CONTENTS

		Page
I.	INTRODUCTION	1
	The Storage-Battery Industry	2
	Primary and Secondary Cells	3
	The Grouping of Cells	4
	Electrical Units	6
II.	MATERIALS AND METHODS OF MANUFACTURE	8
	Historical Development of the Lead-Acid Battery	8
	Pasted Plates	10
	Plante Plates	40
	Separators for Lead-Acid Cells	45
	Containers for Lead-Acid Cells	59
	Assembly of Lead-Acid Cells	63
	Types of Lead-Acid Batteries Hazards in the Process of Manufacture	65 75
	The Edison Cell (Alkaline Type)	75 76
	Nickel-Cadmium Cells	86
III.	THE ELECTROLYTE	90
	The Production of Sulphuric Acid	90
	Properties of Sulphuric Acid Solutions	93
	Measurement of Sulphuric Acid Solutions	107
	Preparation of the Electrolyte	116
	Choice of Specific Gravities for Battery Service	118
	Purity of the Electrolyte	120
	Properties of Alkaline Electrolytes	146
	Shipping the Electrolyte	151
IV.	THEORY OF REACTIONS, ENERGY TRANSFORMATION, AND	
	VOLTAGE	153
	Elementary Theory of Electric Cells	153
	Theory of the Lead-Acid Cells	163
	The Double-Sulphate Theory	165
	Energy Transformations	172
	Electromotive Force	176
	Theory of the Nickel-Iron Cells	186
V.	CAPACITY	194
	Methods of Rating Storage-Battery Capacity	194
	Factors Determining Capacity	197
	Capacity of Edison Batteries Plate Capacities	225 230
X 7 T	OPERATION	226
VI.	OPERATION Methods of Charging	236 236
	Charging and Discharging Lead Batteries	252
	Charging and Discharging Edison Batteries Charging and Discharging Edison Batteries	260
	Charging Equipment	264
	Battery Regulation	280
	Operating Conditions	285
	Dismantling and Assembly of Lead-Acid Type	292

	Sources of Trouble	302
VII.	RESISTANCE	315
	Resistance of the Battery and Its Relation to the External Circuit	315
	Factors which Affect the Resistance	320
	Methods of Measuring the Resistance	323
VIII.	EFFICIENCY	330
	General Expression for the Efficiency	330
	The Ampere-hour Efficiency	332
	The Watt-hour Efficiency	334
IX.	TESTING OF STORAGE BATTERIES	336
	Capacity Tests	336
	Test for Retention of Charge	341
	Vibration Test	342
	Tests for Purity of the Electrolyte	343
	Life Tests	345
	Voltage Tests	347
	Low-Temperature Tests	347
	Efficiency Tests	348
	Other Tests	349
Χ.	PRESENT-DAY USES FOR STORAGE BATTERIES	351
	Telephone Batteries	351
	Storage Battery Applications in Railway Service	364
	Diesel-Cranking Batteries	380
	Marine Applications	386
	Truck, Tractor, and Vehicle Batteries	390
	Central-Station Batteries	405
	Emergency - Lighting Batteries	413
	Automotive Starting and Lighting Batteries	418
	Aircraft Batteries	433
	Isolated Lighting-Plant Batteries	440
	Radio and high-Voltage Batteries	444
	Applications to Portable Electric Lamps for Use in Mines	446
INDEX	INDEX	