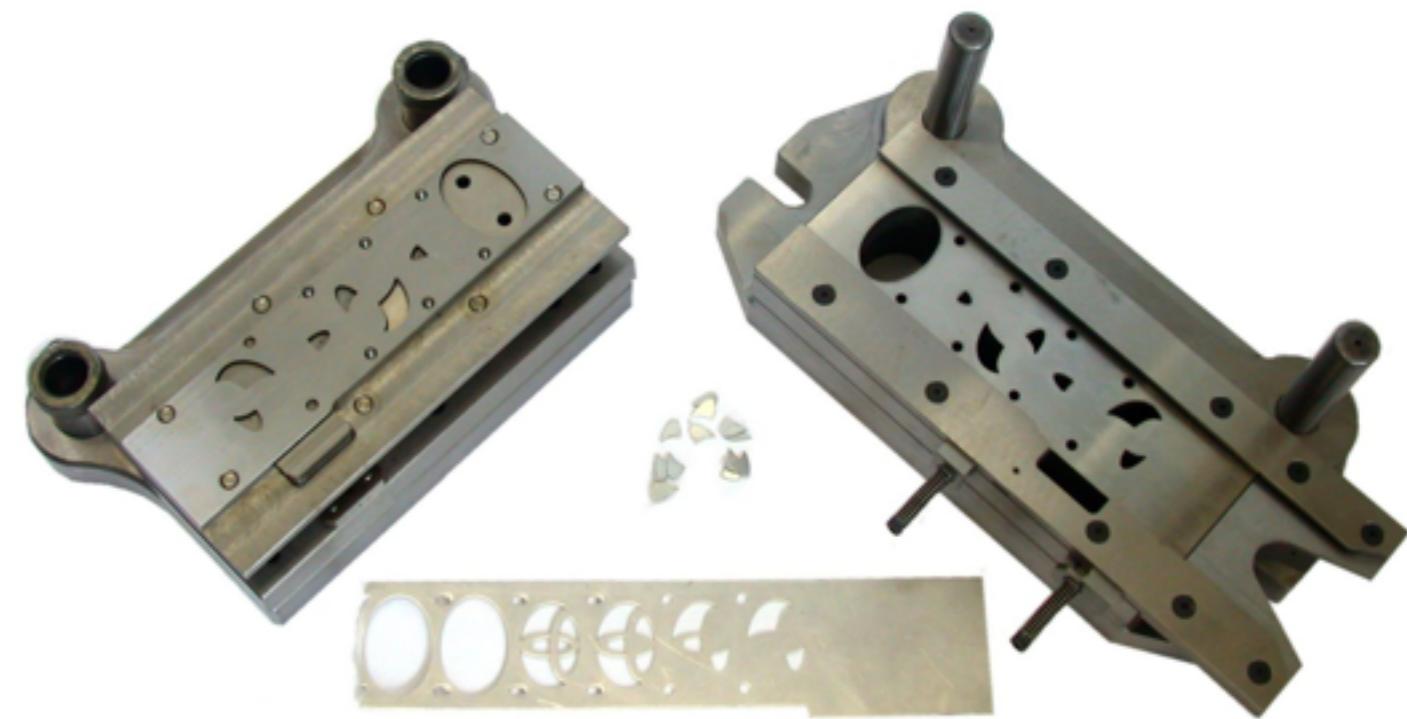
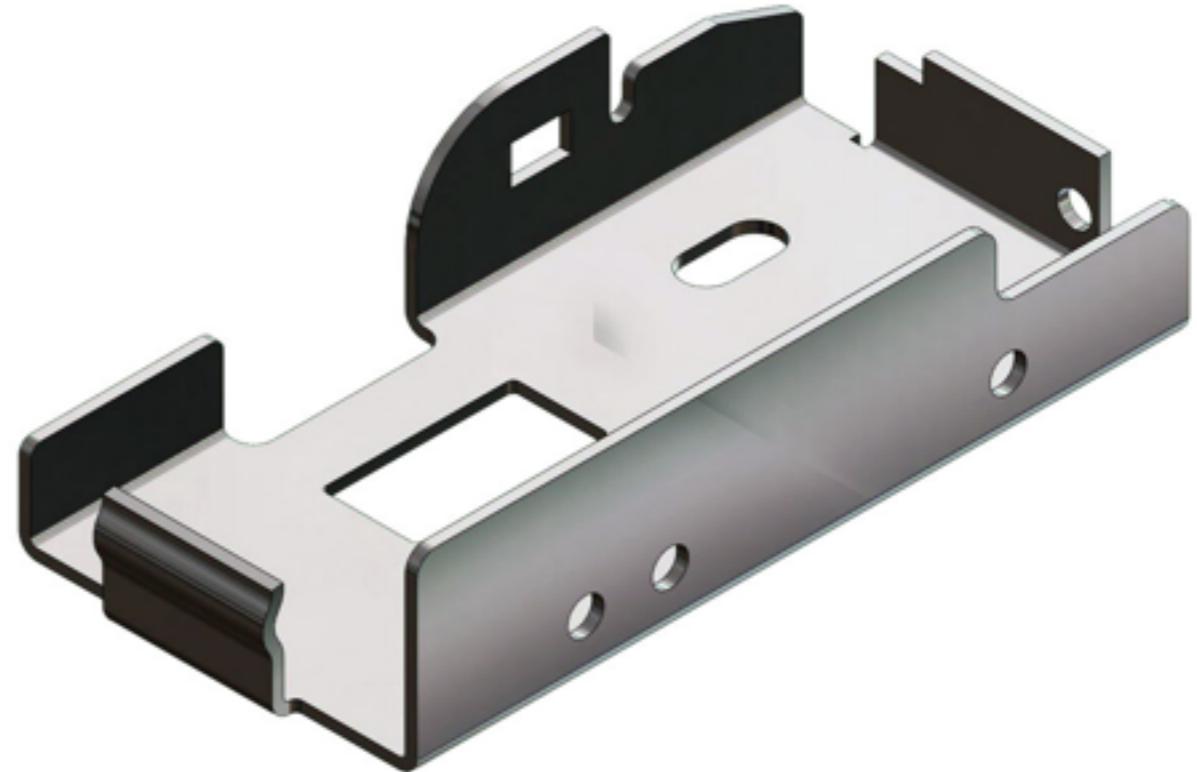
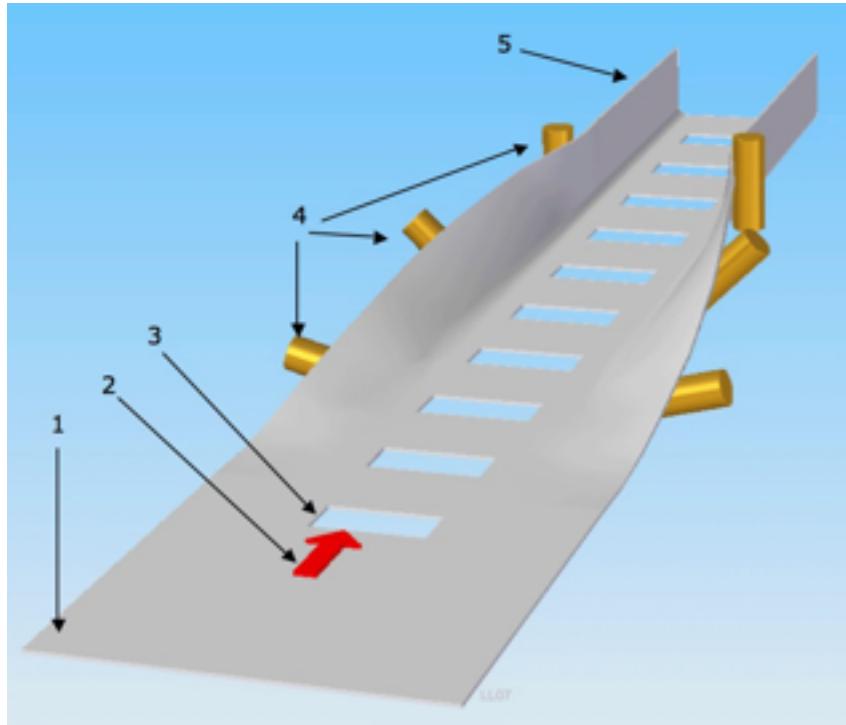
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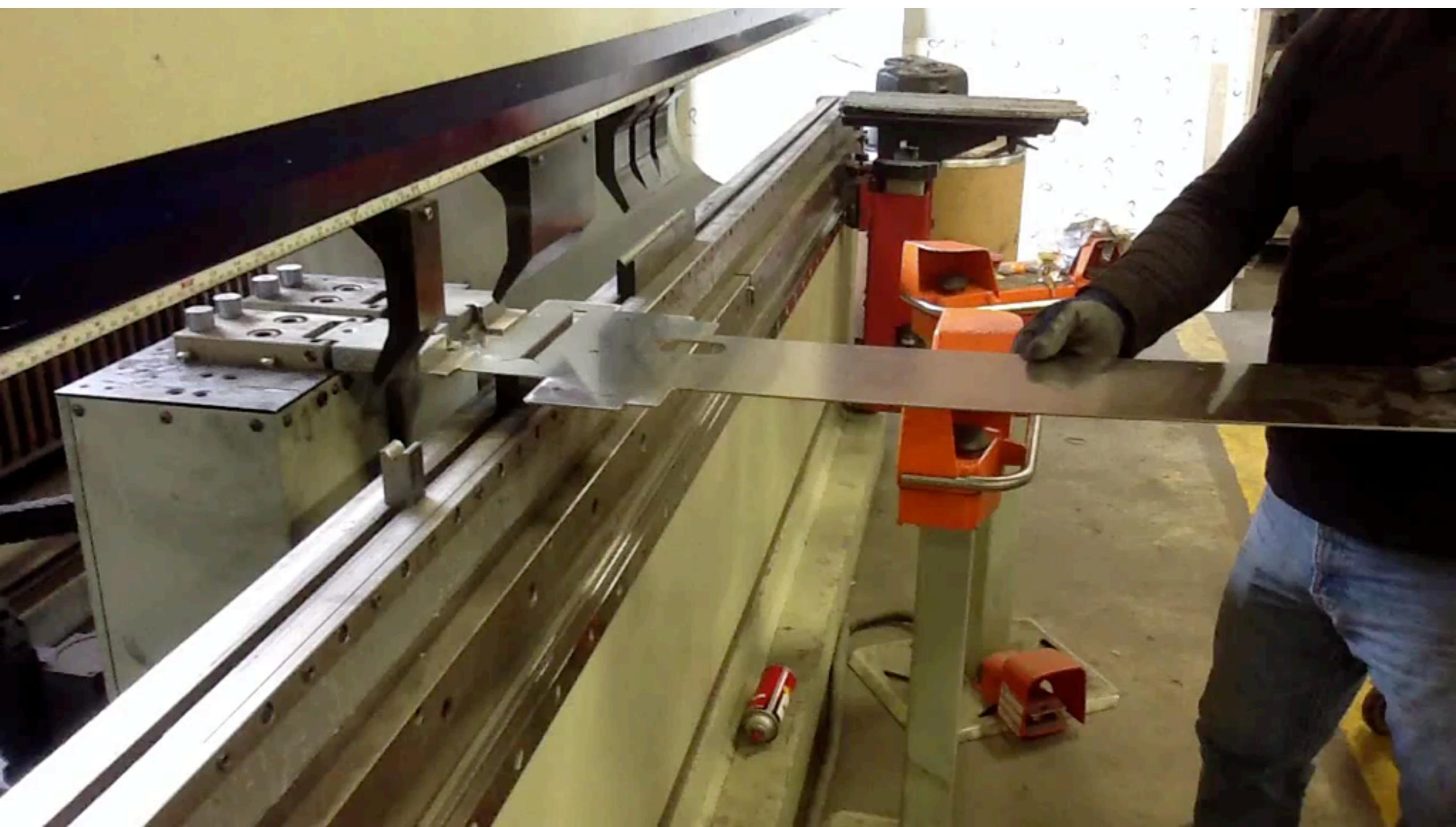
Images: [wikipedia.org](https://en.wikipedia.org)



