

INDEX

- Abrasive Disk, 3-9
- Abrasive Wheels (See Grinding Abrasive Wheels).
- Accidents, Field Report of ,1-1
- Acme Screw Thread (See Also Screw Threads), 7-48
- Adapter, spindle (milling Machine), 8-11
- American (National) Standard Screw Thread (See Also Screw Threads):
 - Description, 7-46
 - General Dimensions (Table), A-17 thru A-27
 - Thread Pitches and Tap Drill Sizes (Table), A-7, A-8
- Angle Plate, Adjustable, 8-12
- Angle Plates, 4-14
- Angular Blade Guide Attachment (Band Sawing Machine), 6-9
- Annealing, 2-13, 2-14
- Arbor Shell Reamer, 8-9
- Arbors (Milling Machine), 8-9,
- Attachments, Machine Tool
 - Angular Blade Guide Attachment, 6- 9
 - Band File Attachment, 6-8
 - Circular Milling Attachment, 8-13
 - Disk Cutting Saw Attachment, 6-9
 - High speed Milling Attachment, 8-12
 - Indexing Fixture (Milling Machine), 8-12
 - Indexing Head (Versa-Mil), 9-5
 - Milling and Grinding Lathe Attachment, 5-4,
 - Miter Guide Attachment, 6-9
 - Offset Boring Head, 8-13
 - Portable Coolant Attachment, 3-14
 - Taper Attachment, 7-40
 - Universal Milling Attachment, 8-13
 - Vertical Spindle Attachment, 8-13
- Band File Attachment (Band Sawing Machine), 6-8
- Band Files, 6-7
- Band Filing, 6-17
- Band Saw Blades, 6-5
- Band Sawing Machines (See Sawing Machines).
- Band Sawing Machine, 6-13
- Band Sawing Radius Guide, 6-6
- Blades (see Band Saw Blades or Hacksaw Blades).
- Boring:
 - Lathes, 7-59, 7-60, 7-64
 - Milling Machines, 8-1
- Buffing:
 - Abrasives, 5-23
 - Description, 5-23

TC 9-524

- Operation, 5-23
- Speeds, 5-23
- Chucks:
 - Drills, Chucks, 4-11
 - Lathe, Chucks, 7-12, 7-13, 7-14
- Circular Milling Attachment, 8-13
- Collet (Milling Machine), 8-10
- Collet Chuck (Lathe), 7-13, 7-14
- Coolant Attachment Portable, 3-14
- Coolant (See Cutting Oils).
- Cutters, Milling (See Milling Cutters), 8-3, 8-8
- Cutting Fluids (See Cutting Oils).
- Cutting Oils:
 - Drilling (Table), A-5
 - Grinding 5-17
 - Lathe (Table), A-5
 - Milling (Table), A-5
 - Sawing, 6-14
 - Types, 7-19, 7-20
- Cutting Speeds:
 - Band Filing (Table), 8-19
 - Band Sawing (Table), 6-17
 - Drill (Table), A-6
 - Grinding Abrasive Wheel, 5-6, 5-9, 5-11
- Hack Sawing (Table), 6-12
- Turning and Threading (Lathe)(Table), A-10
- Cutting Tool Holders (Lathe), 7-10, 7-11
- Definition of Machine Tools, 1-1
- Disk Cutting Saw Attachment (Band Sawing Machine)., 6-10
- Dividing Head (See Indexing Fixture).
- Dogs, Lathe, 7-16
- Dressers, Abrasive Wheel, 5-12
- Drill, Drift, 4-12
- Drill Twist (See Twist Drill), 4-5, 4-7, 4-9
- Drill Grinding Machine, 4-10
- Drill Holding Devices, 4-11, 4-12
- Drill Machines:
 - Bench Type Drilling Machine, 4-11
 - Bench-Mounted Upright Drilling Machine, 4-4
 - Counterboring and Spot Facing, 4-22, 4-23
 - Countersinking, 4-21
 - Cutting Oils (Table), A-5
 - Drilling, 4-19, 4-20
 - Feed, 4-20
 - Floor-mounted Upright Drilling Machine, 4-2, 4-3
 - General Operations, 4-17
 - Installing Drill ,4-17
 - Laying Out Work, 4-14, 4-15

