TABLE OF CONTENTS

Gha	Chapter	
1	RULES AND SCALES	1
	DEFINITIONS — rulescale. TYPES OF RULES AND SCALES AND THEIR USES — graduations — numbers flexible narrow steel rule hook rule reading the rule shrink scales decimal rules.	
2	SEMI-PRECISION AND COMMON PRECISION TOOLS	6
	DEFINITIONS — precision tools non-precision tools semi-precision tools. SEMI-PRECISION TOOLS — combination square dividers trammel calipers outside inside hermaphrodite telescoping gages screw pitch gage radius gage thickness gage surface gage parallels-adjustable non- adjustable V-block planer gage solid square. PRECISION TOOLS — microm- eters principles to read screw thread micrometer inside micrometer depth micrometer tube micrometer verniers — principle height gage vernier caliper vernier depth gage gear tooth vernier caliper Universal vernier bevel protractor how to read the protractor. INDICATING GAGES — dial indicator Universal indicator.	
3	SHAPER – PLANER	36
	SHAPER HISTORY DESCRIPTION CRANK SHAPER IMPORTANT PARTS. SHAPER OPERATION — to set the length of stroke to set the position of the stroke holding the work clamp or vise shaping a block of rectangular form to shape an inside square corner shaping a job to layout angular work to cut a dovetail compound angles solution of work operations square wedge. WORK DIFFICULTIES — chattering tool warping of work checking the square- ness of vise. SPEEDS AND FEEDS — factors involved tables of strokes per minute formula to determine speeds. CUTTING TOOLS — compared to lathe tools tools commonly used Do's and Don'ts. VERTICAL SHAPER (SLOTTER) DEFINITION holding the work setting the length of stroke position of the stroke work difficulties. PLANER — DEFINITION difference between shaper and planer his- tory size planer parts feeds holding the work clamping hints.	
	LATHE	67
	HISTORY — tree lathe. DEFINITION — engine lathe. CLASSIFICATION — screw machine horizontal turret lathe vertical turret lathe back-off lathe.	
	TOOL ROOM LATHES	72
	Bench lathe rool room lathe getting acquainted with the lathe lining up centers cutting tools clearance holders grinding tool bits setting the tool cutting speed.	
6	LATHE WORK	85
	Centering center drilling facing turning filing shoulders chuck and mandrel work draw bar and collets originating and finishing the hole boring counterboring undercutting steady rest work knurling tapers — external taper attachment internal tapers checking tapers threading Do's and Don'ts.	
7	MILLING MACHINES	122
-	INTRODUCTION — historical note. CLASSIFICATIONS — types manufacturing planer knee and column special knee and column — vertical, plain Universal horizontal. ATTACHMENTS — vises plain flanged swivel Universal swivel Vertical dividing head vertical milling attachment heavy duty — light duty compound vertical milling attachment rack milling attachment rotary attachment. CUTTERS — classification formed, inserted, saw tooth plain milling cutters side milling cutters interlocking side milling cutters adouble angle cutters tap and reamer fluting cutters. ABORS — standard stub expansion. END MILLS — two-lipped shell end mills face milling cutter fly cutter T-slot cutter Woodruff key seater.	

Cha	pter	Page
8	MILL OPERATIONS	139
	MILLING PRACTICES — holding the work clamps, vises, dividing head how to true up a job in a chuck spring collets between centers angle plate V-block fixtures speeds and feeds — examples, formula, feed, coolant general suggestions — set-up, selection of cutter, up-feed, down-feed. MILLING SET UP AND OPERATIONS — slab milling procedure gang milling straddle milling ex- ample key-way cutting procedure.	
9	DIVIDING HEAD WORK	
	DIVIDING HEAD — kinds — Milwaukee, Brown & Sharpe classifications rapid, plain, angular, graduating, differential helical and spiral milling DEFINITIONS — helical spiral examples of helical milling solutions procedures spiral milling — solutions procedures.	
10	VERTICAL MILL	
	VERTICAL MILLING MACHINE — work operations boring procedures. MILLING SUGGESTIONS — set-up selection of cutters selection of speeds and feeds. SAFETY — common precautions Do's and Don'ts.	
11	CYLINDRICAL GRINDERS	
•	DEFINITIONS. CLASSIFICATIONS — external internal surface cutter tool grinder of hand grinder plain cylindrical grinders types of work Universal cylinder grinder holding the work driving the work adjusting the machine wheel feed speed of work. WORK OPERATIONS — plain cylinders tapers general comments mottled, checked, or cracked work undercuts plunge-cut dressing the wheel truing glazing loading gaging cylindrical work common amplifier. SAFETY SUGGESTIONS — Centerless grinder.	
12	INTERNAL GRINDERS	
•	DEFINITION. CLASSIFICATION — work rotating type planetary type centerless type. METHODS OF HOLDING WORK — chucking the work internal cylindrical grinding — thirteen step analysis internal taper grinding flat work chuck and steady rest center and steady rest face plate and angle plate face plate and V-block special fixtures. SAFETY SUGGESTIONS — centerless grinder.	
13	SURFACE GRINDERS	
•	DEFINITION — rotary type planer type vertical spindle rotary work oper- ations horizontal planer type holding the work work operations witness marks grinding work parallel grinding work square angular work V-block work — work operations slot grinding — work operations radius grinding surface grinder wheels. GENERAL INFORMATION — safety wheel selections. SAFETY SUGGESTIONS.	
14	CUTTER GRINDING	
	DEFINITION — machines. CUTTER GRINDING WHEELS.— straight flaring cup disk dish abrasive, grain size, and bond direction of rotation tooth rests cutter grinding classifications. CUTTER SHARPENING — plain milling cutters — work operations side milling cutters — work operations end mills face mills helical tooth cutters staggered tooth cutters angular cutters formed cutters taps reamers — machine reamers, hand reamers Do's and Don'ts for cutter grinding.	
15 [.]	GRINDING WHEELS	
	DEFINITION Kind of abrasine size of abrasine kind of bond amount of bond	

... abrasives ... bonds ... wheel hardness. GENERAL SUGGESTIONS.

16, BENCH HAND TOOLS AND THEIR OPERATION

Hammers . . . pliers . . . wrenches . . . screw drivers . . . miscellaneous . . . chisels . . . files ... hacksaws.

Cha	apter	Page
17	BENCH. MATERIALS-ROUTING-INSPECTION	254
	MATERIALS — aluminum copper brass and bronze cast iron cold rolled SAE chromium chrome vanadium tool steel high speed steel. JOB PROCESSING — stock order routing card. GAGES AND INSPECTION — kinds use	
18	BENCH. LAYOUT — DRILLING — THREADING — SCRAPING — HEAT TREATING	264
	Layout drills reamers counterbores countersinks threads scraping heat treating — manganese, silicon, chromium, nickel, vanadium, tungsten, molyb- denum. GENERAL SUGGESTIONS.	
19	FORMULAS AND TABLES	287
	Circles areas solids decimal equivalents — inches to millimeters diameters of numbered drills diameters of lettered drills allowance for machine fits table of cutting speeds taper pins and reamers SAE standard taper dimensions American National Coarse and Fine Thread dimensions and tap drill sizes Woodruff key seat cutter sizes table of co-ordinates for the jig gorer.	• .

INDEX

301

×III