GLOSSARY

ACRONYMS AND ABBREVIATIONS

TC - Training Circular

TM - Technical Manual

AR - Army Regulation

DA - Department of the Army

RPM - revolutions per minute

SAE - Society of Automotive Engineers

SFPM - surface feet per minute

tpf -taper per foot

tpi taper per inch

UNC - Unified National Coarse

UNF - Unified National Fine

SF -standard form

Med - medical

WRPM - revolutions per minute of workpiece

FF - fraction of finish

WW - width of wheel

TT - table travel in feet per minute

sd - small diameter

Id - large diameter

ID - inside diameter

TOS- Intentional Organization for Standardization

LH - left hand

NC - National Coarse

NF - National Fine

OD - outside diameter

RH - right hand

CS - cutting speed

AA - aluminum alloys

IPM - feed rate in inches per minute

FPM - feet per minute of workpiece

pd - pitch diameter

tan L - tangent angle formula

It - length of taper

DEFINITIONS

abrasive - natural - (sandstone, emery, corundum. diamonds) or artificial (silicon carbide, aluminum oxide) material used for making grinding wheels, sandpaper, abrasive cloth, and lapping compounds.

abrasive wheels - Wheels of a hard abrasive, such as Carborundum used for grinding.

accurate - Conforms to a standard or tolerance.

Acme thread - A screw thread having a 29 degree included angle. Used largely for feed and adjusting screws on machine tools.

acute angle - An angle that is less than 90 degrees.

adapter - A tool holding device for fitting together various types or sizes of cutting tools to make them interchangeable on different machines.

addendum - That portion of a gear tooth that extends from the pitch circle to the outside diameter.

align - To adjust or set to a line or center.

allowance - The prescribed difference in dimensions of mating parts to provide a certain class of fit.

alloy - A metal formed by a mixture of two or more different metals.

angle iron - An iron or steel structural member that has been cast, rolled, or bent (folded) so that its cross section is L-shaped.

angle plate - A precision holding fixture made of cast iron. steel, or granite. The two principal faces are at right angles and may be slotted for holding the work **or** clamping to a table.

annealing - The controlled heating and cooling of a metal to remove stresses and to make it softer and easier to work with.

anvil - A heavy iron or steel block upon which metal is forged or hammered-. also the fixed jaw on a micrometer against which parts are measured.

apron - That portion of a lathe carriage that contains the clutches, gears, and levers for moving the carriage. It also protects the mechanism.

arbor - A shaft or spindle for holding cutting tools; most usually on a milling machine.

arbor press - A hand-operated machine tool designed for applying high pressure for the purpose of pressing together or removing parts.

assembly - A unit of fitted parts that make up a mechanism or machine, such as the headstock assemble of a lathe.

automatic stop - A device which may be attached to any of several parts of a machine tool to stop the operation of the machine at any predetermined point.

axis - The line, real or imaginary, passing through the center of an object about which it could rotate; a point of reference.

babbitt - An antifriction metal alloy used for bearing inserts; made of tin, antimony, lead, and copper.

back gears - Gears fitted to a machine to increase the number of spindle speeds obtainable with a cone or step pulley belt drive.

back rake - The angular surface ground back from the cutting edge of cutting tools. On lathe cutting tools. the rake is positive if the face slopes down from the cutting edge toward the shank, and negative if the face slopes upward toward the shank.

backlash - The lost motion or looseness (play) between the faces of meshing gears or threads.

bandsaw - A power saw. the blade of which. is a continuous, narrow, steel band having teeth on one edge and passing over two large pulley wheels.

bar stock - Metal bars of various lengths, made in flat, hexagon, octagon, round, and square shapes from which parts are machined.

bastard - Threads, parts, tools, and sizes that are not standard, such as 'bastard nuts,' "bastard plus," "bastard fittings,' and so forth. The term also refers to a standard coarse cut file.

bearing - Rollers, and balls placed between moving parts to reduce friction and wear.

bed - One of the principal parts of a machine tool, having accurately machined ways or bearing surfaces for supporting and aligning other parts of the machine.

bell mouth - The flaring or tapering of a machined hole, usually made at the entrance end because of misalignment or spring of the cutting tool.

bench grinder - A small grinding machine for shaping and sharpening the cutting edges of tools.

bench lathe - A small lathe mounted on a bench or table.

bench work - Work done primarily at a bench with hand tools. occasionally supplemented by small power-driven tools.

bevel - Any surface that is not at right angles to another surface. Also, the name given a tool used for measuring, laying out, or checking the accuracy of work machined at an angle or bevel.

bit, tool (cutter) - A hardened steel bar or plate that is shaped according to the operation to be performed and the material to be machined.

blind bole - A hole made in a workpiece that does not pass through it.

block, Jo - Shop name for a Johannson gage block, a very accurate measuring device.

blowhole - A defect in a casting caused by trapped steam or gas.

blueprint - A pen or ink line drawing reproduced (printed) on sensitized paper by direct exposure.