Sheet metal work can make strong and thin parts



Images: [wikipedia.org](https://en.wikipedia.org), vibadirect.com





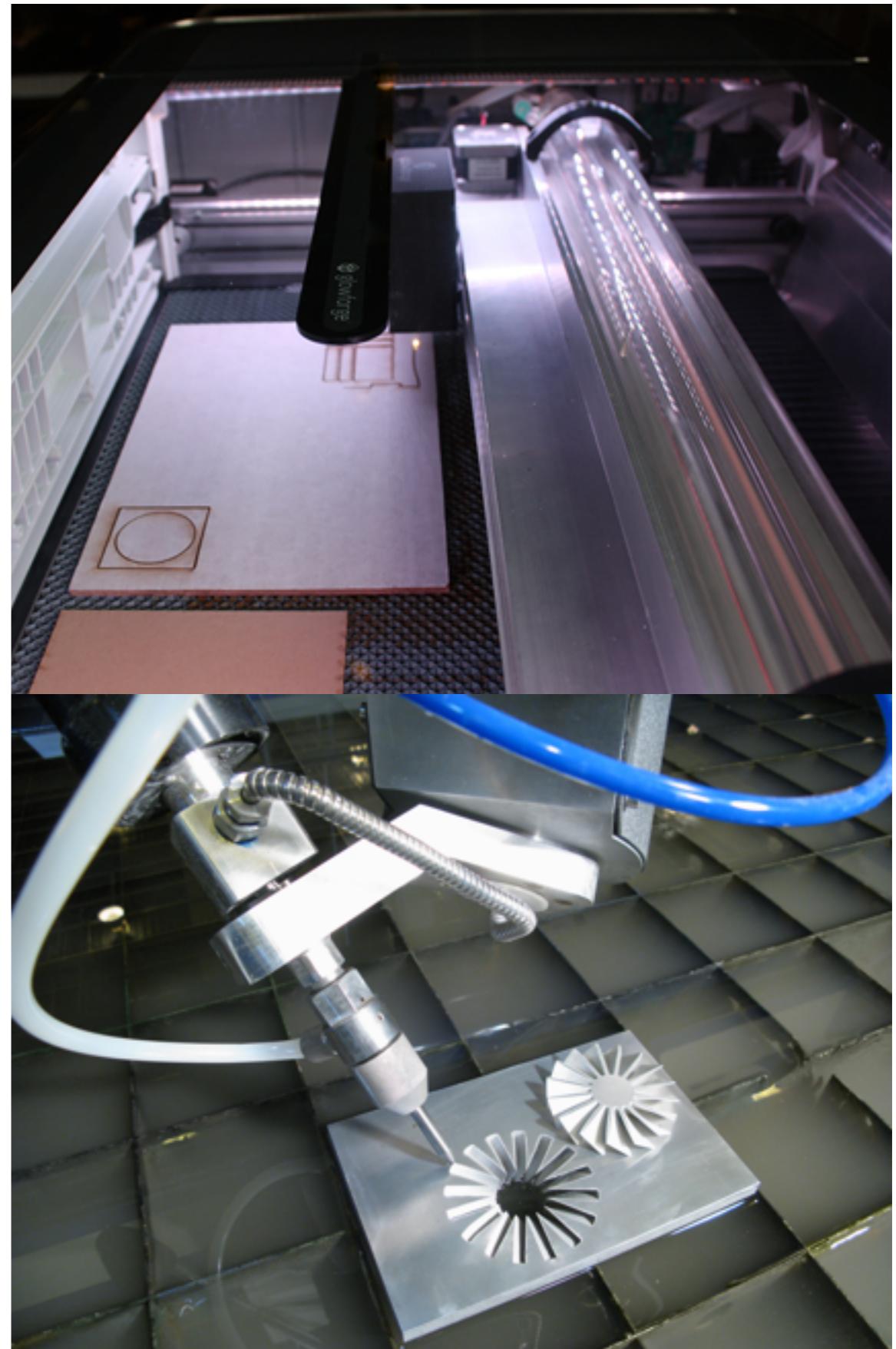
Welding joins most metals together with a very strong bond