- Mounting Workpieces, 4-15
- Purpose, 4-1
- Reaming, 4-24
- Removing Drift, 4-12
- Safety Precautions, 4-4
- Selection of Feed, 4-18
- Selection of Speed, 4-18
- Starting Holes, 4-18
- Tapping, 4-23
- Twist Drills (See Twist Drills).
- Types, 4-5, 4-6
- Drill, Special, 4-7
- Engine Lathes (See Also Lathes), 7-2
- Feeds:
 - Feed Screw (For Portable Drills), 3-4
 - Twist Drills, 4-17
- Files, Bands 6-7
- Filing:
 - Band filing, 6-17
 - Filing on the Lathe, 7-61
- Follower Rest, 7-17
- Forms, Records, and Reports, 1-1
- Grinder (Portable Electric Grinder), 3-7
- Grinder (See Grinding Machines and Portable Grinders).
- Grinding:
 - Buffing, 5-23
 - Cleaning, 5-22
 - Conical Grinding, 5-21
 - Coolants, 5-17
 - Cutting Speeds, 5-16, 5-17
 - Cylindrical Grinding, 5-20
 - Depth of Cut, 5-17
 - Factors Governing Speeds, 5-16
 - Feeds, 5-17
 - Internal, 5-22
 - Lapping, 5-23
 - Off-hand Grinding, 5-18
 - Polishing, 5-23
 - Safety, 5-1
 - Surface Grinding, 5-22
 - Tool and Cutter Grinding, 5-18
 - Work Speed (Cylindrical Grinding), 5-17
 - Work Speed (Surface Grinding), 5-17
- Grinding Abrasive Wheels; 5 -5
 - Abrasive Grain Size, 5-6
 - Abrasive Materials, 5-6

TC 9-524

Bond Materials, 5-6

Dressing Wheels, 5-11, 5-12

Grades of Hardness, 5-6

Mounting Wheels, 5-11

Selecting Wheels, 5-9

Types, 5-5

Grinding Machines (See Also Grinding and Grinding Abrasive Wheels)

Bench-type Utility Grinding and Buffing Machine, 5-3

Bench-type Utility Grinding Machine, 5-3

Floor-mounted Utility Grinding Machine, 5-2

Laying Out Work, 5-13

Milling and Grinding Lathe Attachment, 5-4

Mounting Workpieces, 5-14

Reciprocating Surface Grinding Machine, 5-4

Surface Grinding Machine, 5-4, 5-5

Tool Post Grinding Machine, 5-4

Hack Sawing Machines (See Sawing Machines).

Hacksaw Blades Power, 6-4

High-speed Milling Attachment, 8-12

Hold-down Straps, 8-16

Holder, Cutter Tool (See Cutting Tool Holder), 7-10

Independent Chuck (Lathe), 7-12

Indexing Fixture:

Milling Machine, 8-12

Versa-Mil, 9-5

Indexing Workpieces:

Description of Index Head, 8-16, 8-12

Differential Indexing 8-17

Direct Indexing, 8-17

Indexing in Degrees, 8-17

Plain indexing 8-17

Jigs (Drilling Machine), 4-14

Keys (See Square-ends Machine Key or Round-ends Machine Key or Woodruff Key).

Keyway Cutting (See Milling Operations and Versa-Mil Operations).

Lapping:

Abrasives, 5-23

Lathes (See Also Lathe Operation):

Bench-type Engine Lathe, 7-2

Boring, 7-59, 7-60

Centers, 7-16

Chucks, 7-12

Cutter Bits:

Common Types, 7-5, 7-6

Grinding, 7-9, 7-10

Recommended Angles (Table), 7-5, 7-6

- Terms, 7-5, 7-6
- Cutting Oil, 7-19, A-5
- Cutting Speed (Table), A-5
- Cutting Tools:
 - Cutting Tool Holder, 7-10
- Boring Tool, 7-9
- Knurling Tool, 7-9
- Thread Cutting Tool Holder with Cutter, 7-9
- Tipped Tool Bits, 7-8, 7-9
- Depth of Cut, 7-29
- Dogs, 7-16
- Drilling, 7-59
- Eccentric Turning, 7-62, 7-63
- Facing, 7-27, 7-28
- Feeds, 7-27, A- II
- Filing; 7-65
- Floor-Mounted Engine Lathe, 7-1
- Follower Rest, 7-17
- Knurling, 7-56, 7-57
- Laying Out Work (See also Mounting Work:
 - Drilling Machine, 4-16
 - Grinding Machine, 5-15
 - Hack Sawing Machine, 6-11
 - Horizontal Band Sawing Machines, 6-10
 - Vertical Band Sawing Machine, 6-14
- Lubricants (See Cutting Oils):
- Machine Strap Clamps, 4-13
- Machine Tools (See also Specific Item):
 - Definition, 1-1
 - Listing, 1-1
 - Specialized, 1-1
 - Mandrels (Lathe), 7-17
- Milling Machines:
 - Adjustable Angle Plate, 8-12
 - Angular Milling, 8-22
 - Arbors, 8-8
 - Boring, 8-31
 - Chucks, 8-14
 - Circular Milling Attachment, 8-13
 - Collets and Spindle Adapter, 8-11
 - Computing Speeds, 8-19
 - Cutting Oils, 8-21
 - Cutting Speeds (Table), 8-19, A-28
 - Direction of Feed, 8-20
 - Drilling, 8-31
 - Face Milling, 8-23