blue vitriol copper sulfate - A layout solution which turns a copper color when applied to a clean. polished metal surface.

bond - The material that holds the abrasive grains together to form a grinding wheel.

bore - To enlarge and finish the surface of a cylindrical hole by the action of a rotating boring bar (cutting tool) or by the action of a stationary tool pressed (fed) against the surface as the part is rotated.

boring bar (cuffer bar) - A combination tool holder and shank.

boring tool - A cutting tool in which the tool bit'. the boring bar and, in some cases, the tool holder are incorporated in one solid piece.

boss - A projection or an enlarged section of a casting through which a hole may be machined.

brass - A nonferrous alloy consisting essentially of copper and zinc.

brazing - Joining metals by the fusion of nonferrous alloys having a melting temperature above 800 degrees F, but below that of the metals being joined.

brine - A saltwater solution for quenching or cooling when heat treating steel.

Brinell hardness - A method of testing the hardness of a metal by controlled pressure of a hardened steel ball of a given size.

broach - A long, tapered cutting tool with serration's which, when forced through a hole or across a surface, cuts a desired shape or size.

bronze - A nonferrous alloy consisting essentially of copper and tin.

buff - To polish to a smooth finish of high luster with a cloth or fabric wheel to which a compound has been added.

bull gear - The large crank gear of a shaper.

burnishing - The process of finishing a metal surface by contact with another harder metal to improve it. To make smooth or glossy by or as if by rubbing; polish.

burr - The sharp edge left on metal after cutting or punching-, also, a rotary cutting tool designed to be attached to a drill.

bushing - A sleeve or a lining for a bearing or a drill jig to guard against wear.

caliper - A device used to measure inside or outside dimensions.

caliper, gear tooth - A special caliper used to measure both the "choral thickness" and the depth of a gear tooth.

cam - A device for converting regular rotary motion to irregular rotary or reciprocating motion. Sometimes the effect of off-center lathe operations.

carbide tool bits - Lathe cutting tools to which carbide tip inserts have been brazed, to provide cutting action on harder materials than the high speed cutters are capable of.

carbon steel - A broad term applied to tool steel other than high-speed or alloy steel.

Carborundum - A trade name for an abrasive compounded of silicon and carbon (silicon carbide).

carbonizing - The process of adding carbon to the outer surface of steel to improve its quality by heat treating it in contact with a carbonaceous material.

carriage - A principal part of a lathe that carries the cutting tool and consists of the saddle, compound rest. and apron.

case hardening - A heat treating process, basically carbonizing. that makes the surface layer or case of steel substantially harder than the interior or core.

castigated nut (castle nut) - A nut with grooves cut entirely across the top face.

casting - A part made by pouring molten metal into a mold.

cathead - A collar or sleeve which fits loosely over a shaft to which it is clamped by setscrews.

center - A point or axis around which anything revolves or rotates. 1 n the lathe. one of the parts upon which the work to be turned is placed. The center in the headstock is referred to as the "live' center and the one mounted in the tailstock as the 'dead' center.

center, dead - A center that does not rotate; commonly found on the tailstock of a lathe. Also, an expression for the exact center of an object.

center drill - A combined countersink and drill used to prepare work for mounting centers.

center gage - A small ', flat gage having 60 degree angles that is used for grinding and setting the thread cutting tools in a lathe. It may also be used to check the pitch of threads and the points of center.

center, half male - A dead center that has a portion of the 60 degree cone cut away.

center head - A part of a combination square set that is used to find the center of or to bisect a round or square workpiece.

center, live - A center that revolves with the work. Generally. this is the headstock center; however, the ball bearing type tailstock center is also called a live center.

center punch - A pointed hand tool made of hardened steel and shaped somewhat like a pencil.

ceramic - A new type of cutting tool material made of aluminum oxide . or silicon carbide that is finding increased use where high speed and resistance to high temperatures and wear are factors.

chain gearing (chain drive) - Power transmission by means of an endless chain running around chain wheels (chain pulley) and/or sprocket wheels.

chamfer - The bevel or angular surface cut on the edge or a corner of a machined part.

chasing threads - Cutting threads in a lathe or screw machine.

chatter - The vibrations caused between the work and the cutting tool which leave distinctive tool marks on the finished surface that are objectionable.

chip breaker - A small groove ground back of the cutting edge on the top of a cutting tool to keep the chips short.

chipping - The process of cutting metal with a cold chisel and hammer.

chisel - Any one of a variety of small hand cutting tools, generally wedge-shaped.

chuck - A device on a machine tool to hold the workpiece or a cutting tool.

chuck, independent jaw - A chuck, each of whose jaws (usually four) is adjusted with a screw action independently of the other jaws.

chuck, universal (self-centering chuck, concentric chuck) - A chuck whose jaws are so arranged that they are all moved together at the same rate by a special wrench.

circular pitch - The distance measured on the pitch circle from a point on a gear tooth to the same point on the next gear tooth.

