

Battery Jars, etc

Volume I (Updated)



**A catalog of known Battery Jars and accessories
with research on manufacturers and suppliers**

compiled by

Walter Baumgardt

Tonawanda, NY

2023

Battery Jars, etc.

Volume I

Copyright ©2023 by Walter Baumgardt

All rights reserved. No part of this book may be reproduced, transmitted, stored or utilized in any form or by any means; electronic, mechanical, or by information storage or retrieval system without prior written approval from the author.

compiled and Published by

Walter Baumgardt

Tonawanda, NY

2023

DEDICATION

The dedication of this compilation is twofold, both of whom mean a lot to me.

The first is to my wife Anne, who, not a collector herself has always supported my endeavors in the hobby. Without her love and support this would not have been possible.

The second is to the hobby itself, many of which stepped forward with contributions to my efforts. It is to you, the NIA members that this work is dedicated, as a way of saying Thank You.

Update History

2023

Original posting

Sept. . 2024

Major Update. New material added, especially to Chapters 6, 17, 32.1, 36.1, 38.1, 56A, 91, 91.1, 91.2, 98.1, 106.1, 107.1, 109.1. New Battery jars have been added to several chapters.

Preface

This project started as an attempt to document known battery jars, trays, and other battery associated equipment that may exist. The scope of the project soon dictated that it be split into two volumes.

This is **Volume I** of the Battery Jar Catalog. It contains the discussion and pictures of known battery jars, and particularly their manufacturers, if known. **Volume II** covers topics that are battery jar related, in that they used them, but are not battery jar centered. Thus, the decision to separate them into a separate volume in order to keep both volumes a manageable size.

Volume II, if you're interested, contains the discussions on related items, such as:

- Electric Vehicles
- Street Cars (Trolleys)
- Railroad Signaling
- Medical Batteries
- Pocket Batteries
- Farm Battery Systems
- Battery (Sand) Trays
- Battery Rests
- Battery Oil Bottles
- Telegraph, Telephone,
- Radios, Phonographs, Etc.
- Vintage Advertisements

Volume I presents the battery jars themselves with a brief history of either the manufacturer of the jar or of the major embossing on the jar itself. Unembossed battery jars and embossed jars on which no history could be found, are in the Unknown Chapter. **Both Volumes** contain a History of Battery Development and a primer on electricity. This is an overview only and not intended to be an in-depth study of battery jars and electricity. If you are interested in further information and/or study, the Bibliography lists all my sources.

All battery jars are found in **Volume I**. **Volume II** duplicates the battery jars used in the topics discussed in Vol. II. The section on Vintage Advertisements is also unique to topics discussed in that specific volume.

If you are only interested in the battery jars themselves, **Volume I** will be of the most interest to you. If you are interested in the discussion on the related items, listed above, **Volume II** will likely interest you.

The various chapters are all numbered. Some chapters have a sub-heading, which is denoted as a .XXX. For example Chapter 1 is designated a 1. Sub-headings would be 1.1, 1.2 etc. If need be a sub-sub-heading would be 1.1.1, 1.2.1,etc. Pictures are designated with a period, also. For example 1.1 is a picture in Chapter 1. 1.1.1 is a picture in sub-chapter 1.1, etc.

Happy Reading. I learned so much in researching and putting this project together, that I feel selfish in a way. My wish is that you learn half as much as I did about this important era in our history.

Walt Baumgardt

TABLE OF CONTENTS

The Table of Contents is mostly a list of manufacturers (primarily Electric Companies) who had their names embossed on the jars for advertising. Many of these Electric Companies were small and no information was to be found. In these cases, the information is placed in the Chapter of UNKNOWNs in hopes that at some point information will be found. With few exceptions, most battery jar manufacturers did not emboss their names on the jars. I've identified the following companies that are known to have manufactured battery jars. I'm sure there are others

Brookfield

Corning Glass Works**

Cumberland Glass Co.

Fulmen (France)**

Gayner**

Electric Storage Battery Co. (ESB)

Thatcher Glass** Co.

Turner Bros. Glass Co.

Hemingray**

Illinois Glass Co.

Whitall Tatum**

Whitney Glass Works.

Findlay Bottle Co.

Findlay Glass & Carbon Co.

Peru Electrical Manufacturing Co.

Laclede Carbon & Electrical Co.**

Lamont Glass Co., Nova Scotia

** Denotes manufacturers with identified marking in battery jars. Remember most battery jars do not have manufacturer's embossing.

A chapter is devoted to each of these companies and or subjects, provided information was available. It is incomplete, however, because of the number of embossed Battery jars in the Unknown Section (Chapter 72). The index includes those names. As information is found on the companies and names in the Unknown Chapter, individual Chapters will be created for them

Currently, information on some of these companies is rather sketchy. As we develop more data points, I hope to fill in the blanks and have a more comprehensive history of the Battery jar and

electrical industry at the time. I attempted to keep the company histories brief to highlight the jars and other equipment.

The Bibliography of all my sources is included for you to study, in-depth, anything you find of interest in this catalog.

	Dedication	3
	Update History	4
	Preface	5
	Table of Contents.....	6
4	History of Battery Development	14
5	Electricity	18
5.1	Electrical Current	19
5.2	Direct vs, Alternating Current	23
5.3	War of the Currents	24
6	Batteries	26
6.1	Battery Development	26
6.2	Battery Variants	30
6.3	Battery Connections	31
6.4	The Storage Battery Simplified	33
6.5	Battery Jar Sizes.....	35
6.6	My Observations	37
6.7	Battery Jars: Definitions & Terms	42
6.8.	Battery Rests.....	44
6.9	Battery Trays	47
6.10	Battery Plate Separators	52
7	Medical Batteries	54
10	Electric Vehicles .....	.60
11	Street Cars / Trolley.....	63
12	Rail Road Signaling .....	.68
13	Radios	72
14	Phonograph	78
15	Telegraph / Telephone	81
16	Farm / Home Batteries	82

NOTE: For a more in-depth discussion of the topics in Chapters 7 through 16, the reader is referred to Volume II.

17	Wind & Water Energy	83
. 17.1	Winchargert	83.
... 17.2	Jacob Wind Electric Co.....	86
.17.3	Water Power.....	89

NOTE: Chapter 18 starts the presentation of the major embossing found on battery jars.

18	AMERICAN SPEAKING TELEPHONE CO.	94
19	The Ansonia Electrical Co.....	95
20	BRACH, L.S., MANUFACTURING CO ., Newark, N.J.	96
21	BROOKFIELD.....	100
22	BUNNELL, J.H., & Co.; BUNNELL Telegraphic & Electrical Co.	102
23	Burns, Peter Cooper	110
24	CALIFORNIA ELECTRICAL WORKS	122
25	Chloride of Silver Battery Co.	124
26	Corning Glass Works , CORNING, N.Y.	126
27	CROWN TRADE MARK	144
28	Crows Foot Battery	146
29	The CUMBERLAND GLASS MFG. Co ., Bridgeton, N.J.	149
30	DAVIS & WATTS	150
31	DELAWARE & ATLANTIC TEL & TEL Co	152
32	DELCO	153
	32.1 Delco IRONCLAD.....	170
33	Double Day Hill Electric CO., Pittsburg, PA	171
34	Eagle Charger Corp.	176

35	E. Edelman & Co.	181
36	The Edison Companies	182
	36.1 Con Edison	211
37	ELECTRICAL ENGINEERING CO. Minneapolis, Minn	213
38	The EGL Co – Electric Gas Light Co Boston, MA.....	215
	38.1 Nosmas	223
39	Electrical Goods Mfg. Co. (E.G.M.	227
40	The ELECTRIC STORAGE BATTERY CO (E.S.B. CO., Gloucester, N.J.)	232
41	Fansteel Products Co.	271
42	FINDLAY BOTTLE CO.	280
43	FITCH, D.H. CO	282
44	Flemming, Otto	285
45	Fuller, Seth W., Boston	286
46	GAMEWELL	289
47	Gayner Glass Works , Salem, NJ	296
48	General Electric	305
49	GORDON BATTERY CO	311
50	H.J. GORKE Electric CO . Syracuse, NY	318
51	Gould Storage Battery Co.	319
52	Grant Storage Battery Co.	327
53	HARRISON BROS. & CO	330
54	HEMINGRAY GLASS Co.	334
55	Illinois Glass Co.	336
56	Johnson Electric Service Co., Milwaukee, WI	338
56A	Kimble Glass Co.....	339
57	LaLande Batteries	340
58	Law Telegraph Co	343
59	LeClanche Battery Co., New York	346