TC 9-524

- Feed, 8-20
- Floor-mounted Universal Horizontal Milling Machine, 8-1
- Form Milling, 8-24
- Gang Milling, 8-24
- Gear Milling, 8-29
- General Operations, 8-18
- Helical Milling, 8-29
- High-Speed Milling Attachment, 8-12
- Indexing Fixture, 8-12
- Indexing Workpieces, 8-13, 8-16, 8-17, 8-18
- Keyway Milling, 8-25, 8-27
- Knee-type Milling Machine, 8-1
- Milling Cutters:
 - Care and Maintenance, 8-8
 - Classification, 8-3
 - Grinding of, 5-18, 5-19
 - Kinds, 8-4
 - Nomenclature, 8-3
 - Selection, 8-7
- Milling with the Milling and Grinding Lathe Attachment, CHAP-9
 - Mounting Workpieces, 8-14
 - Offset Boring Head, 8-13
 - Plain Milling, 8-21
 - Purpose, 8-1
 - Safety Precautions, 8-2, 8-3
 - Sawing and Parting, 8-28
 - Speeds, 8-19
 - Spline Milling, 8-29, 8-30
 - Straddle Milling, 8-22
 - Swivel Cutter Head Ram Type Drilling Machine. 8-2
- Mandrels, 7-17
- Milling Fixtures, 7-19
- Milling and Grinding Lath Attachment, CHAP 9
- Mounting Workpieces:
 - Between Centers, 7-22, 7-23
 - In Chucks, 7-21, 7-22
 - To Face Plate, 7-22
- National Taper Pipe Thread (See also Screw Threads):
 - Cutting on Lathe, 7-52
 - Thread Pitches (Table), A-8
- Parting, 7-33
- Polishing:
 - Abrasives, 5-23
 - Attachment (Band Sawing Machine), 6-8
 - Operation, 5-22

- Operation (Band Sawing Machine), 6-18
- Operation (Lathe), 7-62
- Wheels, 5-13
- Portable Coolant Attachment:
 - Description, 3-14
 - Operation, 3-14
- Portable Drill:
 - Feed Screw, 3-2
 - Operation, 3-5
 - Safety Precautions, 3-1
- Portable Electric Hand Drills, 3-2
- Portable Pneumatic Hand Drill with Geared Chuck, 3-3
- Portable Grinder:
- Power Hack Blades:
 - General, 6-4, 6-5
 - Selection (Table), 6-5
 - Setting of Teeth, 6-5
 - Safety (See Safety Precautions).
- Reaming, 7-61
- Rest (Lathe):
 - Follower Rest, 7-17
 - Steady Rest, 7-17
- Right Triangles, C-3
- Rotational Speeds:
 - Lathe Spindle (Table), A-10
 - Milling Cutter (Table), A-20
 - Twist Drill (Table), A-6
- Safety Precautions, 7-4
- Screw Thread Cutting, 7-49
- Shoulder Turning ,7-30
- Speeds, 7-26
- Steady Rest, 7-17
- Straight Turning, 7-29
- Taper Attachment, 7-40, 7-41
- Taper Turning, 7-35 thru 7-43
- Tool Holders and Tool Posts, 7-10
- Tool Post Grinding Machine Attachment, 7-18,
- Tools and Equipment, 7-5
- Types of Lathes, 7-1
- T-Slot Milling, 8-28
- Tools and Equipment, 8-3
 - Types, 8-1
 - Universal Milling Attachment, 8-13
 - Vertical Spindle Attachment, 8-13
 - Vises,. 8-12
 - Miter Guide Attachment (Band Sawing Machine), 6-9