clearance - The distance or angle by which one objector surface clears another.

clearance angle - The angle between the rear surface of a cutting tool and the surface of the work at the point of contact.

climb milling - A method of milling in which the work table moves in the same direction as the direction of rotation of the milling center. Sometimes called down cutting or down milling.

clutch, friction (friction coupling) - A shaft coupling used where it is necessary to provide a connection that can be readily engaged or disengaged while one of the shafts is in motion.

cog - A tooth in the rim of a wheel - a gear tooth in a gear wheel.

cold-rolled steel - Steel that has been rolled to accurate size and smooth finish when made. In contrast, hot-rolled steel may have a rough, pitted surface and slag inclusion.

collet - A precision work holding chuck which centers finished round stock automatically when tightened. Specialized collets are also a-, available in shapes for other than round stock.

color method - A technique of heat treating metal by observing the color changes that occur to determine the proper operation to perform to achieve the desired results.

combination square - A drafting and layout tool combining a square, a level. A protractor, and a center head.

compound (rest) - The part of a lathe set on the carriage that carries the tool post and holder. It is designed to swing in any direction and to provide feed for turning short angles or tapers.

concave - A curved depression in the surface of an object.

concentric - Accurately centered or having a common center.

cone pulley - A one-piece stepped pulley having two or more diameters.

contour - The outline of an object.

convex - The curved surface of a cylinder, as a sphere when viewed from without.

coolant - A common term given to the numerous cutting fluids or compounds used with cutting tools to increase the tool life and to improve surface finish on the material.

corrosion - Oxidation (rusting) or similar chemical change in metals.

counterbore - To enlarge the top part of a hole to a specific size, as for the head of a socket-head or cap screw. Also, the tool that is used.

countersink - To enlarge the top part of a hole at an angle for a flat-head screw. Also, the tool that is used.

cross feed - The feed that operates across the axis of the workpiece or at right angles to the main or principal feed on a machine.

cross section - A view showing an internal structure as it would be revealed by cutting through the piece in any plane.

crucible steel - A high-grade tool steel made by melting selected materials in a crucible.

cutting fluid - A liquid used to cool and lubricate the cutting to improve the work surface finish.

cutting speed - The surface speed of the workpiece in a lathe or a rotating cutter, commonly expressed in feet per minute (FPM) and converted to revolutions per minute (RPM) for proper setting on the machine.

cutting tool - A hardened piece of metal (tool steel) that is machined and ground so that it has the shape and cutting edges appropriate for the operation for which it is to be used.

cyaniding - A process of case hardening steel by heating in molten cyanide.

dead center - See center, dead.

dead smooth - The term applied to the finest cut of a file.

deburr - To remove sharp edges.

decalescence - A decrease in temperature that occurs while heating metal through a range in which change in structure occurs.

dedendum - The depth, or that portion of a gear tooth from the pitch circle to root circle of gear.

diametral pitch - Ratio of the number of teeth on a gear to the number of inches of pitch diameter or the number of teeth to each inch of pitch diameter.

die - A tool used to form or stamp out metal parts', also, a tool used to cut external threads.

die stock - The frame and two handles (bars) which hold the dies (chasers) used for cutting (chasing) external screw threads.

dividers, spring - Dividers whose legs are held together at the hinged end by the pressure of a C-shaped spring.

dividing head (index bead) - A machine tool holding fixture which positions the ",-work for accurately spacing holes. slots. flutes. and gear teeth and for making geometric shapes. When geared to the table lead screw, it can be used for helical milling operations.

Do-Al l saw - A trade name given to a type of band saw used for sawing metal.

dog - A clamping device (lathe dog) used to drive work being machined between centers. Also, a part projecting on the side of a machine worktable to trip the automatic feed mechanism off or to reverse the travel.

dovetail - A two-part slide bearing assembly used in machine tool construction for the precise alignment and smooth operation of the movable components of the machine.

dowel - A pin fitted or keyed in two adjacent parts to accurately align the parts when assembling them.

down feed (climb cutting, climb milling)- A seldom used method of feeding work into milling cutters. The work is fed in the same direction as the portion of the cutter which comes in contact with it.

draw - See tempering.

dressing - The act of removing the glaze and dulled abrasives from the face of a grinding wheel to make it clean and sharp. See truing.

drift - A tapered. flat steel used to remove drills and other tapered shank tools from spindles, sockets, or sleeves. Also a round, tapered punch used to align or enlarge holes.

drill - A pointed tool that is rotated to cut holes in material.

drill bushing - A hardened steel guide inserted in jigs, fixtures. or templates for the purpose of providing a guide for the drill in drilling holes in their proper or exact location.

drill, center - A combination drill and countersink-

drill chuck - A device used to grip drills and attach them to a rotating spindle.

drill, twist - A commonly used metal-cutting drill, usually made with two flutes running around the body.

drill jig - A jig which holds parts or units of a structure and. by means of bushings, guides the drill so that the holes are properly located.

