

# Contents

---

Acknowledgments, *xiii*

**1. The Problem, 1**

Insights of Marx and Mantoux, 3

Issues and Directions, 5

**Part I. The Manufacturing Dynamic, 9**

**2. The Evolution of Markets, 11**

Shoe Production in 1800, 12

Market Formation and Growth, 14

Accounting for Market Growth, 19

**3. Reorganizing Production, 22**

Capitalist Production and the Central Shop System, 22

Innovation and the Craft System, 25

Markets and the Evolution of Production, 30

**4. New Means of Production, 34**

The Pegged Shoe, 34

Lasts and Standardization, 36

New Tools, 37

The Innovative Process, 38

New Means of Production and the Manufacturing Dynamic, 44

**Part II. Initial Mechanization, 47**

**5. The Introduction of Shoe Machines, 49**

The First Shoe Machines, 49

The Importance of Mechanization, 50

Understanding Initial Mechanization, 55

**6. Prospects, 59**

Barriers to Mechanization, 59

Potential Usage, 60

Capacity, 63

Communication, 66

Prospects and Processes, 71

**7. The Birth of the Sewing Machine, 73**

Invention, 73

The Commodity Path of Mechanization, 80

Prospects for Technological Development, 82

Nodality, 83

The Virtuous Circle of Failure, 90

**8. Self-Sustaining Success, 93**

Redefining Product and Market, 93

Market Penetration and Ongoing Technical Change, 101

The Path of Sewing Machine Development, 116

**9. The Genesis of Shoe Machinery, 118**

Shoe-Sewing Machines, 119

Other Shoe Machines, 122

Ongoing Mechanization and New Sectors, 130

**Part III. Continuing Mechanization, 133**

**10. The Evolution of Dry-Thread Sewing Machines, 135**

After the Industrial Revolution, 135

The One and the Many, 138

Market Penetration, 138

New Inventors, 142

Repeat Inventors, 144

Refining the Standard Machine, 148

Specialized Machines, 150

The Novelty of Continuing Mechanization, 154

**11. Leather-Sewing Machines, 156**

The McKay Machine, 156

The Goodyear Machine, 165

Waxed-Thread Invention as a Whole, 168

Path or Paths?, 171

Appendix: Estimates of Annual Shoe Output, 1859–1899, 179

**12. Ongoing Shoe Invention, 182**

Learning by Selling and New Inventors, 183

Kinds of Use and Repeat Invention, 186

Internal versus External Determinants, 195

**13. Integration by Inventors, 198**

The Break between Initial and Ongoing Mechanization, 199

Leather-Sewing Machine Leadership, 202

Ties among Shoe Machines, 207

Inventive Leadership and Integration, 211

**14. Integration by Firms, 213**

McKay, 214

Goodyear, 217

The Extent of Integration by Firms, 219

Planned and Independent Product Development, 222

**15. Two Results, 225**

Mechanized Shoe Production, 225

The Concentration of the Shoe Machinery Industry, 228

## **Part IV. Conclusion, 233**

**16. Continuity and Change, 235**

Starting the Commodity Path, 235

On the Commodity Path, 238

Old Paths and New, 240

Generality, 242

Notes, 245

Bibliography, 277

Index, 289

## Tables

- 2.1 The Value of Shoe Output by Region, 1810, 1840, and 1850, *15*
- 2.2 Lynn Producers by Employment and Markets, 1832, *16*
- 2.3 Shoe Output, Employment, and Markets in Selected Massachusetts Towns, 1832, *17*
- 2.4 Unevenness of Shoe Production by Region, 1810, 1840, and 1850, *18*
- 3.1 Employment by Sex in Selected Shoe Towns, 1832 and 1837, *24*
- 4.1 Regional Shares of Shoe Output and Nonmachine Shoe Patents, 1806–1855, *41*
- 5.1 Mean Shoe Establishment Size by Region, 1840, 1850, and 1860, *57*
- 6.1 Geographic Concentration of Output, 1810, 1840, 1850, and 1860, *67*
- 6.2 Geographic Distribution of Employment by Industry, 1850, *69*
- 7.1 Stitching Mechanism Inventions, 1790–1846, *78*
- 8.1 Sewing Machine Patents, 1846–1861, *95*
- 8.2 Sewing Machine Sales and Agencies, 1852–1860, *103*
- 8.3 U.S. Cities with Directories Listing Sewing Machine Agencies, 1860 and 1880, *105*
- 8.4 Sales and First Patents, 1853–1861, *107*
- 8.5 First Patenting per Capita, 1853–1861, *108*
- 8.6 Geographic Distribution of Agencies and First Patents, 1853–1861, *109*
- 8.7 Interstate Learning, Machinists, and Invention, *110*
- 8.8 First Patenting per Capita by Nodality and Concentration of Machinists, 1853–1861, *111*
- 8.9 Patent Use and Repeat Invention, 1842–1861, *112*
- 8.10 Patent Use and Sequenced Repeat Patenting, 1842–1861, *114*
- 8.11 Repeat Patenting by Type of Patent User, *115*
- 8.12 Variation in the Rate of Repeat Patenting by Type of State, *116*
- 9.1 Geographic Distribution of Shoe Employment and Patenting, 1837–1861, *123*
- 9.2 Types of Shoe Patents, 1837–1861, *124*
- 9.3 Number of Shoe Patents Issued to Massachusetts Inventors, 1837–1861, *131*
- 10.1 Distribution of Multiple-Agency Sewing Machine Firms by Number of Agencies, 1862, 1866, 1872, and 1882, *140*

