# CONTENTS

**Preface**

**Chapter 1  Machining**

Drilling 01
Drill Press Troubleshooting 02
Drill Sharpening 03
Drill Sizes and Decimal Equivalents 06
Screw Threads 09
Drilling and Tapping a Hole 12
Calculating a Tap Drill Size without a Table 15
Screw Thread—Drill and Tap Chart (UNC and UNF) 16
Taper Pipe—Drill and Tap Chart (NPT) 17
Screw Thread—Drill and Tap Chart (UNEF) 17
Metalworking Lubricants 18

**Chapter 2  Metals**

Thermal Expansion of Metals 19
Linear Expansion for Various Materials 21

**Chapter 3  Repairs and Rebuilding**

Stub Shaft Repair 24
Freeing Frozen Bolts 28
Removing Broken Bolts 30

**Chapter 4  Machinery Inspection and Measurement**

Reading a Micrometer 32
Using a Strobe Light 39
Vibration Measurement 44
Simple Vibration Severity Test 56
Vibration Calibration 57
Detecting a Bad Bearing 58

**Chapter 5  Lubrication**

Prepacking a Bearing with Grease 59
Calibration of a Grease Gun 60
How Much Grease to Add to a Bearing 62
Grease Relubrication Interval 64

**Chapter 6  Bearings**

Bearing Identification Numbers 69
Bearing Dimension Tables 74
Bearing Installation 78
Fitting of Antifriction Bearings 81
Bearing Bore and Shaft Seat Dimensions 83
## CONTENTS

Bearing OD and Housing Dimensions—100 Series  84  
Bearing OD and Housing Dimensions—200 Series  85  
Bearing OD and Housing Dimensions—300 Series  86  
Bearing OD and Housing Dimensions—400 Series  87  

**Chapter 7  Shaft Alignment**  88  
Rough Shaft Alignment  88  
Correcting Soft Foot  90  
Shim Chart  93  
Straightedge and Feeler Gage Alignment  94  

**Chapter 8  V-Belt Drives**  95  
V-Belt Drives  95  
V-Belt Sheave Inspection  97  
Sheave Speed Ratio Calculation  98  
V-Belt Tensioning—Force Deflection Method  101  
V-Belt Tensioning—Percent Elongation Method  105  
Belt Length Calculation  108  
Standard V-Belt Lengths  110  

**Chapter 9  Mechanical Bushings**  113  
Mechanical Bushings  113  
Mechanical Bushings—QD Installation  114  
Mechanical Bushings—Taper Lock Installation  117  

**Chapter 10  Electricity**  118  
The Laws of Electricity  118  

**Chapter 11  Electric Motors**  122  
Understanding and Troubleshooting Industrial Induction Motors  122  
Improving Motor Bearing Life  125  
Electric Motor Insulation Values  128  
Industrial Motor Dimension Charts  129  
Electric Motor Sleeve Bearing Wear  134  
Industrial Motor Keyseat Dimensions and Horsepower Ratings  135  
Adding a Wire to a Conduit  136  

**Chapter 12  Centrifugal Pumps**  138  
Understanding and Troubleshooting Centrifugal Pumps  138  
Packing a Pump  144  
Centrifugal Pump Affinity Laws Explanation  146  

**Chapter 13  Industrial Fans**  155  
Understanding and Troubleshooting Industrial Fans  155  
Balancing a Fan  164  

**Chapter 14  Welding**  174  
Oxyacetylene Gas Welding  174  

**Chapter 15  Miscellaneous Information**  178