drill press - An upright power-driven machine for drilling holes in metal, wood, or other material.

drill press, radial (radial drill) - A machine tool for drilling holes. The drill head is so supported that it may be moved over a large area to drill holes in objects of large size or to drill several holes in an object without shifting the object.

drill press - A drilling machine with a counterbalanced spindle which makes it possible for the operator to control accurately the rate at which the drill is fed into the work. The sensitive drill press usually contains drills that are less than 1/2 inch in diameter and which rotate at high speeds.

drill rod - A high-carbon steel rod accurately ground to size with a smooth finish. It is available in many sizes and is used extensively in tool making.

drill sleeve - An adapter with an internal and external taper which fits tapered shank tools such as drills or reamers to adapt them to a larger size machine spindle.

drill socket - An adapter similar to a sleeve except that it is made to adapt a larger tapered-shank tool to a smaller size spindle.

drill, twist - A commonly used metal-cutting drill, usually made with two flutes running around the body.

drive fit - One of several classes of fits in which parts are assembled by pressing or forcing one part into another.

ductility - The property of a metal that permits it to be drawn. rolled, or hammered without fracturing or breaking.

eccentric - A circle not having a geometric center. Also, a device such as a crankshaft or a cam for converting rotary motion to reciprocating motion.

element - Matter which cannot be broken up into simpler substances by chemical action, that is, whose molecules are all composed of only one kind of atom.

elongation - Lengthening or stretching out.

emery - A natural abrasive used for grinding or polishing. It is being largely replaced by artificial abrasives.

emulsion - A coolant formed by mixing soluble oils or compounds with water.

extruded - Metal which had been shaped by forcing through a die.

extrusion - A shaped part resulting from forcing a plastic material such as lead, tin. aluminum. zinc., copper, rubber, and so forth. through a die opening

EZY OUT (trademark) - A tool for removing broken bolts or studs from a hole.

face - To machine a flat surface, as in the end of a shaft in the lathe. The operation is known as facing.

face milling - Milling a large flat surface with a milling cutter that operates in a plane that is at right angles to its axis.

faceplate - A large circular plate with slots and holes for mounting the workpiece to be machined. It is attached to the headstock of a lathe.

facing - The process of making a flat or smooth surface (usually the end) on a piece of stock or material.

fatigue - The effect on certain materials, especially metals, undergoing repeated stresses.

feed - The rate of travel of a cutting tool across or into the work-, expressed in inches per minute or in inches per revolution.

feed mechanism - The mechanism, often automatic. which controls the advancing movement (feed) of the cutting tools used in machines.

female part - A concave piece of equipment which receives a mating male (convex) part.

ferrous - A metal alloy in which iron is the major ingredient.

rile test - A test for hardness in which a corner of a file is run across the piece of metal being tested. The hardness is shown by the dent the file makes.

fillet - A curved surface connecting two surfaces that form an angle.

fishtail - A common name for the center gage. It is used to set thread cutting tools and has scales on it for determining the number of threads per inch.

fit - The relation between mating or matching parts, that is, the amount of, or lack of. play between them.

fitting - Any small part used in aircraft construction.

fixture - A production work-holding device used for machining duplicate workplaces. Although the term is used interchangeably with a jig, a fixture is not designed to guide the cutting tools as the jig does.

flange - A relatively thin rim around a part.

flash - A thin edge of metal formed at the parting line of a casting or forging where it is forced out between the edges of the form or die.

flute - The groove in a cutting tool which provides a cutting edge and a space for the chips to escape and permits the cutting fluids to reach the cutting edges.

fly cutter - A single-point cutter mounted on a bar in a fly cutter holder or a fly cutter arbor- used for special applications for which a milling cutter is not available.

follower rest - A support for long, slender work turned in the lathe. It is mounted on the carriage, travels close to and with the cutting tool, and keeps the work from springing away.

footstock - Part of an indexing, attachment which has a center and serves the same purpose as the tail stock of a lathe.

force fit - A fitting which one part is forced of pressed into another to form a single unit. There are different classes of force fits depending on standard limits between mating parts.

forge - To form or shape heated metal by hammering. Also. the name of the unit used for heating metal, as the blacksmith's forge.

formed cutters - Milling cutters which will produce shaped surfaces with a single cut', and so designed that they may be sharpened without. changing their outline or shape.

forming tool - Tool ground to a desired shape to reproduce this shape on the workpiece.

free cut - An additional cut with no advancement of depth.

free cutting steel - Bar stock containing a high percentage of sulfur. making it very easy to machine. Also known as Bessemer screw stock.

free fit - A class of fit intended for use where accuracy is not essential. or where large temperature variations are likely to be encountered, or both conditions.

fulcrum - The point or support on which a lever turns.

gage - Any one of a large variety of devices for measuring or checking the dimensions of objects.

gage blocks - Steel blocks machined to extremely accurate dimensions.

gage, center - See center gage.

gage, depth - A tool used in measuring the depth of holes or recesses.