60	LEEDS & NORTHRUP .....	. 356
61	Little Giant .....	...357
62	Lutz Lockwood Mfg. Co. ....	. 359
63	MONARCH	361
64	National Carbon Co. ....	. 362
65	NATIONAL TELEPHONE CO. Ltd. ....	.366
66	Ness, Ness, McLaren & Bates Electrical Supplies, Montreal, N.W. & B.I.T. Co	367
67	New York, Westchester and Boston Railway (NYW&B)	368
68	Northern Electric Ltd	370
69	NOVELTY Electric Co., Philadelphia, PA	371
70	Old IRONSIDES, .....	.373
71	Ostrander, W.R. & Co., New York & Brooklyn	377
72	Otto, F.G.	373
73	Partrick & Carter	382
74	PATENTED	383
75	Pettingell Andrews, Boston, MASS	386
76	PHILCO Batteries	388
77	Porous Cup Battery Co. ....	. 397
78	PRISM	400
79	RAILWAY STORAGE BATTERY CAR CO. ....	. 405
80	Samson Electric Co, Canton MASS	407
81	Self-Winding Clock Co .....	. 410
82	J. Elliott Shaw & Co., Philadelphia .....	... 413
83	STEWART, FRANK H., Electric Co. Philadelphia	415
84	Thatcher Glass Manufacturing Co. ....	. 416
85	Thaxter, Samuel & Son, Boston	417
86	Thomson-Houston Electric Co.	418
87	Tillotson, L.G.	419
88	U.S. L. Battery Co.	422
89	Union Carbide and Carbon Co. ....	.423
90	UNIVERSAL BATTERY CO. Chicago, IL	425
91	Van Houten & Tenbroeck	429

91.1	Galvanic Faradic Mfg. Co.	431
91.2	C.F. Britman, Chicago	432
92	Viaduct Manufacturing Co ., Baltimore	433
93	Voltamp Electric Mfg. Co., Baltimore	435
94	Waite & Bartlett Co.	437
95	WALKER & KEPLER	439
96	Wannamaker, John	442
97	WATERBURY BATTERY CO	444
98	Western Electric Co.	446
98.1	HYRAY	450
99	Westinghouse	452
100	Whitall Tatum	458
101	Whitney Glass Works, Glassboro, NJ	471
102	WILLARD Storage Battery CO., Cleveland, OH.	472
104	Submarine Batteries	481
105	Batteries from Fruit Jars	484.
106	Battery Jars, etc. of Unknown Manufacturers	487
106.1	Uranium (Vaseline) Glass.....	563
107	Battery Jars from Outside the U.S.	574
...	107.1 Medical Batteries From Outside The U.S.....	587
108	Manufacturers Catalogs	593
109	Associated Equipment	594
109.1	Distilled Water & Acid.....	603

110	Battery Patents	607
111	Vintage Advertisements	646
113 -	Appendix A Battery Insulators, Oil Insulators, etc by Charles & Sandi Irons.....	686.
114	Appendix B By Charle &Sandi Irons	692
115	Appendix C: Gamewell Battery Support Insulators	695
116	Appendic D: Porous Cup Patents.....	700
117	Appendix E: Battery Section from Stout-Meadowcroft	701
117	Appendix F: Power Plants for Trolleys	710
118	Appendix G: Delco Ironclad brochure	725
119	Appendix G: Western Electric HYRAY brochure	729
120	Appendix H: Reminiscing of Frank Stewart	740
121	Appendix J: Reminiscing of an Early Wireman	751
122	Bibliography	755
102	INDEX	767
103	Author's Comments	771

4.0 History of Battery Development

There are still only two ways to generate electricity, electromechanically and chemical reaction. Although Michael Faraday discovered the electromechanical generation in the early 1800s, it was the end of the century before it became practical. Even then distribution was a problem. The result was that a great deal of the United States relied on electricity generated by a chemical reaction from the last half of the 18TH century to the mid 20TH century. Let's look at some statistics. The term electrification refers to electricity generated electromechanically rather than by chemical reaction.

- By 1920 about 90% of urban communities were on commercial power grids.
- At the same time only 3% of The United States was considered urban.
- In 1920 only 5 % of rural America was electrified.
- At the start of WWII (circa 1940) only about 30% of rural America was electrified.
- In 1956, about 95% of rural America was electrified.

Until electrical distribution was available to everyone, much of America relied upon Farm / Home batteries for their electrical needs.

The role of the REA (Rural Electrification Act) enacted in 1936 was to promote the electrification of America. With local and regional promotions such as REDDY KILLOWATT it seems to have been successful. The fact remains, however, that for almost a century our electrical power was generated on jars via a chemical reaction.

We will start by looking at the individuals who played a role in the development and understanding of electricity. Strangely, the first battery of modern times was invented by **Benjamin Franklin** an American Statesman in the 1700s. Development then switched to Europe until we get to **Thomas A. Edison** in the late 1800s.



The invention of the Leyden Jar in 1745 in a joint discovery by cleric **Georg von Kleist** and Dutch scientist **Pieter van Musschenbroek** of Leiden (Leyden) paved the way for the discoveries that came later. The Leyden Jar is an electrical component which stores a high-voltage electrical charge (from an external source) between electrical conductors on the inside and outside of a glass jar.

←4.0.1

Using a Leyden jar (4.0.1), Benjamin Franklin was able to determine that “positive “ charges resided on one side and “negative “charges on the other side of the jar. Franklin also discovered that by linking several jars together, he could increase the amount of charge they could store. He called this combination of Leyden Jars a “Battery” and is credited with being the first to use the term “Battery” in relation to electricity. It was commonly believed, at the time, that there was a relationship between lightning and electricity. Franklin set out to prove it. He listed 12 things in common between lightning and electrical fire.

1. Giving light
2. Crooked direction
3. Swift motion
4. Crack or noise in exploding
5. Being conducted by metals
6. Color of the Light
7. Destroying animals.
8. Melting Metals
9. Firing inflammable substances
10. Sulfurous smell
11. Rending bodies it passes through
12. Subsisting in water or ice

This led to Franklin’s famous experiments with lightning, proving that clouds were electrically charged.

A friend of Franklin, Peter Collinson, wrote of Franklin’s experiments in detail and sent them to French Naturalist Georges-Louis LeClerc, who had them translated into French.

In 1800 **Allesandro Volta** created the first electric cell. He soaked paper in water, placed zinc and copper on opposite sides of the paper and watched a chemical reaction create an electric current. By connecting several cells together, he created a battery. The world had a safe and dependable source of electricity, making it easy for scientists to study this new power source. It is in honor of Volta that we rate batteries in volts.

In the early 1800s, **Michael Faraday**, an English scientist, was the first to realize that an electric current could be produced by passing a magnet through a copper wire. Almost all the electricity we use today is made with magnets and coils of copper wire.

In 1827 **George Ohm**, a German physicist, introduces the concept of electrical resistance.

In 1844, **Samuel Morse** develops telegraphy and the Morse Code.

In 1859, **Gaston Plante**, a French Physicist invented the first rechargeable battery; the lead-acid battery. In 1880, **Camille Faure** improved upon the design, patenting a method of coating lead plates with a paste of lead oxides, sulfuric acid and water, which was then cured by gentle warming in a humid atmosphere. The curing process caused the paste to change to a mixture of lead sulphates which adhered to the lead plate. During charging the cured paste was converted into electrochemically active material (the "active mass") and gave a substantial increase in capacity compared with Planté's battery.^[6] This was a significant breakthrough that led to the industrial manufacture of lead-acid batteries, as now used for starting motor cars.

In 1886, **Henri Tudor**, a Luxembourg inventor, improved upon the Electrodes, by applying a weak intensity current until the paste is transformed into lead peroxide on the cathode and into reduced lead on the anode. This improvement led to a weight reduction in the electrodes while increasing their capacity, leading to a 15% reduction in price.

The turning point of the electric age came towards the end of the 19TH century with the discovery of Alternating Current (AC). Croatian born scientist, **Nikola Tesla**, came to the United States to work with **Thomas Edison**. After a falling out, **Tesla** discovered the rotating magnetic field and created the alternating current (AC) electrical system. He partnered with **George Westinghouse** to patent the AC system. Alternating Current was able to deliver electrical power over long distances, whereas Edison's Direct Current (DC) could only deliver it within a mile radius.

Thomas A. Edison was the most productive electrical scientist in the latter part of the 18TH and early 19TH centuries. He developed the first long lasting light bulb, the phonograph, motion pictures and many other products that electricians use or install. He is the owner of over 3000 patents in the field.

Alexander Graham Bell, a Scottish inventor, patented the telephone in 1876.

