

CONTENTS

CHAPTER 1 MACHINE TOOLS	1
Common Machine Tools	
CHAPTER 2 SAFETY	5
Causes of Accidents	
CHAPTER 3 MEASUREMENT SYSTEMS, PRECISION MEASUREMENT, AND INSPECTION	8
Measurement Systems Basic Measurement Precision Measuring Tools Gauge Blocks Angular Measurement Fixed Gauges Comparison Measurement Comparators Surface Finish Measurement Light Wave Precision Measurement	
CHAPTER 4 LAYOUT TOOLS	59
Layout Tables Surface Preparation of the Metal for Layout Methods of Scribing Lines Parallel to a Surface or Edge Angular Layout Circular Layout Permanent Layout Layout Accessories Layout Operations	
CHAPTER 5 HAND TOOLS AND BENCH WORK	70
The Bench Vise Hammers Screwdrivers The Hand Hacksaw Files Scrapers Hand Taps Threading Dies Hand Reamers Broaching Lapping Bearings	
CHAPTER 6 PHYSICS OF METAL CUTTING	88
Need for Metal Cutting Research Metal Cutting Terminology Plastic Flow of Metal Chip Formation Machinability of Metals Cutting Tool Shape Tool Life The Effects of Temperature and Friction Effects of Cutting Fluids	
CHAPTER 7 CONTOUR BANDSAW	99
Basic Bandsaw Applications Contour Bandsaw Construction Bandsaw Blade Types and Applications Job Requirements The Saw Band Welding Attach- ment Coolants Power Feed Bandsaw Operations Accuracy and Finish Bandsaw Attachments	

CHAPTER 8 DRILLING MACHINES 114

Sizes of Drill Presses Principal Types of Drilling Machines Standard Operations
Drill-Holding Devices Work-Holding Devices Clamping Stresses
Twist Drills Systems of Drill Sizes Special Drills Drilling Speeds and Feeds
Cutting Fluids Drill Point Characteristics Drilling Facts and Problems
Reamers Drill Press Operations

CHAPTER 9 THE ENGINE LATHE 141

Lathe Size and Capacity Parts of the Engine Lathe Setting Speeds on a Lathe
Setting Feeds Shear Pins and Slip Clutches Lathe Accessories Cutting Speeds and Feeds
Lathe Toolholders Cutting Tool Materials Cutting Tool Nomenclature
Lathe Toolbit Angles and Clearances Grinding Lathe Cutting Tools
Lathe Safety Mounting and Removing Lathe Centers
Alignment of Lathe Centers Mounting Work Between Centers Facing Between Centers
Graduated Micrometer Collars Parallel Turning Rough Turning
Finish Turning Turning to a Shoulder Filing in a Lathe
Polishing in a Lathe Knurling Grooving Tapers Taper Calculations
Taper Turning Checking a Taper Mounting and Removing Chucks Boring
Reaming Tapping Cutting Off Work in a Chuck Follower and Steady Rests
Threads Thread Terminology Thread Forms Thread Fits and Classifications
Thread Chasing Dial Thread Cutting Thread Measurement
Multiple Threads Square Threads Acme Thread Internal Threads
Mandrels Eccentrics Grinding on a Lathe Form Turning on a Lathe
Tool Finishes

CHAPTER 10 SHAPERS AND SLOTTERS 200

Shapers Shaper Feeds Cutting Tools Aligning the Shaper Vise Shaper Operations
Machining Angular Surfaces Dovetails Cutting Keyways and Grooves
Vertical Shapers or Slotters

CHAPTER 11 MILLING MACHINES 217

Horizontal Milling Machines Manufacturing Type Milling Machines Special Type Milling Machines
Knee-and-Column Type Milling Machines Milling Processes Milling Machine Accessories
Milling Cutters Milling Cutter Materials Cutting Speeds Feed Depth of Cut
Milling Machine Setups Sawing and Slitting
The Indexing or Dividing Head Linear Graduating Gears and Gear Cutting
Gear Tooth Measurement Helical Milling Rack Milling Helical Gearing
Bevel Gearing Cams and Cam Milling Worms and Worm Gears
Clutches Vertical Milling Machines The Rotary Table Radius Milling
Jig Boring on a Vertical Milling Machine Vertical Milling Machine Attachments

CHAPTER 12 THE JIG BORER AND JIG GRINDER 293

The Jig Borer Jig Borer Parts Accessories and Small Tools Work-Holding Devices
Methods of Locating an Edge The Coordinate Locating System Making Settings
Measurement and Inspection of Holes The Jig Grinder Grinding Methods
Grinding Wheels

CHAPTER 13 ABRASIVES	317
Types of Abrasives Abrasive Products Wheels Diamond Wheels Coated A	
CHAPTER 14 GRINDING MACHINES	330
The Grinding Process Surface Grinding Grinding Wheel Care Work- Holding Devices Grinding Fluids Surface Finish Mounting the Work- piece for Grinding Grinder Safety Grinding Operations Form Grinding Cutting-Off Operations Cylindrical Grinders Internal Grinders Center- less Grinders The Universal Cutter and Tool Grinder Milling Cutter Nomen- clature Cutter Clearance Angles Methods of Grinding Clearance on Cutters Methods of Checking Cutter Clearance Angles Cutter Grinding Operations and Setups	
CHAPTER 15 CARBIDE, CERAMIC AND DIAMOND CUTTING TOOLS	367
Carbide Cutting Tools Tool Geometry Cutting Speeds and Feeds Machin- ing with Carbide Tools Grinding Cemented Carbide Tools Cemented Carbide Tool Problems Cubic Boron Nitride (Borazon) Tools Ceramic Cutting Tools Advantages and Disadvantages of Ceramic Tools Ceramic Tool Geometry Cutting Speeds Ceramic Tool Problems Grinding Ceramic Tools Diamon Cutting Tools Cutting Speeds and Feeds	
CHAPTER 16 CUTTING FLUIDS	387
Purpose and Advantages Characteristics of a Good Cutting Fluid Types of Cutting Fluids Functions of a Cutting Fluid Application of Cutting Fluids	
CHAPTER 17 METALLURGY	396
Physical Properties of Metals Manufacture of Ferrous Metal Heat Treatment Terms Selection of Tool Steel Classification of Steel Heat Treatment of Carbon Steel Casehardening Methods Testing of Metals Nonferrous Metals and Alloys Bearing Metals	
CHAPTER 18 HYDRAULICS	427
Fundamental Hydraulic Circuit The Hydraulic Principle Hydraulic System Components The Hydraulic System Hydraulic Couplings and Torque Converters	
CHAPTER 19 SPECIAL PROCESSES	440
Electrical Machining Processes Electro-chemical Machining Electrical Discharge Machining Electrolytic Grinding High Energy Milling Forming Numerical Control Powder Metallurgy	