gage, drill - A flat steel plate drilled with holes of various sizes, each marked with the correct size or number. into which small twist drills may be fitted to determine the size of their diameters.

gage, drill point - A gage use to check the 59" angle on drills.

gage, feeler (thickness gage) - A gage consisting of a group of very thin blades, each of which is accurately ground to a specific thickness.

gage, indicating (dial indicator) - A gage consisting of a dial, commonly graduated (marked) in thousandths of an inch, to which is fastened an adjustable arm.

gage, radius (fillet gage) - Any one of a number of small. flat, standard-shaped metal leafs or blades used for checking the accuracy of regular concave and convex surfaces.

gage, screw pitch - A gage consisting of a group of thin blades. used for checking the number of screw threads per unit of distance, usually per inch, on a screw, bolt, nut, pipe, or fitting.

gage, surface (scribing block) - A gage used to check the accuracy, of plane surfaces, to scribe lines at desired distances from a given surface and to check the height of a point or points on a piece of work from a given surface.

gage, telescoping - A T-shaped gage used to measure the diameter **or** width of holes.

gang milling - A milling setup where a number of cutters are arranged on an arbor so that several surfaces can be machined at one time. It is commonly used for production purposes.

gear blank - A stamping, casting. or any, piece of material from which a gear is to be machined. It is usually a disk.

gib - A tapered strip of metal placed between the bearing surface of two machine parts to ensure a precision fit and provide an adjustment for wear.

hacksaw - A metal blade of hardened steel having small, close teeth on one edge. It is held under tension in a U-shaped frame.

half nut - A lever-operated mechanism that resembles a split nut that can be closed on the lead screw of a lathe when threads are being cut.

handwheel - Any adjusting or feeding mechanism shaped like a wheel and operated by hand.

hardening - A heat-treating process for steel which increases its hardness and tensile strength and reduces its ductility.

hardness tests - Tests to measure the hardness of metals.

headstock - The fixed or stationary end of a lathe or' similar machine tool.

heat treatment - The process of heating and cooling a solid metal or alloy to obtain certain desired properties or characteristics.

helical gear - A gear with teeth cut at some angle other than at a right angle across the face of the gear, thus permitting more than one tooth to be engaged at all times and providing a smoother and quieter operation than the spur gear.

helix - A path formed as a point advances uniformly around a cylinder, as the thread on a screw or the flutes on a drill.

helix angle - The angle between the direction of the threads around a screw and a line running at a right angle to the shank.

hex - A term used for anything shaped like a hexagon.

high-speed steel - An alloy steel commonly used for cutting tools because of its ability to remove metal at a much faster rate than carbon steel tools.

hob - A cylindrical cutting tool shaped like a worm thread and used in industry to cut gears.

hobbing - The operation of cutting gears with a bob.

hog - To remove in excess of what is considered normal, sometimes causing accidents or tool breakage; also, to rough out haphazardly.

hole saw - A cutting tool used to cut a circular groove into solid material.

honing - The process of finishing ground surfaces to a high degree of accuracy and smoothness with abrasive blocks applied to the surface under a light controlled pressure. and with a combination of rotary and reciprocating motions.

hot-rolled steel - Steel which is rolled to finished size. while hot. Identified by a dark oxide scale left on the surface.

idler - A gear or gears placed between two other gears to transfer motion from one gear to the other gear without changing their speed or ratio.

independent chuck - A chuck in which each jaw may be moved independently of the others.

indexing - The process of positioning a workpiece for machining it into equal spaces. dimensions. or angles using an. index or dividing head.

indexing fixture - A complete indexing unit composed of a dividing head and rootstock. (See dividing head.)

index plate - A metal disk or plate punched with many holes arranged in a series of rings. one outside the other each ring containing a different number of holes.

indicator - A precision instrument which shows variations of thousandths of an inch or less when testing the trueness or alignment of a workpiece, fixture, or machine.

inserted-tooth cutter - A milling cutter designed with replaceable cutting tooth inserts to save the expense of a new cutter whenever the teeth become damaged or worn. Generally, they are made 6 inches or more in diameter.

intermediate gear - See idler.

jack, leveling - Small jacks (usually screw jacks) for leveling and holding work on planner beds and similar places.

Jacobs chuck - Common term for the drill chuck used in either the headstock spindle or in the tailstock for holding straight-shank drills, taps, reamers, or small diameter workplaces.

Jarno - A standard taper having 0.600-inch taper per foot used on some machine tools.

jig - A production work holding device that locates the workpiece and guides the cutting tool (see fixture).