George Westinghouse was a champion of Alternating Current vs. Edison's Direct Current See chapter 2 for a brief history of the "Current Wars" between Westinghouse and Edison. In 1893 Westinghouse used an AC system to light the Chicago World's Fair.

In 1881 The Brush Electric Co. of Buffalo installed the first electric plant which supplied power for a mile of carbon arc lights. At this time, the Niagara Falls power plants were being built, and in 1896 a 22-mile-long AC powerline was opened to transmit electrical power from Niagara Falls to Buffalo, NY. This same power lit The Pan American Exposition in 1901. This resulted in Buffalo being nicknamed the "City of Light."

As you go through these pages, you will find that Alternating Current, like we use today was actually generated in the mid 19TH century, during the Civil War. However, it took until the end of the 19TH century for Nikolai Tesla to develop the system to a usable state. We don't know if the mid-century inventors didn't know what they had or if the rest of the technology wasn't at a

state to develop it further. As a result, particularly in rural areas, our electricity came from a jar as the result of a chemical reaction until the mid-20TH Century.

Remember, the entire modern world was undergoing this awakening of electrical power; thus, we find scientists of many nations involved in the development. This is evidenced by the nationalities of the few scientists named above. There were many others, but these few suffice to show the international effort in the discovery and production of electricity.

You will observe that the above list is largely European. America was still a young nation, struggling for an identity in the world. It wasn't until after the Civil War that we became established and accepted. Thomas Edison was one the first of many Americans to revolutionize the world with their inventions.

Edison's discoveries are all the more remarkable when you consider that he had only a few months of advanced education. T.A. Edison was born in 1847 in Milan, MI and grew up in Port Huron, MI. He attended formal school for only a few months. His mother, a teacher by profession, taught him reading, writing and arithmetic. A chemistry class at the Cooper Union for the advancement of science and art is his only known enrollment of any kind at an institution of higher learning. He was a curious child and learned most things by reading on his own. An early bout with Scarlet Fever caused the loss of hearing in one ear and most of the hearing in the other. Edison believed that his hearing loss allowed him to avoid distraction and to concentrate more easily.

Rutgers U. seems to maintain the records and information about Thomas A. Edison. If anyone is interested in learning more about his career, I refer you to:

<https://edison.rutgers.edu/company.htm>.

Throughout his career he received 1,093 U.S. patents in his name and counting his foreign patents the total is about 3000. He formed about 200 companies. If we attempt to break them down by category, we find:

Battery:	7	Office Machinery & Supplies:	6
Cement & Cement Products:	7	Phonograph, Domestic:	14
Electric Light, Domestic:	15	Phonograph, Foreign:	16
Electric Light, Foreign:	24	Railway:	6
Mining:	11	Telegraph & Telephone,	
Miscellaneous:	11	Domestic:	28
Motion picture:	13	Telegraph & Telephone,	7
		Foreign:	14

Some information about the various battery companies:

Thomas A. Edison, Inc, originally the National Phonograph Co., was the main holding company for the various manufacturing companies established by Edison. It was the successor to the Edison Mfg. Co. and operated between 1911 and 1957 when it merged with McGraw Electric to form McGraw Edison.

The *Edison Mfg., Co.* was incorporated in 1900, as Edison's personal business. It manufactured and marketed the Edison-LaLande primary battery, as well as batteries for telegraph, telephone, phonograph. It also sold X-Ray equipment, medical instruments and electric fans as well as having a motion picture branch. The LaLande (Edison Storage Battery Co.) was an alkaline primary battery developed by Edison from an earlier design by Felix LaLande. It consisted of copper oxide and zinc plates in a solution of potassium hydroxide.

The *Battery Supplies Co.*(BSCO) was formed in 1903 by former Edison Employees to manufacture primary batteries. Edison sued, alleging patent infringement. A settlement called for the Edison Mfg. Co. to purchase it in 1905. It was officially dissolved in 1908.

The *Edison Storage Battery Co.* Although the initials are the same, The **Edison Storage Battery Co.** is not to be confused with the **Electric Storage Battery Co. (ESB Co.)**. In my research, I have never seen the **Edison Storage Battery Co.** referred to as (E.S.B. Co.), while references to The Electric Storage Battery Co. was commonly referred to as the E.S.B. Co. I will continue that distinction, referring to the Edison Storage Battery Co. with its full name, while referring to the Electric Storage Battery Co. as E.S.B. Co.

The **Edison Storage Battery Co.** was formed in 1904 to produce Edison's nickel-iron battery. Edison's life-long dream was the electric vehicle, and the Battery Supplies Co. was to make it happen. He refined the nickel-iron battery first patented by Swedish inventor, Ernst Waldemar Jungner in 1899. It was so revolutionary that even Henry Ford wanted it. He struck a deal with Edison in 1914, to release the "Ford Electric", selling for \$900.00 with a range of 100 miles. However, the Edison Battery was big, heavy, expensive and required frequent charging. By the time Edison's project was complete, consumers had spoken in favor of the fossil fuel-powered Model T. The nickel-iron battery never became very successful. In 1960 the Edison Storage Battery Co. became part of Exide Technologies, formerly The Electric Storage Battery Co.

As a side note, Edison championed Direct Current for many years, claiming its superiority over alternating current. Westinghouse and The Thomas Huston Co. championed the alternating current. Edison used what some might consider un-ethical means to combat AC current, which didn't sit well with his Board of Directors. *See the War of the Currents for more information.* In 1892 J.P. Morgan engineered a merger between Edison-General Electric and Thomas Huston that put the Board of Thomas Huston in charge of the new company; General Electric. Edison was essentially forced out of controlling his own company. General Electric now controlled 75% of the U.S. Electrical business and would compete with Westinghouse for the AC market.

Ironically, today's electronic devices require Direct Current meaning Alternating Current has to be converted back to Direct Current in order to power any electronic devices. This is accomplished with commutators or rectifiers. Dry cell batteries supply DC so no further modification is needed.

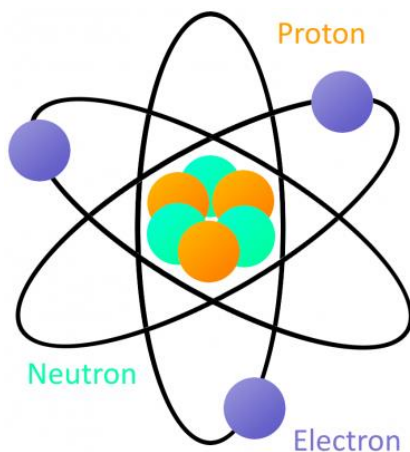
5.0 Electricity

A simple definition of electricity is the movement of electrical energy (current / charged particles) through a conductor. As we shall see, the charged particles go back to the building blocks of nature.

5.1 Electrical Current

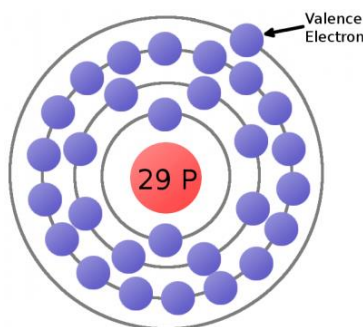
By 1840 – 1850, the concept of producing an electrical current with dissimilar metals in an acidic solution was solidly established. It led to the development of the telegraph, telephone and other equipment which needed a power source. It played a major role in communication during the Civil War and the later westward expansion.

Electricity is the flow of electrons from one point to another. All matter is composed of atoms, which contain a positively charged nucleus (a mixture of protons and neutrons). The nucleus is surrounded by negatively charged particles known as electrons.



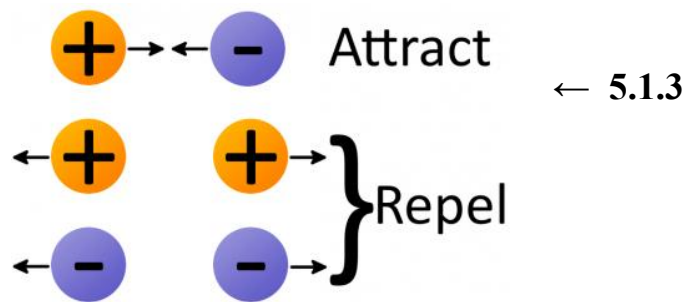
←**5.1.1** shows this arrangement of Protons, Neutrons and Electrons. The number of protons equals the number of electrons.

The electrons in the outer orbits, furthest from the nucleus, are called valence electrons and with enough outside force can escape the orbit and become free. These free electrons allow us to move a charge.