- 10.2 Sewing Machine Patenting, Sales, and Agencies, 1862–1882, *143*
- 10.3 Geographic Concentration of Sewing Machine Agencies and First Patents, 1862–1882, *144*
- 10.4 Influences on Sewing Machine Invention, 1862–1882, *145*
- 10.5 Repeat Sewing Machine Invention and Patent Usage, 1862–1882, *147*
- 10.6 Repeat Sewing Machine Patenting by Date of First Patent, *148*
- 10.7 Rate of Repeat Sewing Machine Patenting by Type of State, 1842–1882, *149*
- 10.8 Types of Sewing Machine Patents, 1842–1882, *150*
- 10.9 Types of Special Sewing Machine Patents, 1862–1882, *151*
- 10.10 Regional Shares of Sewing Machine Patents by Type, 1862–1882, *152*
- 11.1 Number of McKay Machines Used in the United States, *164*
- 11.2 Leather-Sewing Machine Patenting, 1862–1901, *168*
- 11.3 Shares of First Leather-Sewing Machine Patents and Shoe Employment, 1862–1901, *170*
- 11.4 Repeat Leather-Sewing Machine Patenting and Use, 1853–1901, *171*
- 11.5 Sequenced Repeat Leather-Sewing Machine Patenting, 1853–1896, *172*
- 11.6 Repeat Leather-Sewing Machine Patenting by Region, *173*
- 11.7 Regional Distribution of Sewing Machine Patents by Type, 1862–1881, *174*
- 11.8 Leather-Sewing Machine Patents by Type, 1853–1901, *176*
- 11.9 Welt- and Turn-Sewing Patents, 1862–1901, *179*
- 11.10 The Size of Shoe Cases, *180*
- 11.11 Boston Shoe Shipments and Estimated U.S. Shoe Output, 1859–1899, *181*
- 12.1 Shoe Patents, Employment, and Output, 1862–1901, *183*
- 12.2 Regional Shares of First Shoe Patents and Shoe Employment, 1862–1901, *184*
- 12.3 Occupations of Shoe Inventors, 1837–1901, *185*
- 12.4 Repeat Shoe Patenting, 1837–1901, *187*
- 12.5 Sequenced Repeat Shoe Invention, 1837–1896, *188*
- 12.6 Distribution of Used Shoe Patents by Inventor, 1837–1901, *189*
- 12.7 Repeat Shoe Patenting by Region, *191*
- 12.8 Repeat Patenting by Occupation and Commodity Usage, *192*
- 12.9 Repeat Patenting by Type of First Patent and Usage, *194*
- 12.10 Shoe Patenting, Output, and Machinists, 1857–1901, *196*

- 13.1 Share of Shoe Patents by Type, 1837–1901, *199*
- 13.2 Share of Sole Machine Patents by Type, 1837–1901, *201*
- 13.3 Regional Distribution of Shoe and Sewing Machine Patents, *202*
- 13.4 Crossover Leather-Sewing Machine and Shoe Invention, 1837–1901, *203*
- 13.5 Single- and Multiple-Category Shoe Inventors, 1837–1901, *208*
- 13.6 Inventive Redirection for Shoe Inventors with Used Patents, 1837–1901, *209*
- 14.1 Shoe Inventors by Type of User, 1837–1901, *216*

## **Figures**

- 3.1 The Movement of Massachusetts Shoemakers and the Spread of Capitalist Production and the Central Shop, *28*
- 7.1 Greenough's Hand-Stitch Machine, *74*
- 7.2 Howe's Patent Model, *76*
- 7.3 Lines of Influence of American Sewing Patents, 1848–1851, *85*
- 7.4 The Bachelder Feed Mechanism, *86*
- 7.5 Singer's Patent Model, *87*
- 7.6 Types of Stitches, *88*
- 7.7 Wilson's Patent Model, *89*
- 9.1 Sturtevant's Blank for Shoe-Pegging Machines, *126*
- 11.1 The McKay and Goodyear Welt Shoes, *157*
- 11.2 Blake's Patent Model, *158*
- 11.3 The McKay Stitching Mechanism, *159*
- 11.4 The McKay Rotating Horn Machine, *162*
- 16.1 Learning by Selling and Ongoing Invention, *239*
- 16.2 Lines of Influence of Sewing and Shoe Inventions, *241*