Johannson blocks (Jo blocks) - Common term for the precision gage blocks used and accepted as dimensional standards by machinists, toolmakers. and inspectors.

kerf - The width of cut made by a Saw.

key - One of the several types of small metal objects designed to fit mating slots in a shaft and the hub of a gear or pulley to provide a positive drive between them: also. the name of the T-handle wrench used on chucks.

key seat - A recessed groove (slot) machined into a shaft or a part going on the shaft (usually a wheel or gear).

knee - That part of a column of a knee-type milling machine which carries the saddle and the table and provides the machine with vertical feed adjustments. Also, the name of a precision angle plate called a "toolmaker's knee".

knurl - A decorative gripping surface of straight-line or diagonal design made by uniformly serrated rolls called knurls.

knurling - The process of finishing a part by scoring (pressing) patterns on the surface of the work.

land - That surface on the periphery of a rotary cutting tool, such as a milling cutter. drill tap, or reamer, which joins the face of the flute or tooth to make up the basic cutting edge.

lap - A tool made of soft metal and charged With fine abrasives for precision finishing of metal surfaces. Also, to perform the operation using a lap-

lard oil - A cutting oil made from animal fats usually mixed with mineral oils to reduce its cost and improve its qualities.

layout - To locate and scribe on blank stock the shape and size dimensions required to machine or form the part.

lead - The distance a thread will advance along its axis in one complete revolution. Also, a heavy, soft', malleable metal having a low melting point. It has a bright. silvery color when freshly cut or poured and turns to a dull gray with aging.

lead hole - See pilot hole.

lead screw - The long, precision screw located in front of the lathe bed geared to the spindle, and used for cutting threads. Also, the table screw on the universal milling machine when geared to the indexing head for helical milling.

limits - The smallest and largest dimension which are tolerable (allowed).

lip of a drill - The sharp cutting edge on the end of a twist drill.

live center - See center, live.

loading - A condition caused by grinding the wrong material with a grinding wheel or using too heavy a grinding action.

machinability - The degree of difficulty with which a metal may be machined; may be found in appropriate handbooks.

machine tool - A power-driven machine designed to bore, cut, drill, or grind metal or other materials.

machining, Finish - Machining a surface to give it the desired finish.

machinist - A person who is skilled in the operation of machine tools. He must be able to plan his own procedures and have a knowledge of heat-treating principles.

machining, rough (rough finishing) - Removing excess stock (material) with a machine tool thus shaping it in preparation for finish machining.

magnesium - A lightweight, ductile metal similar to but 1ighter than aluminum.

magnetic chuck - A flat'. smooth-surfaced work holding device which operates by magnetism to hold ferrous metal workplaces for grinding.

malleable - Capable of being extended or shaped by hammering or rolling.

mandrel - A precision-made tapered shaft to support work for machining between centers.

mesh - To engage. as the teeth between two gears.

mic; mike - A term used for micrometer, or to measure with a micrometer.

micrometer, depth - A micrometer in which the spindle projects through a flat, accurately machined bar.. used to measure the depth of holes or recesses.

micrometer, thread - A micrometer in which the spindle is ground to a point having a conical angle of 60 degrees. The anvil, instead of being flat. has a 60 degree V-Shaped groove which fits the thread.

mild steel - A term used for low-carbon machine steel.

mill - A milling machine; also, the act of performing an operation on the milling machine.

milling, climb - See climb milling. milling, face-See face milling.

milling cuffer - A cutting tool, generally cylindrica] in shape. used on a milling machine and operated essentially like a circular saw.

minor diameter - The smallest diameter of a screw thread. Also known as the "root diameter."

Morse taper - A self-holding standard taper largely used on small cutting tools such as drills, end mills, and reamers, and, on some machines, spindles in which these tools are used.

multiple-thread screw - A screw made of two or more threads to provide an increased lead with a specified pitch.

music wire - A high-quality steel wire used for making springs. Also called piano wire.

necking - Machining a groove or undercut in a shaft to permit mating parts to be screwed tightly against a shoulder or to provide clearance for the edge of a grinding wheel.

nickel - An alloying element which increases the strength, toughness, and wear and corrosion resistance of steels.

nitrating - A case hardening process in which ammonia or some other form of nitrogen is introduced to the surface of certain alloys.

nonferrous - Metal containing no iron, such as brass and aluminum.

normalizing - Process of heating a ferrous metal or alloy to above its critical temperature and cooling in still air to **room** temperature to relieve Internal stresses.

off center - Not centered; offset, eccentric, or inaccurate.

oil hardening - The process of quenching in oil when heat treating alloy steel to bring out certain qualities.

oilstones - Molded abrasives in various shapes used to hand-sharpen cutting tools.

overarm - The support for the end of a milling cutter which is on the opposite side of the cutter from the spindle and column.

pack hardening - A heat-treating process in which the workpiece is packed into a metal box together with charcoal, charred leather. or other carbonaceous material to case-harden the part.

parallels - Hardened steel bars accurately ground to size and ordinarily made in pairs in many different sizes to support work in precision setups.

parting - The operation of cutting off a piece from a part held in the chuck of a lathe.

pawl - A pivoted lever or sliding bolt that secures as an automatic directional table control on a grinder.

peen - To draw, bend. or flatten, also, the formed side of a hammer opposite the face.

