671 DEG 5th ed.

CONTENTS

Part One
MATERIALS 1

1 Introduction 3
2. Properties of Materials 26
3. The Nature of Metals and Alloys 61
4. Production and Properties of Common Engineering Metals 86
5. Equilibrium Diagrams 112
6. Heat Treatment 136
7. Alloy Irons and Steels 166
8. Nonferrous Alloys 186
9. Nonmetallic Materials: *Plastics, Elastomers, Ceramics* 208
10. Material Selection 243

Part Two
CASTING AND FORMING PROCESSES 255

11. Casting Processes 257
12. Powder Metallurgy 323
13. The Theoretical Basis for Metal Forming 338
14. Hot-Working Processes 354
15. Cold-Working Processes 388

Part Three
MACHINING PROCESSES 457

16. Measurement, Gaging, and Quality Control 459
17. Metal Cutting 509
18. Shaping and Planing 538
19. Drilling and Reaming 555
20. Turning and Related Operations 583
21. Boring 636
22. Milling 647
23. Sawing and Filing 674
24. Broaching 692
25. Abrasive Machining Processes 706
26. Chipless Machining Processes: Chemical, Electrochemical, Electrodischarge 751
27. Thread Cutting and Forming 770
28. Gear Manufacturing 795

Part Four
WELDING AND ALLIED PROCESSES 829

29. Forge, Oxyfuel Gas, and Arc Welding 831
30. Resistance Welding 859
31. Miscellaneous Welding and Related Processes 875
32. Torch and Arc Cutting 897
33. Brazing, Soldering, and Adhesive Bonding 909
34. Heat and Design Considerations in Welding 928

Part Five
PROCESSES AND TECHNIQUES RELATED TO MANUFACTURING 937

35. Layout 939
36. Jigs and Fixtures 950
37. Decorative and Protective Surface Treatments 968
38. Mass-Production Tools and Techniques 995
39. Numerical, Tape, and Computer Control 1011
40. Planning Manufacturing Operations 1041

Case Studies

1 The Case of the Mixed-up Steel 59
2. The Misused Test Data 85
3. The Repaired Bicycle 111
4. Improper Utilization of Phase Diagrams 135
5. The Broken Marine Engine Bearings 165
6. The Short-Lived Gear 185
7. The Substitute Aluminum Connecting Rods 207
8. The Case of the Chipped Hammer 252
9. The Defective Propellors 322
10. Material for a Corrosion-Resistant Processing Vessel 352
11. The Threaded Ball Studs 454
12. The Underground Steam Line 507
13. Aluminum Retainer Rings 554
14. Bolting Leg on a Casting 582
15. The Titanium Stiffeners 673
16. The Gasoline Tank Fastener 691
17. The Jo-Ko Company's Collars 705
18. The Case of HSS Versus Tungsten Carbide 750
19. How Did the Tubing Get Flared? 768
20. The Steering Shaft Connection 794
21. The Vented Cap Screws 826
22. The Disputed Bolt Flange 874
23. The Cracking Wing Planks 896
24. Cargo-Container Racks 926
25. The Bronze Bolt Mystery 949
26. The Holes in Columns 967

27. The Dirty Brass Inserts 994
28. Machining Small Collars 1010
29. Shaft and Circular Cam 1040
30. The Component with the Triangular Hole 1057

Selected References for Additional Study 1058

Index 1063