

CONTENTS

FOREWORD

11

CHAPTER ONE—THE LATHE

Short History—Importance—Utility—The Lathe Parts Detailed and Described, with their Uses—Methods of Adjustment—Detailed Drawing of Lathe, with parts numbered—Backgear Explained.

CHAPTER TWO—CHOOSING A LATHE

19

Plain Lathes—The Screwcutting Lathe—Suitable Sizes—Importance of Rigidity—Second-hand Lathes—The Gap Bed—The Back Gear—The Hollow Mandrel—The Lathe Ways—The Head Bearings—Power or Treadle Drive—The Lathe Stand—Drives—Flat Belt—“V” Rope—Toolposts—A Popular Toolpost—The Box Toolpost—The Four-way Toolpost—The American Toolpost—The Slotted Cross-slide—The Topslide—The Index Dials—(Methods of Using)—The Thread Dial Indicator—Rack and Pinion Feed—The Set-over Tailstock—The Tumbler Reverse—Summary ; Some Essential Features—Highly Desirable Features—Desirable Features.

CHAPTER THREE—INSTALLING THE LATHE

31

Workshops : Indoor, Outdoor—Danger of Rust—Humidity—Precautions—Heating Methods—The Bench—Easily Made Bench (with Drawings)—Finding the Correct Lathe Height—The Lathe Foundation—Bolting Down the Lathe—Precautions Against Straining—Fitting-up the Drive—The Line Shaft—The Countershaft Explained—Alternative Arrangements—“V” Belt Countershafts—Independent Overhead Drives—The Revolving Roller—Lathe Speeds—Electric Wiring—Precautions—Materials—Switching—Reversing.

CHAPTER FOUR—LATHE ACCESSORIES

43

Minimum Necessities—The Three-jaw Self-centring Chuck—The Four-jaw Independent Chuck—Lathe Collets—Drawbar Type—Adapter Type—Morse Taper Type—How to Make a Collet Set (with Drawings)—The Angle Plate—The Faceplate “V” Block—Faceplate Dogs—Lathe Centres ; Types, Care of—Live Centre—Dead Centre—Lathe Carriers—Fixed and Travelling Steadies—Makeshift Steadies (Drawings)—Drill Chucks—Tailstock Die Holder—Special Accessories—Tailstock Turret Tool Holder, How to Make (with Drawings)—The Running Centre, How to Make (with Drawings)—The Taper Turning Attachment—The Ball-turning Attachment.

CHAPTER FIVE—MEASURING EQUIPMENT

58

Necessary Limits of Accuracy—The Micrometer—How to Use—The Vernier Caliper Gauge—How to Use—Care of—The Test Dial Indicator—Functions—The Scribing Block—Calipers—Plain and Spring—How to Use—Combination Sets and Protractors—Depth Gauges—Centre Finders—Home-made Centre Finder—Telescopic Inside Gauges—Parallels and “V” Blocks, Ball-race Rings used as Parallels—Inside Micrometers—The Steel Rule—Types.

CHAPTER SIX—LATHE TOOLS

70

Minimum Required—Angles and Clearances Explained—The Grinding Head—How to Grind Tools—High Speed Steel—Cemented Carbide Tools—The Knife Tool—The Corner Tool—Round Nosed Tool for Steel—Universal Brass Tool—Round Nosed Tool for Brass—Parting-off Tools—Form Tools—Tool Holders—Boring Tools—Tipped Tools—The Boring Tool Holder—The Boring Bar—Boring Tool “V” Block—External Screwcutting Tools—The Spring Tool Holder—Internal Threading Tools—Knurling Tools.

CONTENTS

CHAPTER SEVEN—DRILLS AND REAMERS

81

Importance of Correct Grinding—Effects and Danger of Incorrect Grinding—Backing-Off—Measuring Clearance—Drilling Thin Sheet—General Purpose Drills—Drills for Plastics and Ebonite—Countersink Drills—Drills for Wood—Flat Bottom Drills—Drilling Holes to Dead Size—Drilling Bronze or Copper—Home-made Drills—Extension Drills—Lubricants and Speeds—Reamers—Hand and Machine—Straight and Spiral Flutes—Home-made Reamers—How to Use Reamers—Reaming in the Lathe—Floating Reamer—Taper Reamers—Home-made Taper Reamers.