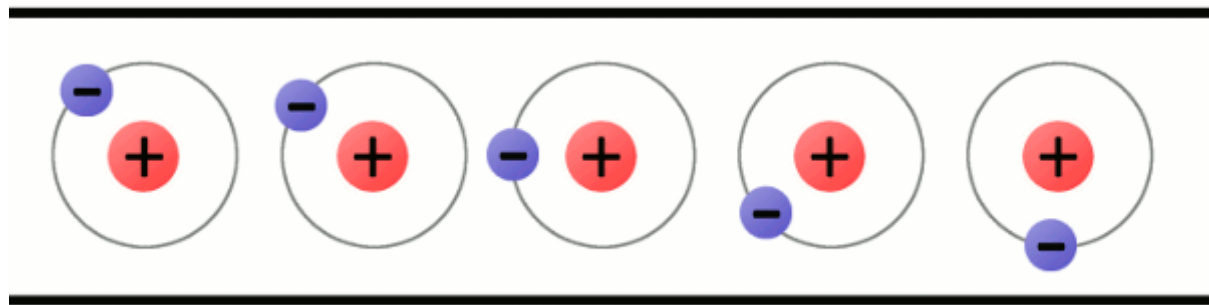


←**5.1.2** shows a copper atom. It is the lone electron in the outer orbit that can become free and create a charge.

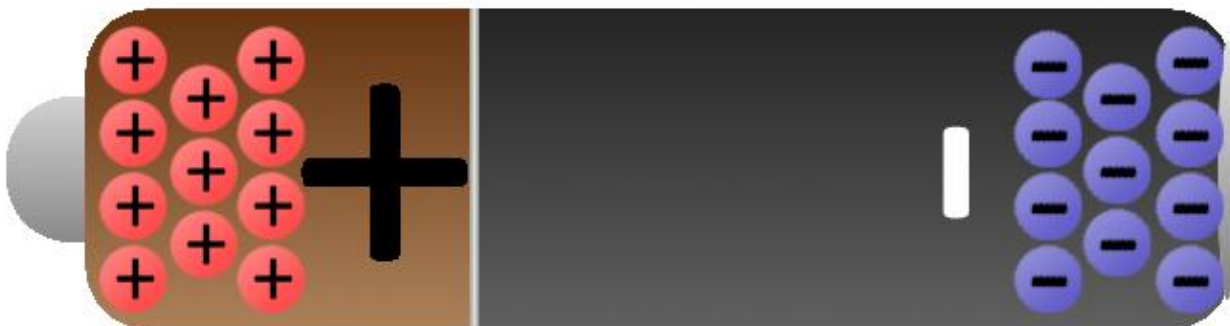
We know that opposites attract and likes repel one another, as shown in **5.1.3**



Thus, electrons and protons attract one another. **5.1.4** depicts the flow of this charge in a copper wire filled with countless copper atoms. The free electron is floating in space between atoms is pulled and prodded by surrounding charges. Eventually the free electron finds a new atom to latch on to. In doing so, it ejects another valence electron from the new atom. This chain effect can continue and in so doing creates a flow of electrons called electric current. **5.1.4**↓

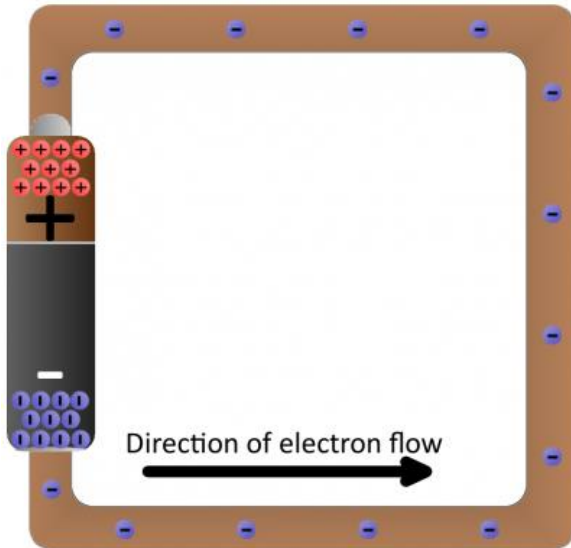


Batteries are sources of energy which convert chemical energy to electrical energy. The two battery terminals connect to the rest of the circuit. On one terminal is an excess of negative charges, while all the positive charges group at the other terminal. This is depicted in **5.1.5**↓.

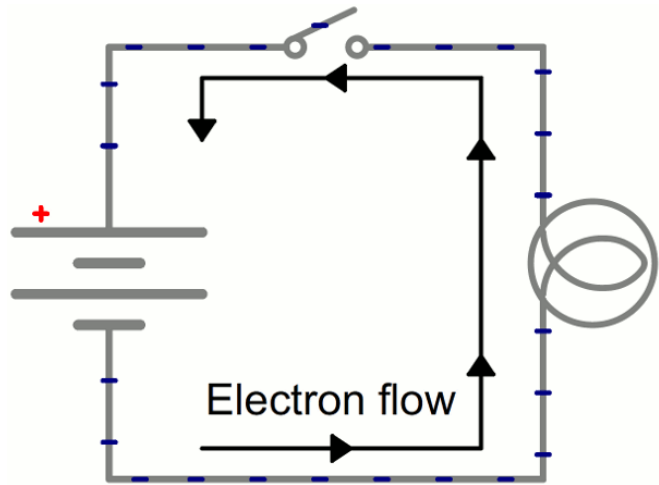


If we connected our copper wire to a battery, we would create a flow of electrons, electricity, from one terminal to the other as shown in **5.1.6**. Rather than wasting this energy, if we build a circuit with a switch and an appliance that needs power, such as a light, we are making use of the electrical potential that has built up in the battery (**5.1.7**).

It is important to understand that the flow of electrons does not happen as if by magic. The electrode materials and the electrolyte have to be chosen because it is the chemical reaction that occur between these three components that excites the electrons creating the electrical energy we can then use as power. We will explore this in layman's terms in chapter 6.3.

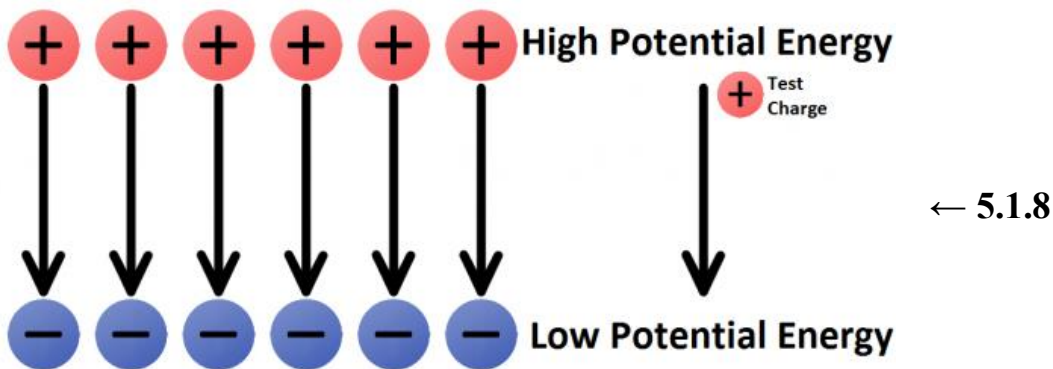


5.1.6↑



5.1.7↑

Electrical current is the potential energy stored in the battery. In the natural order of things, the flow is from a state of high potential to a state of low potential energy, as seen in **5.1.8**. Lightning is an example of this release of high potential energy to a more stable state of lower potential energy.



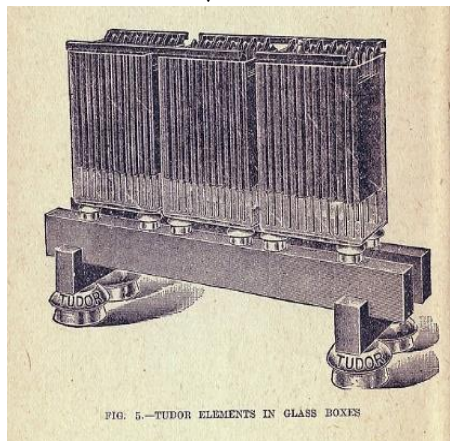
A Battery Jar is simply a container, round, square, or rectangular, containing this high potential energy. Usually they are glass, but they also were made in porcelain and modified hard rubber, whose sole purpose is to hold the components of a battery. The earliest jars were generally hand blown, with a ground lip**, open at the top and fitted with lead electrodes (anode and cathode) in an electrolyte solution of sulfuric acid and water, (based on the Plante battery patented in 1859). The reaction of the acid with the dissimilar metal electrodes produced an electric current. The Cathode is the Positive (+) electrode, and the Anode is the Negative (-) electrode. The chemical reaction of the electrode with the electrodes causes an electric current to flow between the Cathode and Anode. There are many who believe that the battery was a great idea, and that the early batteries were a great idea in search of a purpose. To a large extent this was true

The open tops resulted in acid leakage, which resulted in corrosion to surrounding areas. Battery trays, commonly known as sand trays, were used to collect the acid leakage and prevent the damage. Battery trays were shallow flat trays of glass which were filled with sand. The batteries were placed in the sand trays which collected the acid dripping from the batteries. The earliest battery trays were made of wood and lined with lead. Due to the nature of their construction, these trays did not survive, and none are known. Some of the glass trays did survive. What I have found is identified in Chapter 8.