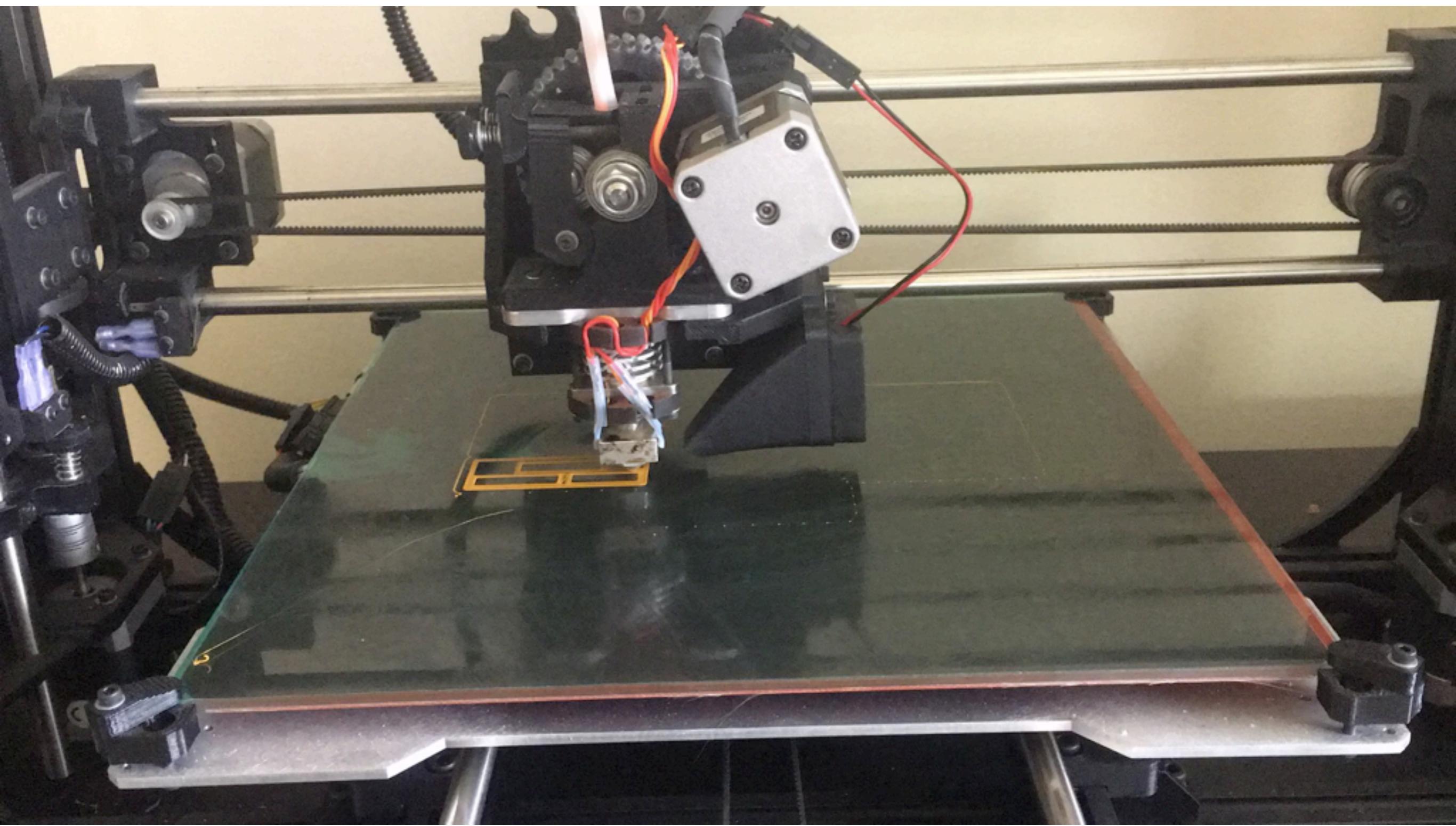


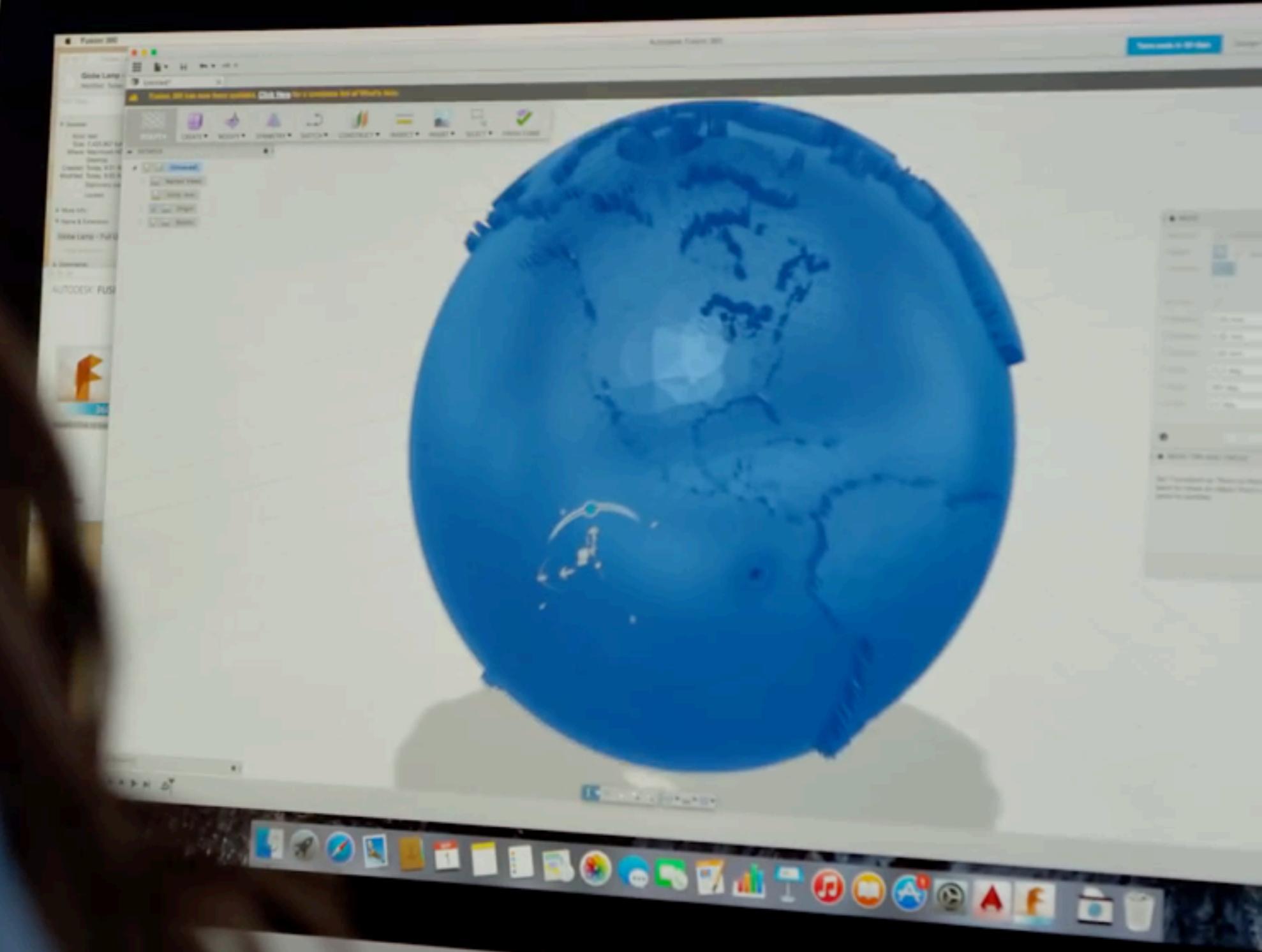
<https://youtu.be/ogyBd0CWbS8>

“Printing” is a NOT new way of creating quick prototypes



Images: [wikipedia.org](https://en.wikipedia.org), [glowforge](https://glowforge.com), [SparkFun](https://sparkfun.com)