CHAPTER EIGHT—HOLDING WORK IN THE LATHE

89

Essentials—General Observations—Notes on Chucks—Care of Chucks—Screwing Chucks on Lathe Spindle—The Chuck Board—Don't Strain the Chuck—Supporting by Back Centre—Removing and Replacing Chuck Jaws—Using the Self-centring Chuck—Facing Square Stock—Four-jaw Independent Chuck—Setting up in the Four-jaw Chuck—Centring Square Stock—Faceplate Work—More Complicated Set-ups—Unusual Faceplate Set-ups—Angle Plate Work—Using the Faceplate "V" Block—Work Between Centres—Truing the Head Centre—Turning a Parallel Shaft—The Test Bar—The Trial and Error Method—Adjusting the Centres—Lubricant for Lathe Centres—Holding Wood Between Centres—Lathe Steadies—Adjusting the Fixed Steady—Adjusting the Travelling Steady—Using the Running Centre—Mandrels—Stub Mandrels—Expanding Mandrels—Home-made Expanding Mandrels—Screwed Mandrels—Internal Screwed Mandrels—Shanks for Chucking Purposes—Turners' Cement.

CHAPTER NINE—MARKING OUT

109

Marking Out Tools—The Surface Plate—Odd-leg Calipers and Dividers—Centring Round Bars—By Fixed Steady—An Accurate Method—By Marking Out—By Odd-leg Calipers—By Scribing Block—By Bell Punch—Copper Sulphate Solution—Marking Out Castings—Preparing Castings for Marking Out—Preliminaries to Marking Out—Some Principles of Marking Out—Right-angle Lines—Duplicating Reference Lines—Centre Punching—The Uses of Parallels—The Use of Odd-leg Calipers and Dividers.

CHAPTER TEN—PLAIN TURNING AND BORING

118

Outlook—Some Wise Precautions—Speed, Depth of Cut, Feed, and Cutting Speed—The Self-act or Automatic Feed—Speeds and Feeds—Formula for Cutting Speeds on Various Metals and Diameters—Cutting Lubricants—Roughing Out—Finishing—Brass—Mild Steel—Cast, Nickel and Silver Steels—Copper—Aluminium, Dural and Alloys—Filing and Polishing in the Lathe—Fits—Running Fits—Push Fits—Drive Fits—Force Fits—Shrink Fits—Parting-off—Backlash—Loose Bearings, etc.—Parting-Off Large Steel or Cast Iron Work—Inverted Parting Tool—Parting-Off Brass—Chip Guard—Boring—Single Point Boring—Tool Spring—Tool Clearance—Blind Holes—Attaining Correct Depth and Diameter—Work on the Boring Table—Fly Cutters—Setting Fly Cutters to Size—Facing on the Boring Table—Boring Holes Parallel to Each Other.

CHAPTER ELEVEN—TAPER TURNING, CRANKSHAFT TURNING, DISC AND BALL TURNING

132

Methods of Turning Tapers—Measuring Tapers—Taper Gauges—Tool Height—A Word of Caution—Taper Turning by Topslide—Fitting Tapers—Chalk Method—Marking Blue—Taper Turning Between Centres—Formula for Off-set—Setting Over the Tailstock—Internal Tapers—Using Taper Reamers—Crankshaft Turning—Overhung Type—Double-webbed type—Twin Centres—Method of Procedure—Supporting the Webs—Alternative Techniques—Cutting Blank from Flat Bar—Turning Cheeks—Ball Turning—By Form Tool—By Ball-turning Attachment—Making Form Tools—Turning Ebonite Balls—By Means of Tube Cutter—Polishing—Turning Blank Discs—Pressure Pads, Operation, Precautions.