It was also found to be necessary to insulate the batteries from their surroundings, to prevent short-circuiting the battery. The acidic nature of the early batteries would soon create a fine acidic coating on everything, causing the battery to short. Battery rests helped to solve this problem. The picture below, (**5.1.9**), shows such battery rests in use. Note the battery rests under each of the batteries, as well as the larger rests under the battery supports. The topic of

battery rests is discussed fully in “Battery Insulators, Oil Insulators, and Chloride Accumulators”, by Charles and Sandi Irons (2005). This is reproduced (with permission) in Appendix 67. In addition, the “Guide for North American Pin Type Insulators” has a well defined and dedicated section on battery rests. The Price Guide is available from Andrew Gibson of Dansville, NY. Mr. Gibson can be reached at www.insulatorpriceguide.com.

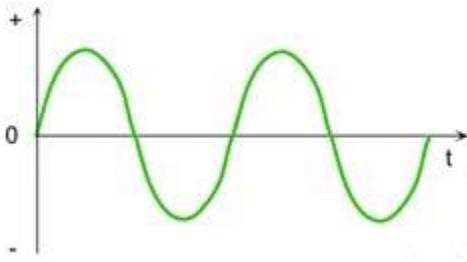
↓ 5.1.9



******A ground lip is a method of finishing the jar, rather than being a finish. This form of finishing a jar originated with fruit jars and carried over to other, open topped vessels. The early fruit jars were hand blown, with uneven tops. In order to form a seal with the jar lids, the tops needed to be smooth and perpendicular to the threads in order to achieve a proper seal with the lid. This was achieved by grinding the hand-blown surface with a wheel achieving a relatively smooth surface, looking like a sanded surface. This process of finishing the lip was carried over to battery jars. As automatic machines were introduced it became possible to achieve the needed lip surface as the jar was being made, without the added step to finish the lip. According to the literature (Talouse, etc.) this transition occurred over a period of years, from approximately 1880 to 1900.

5.2 Direct vs. Alternating Current

Electricity was only useful if it could be transported over long distances. With this in mind consider that there are two types of electrical current, Direct Current (DC) and Alternating Current (AC). Battery jars produce only Direct Current. An alternator is required to convert DC to AC.



5.2.1



5.2.2

5.2.1 and **5.2.2** picture Alternating and Direct current. Alternating current changes direction (both positive and negative). The waveform of pure AC is a sine wave. Other forms of AC waves are square, triangle, sawtooth waves. Direct current always flows in the same direction. It's either positive or negative. Pure DC is a flat line.

There are pros and cons of each.

Direct Current:

- DC electricity is easier to store.
- DC motors are more efficient than AC by 15% -20%.
- The major problem with DC is that it cannot be transmitted over long distances.

Alternating Current:

- The main advantage of AC is its ability to be transmitted over long distances with minimal energy loss. This makes it ideal for electrifying towns, cities, and even the whole country.
- In the early years, most household appliances ran on Direct current. The conversion from AC back to DC resulted in approximately a 20% loss in power. Although most electronic equipment still require DC, most household appliances have been reconfigured to run on AC
- Although both AC and DC are dangerous, AC is most likely to cause heart fibrillation and death.

The differences in current led to what is known as the *War of the Currents*.

5.3 War of the Currents

The history would not be complete without mentioning the “**War of the Currents**”. Each current, either Direct or Alternating had its champions. George Westinghouse championed Alternating Current while Thomas Edison championed Direct Current. This was the battle that took place between these two men to determine which electrical system would be the one to electrify America. Both men knew that there was only room for one system, and Edison set out to ruin Westinghouse in a ‘great political, legal and marketing game’.

Edison realized the Alternating Current was the better system, because of the transmission issue, but refused to relent. He hired Nikola Tesla to solve the problem and/or design a new system. When Tesla told Edison that the future of electrical transmission was Alternating current, Edison reportedly fired him, and, according to Tesla, refused to pay him for the work he had done.

To sway public opinion about the dangers of alternating current, Edison reportedly electrocuted dogs, cats, calves, horses and even an elephant to show that alternating current was dangerous. In his defense, all the animals were destined for euthanasia to start with. It was the manner in which Edison went about it that enraged people.

Westinghouse, in the meantime had purchased all rights to Tesla's patents. The beginning of the end of direct current was in 1896 when Westinghouse and Tesla harnessed the power of Niagara Falls and sent electricity all the way to Buffalo, NY.

Edison attempted to borrow money from J.C. Morgan to buy The Thomson-Houston Electric Co., which in a period of only ten years had grown to the third largest energy producer. Westinghouse and Edison were the other major suppliers. Instead, Morgan, himself, purchased Edison and Thomson-Houston to create The General Electric Co. The Board of Directors, enraged with Edison's shenanigans to promote direct current, left him as a member of the Board of Directors, but, with no authority or power in the company. The final straw was when Westinghouse was awarded the contract to provide electricity for the 1900 World's Fair in Buffalo. In the end, alternating current won because it was simply the best system. Westinghouse and Thomson Houston went on to power America.

References: 61,62

6 Batteries

A battery is basically the container including electrodes and electrolyte necessary to create an electrical current. In the beginning, they were generally glass in various shapes and sizes, although porcelain was also used.

6.1 Battery Development

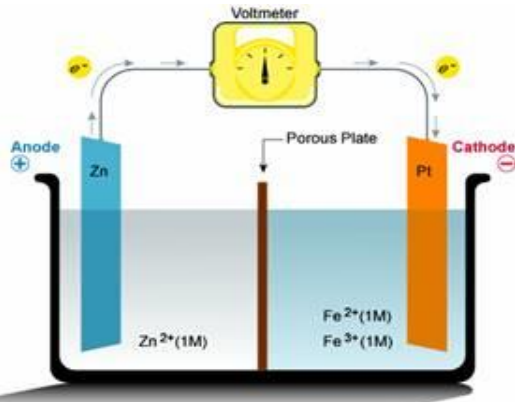
The earliest batteries were called Primary Batteries, because they were not rechargeable. When the electrodes were spent you dumped the whole thing out and started over. The advent of the Secondary Batteries, which were rechargeable, enabled batteries to have sealed lids. A perfect example was Farm batteries, which were sealed and used an internal combustion engine for recharging. The jar lids were either glass, porcelain, or hard rubber. By the latter part of the 1800s and early 1900s, batteries were developed with different electrodes that used an electrolyte other than acid, thus eliminating the dangers of acid usage. The Leclanche battery, patented in 1866, was one of these alternative batteries. It used Zinc and Carbon Manganese electrodes with Ammonium Chloride as the electrolyte. The Plante, Lead – Acid battery, the first rechargeable battery, remained popular as automotive, and farm and home batteries, but the less hazardous, and lighter, LeClanche battery was far friendlier for telegraph and telephone use.

Comparing the differences of Lead-Acid vs. LeClanche batteries, helps to explain how their usage dictated which was used.

In a LeClanche battery the voltage falls steadily with discharge, whereas in a Lead-Acid Battery the voltage is constant.

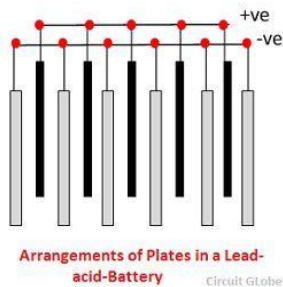
- The Energy density of a LeClanche Battery is very low, whereas the Lead-Acid battery can deliver very high currents.
- The LeClanche battery does not perform efficiently at high current drain applications.
- The shelf life of The LeClanche Battery is not very good.

Looking at these differences you can see why the lead-acid battery was the choice for high demand systems such as automotive and the farm and home battery systems. The decreased power demand of telegraph and telephone service favored the LeClanche battery.



