

# CUTTING TOOL ENGINEERING



FEBRUARY 1986

■ Metal Cutting   ■ Metal Removal   ■ Abrasive Machining

## WESTEC '86

Complete Report on  
EXPOSITION & CONFERENCE

Selecting The Right  
Carbide Cutting Tool

Recoating: A Viable Option

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VOLUME 38 NUMBER 1

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## On The Cover

*Specialty custom-made carbide tools tailored to unique requirements of firearms manufacturer. Photo courtesy of Beretta U.S.A. Corp., Accokeek, MD. Insert photo of recoating process, courtesy of Multi-Arc Vacuum Systems, Inc., St. Paul, MN.*

The modern machine tools used in the metalworking process evolved from seven basic machine tools developed from 1800 through 1933. These basic machine tools include: lathes, drill presses and boring mills, milling machines, planers, saws, grinders, and forming machines.

Have you ever seen pottery being made by hand? Today, as in 2500 B.C., some artists use what is called a "potter's wheel" to spin wet clay while their hands shape the clay into a vase, jar, bottle, bowl, or other object. Almost the same thing happens to metal on a lathe. Here, the workpiece is turned while a cutter is held against or moved over the workpiece to give it a new shape.

The lathe was one of the earliest machine tools developed and is still one of the most important. It is versatile, too. With the appropriate attachments, it can taper and form cut as well as make straight cuts. This operation is often referred to as turning, and is exactly what the name implies: a workpiece is held and turned on its axis to give it a new shape. The turning machine utilizes a rigidly-mounted turning tool to re-

tooling for forming machines. In high volume operations, turning machines normally perform only one function.

### How Turning Works

A turning machine "turns" a workpiece about its own centerline and into the cutting edge tool; except for this rotation, the workpiece does not move. The cutting tool is mounted in a traveling toolholder that can move it into the work and along its length. The workpiece is mounted in one of two basic ways: between centers or in a chuck.

The chuck is used for short or thick stock,

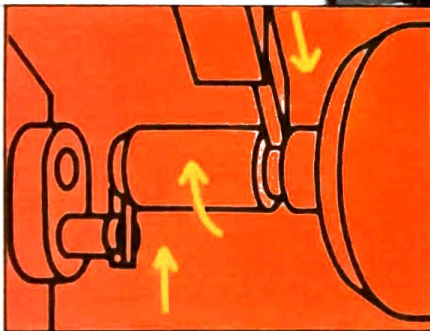
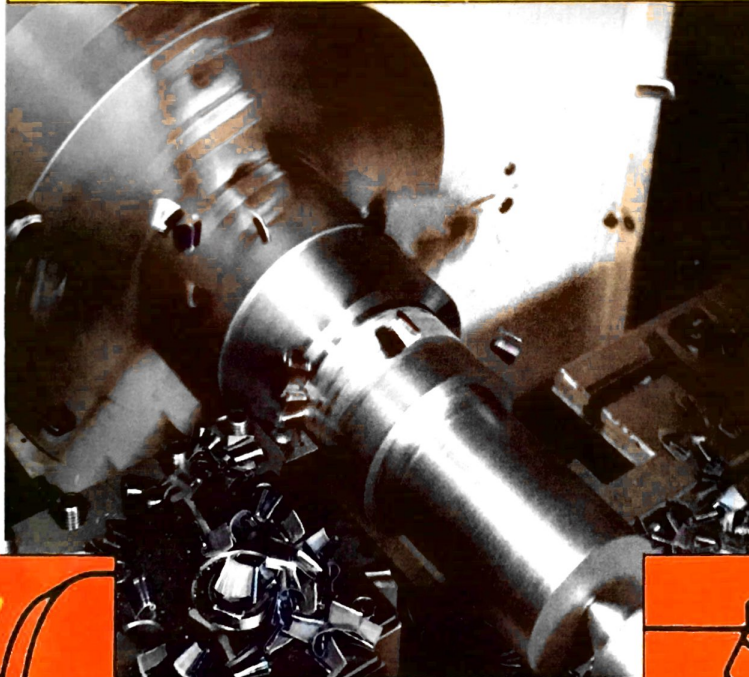
Manufacturing developed a machine shop to build and repair textile machinery. This shop included two buildings each three stories high and nearly 400 feet long. In 1851, a giant pit lathe was built at Amoskeag. The lathe could swing 33 feet and had a 21 foot diameter faceplate. \*

Also, in 1851, the firm of Gage, Warner & Whitney was "producing iron planers of all sizes, engine lathes, from the smallest watchmaker's up to a size suitable for turning locomotive driving-wheels six or eight feet in diameter, hand lathes of all sizes, chucking lathes of all dimensions with sliding bed bolt cutting machines for rapidly transforming any part of a plain bolt into a nice even threaded screw..."\*\*

It was late 1955 when certain fundamental advantages of numerical control had been clearly spelled out. By 1968, the lathe builders had shipped 3355 NC models. \*\*

The first public demonstration of a numerically controlled lathe was Sundstrand Machine Tool Company's Model 14, multi-cycle single-point lathe for production. This was at the 1955 NMTBA Exposition in Chicago, Illinois.

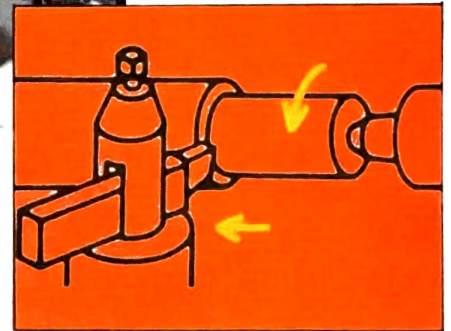
## History of Tools: Lathes



Necking and chamfering.

DoALL 20" Lathe

*This is the fourth of a series dealing with the history of tools. It is being presented through the courtesy of Wilkie Brothers Foundation, Des Plaines, IL*

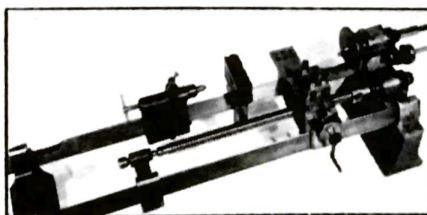


Shaft turning

move metal chips to create the new shape.

One of the first of the powered machine tools was Henry Maudslay's metal cutting lathe for making threads. Since 1800 when Maudslay's machine was invented, turning machines have come in a variety of sizes, ranging from tiny watchmaker's lathes on up to gigantic ones capable of turning parts 12 feet or more in diameter. They also come in a wide variety of types and functions — from "engine" and "turret" lathes through "chuckers" and high-speed "automatic screw machines" to multi-spindle, numerically-controlled "turning centers."

This versatility is important for the small lot machining typically handled by shops that make dies, molds, punches, and similar



Maudslay's lathe, circa 1800

for facing, and for internal cutting. Between centers is used for long or thin stock. To prevent deflection a "steady" or "follow" rest may be placed against the stock at points between the centers.

### Developments of the Lathe

In 1840, a company called Amoskeag

Though Model 14 was designed primarily for straight shaft work, it could cut tapers or curves using an appropriate cam that was inserted into the machine by the operator.

Today, there is a wide variety of lathes and turning machines available. They can be controlled manually, semi-manually, or automatically. The major classifications of types include: engine lathes, contouring lathes, turret lathes, and NC/CNC turning machines.  $\Delta$

\* from *American Machinist*, Nov. 1977, page C-2

\*\* from *Iron Age*, August 30, 1976, pp 157, 159, 160