pilot - A guide at the end of a counterbore which keeps it aligned with the hole,

pilot hole - A starting hole for large drills to serve as a guide, reduce the resistance, and aid in maintaining the accuracy of the larger hole. Also called a lead hole.

pinning - A term used to describe the condition of a file clogged with metal filings causing it to scratch the work.

pitch - The distance from any point on a thread to the corresponding point on the adjacent thread. measured parallel to the axis. Also applied to spur gears-. see diametral pitch.

pitch circle - The line (circle) of contact between two meshing gears.

pitch diameter - The diameter of a thread at an imaginary point where the width of the groove and the with of the thread are equal.

pitch line - An imaginary line which passes through threads at such points that the length of the part of the line between adjacent threads is equal to the length of the line within a thread.

plain cutter - A milling cutter with cutting teeth on the periphery (circumference) only.

play - The looseness of fit (slack) between two pieces press tit-See force fit.

punch, prick - A solid punch with a sharp point, used to mark centers or other locations on metal.

pyrometer - A device for measuring the high temperatures in a heat-treating furnace.

quench - To rapidly cool heated metal in water, oil brine, or air in the process of heat treating.

quick return - A mechanism on some machine tools that provides rapid movement of the ram or table on the return or anointing stroke of the machine.

rack - An array of gears spaced on a straight bar.

radial - In a direction directly outward from the center of a circle or sphere or from the axis of a cylinder. The spokes of a wheel, for example, are radial.

radius - The distance from the center of a circle to its circumference (outside).

rake - That surface of a cutting tool against which the chips bear while being severed. If this surface is less than 90” from the surface being cut, the rake is positive-, if more, the rake is negative.

ram - That part of a shaper which moves back and forth and carries the tool head assembly.

rapid traverse - A lever-controlled, power-operated feature of some machines that permits the rapid movement of the worktable from one position to another.

reaming, line - The process of reaming two or more holes to bring them into very accurate alignment.

recalescence - An increase of temperature that occurs while cooling metal through a range of temperatures in which changes in metal occur.

recess - An internal groove. See undercut.

relief - A term for clearance or clearance angle.

root diameter - See minor diameter.

roughing - The fast removal of stock to reduce a workpiece to approximate dimensions'. leaving only enough material to finish the part to specifications.

rule, hook - A rule with a hook on the end for measuring through pulley holes and in similar places.

running fit - A class of fit intended for use on machinery with moderate speeds, where accurate location and minimum play are desired.

SAE steel - Steel manufactured under the specifications by the Society of Automotive Engineers.

sandblasting - A process of blowing sand by compressed air with considerable force through a hose against an object.

scale - The rough surface on hot. finished steel and castings. Also, a shop term for steel rules.

scraper - A hardened steel hand tool used to scrape surfaces very smooth by removing minute amounts of metal.

scribe (scribe; scratch awl) - A steel rod 8 to 12 inches long and about 3/16 inches in diameter. It has a long, slender, hardened steel point on one or both ends.

sector - A device that has two radial, beveled arms which can be set to include any number of holes on the indexing plate of a dividing head to eliminate recounting the holes for each setting.

set - The bend or offset of a saw tooth to provide a clearance for the blade while cutting. Also, the permanent change in the form of metal as the result of repeated or excessive strain.

set screw - A plain screw used principally for locking adjustable parts in position.

setup - The preparation of a machine tool to complete a specific operation. It includes mounting the workpiece and necessary tools and fixtures, and selecting the proper speeds. feeds, depth of cut and coolants.

shank - That part of a tool or similar object which connects the principal operating part to the handle, socket', or chuck by which it is held or moved.

shims - Very thin sheets of metal made in precise thickness and used between parts to obtain desired fits. Sometimes they are laminated, to be pulled off to the desired depth.

shoulder - A term for the step made between two machined surfaces.

shrink fit - A class of fit made when the outer member is expanded by heating to fit over a shaft, and then contracts or shrinks tightly to the shaft when cooled.

side cutter - A milling cutter that has cutting teeth on the side as well as on the periphery or circumference.

side rake - That surface which slopes to the side of the cutting edge. It may be positive or negative and is combined with the back rake. See rake.

sine bar - A precision instrument for laying out, setting, testing, and otherwise dealing with angular work.

slabbing cutter - A wide, plain milling cutter having helical teeth. Used for producing large, flat surfaces.

sleeve - See drill sleeve.

slitting saw - A narrow milling cutter designed for cutoff operations or for cutting narrow slots.

slotter - An attachment which operates with a reciprocating motion. Used for machining internal slots and surfaces.

soft hammer - A hammer made of brass, copper, lead'. or plastic to a, non-marring finished surfaces on machines or workplaces.

spherodizing - A process of heat treating steel to produce a grain structure that is relatively soft and machinable.

spindle - A rotating device widely used in machine tools. such as lathes., milling machines, drill presses, and so forth, to hold the cutting tools or the work, and to give them their rotation.

spindle speed - The RPM at which a machine is set. See cutting speed.

spot facing - Finishing a bearing surface around the top of a hole.