← **6.1.1** is a schematic of a battery jar with a single set of electrodes, depicting the Plante battery invented in 1859. It is still widely used in automobiles today. It is a single cell and also the simplest battery. It gets confusing because the term cell and battery are used interchangeably. Convention, however, dictates that a battery is a minimum of 2 cells. Single cells, or batteries, can be linked together to increase the voltage. This can be done by linking individual jars together or by increasing the size of the jar and adding

additional sets of electrodes to the same jar. A spacer is needed between the electrodes, to prevent them from touching, a single cell will always have an odd number of plates. 3 plates being a single cell or the simplest battery.



← **6.1.2:** The plate arrangement in a lead – acid battery , showing the alternating positive and negative plates. (Note: in this simplified format the spacers are not shown).

Electrodes varied in size and shape. **6.1.3**, right, is the typical plate assembly. **6.1.3**→



6.1.4↓



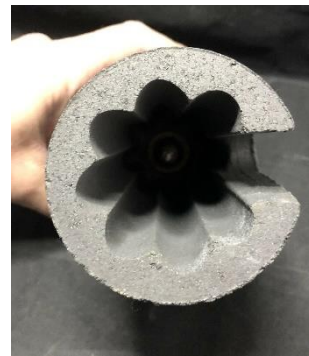
6.1.5↓



6.1.6↓



6.1.7↓



You will find, however, that most circular jars used circular electrodes, as seen in 5.4 through 5.7. The anode and cathode were still present, but arranged differently, one around the other. The basis of the Fitch Perfect Battery, it came in different shapes.

Other electrode variants are seen in 5.8 through 5.10. Sizes and shape may vary, but the concept remains the same.

6.1.8↓



6.1.9↓



6.1.10↓



6.1.9 and 6.1.10, are from the McIntosh Medical Battery.

The following table (6.1.11) lists a portion of the chronology of the development of the battery, concentrating on the wet cells which used battery jars. It should be noted that the Plante Lead Acid battery of 1859 was the first Secondary battery. Everything prior to this was a Primary battery and could not be recharged.

It stands to reason that the early work was done in Europe. At the time wet cell batteries were being developed, the United States was a new nation, still struggling for survival. It wasn't until after the Civil War, in the latter half of the 19th Century that the United States had an identity in the world. The work of Thomas Edison helped to establish the United States as an innovative force in world, and we start to see technological advances originating here rather than abroad.

6.1.11 Chart of Wet Cell Battery Variations

<u>≈Year</u>	<u>Name of Cell</u>	<u>Country</u>	<u>Anode</u>	<u>Cathode</u>	<u>Electrolyte</u>	<u>Volts</u>	
250 BC	Baghdad Battery		Iron	Copper	Unknown		
1799	Volta (Wollaston, etc.)	Italy	Zinc	Copper	Solution of Sulfuric Acid	1 to 1.5	
1836	Daniel	England	Zinc	Copper	Zinc Sulfate	1.1	
1838	Poggendorf (Dancer)	Germany		Version of Daniel Cell			
1839	Bird	England		Version of Daniel Cell			
1839	Grove	England	Zinc	Platinum	Dilute Sulfuric Acid	2	
1840	Smee	England	Zinc	Platinized Silver	Solution of Sulfuric Acid	1 to 1.5	
1842	Grenet	France	Zinc	Graphite (Carbon)	Solution of Sulfuric Acid	2.1	
1842	Bunsen	Germany	Zinc	Graphite (Carbon)	Dilute Sulfuric Acid	1.8	
1842	Bunsen variation of previous)	Germany	Zinc	Graphite (Carbon)	Dilute Sulfuric Acid	1.8	
1850	Poggendorf (Grenet)	German	Zinc	Graphite (Carbon)	Solution of Potassium Dichromate and Sulfuric Acid	2	
1850	LaLande - Chaperon	France	Zinc	Copper Oxide	Caustic Potash or Potassium Hydrate	0.9	
1859	Plante (Lead Acid)	France	Lead	Lead Dioxide	Concentrated Sulfuric Acid	1.8 - 2.1	
1860	Fuller	England	Zinc	Carbon	Sulfuric Acid		
1863	Callaud	France	Copper	Zinc	Zinc Sulphate		
1866	LeClanche	France	Zinc	Manganese Dioxide	Ammonium Chloride	1.4	
1886	Carl Gassner	German	The dry cell, based on the LeClanche cell of 1866				
1893	Weston	English American	Cadmium	Mercury	Cadmium Sulphate	1	
1899	Jungner	Sweden	Nickel	Cadmium	Potassium Hydroxide		
1900	Edison	American	Iron	Nickel Oxide	Potassium Hydroxide	1.4	

6.2 Battery Variants

The chart (6.1.11) is actually a list of battery variants. The different inventors merely changed electrolyte and/or electrodes and called it their own.

Many battery technologies were developed. The porous technology is the one most used in batteries. It was developed by John Fredrick Daniel in 1836. He used a copper pot filled with a solution of copper sulfate. Into this he immersed an unglazed earthenware container filled with sulfuric acid and a zinc electrode. The earthenware was porous, allowing ions to pass through, but keeping the solutions from mixing.

There were several variations of this technology, using different elements and solutions, but the basic technology remained the same. The porous membrane allowed ions to pass but yet kept the solutions from mixing.

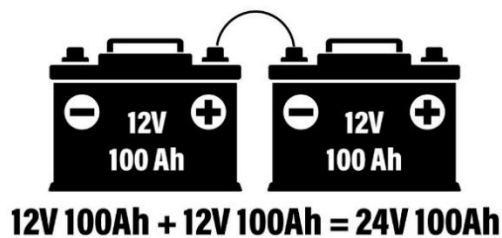
- ❖ For example: Dancer used zinc sulfate and copper sulfate solution.
- ❖ Grove used Zinc and sulfuric acid with platinum and nitric acid.
- ❖ Poggendorf developed a way to eliminate the porous cup. He mixed sulfuric acid and chromic acid together. If he placed two copper plates with a zinc plate positioned between them. Because of the tendency of the acid mixture to react with the zinc, he included a mechanism to raise the zinc electrode clear of the acid. This stopped the reaction when the battery was not needed.
- ❖ In the 1860s Callaud, a Frenchman invented the gravity cell. It consisted of a copper cathode on the bottom of the battery jar, and a zinc anode suspended at the top. A layer of copper sulfate crystals is laid on top of the copper plate, and the jar filled with distilled water. As current is drawn, a layer of zinc sulfate solution forms at the top of the jar. This top layer is kept separate from the copper sulfate by its lower density and by the current draw. It had two major drawbacks: 1. It had to remain stationary to prevent mixing. 2. The current draw had to be continuous to prevent mixing by diffusion, making it unsuitable for intermittent use. In spite of these, however, this was the battery of choice for American and British Telegraphers until the 1950s.

6.3 Battery Connections

Batteries can be connected together in two ways. One will increase the Voltage of the system, while maintaining the Capacity. The other maintains the Voltage but increases the Capacity. The capacity of a battery is rated in amp-hours. It tells you the amperage that a battery can provide for one hour.

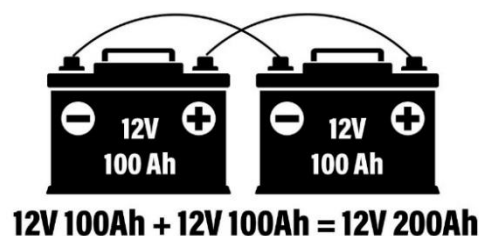
Series connections involve connecting 2 or more batteries together to increase the voltage of the battery system but keeps the same amp-hour rating. Keep in mind, in series connections each battery needs to have the same voltage and capacity rating, or you can end up damaging the battery. To connect batteries in series, you connect the positive terminal of one battery to the negative of another until the desired voltage is achieved.

In the image below (6.2.1) there are two 12V batterie systems, connected in series which turns this battery bank into a 24V system. You can also see that the bank still has a total capacity rating of 100 Ah. Connecting the cells in series increases the voltage while maintaining the capacity.



6.3.1↑

Parallel connections involve connecting 2 or more batteries together to increase the amp-hour of the battery bank, but your voltage stays the same. To connect batteries in parallel, the positive terminals are connected, via a cable, and the negative terminals are connected with another cable, until you reach your desired capacity, as in the diagram below (6.2.2).



6.3.2↑

A parallel connection is not meant to allow your batteries to power anything above its standard voltage output, but rather increase the duration for which it could power equipment. As you can see, the system remains at 12 volts, but the capacity has increased to 200Ah. Connecting the cells in Parallel increases the capacity of a battery, while maintaining the Voltage.

Table 6.2.3 (below) shows the relationship between amp hours and the rate at which you use them. To increase the capacity of a battery, connect your cells in Parallel. To increase the Voltage, connect your cells in Series.