TC 9-524

Mounting Work (See Also Laying-out Work):	Description, 3-12, 3-13
Drilling Operations, 4-16, 4-17	Operation, 3-13
Grinding Machine, 5-16	Portable Polisher (See Portable Sander and Polisher).
Hack Sawing Machine, 6-10	Portable Sanders and Polishers:
Horizontal Band Sawing Machine, 6-10	Disk-type Portable Electric Sander, 3-8
Lathe, 7-21, 7-22, 7-23	Polishing Operation, 3-10
Milling Machine, 8-14, 8-15	Portable Electric Polisher, 3-8
Offset Boring Head (Milling Machine) 8-13	Safety Precautions, 3-8
Pneumatic Drill (See Portable Drills).	Sanding Operations, 3-10
Pneumatic Grinder (See Portable Grinder).	Safety Precautions, General, 1-12, 1-13, 1-14, 1-15 1-16
Pneumatic Sander (see Portable Sander and Polisher).	Sander (See Portable Sander and Polisher).
Equipment, 3-6	Sawing Machines:
Operation, 3-9	Angular Blade Guide Attachment, 6-9
Portable Electric Grinder (Chuck Type), 3-6	Band File Attachment, 6-8
Portable Electric Grinder (Wheel Type), 3-7	Band Sawing , 6-13, 6-14, 6-15
Portable Pneumatic Grinder, 3-7. 3-8	Band Sawing Machines (See Sawing Machines)
Safety Precautions, 3-1	Band Filing, 6-17
Portable Horizontal Hack Sawing Machine:	Contour Sawing, 6-16
Description, 3-11	Cutting Oils, 6-14
Portable Machine Tools (See also Specific Items):	Feeds Horizontal Machine, 6-13,
Purpose, 3-1	Feeds (Vertical Machine), 6-14
Safety Precautions, 3-1	Internal Sawing, 6-17
Portable Metal Cutting Shears:	

- Polishing, 6-18
- Speeds (Table), 6-13
- Straight-line Sawing (Horizontal Machine), 6-14
- Straight-line Sawing (Vertical Machine), 6-15
- Cutting Oils, 6-14
- Disk Cutting Saw Attachment, 6-9
- Feeds:
 - Band Sawing, 6-13
 - Hacksawing, 6-14
- General Operations, 6-12
- Hack Sawing Machines:
 - Cutting Oils, 6-14
 - Feeds, 6-13
 - Speeds (Table), 6-13
 - Straight-line Sawing, 6-14
 - Horizontal Hack Sawing Machine, 6-1
 - Metal Cutting Band Sawing Machine, 6-2
 - Metal Cutting Horizontal Band Sawing, 6-3
 - Miter Guide Attachment, 6-9
- Polishing, 6-18
- Polishing Attachment, 6-8
- Polishing Bands, 6-8
- Portable Horizontal Hack Sawing Machine, 3-11
- Power Hack Saw Blades, 6-4, 6-5
- Safety Precautions, 6-3
- Speeds:
 - Band Sawing, 6-13
 - Hack Sawing, 6-11
 - Straight-line Sawing, 6-14
- Tools and Equipment, 6-4
- Types, 6-1
- Screw Threads (See Also Specific Item):
 - Cutting Screw Threads (Lathe), 7-49 thru 7-53
 - Fit, 7-46 thru 7-48
 - Forms, A-14, A-15, A-16, 7-45, 7-46
 - Measurement, 7-52, A-28
 - Tapping (Drilling Machine), 4-23
 - Tapping (Lathe), 7-60
 - Terminology, 7-44, 7-46
- Specialized Machine Tools, 1 -1
- Speeds (See Cutting Speeds and Rotational Speeds).
- Spindle Adapter (Milling Machine), 8-11
- Splines, Table of Dimensions, A-32
- Square Thread (See also Screw Thread), 7-48, A-15
- Stand, Grinder (For Portable Electric Grinder), 3-7
- Stand, Vertical (For Portable Electric Drill), 3-4

TC 9-524

Steady Rest, 7-17

Step Blocks, 4-13

Tapping:

Operations (Drilling Machine), 4-23

Operations (Lathe), 7-60

Tap Drill Sizes (Table), A-7, A-8

Tempering, 2-13

Tool and Cutter Grinding:

General, 5-15

Lathe and Cutter Bits, 7-5, thru 7-7

Milling Cutters, 5-18, 5-20

Tool and Cutter Grinding Machines, 5-3

Tool Post Grinding Machine, 5-3

Tools and Equipment (See Specific Item)

Trigonometry Formulas, C-2

Twenty-nine- Degree Worm Thread (See also
Screw Threads), 7-45 thru 7-6

Twist Drills:

General, 4-5

Letter Sizes for Twist Drills, 4-5

Parts, 4-8, 4-9

Recommended Angles (Table), A-4

Sharpening, 4-7

Special Drills, 4-7

Turning (See Lathe Operation).