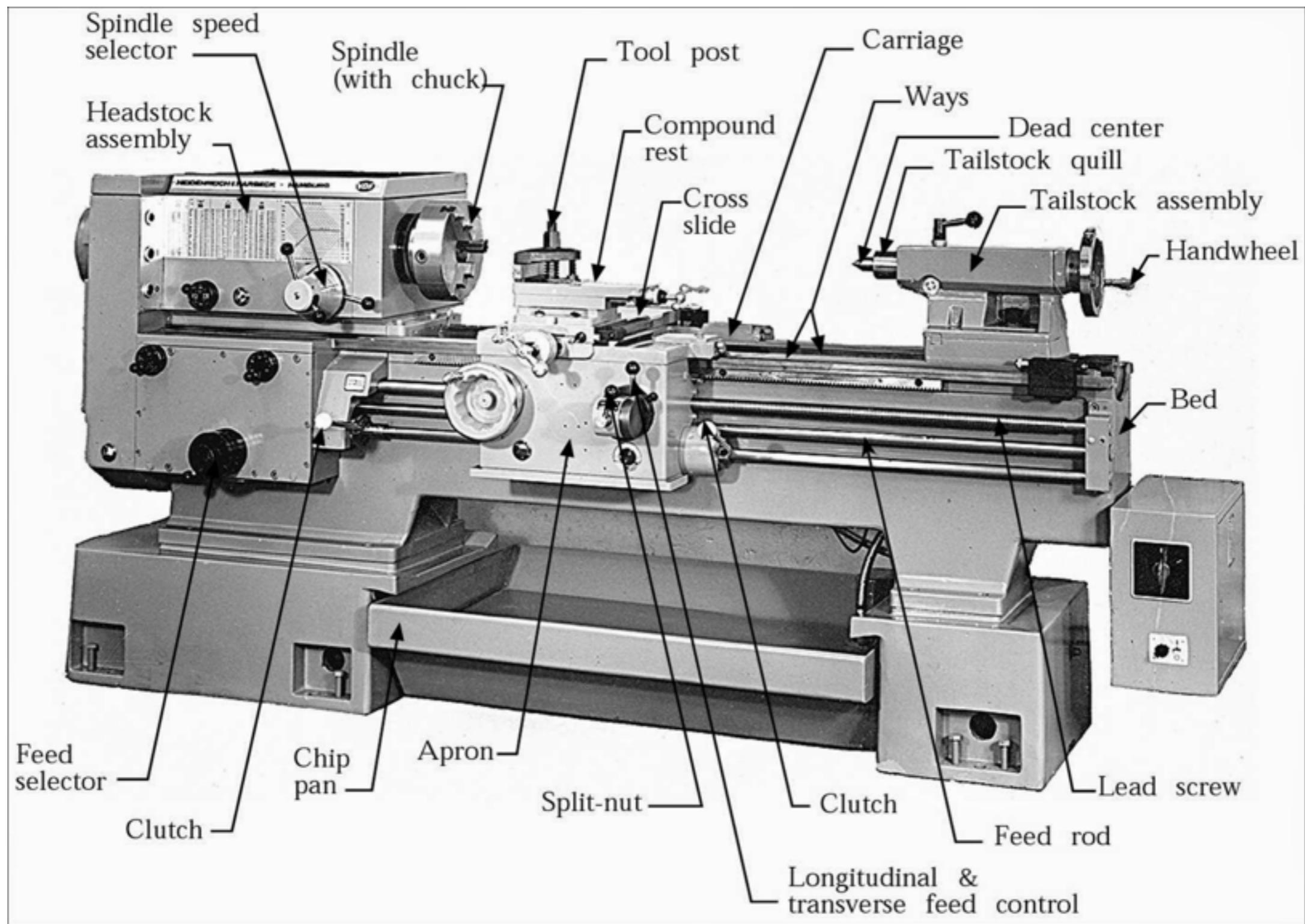


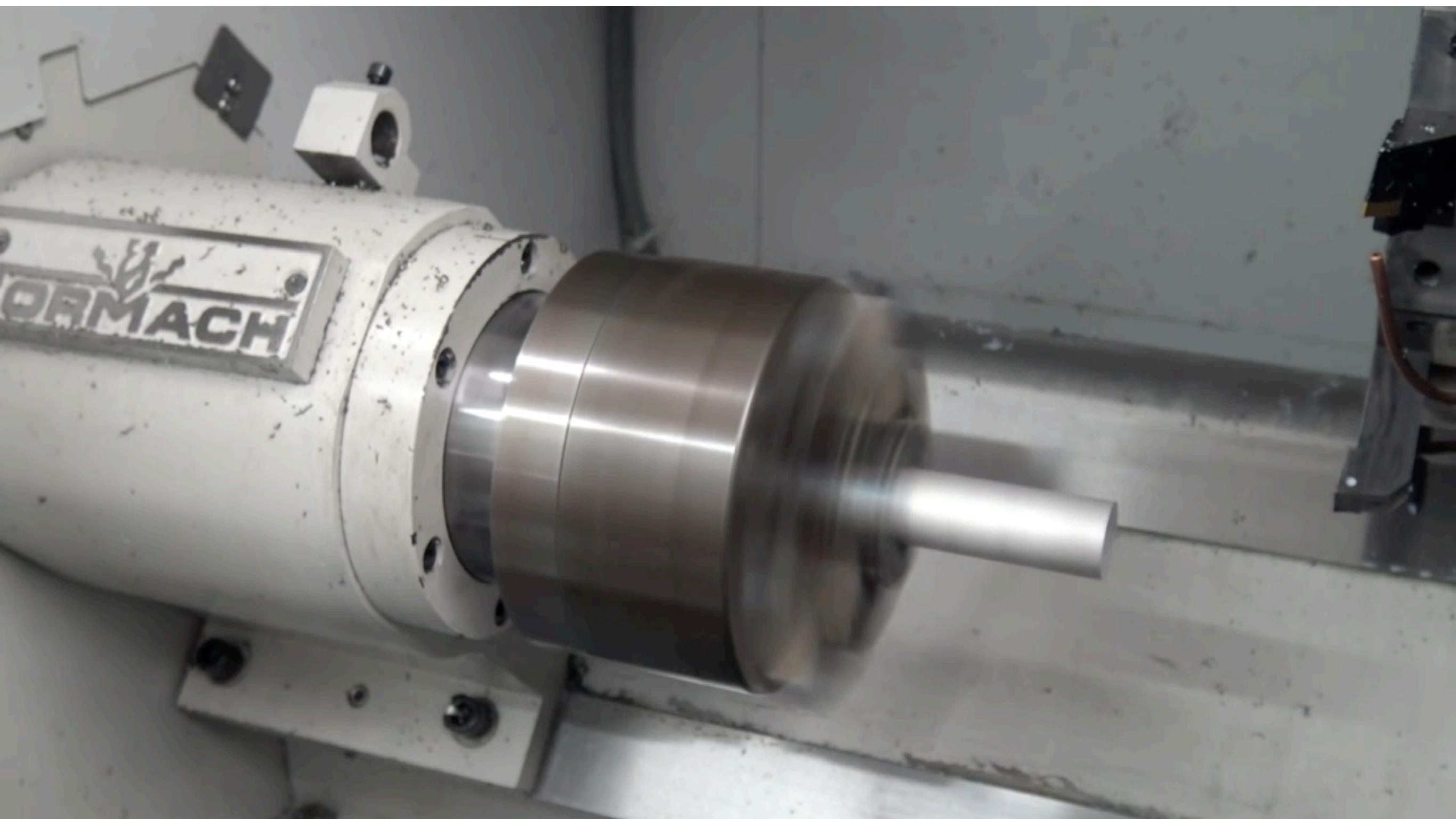




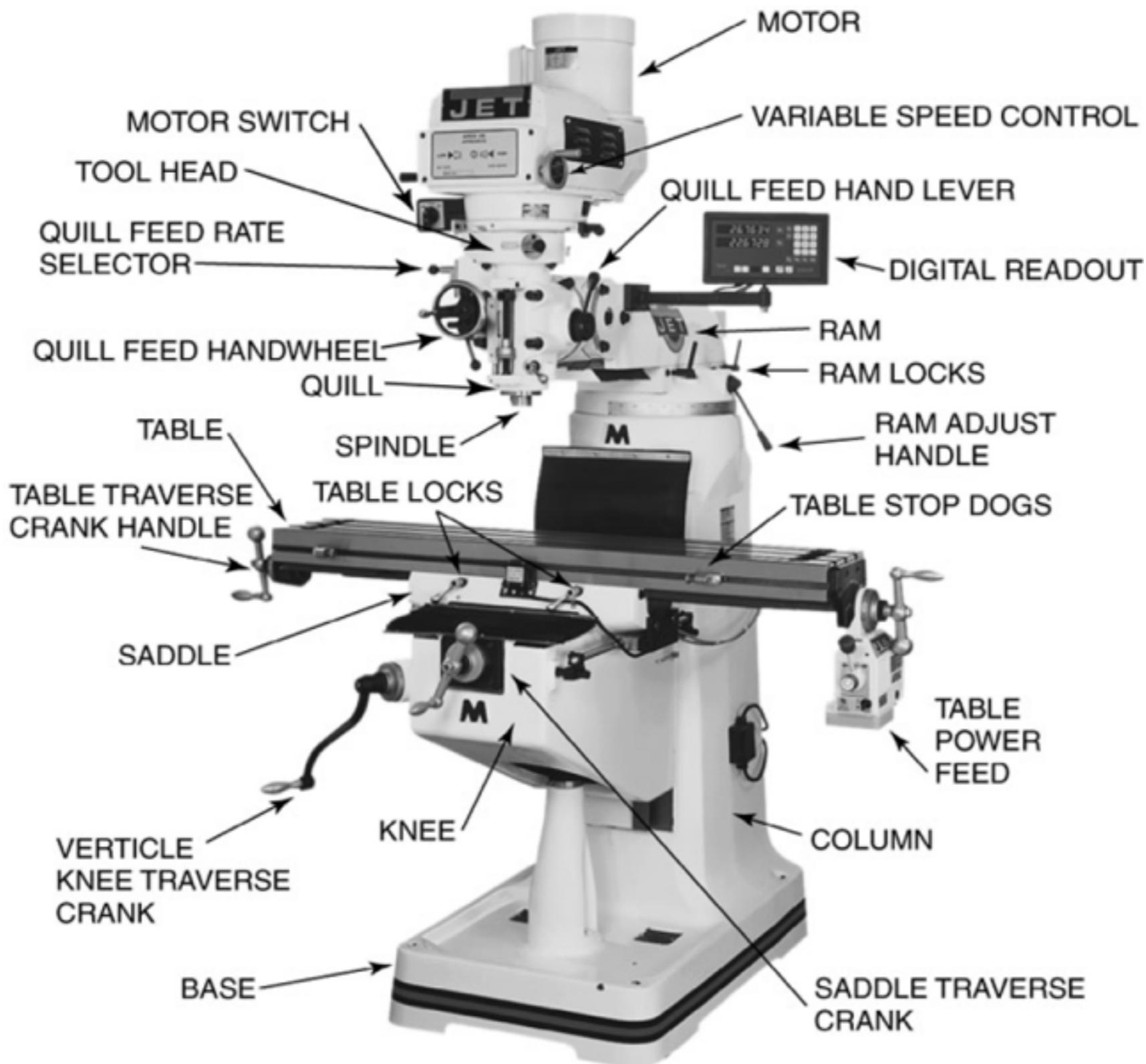
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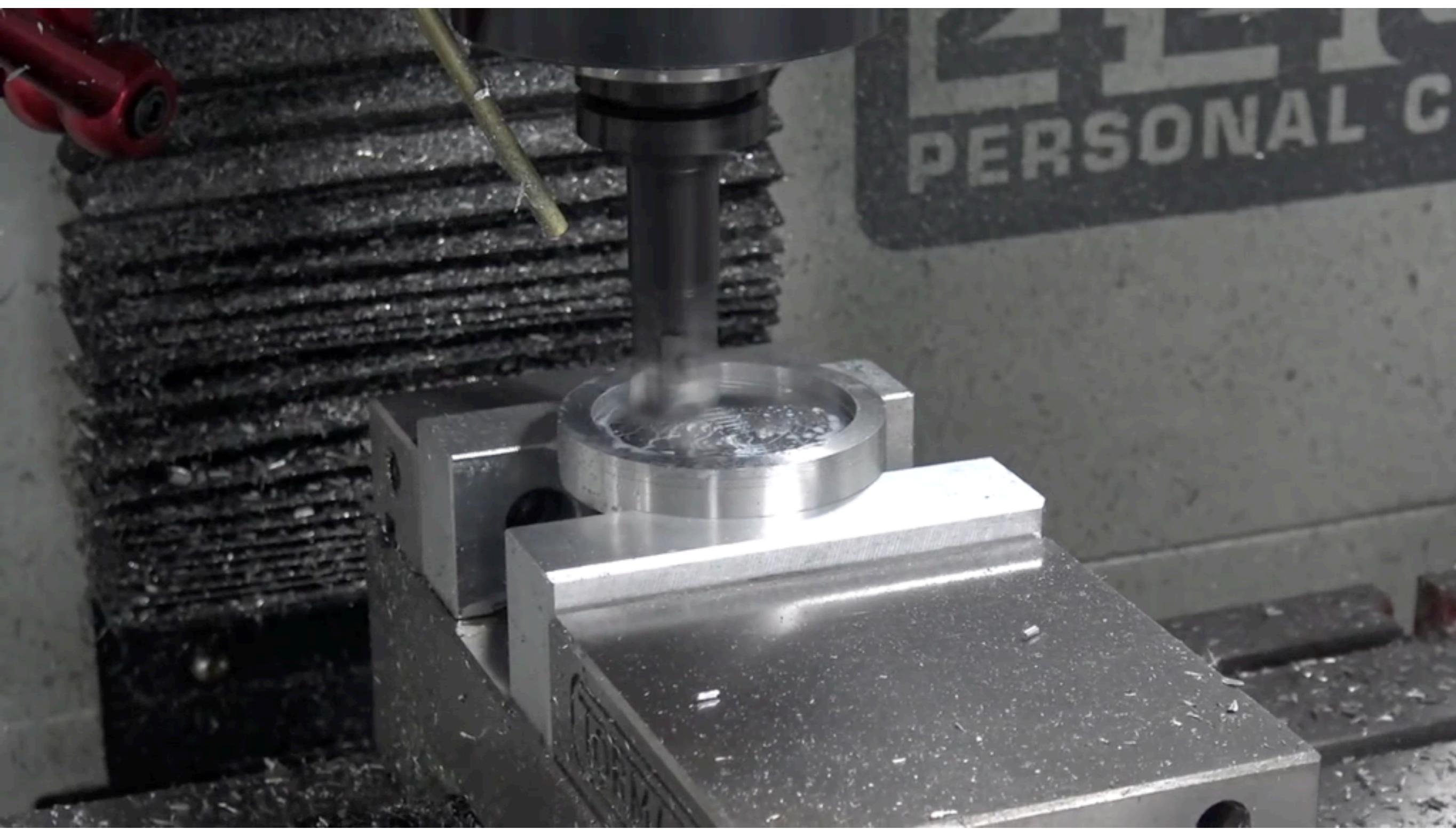
The lathe is a widely used and fascinating machine tool