spring collet - See collet.

spur gear - A gear having teeth parallel to the axis of the shaft on which it is mounted.

square, solid (toolmaker's tri square) - A very accurate try square in which a . steel blade is set firmly into a solid, rectangular-shaped handle so that each edge of the blade makes an angle of exactly 90" with the inner face (side) of the handle.

square surface - A surface at a right angle with another surface.

square threads - A thread hating a depth. width. and space between threads that are equal. It is used on heavy jack screws. vise screws. and other similar items.

steady rest - A support that is clamped to the bed of a lathe used when machining a long workpiece. Sometimes called a center rest.

stellite - A cast al alloy of chromium, cobalt. and sometimes tungsten, used to make lathe cutter bits that will stand exceptionally fast speeds and heavy cuts.

step block - A fixture designed like a series step to provide support at various heights required for setups.

stock - A term for the materials used to make parts in a machine tool. Also, the die stock used for threading dies.

stop - A device attached to a machine tool to limit the travel of the worktable and sometimes the work head.

straddle milling - A milling setup where two side milling cutters are spaced on an arbor to machine two parallel surfaces with a single cut.

stress - The internal force or resistance developed in steel which was hardened, extensively machined. or cold worked.

surface grinding - The process of grinding flat surfaces on a surface grinding machine. With special setups, angular and form surfaces may also be ground.

surface plate - An accurately machined and scraped flat metal piece (usually of cast iron) used to check the flatness of surfaces.

swing - The dimension of a lathe determined by the maximum diameter of the work that can be rotated over the ways of the bed.

tailstock - That part of a machine tool. such as a lathe or cylindrical grinder which supports the end of a workpiece with a center. It may be positioned at any point along the way of the bed, and may be offset from center to machine tapers.

tang - The flat on the shank of a cutting tool, such as a drill, reamer or end mill, that fits a slot in -the spindle of a machine to keep the tool from slipping. Also, the part of a file that fits into a handle.

tap - A tool used to cut threads on the inside of a round hole.

taper - A uniform increase or decrease in the size or diameter of a workpiece.

tapping - The process of cutting screw threads in a round hole with a tap (an internal thread cutting tool).

T-bolt - Term for the bolts inserted in the T-slots of a worktable to fasten the workpiece or work-holding device to the table.

tempering - A heat-treating process to relieve the stresses produced when hardening and to impart certain qualities‘, such as toughness-, sometimes called “drawing.”

template - A pattern or a guide for laying out or machining to a specific shape or form.

tensile strength - The property of a metal which resists force applied to pull it apart.

thread - A helical projection of uniform section on the internal or external surface of cylinder or cone. Also, the operation of cutting a screw thread.

thread angle - The angle formed by the two sides of the thread (or their projections) with each other.

thread axis - A line running lengthwise through the center of the screw.

thread crest - The top surface joining the two sides of a thread.

thread depth - The distance between the crest and the root of a thread.

thread pitch - The distance from a point on one screw thread to a corresponding point on the next thread.

thread pitch diameter - The diameter of a screw thread measured from the thread pitch line on one side to the thread pitch line on the opposite side.

thread root - The bottom surface joining the sides of two adjacent threads.

throw - The crankpin on a crankshaft. Also, the length of the radius of a crank, an eccentric, or a cam.

tolerance - The allowable deviation from a standard size.

tool steel - A general classification for high-carbon steel that can be heat treated to a hardness required for metal cutting tools such as punches, dies. drills. taps’, reamers, and so forth.

traverse - One movement across the surface of the work being machined.

truing - The act of centering or aligning a workpiece or cutting tool so that an operation may be performed accurately. Also, correcting the eccentricity or out of-round condition when dressing a grinding wheel.

T-slot - The slots made in the tables of machine tools for the square-head bolts used to clamp the workpiece,, attachments, or work-holding fixtures in position for performing the machining operations.

tumbler gears - A pair of small lever-mounted gears on a lathe used to engage or to change the direction of the lead screw.

two-lip end mill - An end milling cutter designed with teeth that cut to the center so that it may be used to feed into the work like a drill.

universal grinder - A versatile grinding machine designed to perform both internal and external grinding operations. including straight and tapered surfaces on tools and cutters.

universal milling machine - A milling machine with a worktable that can be swiveled for milling helical work. It is always supplied with attachments, including an indexing fixture.

universal vise - A vise designed for holding work at a double or compound angle. Also, a toolmaker’s vise.

Ways - The flat or V-shaped bearing surfaces on a machining tool that guide and align the parts which they support.

wheel dresser - A tool or device for dressing or truing a grinding wheel.

work - A common term for a workpiece or part being machined.

working drawing - A drawing. blueprint, or sketch of a part, structure, or machine.

worm - The threaded cylinder or shaft designed to mesh with a worm gear.

worm gear - A gear with helical teeth made to conform with the thread of the mating worm.

wrought iron - A commercially pure form of iron with minute slag inclusions which make it soft, tough, and malleable.