CHAPTER TWELVE—SCREWCUTTING	142
Principles—Pitch and Lead—Gearing—Plain—Intermediate Gears—Compound Gear Trains—Calculating Gear Trains for Screwcutting—Formula and Examples—Thread Forms—The “V” Thread—The Square Thread—The Acme Thread—The Buttress Thread—Procedure (External “V” threads)—Indexing for Depth of Cut—Picking up the Cut—By Thread Dial Indicator—The Reversing Method—The Chalking Process—Cutting the Thread—Setting Over the Topslide—Thread Gauges—Procedure (Square and Acme Forms)—Clearance Angles—Helix Angles—Tool Width—Multiple Start Threads—Spacing Multiple Threads—By Chalking Gear Wheels—By Test Dial Indicator—Left-hand Threads—Internal Threads—Core Size—How to Fit Nuts—Fitting Nuts of Square or Acme Form—Cutting Left-hand Nuts—How to Fit Multiple Start Nuts—Taps and Dies—Tailstock Die Holder—Chip Clearance—Lubrication—Ensuring True Threads.	
CHAPTER THIRTEEN—MILLING, SHAPING AND GRINDING IN THE LATHE	159
Possibilities—Limitations—Methods—The Vertical Slide—General Observations—Types of Cutters—The Side and Face Cutter—End Mills—Counterbores—Woodruff Cutters—Angle Cutters—Fly Cutters—Gear Cutters—Slotting with Fly Cutters—Gang Milling—Sawing in the Lathe—Saw Tables—Milling Spindles—Overhead Drives and Speeds—Dividing or Indexing—The Dividing Head—A Home-made Dividing Head (with Plans)—Method of Using—Shaping in the Lathe—Keyway Cutting—Grinding in the Lathe—Home-made Grinding Spindle (with Drawings)—Grinding Speeds—Precautions—Against Grit—Against Burst Wheels—Filing Jigs—How to Use.	
CHAPTER FOURTEEN—LAPPING AND HONING	180
Purposes—What is Lapping?—Laps—Plain Laps—Truing Laps—Expanding Laps—How to Make—External Laps—How to Make—Abrasives—Operation—Precautions—Parallel Expanding Laps—How to Make—Honing—“Delapena” Portable Laps—Flat Lapping—Lapping Plates—How to Use.	
CHAPTER FIFTEEN—METAL SPINNING, SPRING WINDING, TURNING RUBBER, ETC.	188
Uses of Spinning—Suitable Materials—Annealing—Formed Chucks—Pressure Pads—Spinning Tools—Spinning Rests—Speeds—Lubricants—Operation—Estimating Size of Material Required—Winding Springs—Estimating Finished Size—Compression Springs—Tension Springs—Materials—Precautions—Turning Rubber and Leather—Methods—Tools—How to Make—Operation.	
CHAPTER SIXTEEN—PRODUCTION METHODS IN SMALL LATHES	194
Uses—Principles—The Mandrel Stop—Distance Stops—Method of Using—Duplicating Diameters—Making Small Screws—Inverted Parting Tool—Setting Up—Operation—Making Nuts—Setting Up—Operation—The Tailstock Turret Tool Holder—The Lever Feed.	
CHAPTER SEVENTEEN—CARE OF THE LATHE AND ITS ACCESSORIES	201
Lubrication—Cleaning—Swarf Protection—The Sacred Lathe Bed—Placing Files, Tools, etc., on Bed—Use of Lathe Board—Preserving Tapers in Head and Tailstock—Use of Paper Slips—Hints on Starting Up—Warming Up—Checking that Lathe is not in Gear—That Locking Bolt is Free—Checking Clearances before Using Self Act—Damage to Bed by Knocking Out Centres—Jamming of Lathe by Bad Chucking—Use of Tailstock Support—Bearing Adjustments—How to Adjust Head—How to Adjust Slides—Keeping Gear Teeth Clean—Meshing Gears—Precautions.	
CHAPTER EIGHTEEN—HANDY TABLES FOR HOME MECHANICS	208
Double Depth of Thread Table—Decimal Equivalents of Drill Sizes—T.P.I. and Tapping Sizes for Whitworth and B.S.F. Threads—For B.A. Threads—Decimal Equivalents of Millimetres—Morse Taper Shanks—Jano Taper Shanks—Change Wheel Tables for Lathe Leadscrew of 10 T.P.I.—For Leadscrew of 8 T.P.I.—For Leadscrew of 6 T.P.I.—For Leadscrew of 4 T.P.I.	