The milling machine is the second most commonly used tool





The EDM is not available in many shops, but is very precise

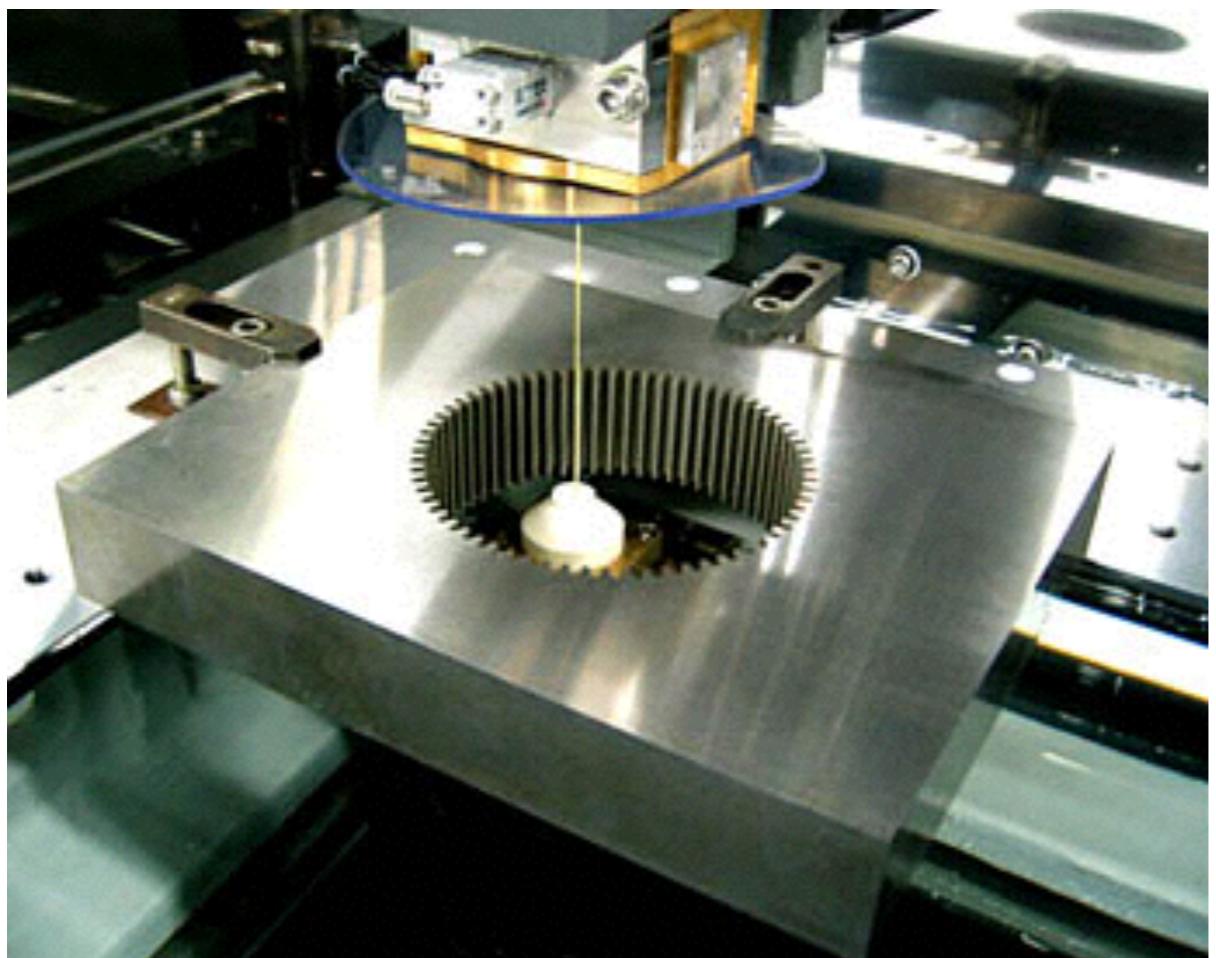


Image: <http://www.fagorautomation.com>

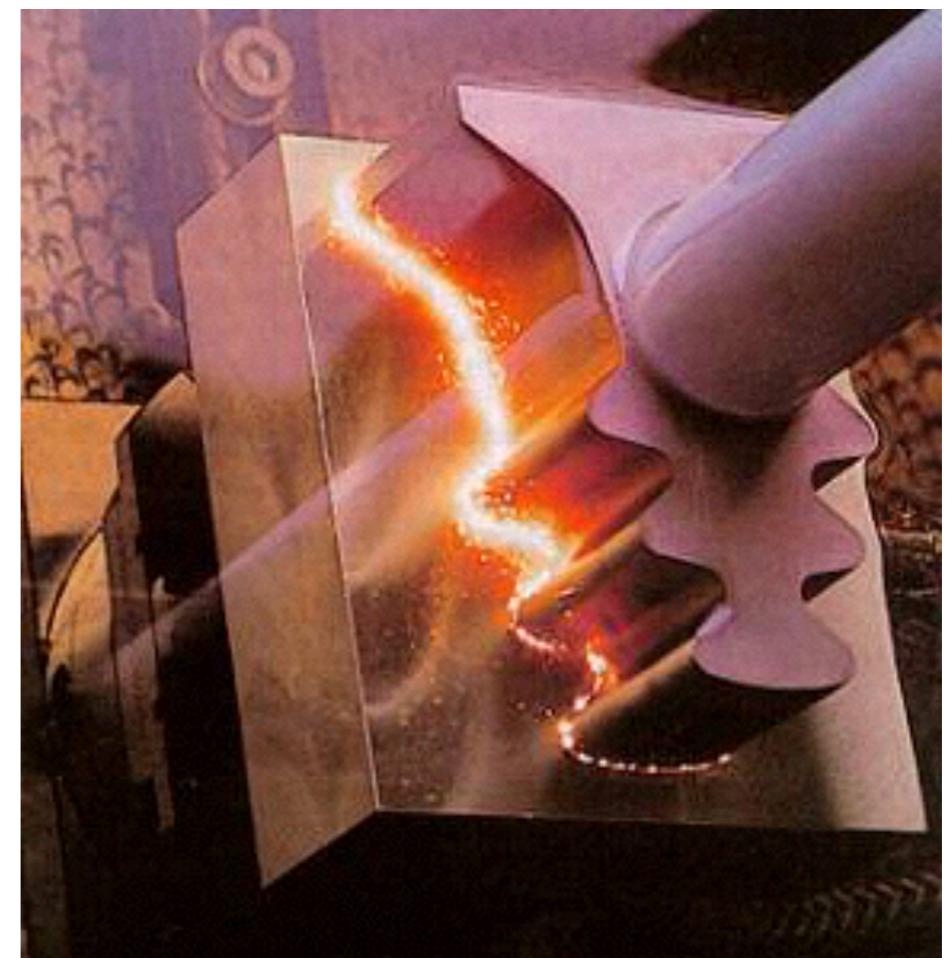


Image: <http://www.mercatech.com>