Battery Capacity	Discharge Rate			
	1 Amp Draw	2 Amp Draw	3 Amp Draw	4 Amp Draw
2 Amp hour	2 hours	1 hour	40 minutes	30 minutes
3 Amp hour	3 hours	1 hour 30 minutes	1 hour	45 minutes
4 Amp hour	4 hours	2 hours	1 hour 20 minutes	1 hour
5 Amp hour	5 hours	2 hours 30 minutes	1 hour 40 minutes	1 hour 15 minutes
6 Amp hour	6 hours	3 hours	2 hours	1 hour 30 minutes

6.4 The Storage Battery Simplified

I came across a reference that simplifies the explanation of a Secondary or Storage battery. It is www.PowerStream.com/1922/battery. It was written by A.O Witte in 1922 and explains the working of a battery in non-technical terms.

There are only two ways of generating electricity; magnetically or chemically. The magnetic method was discovered by Volta, and led to the development of Alternating Current. It is basically a generator in which wires are rotated in a magnetic field. The Niagar Power Plant uses water power to thr generator. This is the power used at the 1901 Buffalo World's Fair. See Chapter

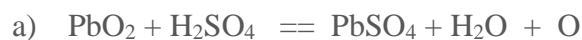
We are interested in the second or chemical method, which prtoduces Direct Current.. If two unlike metals (electrodes) are placed in a liquid (electrolyte) which causes a greater chemical change on one electrode than the other, an electrical pressure is built up. The greater the difference in the chemical change, the greater the electrical pressure. If the electrodes are connected together outside of the electrolyte an electric current will flow through the path (circuit) consisting of the electrolyte, electrodes amd the external wire.

As the current flows through the circuit the electrodes continue to change chemically, until one of them is entirely changed, at which point current flow stops and the battery is dead. This basically describes a Primary battery.

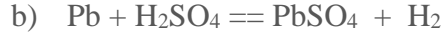
The chemical change usually results in the formation of gases of solid chrmlcal compounds. If gases are formed those materials are lost forever. If solids are formed, no material is actually lost. If the proper electrodes and electrolyte were used, it may be possible to recharge the battery. This is done by sending an electric current througth the cell in reverse, producing the same chemical reactions in reverse. When fully charged we have the original call as if it had never been used.. The battery is now ready to be used again. This describes the Farm Battery system where a gasoline powered engine was used to recharge the batteries (see Chapter 11).

The term Storage Battery is actually a misnomer. It doesn't actually store electricity at all, but rather creates it by chenging chemical into electrical energy while discharging. If we consider the typical automotiove battery (a lead acid battery) it consists of a positive electrode of Peroxide of Lead (shown chemically as PbO_2) a negative electrode of pure Lead (Pb) and an electrolyte of dilute sulphuric acid.

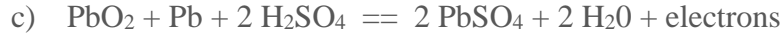
At the positive electrode Lead Peroxide and Sulphuric acid produce Lead Sulphate, water and oxygen, which is depicted as



At the negative electrode Lead and Sulphuric Acid produce Lead Sulphate and Hydrogen, or

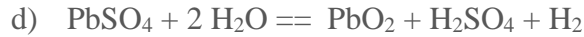


The oxygen of equation a) and the Hydrogen of equation b) combine to form water. If we combine the two equations we get:

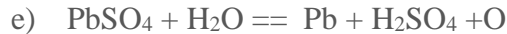


This reads as one part of Lead Peroxide (PbO_2) + two parts of Sulphuric Acid (H_2SO_4) yield two parts of Lead Sulphate (PbSO_4) + two parts of water (H_2O). Electrons are released during the reaction creating the electrical current.

If we now connect the spent cell to a generator and send an electrical current through the cell in reverse, the Lead Sulphate will be changed back into Lead, Lead Peroxide and Sulphuric Acid at the positive electrode, depicted as:



At the negative electrode Lead Sulphate and water produce Lead, Sulphuric Acid and Oxygen, which is depicted as:



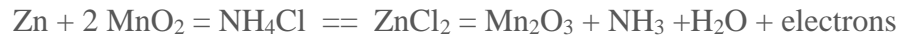
Again the Hydrogen from equation d) combines with the Oxygen of equation e) to form water. Combining the equations yields:



Which returns the battery to its original state, ready for use.

None of these reactions occur instantaneously, but rather, over a period of time. The rate of discharge and charge is affected by the flow of electrical current. In layman's terms a 100 watt bulb draws more current than a 60 watt bulb, resulting in a shorter battery life.

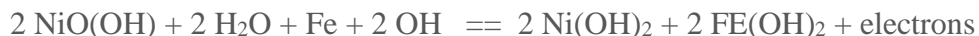
Similar reactions occur in the Leclanche Cell, which uses electrodes of Zinc and Manganese Dioxide with an electrolyte of Ammonium Chloride. The reaction there is Zinc, Manganese Dioxide and Ammonium Chloride produce Zinc Chloride, Manganese Oxide, aqueous Ammonia, water and electrons.



All reactions are in a liquid, with little gases released. This battery had some drawbacks which were discussed earlier. On the positive side, when the battery was idle the reactions would reverse, automatically recharging the battery.

The reactions in the Edison Battery which used electrodes of Nickel Oxide and Iron with a Potassium Hydroxide electrolyte are: Nickel Oxide, Iron, and Potassium Hydroxide produce

Nickel Hydroxide , Iron Dioxide. Unlike the other batteries, the Potassium Hydroxide does not react, and is not consumed.



The reactions in the Edison Battery progressed very slowly, limiting its strength. Of the three batteries mentioned, the Lead-Acid is the most robust.

6.5 Battery Jar sizes

Battery jars were available in various sizes and shapes. You will notice, as you study the information within these pages, that many battery jars, particularly the larger square and/or rectangular ones were available in a myriad of sizes. There seemed to be no attempt to standardize on size. The smaller cylindrical or square jars, which, in appearance, resemble a quart jar without the threaded top, I have termed “*Quart*” size. They have a diameter of 3 - 5” and a height of 5 - 8”. The average of all the quart size jars shown is approximately 4.75” diameter x 6.5” tall. You will find a few slightly outside of these ranges, but not many. They came with either a ground or finished lip, depending on when they were manufactured. Some had a pour spout. The electrodes could be flat or cylindrical. Most of these jars were embossed with the name of the customer, rather than the manufacturer. Only a few jars seem to have been embossed with the name of the manufacturer, and even then, most were not so embossed. It is known that the following glass houses did emboss their name on a few of the jars they manufactured; typically on the bottom.

Hemingray Glass Co.
Corning (Pyrex)

Whitall Tatum Co.
Gayner

Then you have the Farm size batteries. These are the large square and/or rectangular jars, generally with a formed lip and a sealed lid. These will not have an Electric Co. name embossing, but rather the name of a major brand, such as: Delco, Universal, Exide, Gould, Grant, Willard, etc. A few of those manufactured by Gayner will have a G – XXX designation on the

bottom. These batteries seemed to not have standard sizes. As you go through these pages, you will be amazed to find that they were available in sizes that differ by only an inch or two in size. In an attempt to illustrate this I have extracted size information from the jars presented in this work.

Corning Glass Works manufactured large cylindrical battery jars, again with little to no standardization. Their jars were embossed 9BJ-XXX, Cnx or PYREX.

And then there are what I call “specialty batteries”, manufactured for a specific company for a specific purpose. You will recognize these as you read through the chapters, as they don’t conform to the “quart” size; nor do they conform to the large size and shape of the Farm battery. Specialty batteries are generally small, sized by oz., or unusually shaped. It is known that Whitall Tatum manufactured Specialty Batteries, with many used in medical batteries or similar applications. See Chapter 2 on Medical batteries. The technical name for these batteries is the Poggendorf cell, often referred to as the Grenet cell.

We have to remember that a lot was happening at this time. As we learned to make and harness electricity, batteries were called upon to power many things eg. home radio, door bells, radios, phonographs and a myriad of other home related items. Most electrical devices you could name were powered by batteries, i.e., battery jars, as AC current was not wide available until the early 1900s. The Pan Am Exposition in Buffalo, NY in 1901 was the first demonstration of AC current.

The development of the battery also spawned the growth of electricity in the medical industry. Chapter 2 is a more detailed discussion of medical batteries.

Many glass companies that provided battery jars, etc, published sales catalogs. Where possible I have had these catalogs placed on the NIA web-site (Members Only). To date The ESB Co and Northern Electric Co. offered complete lines of not only battery jars, but also associated equipment. The jars were manufactured by some glass house. To highlight the extent of this industry, I extracted parts of the Electric Storage Battery Co. (ESB) catalog and placed it in its own chapter (17).