Unified Screw Thread (See also Screw Threads), 5

Universal Milling Attachment (Milling Machine),

Universal Scroll Chuck (Lathe), 7-12

Upright Drilling Machine (See Drilling Machines)

Unsatisfactory Equipment or Material Report of, 1

V-blocks,. 4-14

Versa-Mill:

Adapter Mounting Base, 9-5

Angle Drilling, 9-11

Angle Milling, 9-12

Arbors, 9-6

Bases. Mounting, 9-5

Milling Cutter, Selection, 9-6

Basic Unit, 9-2

Computing Speeds, Tables Appendix A

Cutters, 9-7

Plain Milling, 9-10

Depth of Cut, 9-10

Safety Precautions, 9-1

Description of, 9-1

Speeds, 9-9,. A-33 thru A-36

Drilling, 9-10

Spline Milling, 9-14	Dimensions of Square-end Machine Keys (Table), A-30
External Grinding Attachment 9-2	Dimensions of Steep Machine Tapers (Table), A-12
Straddle Milling, 9-13	Dimensions of T-slots (Table), A-30
Feeds, 9-10	Drill Speeds for Different Materials (High Speed Steel Drills (Table), A-4, A-6
Thread Milling, 9-20	Grinding Wheel Selection and Application (Table), A-9
Feed Table, 9-5	Hack Sawing Machine Speeds (Table). 6-12
Tools and Equipment:	Lathe Cutting Speeds for Straight Turning and Threading (Table), A-10
Fly Cutting, 9-15	Lip Angles and Lip Clearances for Twist Drills (Table), A-4
T-Slot, 8-28	Metric Conversation Table (Table), A-3
T-Slot Bolts, 4-14	Milling Cutter Rotational Speeds (Table), A-29
Tables:	Milling Machine Cutting Speeds for High-speed Milling Cutter (Table), A-28
American Standard Taper Pins (Table), A- 1 3	Morse Taper (Table), A-1
Band Filling Speeds (Table), 6-17	Number, Fractional and Letter Drill Sizes (Table), A-3
Band Sawing Radius Guide (Table), 6-6	Primary Clearance Angle Calculations for Straight and Cup Grinding Abrasive Wheels, 5-20
Band Sawing Speeds (Table), 6-13	Rotational Speed and Feed for High speed Twist Drills (Table), A-6
Basic Dimensions of American Standard Taper Pipe Threads (Table), A-8	Selection of Abrasive Disk (Table), A-2
Clearance and Rake Angles for Lathe Cutter Bits (Table), A-10	Selection of Band Files (Table), 6-7
Cutting Fluids for Drill Press Work (Table), A-5	
Cutting Oils for Lathe Operations (Table), A-5	
Cutting Oils for Milling Operations (Table), A-5	
Decimal Equivalentents of Millimeters (Table), A-3	

- Selection of Band Saw Blades (Table), A-2
- Selection of Power Hack Saw Blades (Table), 6-5
- Self-holding Tapers Basic Dimensions (Table), A- 12
- Series of Involute Gear Milling Cutters for Each Pitch (Table), A-31
- Sizes of Woodruff Keys (Table),. A-30
- Standard Series Limits of Sizes Unified and American Screw Threads (Table), A-17 thru A-27
- Standard Spline Dimensions (Table), A-32
- Tap Drill Sizes for Fractional Size Threads (Table), A-7
- Taper Sizes and Angles (Table), A- I I,. A- 12, A- 13
- Taper Attachment (Lathe), 7-40, 7-42
- Tapers:
 - Angles (Table), A- I 1, A- 12,. A- 1 3
 - Sizes, A- I 1, A- 12, A- 1 3
 - Turning, 7-35 thru 7-41
- Vertical Spindle Attachment (Milling Machine), 8-13
- Vertical Stand (For Portable Electric Drill), 3-4
- Vises:
 - Angle Vise, 4-13
 - Machine Table Vise, 4-13
 - Plain Vise, 8-15
 - Swivel Vise, 4-13
- Wheels:
 - Abrasive, Materials 5-6
 - Buffing, 5-13
 - Grinding, 5-5
 - Polishing, 5-13
 - Wire, 5-13
- Wire Sizes for Measuring 60 Degree Threads by the Three Wire Method, A-28
- Wire Wheels, 5-13
- Woodruff Keys, 8-25, 8-27, A-30
- Work Holding Devices:
 - Angle Plates, 4-15
 - Blocks, 4-13
 - Clamps, 4-13
 - Hold-down Straps, 8-16
 - Jigs, 4-14
 - Machine Strap Clamps, 4-13
 - Machine Table Vise, 4-13
 - Stop Blocks, 4-13
 - T-Slot Bolt,. 4-14
 - V-blocks, 4-14