MAILLEFER
ACCESSORIES

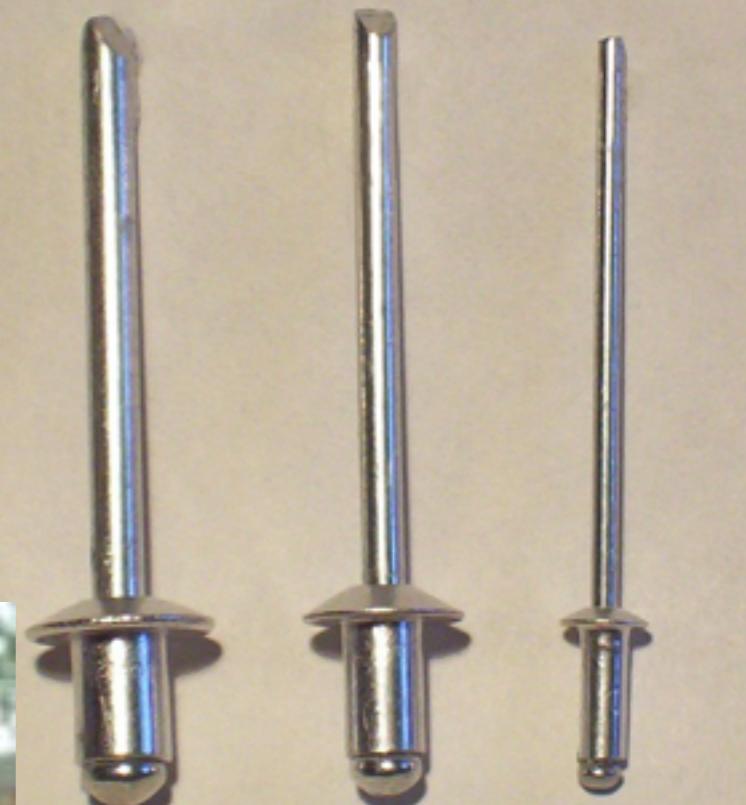
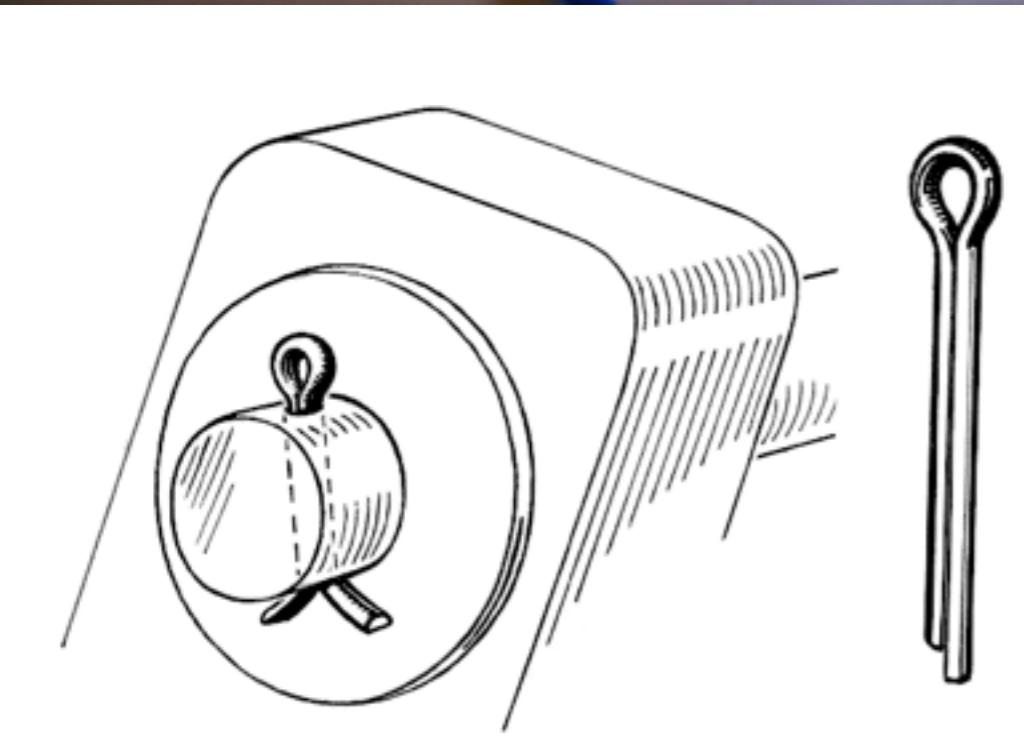
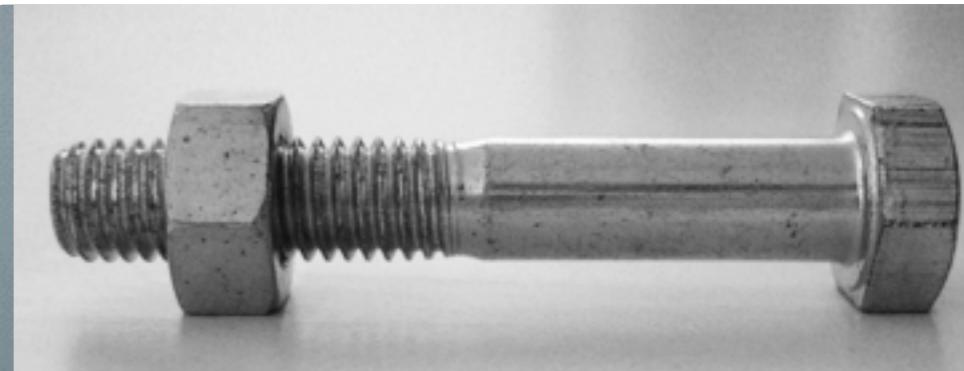
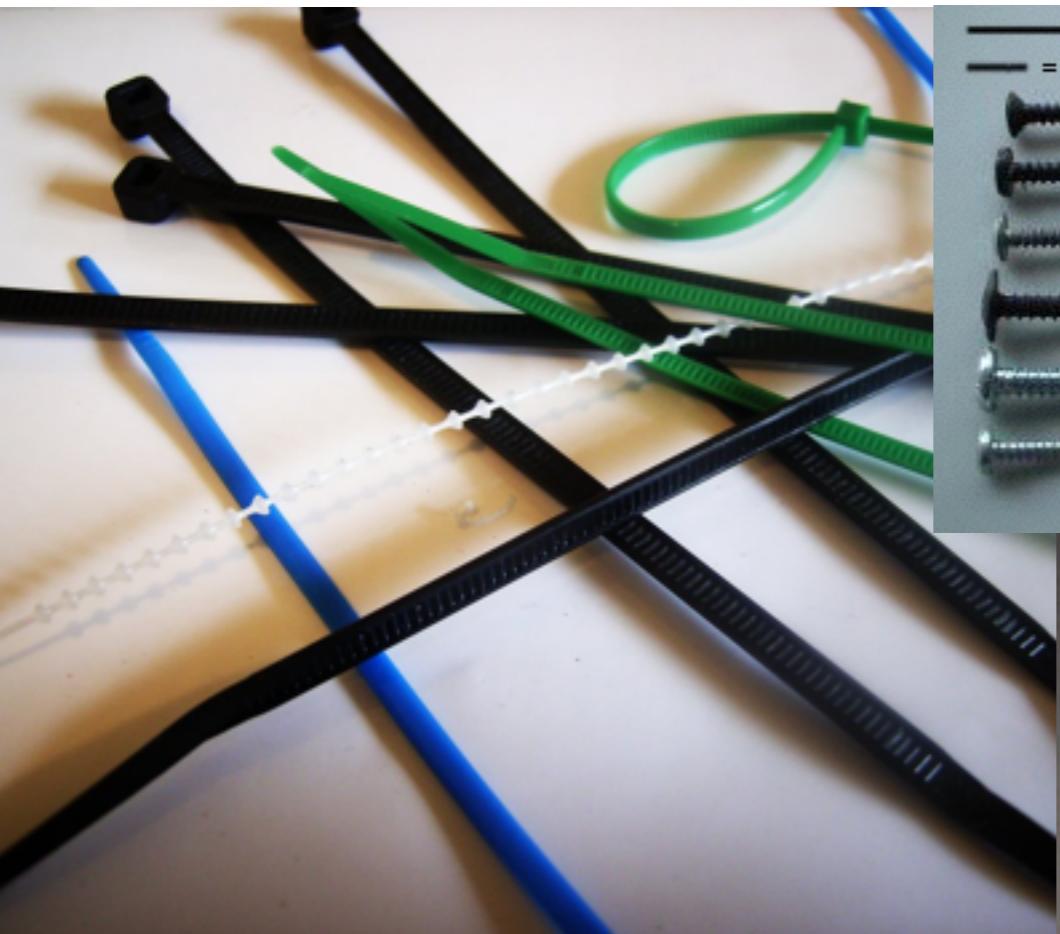
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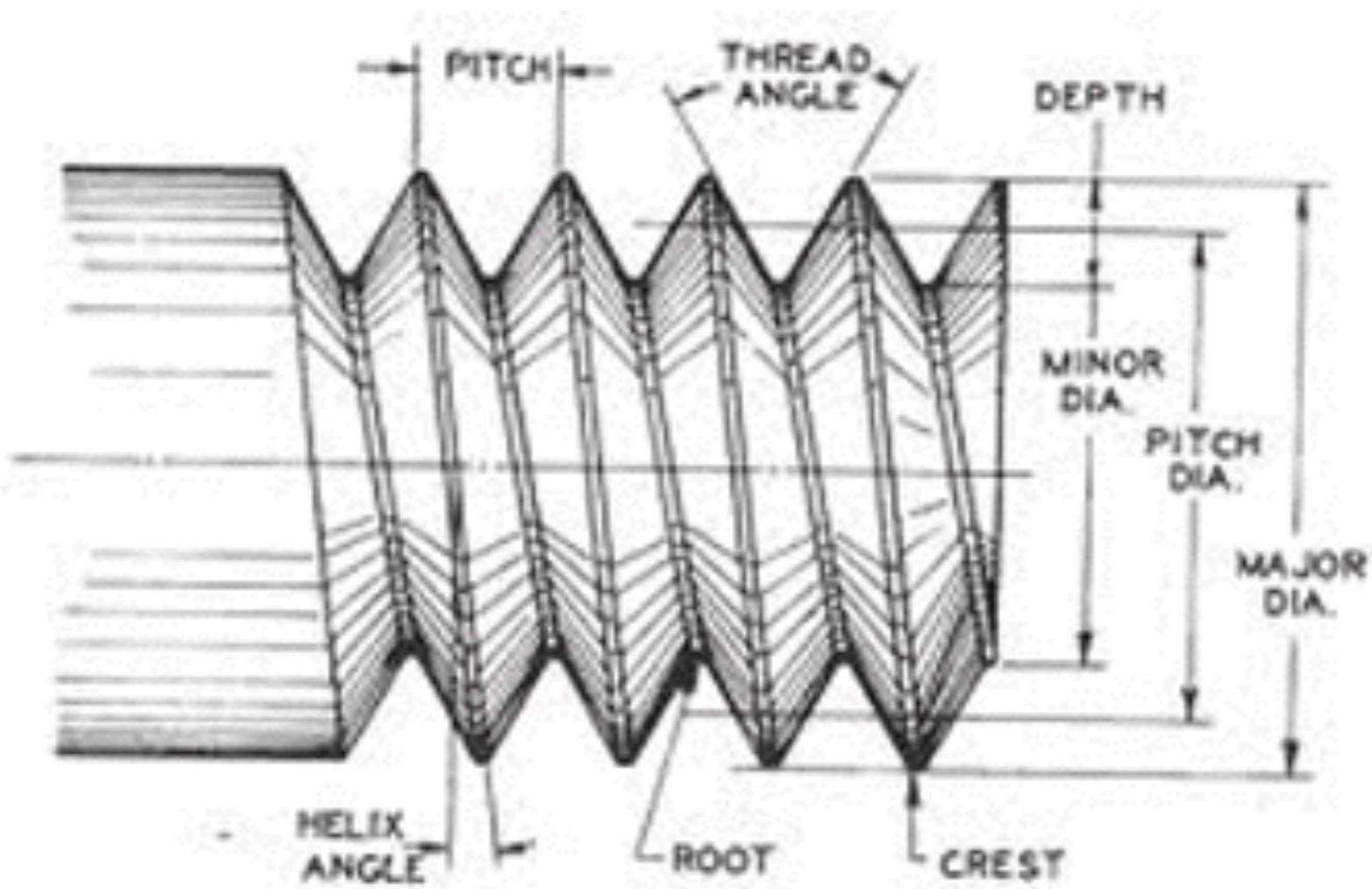


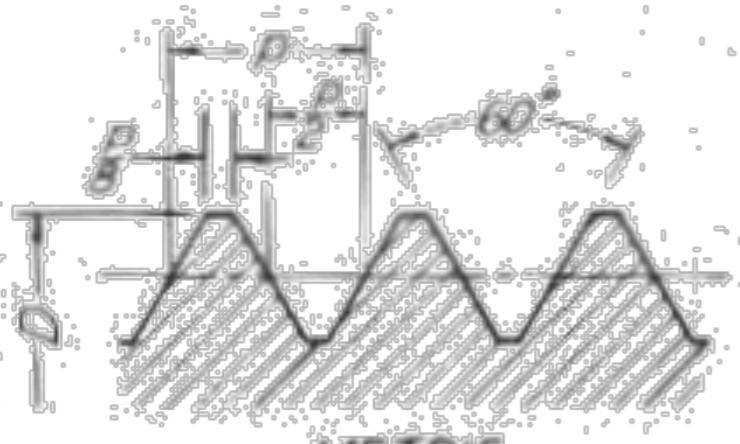
Material makes the difference in the cost and performance of your part



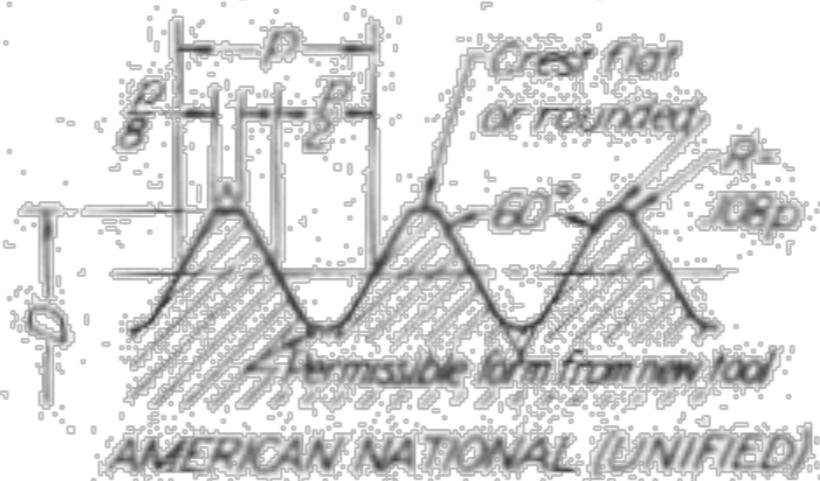
Fasteners hold our parts together into assemblies



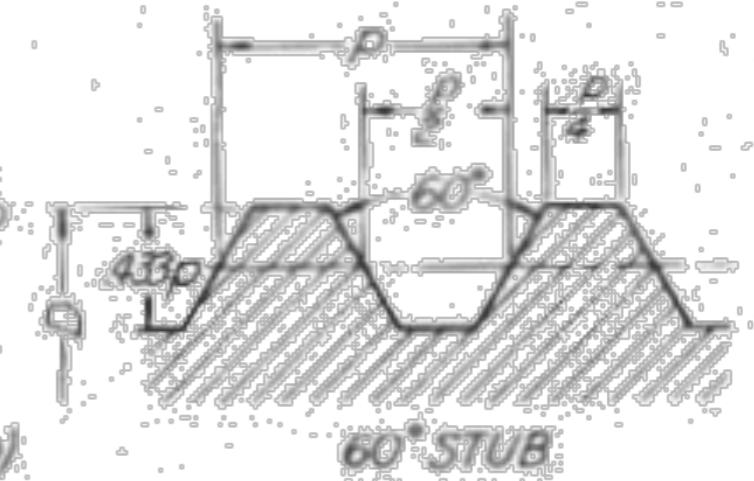




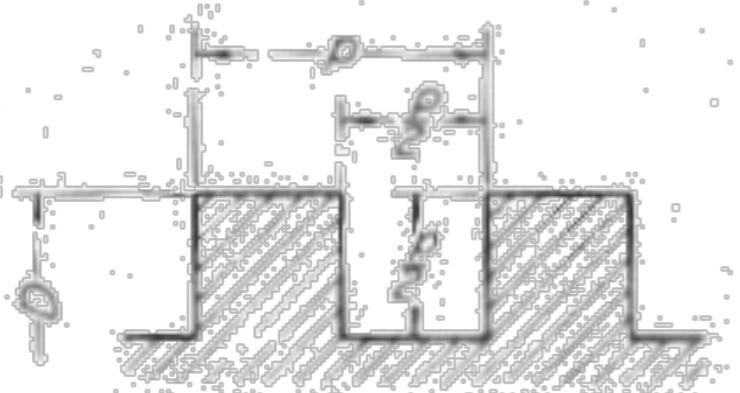
METRIC



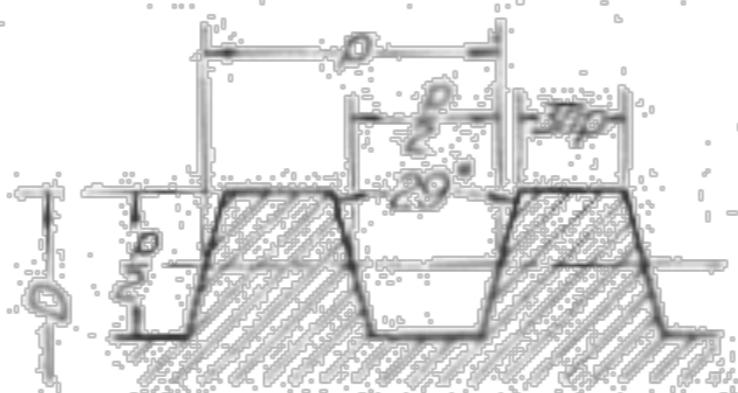
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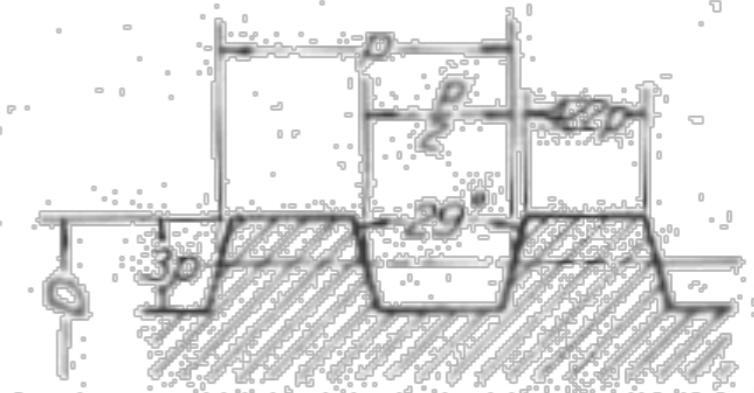
60° STUB



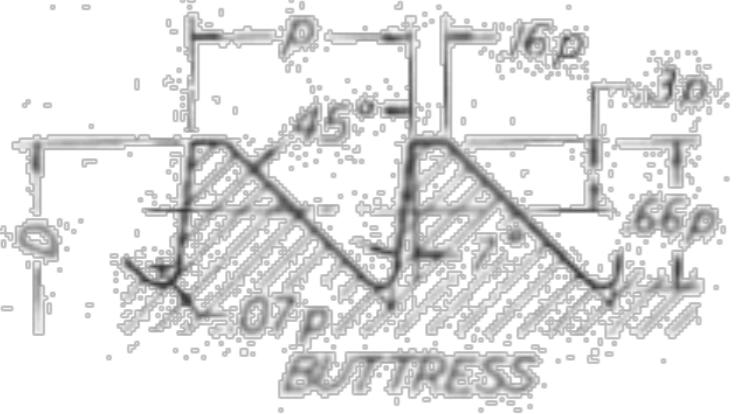
SQUARE



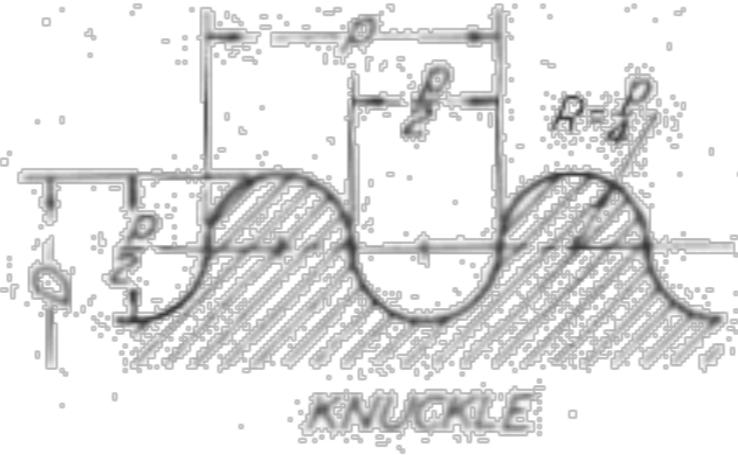
ACME



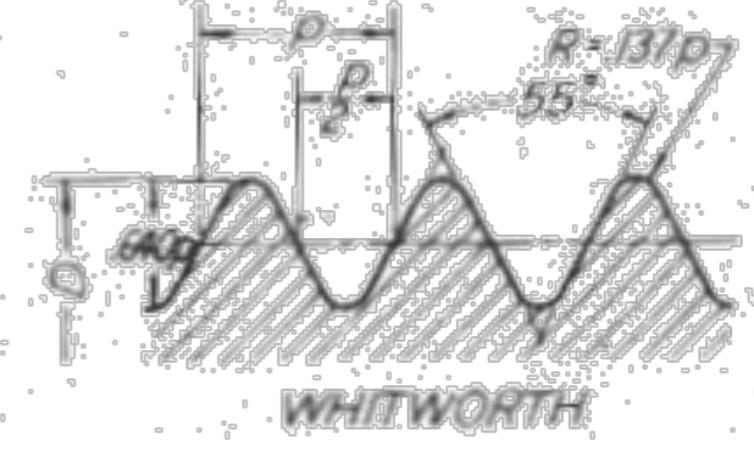
STUB ACME



BUTRESS



NUCKLE



WHITWORTH

US Machine Screw Diameters

Size	Thread Diameter	
	Decimal	Nearest Fractional
#0	0.06"	1/16"
#1	0.07"	5/64"
#2	0.08"	3/32"
#3	0.09"	7/64"
#4	0.11"	7/64"
#5	0.12"	1/8"
#6	0.13"	9/64"
#8	0.16"	5/32"
#10	0.19"	3/16"
#12	0.21"	7/32"
#14	0.24"	1/4"



A diagram of a machine screw is shown from a side-on perspective. The screw has a flat head on the left and a threaded shaft extending to the right. A horizontal line with arrows at both ends spans the width of the threaded part. Two vertical arrows point downwards from the top and bottom of this line, meeting in the center. The word "Diameter" is written in a bold, black, sans-serif font directly below the center of the line.

Activity: Part Manufacturing Techniques

We've discussed the many ways that parts and assemblies are manufactured. Get a few different parts and objects from your everyday environment. Describe and discuss how they are made. Look for clues like the surface finish of the part, what material it is made of, and where mechanical movement and wear happens.

Questions

- What techniques were used to create the part?
Why?
- What fasteners were chosen? Why?
- What is the part made of? Why?



Image: Wikipedia.

Assignment: Prepare for next class

- * Watch video on the threading activity**
- * Remember to wear shop appropriate clothing**