It is important to keep in mind that advancements in electricity were not slow moving. This was a very dynamic time. The companies at the forefront of this industry were generally incorporated in the last quarter of the 1800s. By the turn of the century we had the first dry cells. The Chloride of Silver Battery Co., of Baltimore Maryland is just one of the companies offering Dry Cells (See Chapter 9). Surprisingly, the Chloride of Silver Dry Cells have a history traced back to the Civil War. National Carbon’s Eveready brand was also introduced about this time. Electroplating equipment was offered in catalogs as early as 1890.

Whereas, in Volume I everything is grouped under the Primary Embossing, In Volume II everything is grouped under major headings, sub-groups by embossing.

6.6. My Observations

I have lived with the data in this study for months. At this point it is a part of me , I would like to share my general observations, based on my knowledge of the data.

- My first observation concerns the size of the jars, particularly the large square or rectangular farm / Home battery jars. There seems to be no standard sizes. By today's standards, making standard sizes is very logical. Apparently it was not a concern at the time. I can understand different suppliers making jars with very similar dimensions, but you will see that many jars from even the same supplier varied by an inch or less in size. I find this surprising, because the output from a single set of electrodes was approximately 2 volts, regardless of supplier. Larger battery jars provided room for a larger number of plates and thus a stronger battery.
- On the next few pages I have listed the dimensions of the Farm / Home battery jars found within these pages. The quart size falls within a fairly narrow range of dimensions, and by their very nature the specialty battery jars were made in a variety of shapes and sizes did not include specialty batteries, as you would expect greater variation in them. There is also a page listing the sizes of the cylindrical battery jars. I just listed the sizes as they were reported, realizing that measurement error plays a role. Therefore, it is likely that some of the listings could be the same. In any event I believe that you will see the point I'm trying to make. In order to keep it readable I deleted those brands with only a few batteries.
- At first I was amazed when I found that only 30% of rural America was electrified at the start of WWII. Consider the contrasts. Scientists were investigating atomic energy while most of rural America got their electricity from battery jars. I was raised on a small farm in Sullivan County, N.Y. We had electricity, likely because it was the vacation land for people from New York City. It was easy access from the city, at about 3 hours away, and air travel was not yet available to the masses.
- Corning battery jars are most likely to be found with an Edison Porcelain lid.
- Very few batteries are marked with the glass house that manufactured them, so most of the chapters are titled by the major embossings found on the jars. In the majority of cases this is the name of various electric companies or of electrical equipment suppliers. A few glass houses did mark some of the battery jars they manufactured. Hermingray marked a few, as did Whitall Tatum and Gayner. In a few cases where a paper label was applied to the jar, the name of the glass house would be listed on the bottom. Illinois Glass Works and The California Electrical Works are two that come to mind.

Farm/Home Battery Jar Size Comparison. (in.)

<u>ESB</u>	<u>Gayner</u>	<u>Gould</u>	<u>Philco</u>	<u>Westinghouse</u>	<u>Delco</u>	<u>Unknown</u>
						2.25 x 3.75 x 5.25
1.75 x 3.75 x 7.5						2 x 3.75 x 7.25
1.75 x 4 x 6.5						2.25 x 6.5 x 7.75
2 x 4 x 7				2 x 4 x 6		2.75 x 5.25 x 7.75
2 x 6 x 9						7.5
			2.5 x 6.75 x 9			2 x 6 x 9
2.5 x 7.5 x 10						2.5 x 6.4 x 8
2.5 x 8.75 x 11.55						2.5 x 6 x 12
					2 x 7 x 12.5	
2.5 x 9.25 x 11.5						3 x 4 x 6
						3.75 x 4 x 6
						3.75 x 6 x 7
	3.25 x 7 x 10				3.5 x 7.5 x 10	3 x 7.75 x 10
		3.75 x 5 x 13				
	3 x 10 x 14					
					4.25 x 7.5 x 10.5	4 x 4 x 9
4 x 7.5 x 10.5		4 x 7.5 x 10			10.5	4.75 x 8 x 10
4.75 x 8 x 11						4 x 7 x 11.5
	4 x 7.5 x 12.5		4 x 7 x 12			
		4.5 x 9.5 x 13				
4.5 x 8 x 14						
4.5 x 9.5 x 15						
4 x 10 x 14.75						

		5 x 7.5 x 10				5 x 8 x 10
ESB	Gayner	Gould	Philco	Westinghouse	Delco	Unknown
			5.5 x 7.5 x 10			5.5 x 7 x 11.5
5 x 8 x 11						
5 x 7 x 12						
5.5 x 7.5 x 12		5.5 x 8.5 x 12				5.5 x 7 x 13
		5.75 x 9 x 13.25			5.5 x 7.5 x 12**	
5 x 9.75 x 14.75						
6.25 x 6.75 x 7.25						6.6 x 6.5 x 8
	6 x 7.5 x 10				6.5 x 7.5 x 10 **	6 x 7 x 10
6 x 8 x 10	6 x 8 x 10				6.75 x 8 x 10	
	6.75 x 8 x 11.25		6 x 7.5 x 10.5	6.5 x 7.5 x 10.75		
6.5 x 7.5 x 10.5					6.5 x 7.5 x 10	6.5 x 7.5 x 10
					6 x 7 x 11	6 x 7 x 10
					6.75 x 8 x 11.5	
	6.5 x 7.5 x 12					
		6.75 x 10 x 13.5				6 x 8.75 x 13.75
6 x 9 x 13.5	6.5 x 9 14		6 x 9 x 14		6 x 9 x 14	
6 x 11 x 15						
7.5 x 7.5 x 10.25	7.5 x 7.5 x 10.25					7.75 x 7.75 x 10.5
		7 x 8 x 11		7.5 x 8 x 11	7 x 8 x 10.5**	7 x 8 x 10
						7.5 x 9 x 12
						7 x 7.5 x 13
						7.75 x 10 x 13
					7.25 x 10 x 14**	
7 x 10 x 14.5	7 x 10.5 x 14					7.25 x 7.5 x 14

7.5 x 10 x 14.75							
ESB	Gayner	Gould	Philco	Westinghouse	Delco	Unknown	
8 x 8.5 x 12				7 x 11 x 17			
	8 x 8 x 13.5			7 x 11 x 17			
				8 x 8 x 11		8 x 10 x 11	
						8.5 x 10 x 13	
						8 x 11.5 x 14.25	
						8.5 12.75 x 17	
						8.25 x 19 x 14.75	
	8.5 x 9.25 x 14			8.25 x 10 x 11			
		9.5 x 12.5 x 15.75				9.5 x 12 x 13	
9 x 10 x 15							
9.75 x 13 x 19							
10 x 10.5 x 15							
10 x 12 x 14.5							
						11 x 11.25 x 14	

** = Ironclad Models

Cylindrical Battery Jar Size Comparison (in.)

<u>Corning</u>	<u>Unknown</u>	<u>Kimble</u>
	5 x 7.25	
	6 x 8	6.x 8
	6.75 x 8.25	
6.5 x 10		
6.5 x 10.5	6.5 x 10.75	
6.75 x 10		
6.5 x 11		
6.75 x 11		
6.5 x 12		
7 x 10		
7.5 x 10		
7.5 x 11.75		
8 x 10.25		
8.75 x 10	8.5 x 10.5	
9 x 13		
6 x 16		
12 x 24		

6.7 Battery Jars: Definitions & Terminology

- The most important part is the set of positive and negative plates. As discussed earlier (page 9), the number of plates was always an odd number because of the spacer needed between the positive and negative plates. Common numbers of plates ranged from 1 to 17. Specialty batteries had as many as 33 plates, or more.
- Battery Bridge Rests. Usually these were an integral part of the jar, but if not, the bridge was placed on the floor of the jar to support the plates. All battery reactions produced debris which would fall to the bottom. The Bridge Rests supported the plates from the bottom to prevent the debris from building up and shorting the plates.
- The Battery Cell Cover was a lid that covered the jar. We have seen screw-on lids as well as lids that simply rested on top of the jar. On Farm batteries they were glued to the jar with a tar-like substance to prevent leaks.
- Floating Battery Post Bushing: Over time the positive post grows upward, which could cause damage. The floating bushing grew upward at the same rate as the post, thus preventing damage.
- Battery Vent Caps: All lead-acid batteries form gas, usually during charging. If allowed to build up, it could cause damage or even an explosion. The vent cap releases any gas pressure build-up from the battery as it is formed.
- Battery: Two or more electrical cells, electrically connected so that they furnish current as a unit.
- Cell: The battery unit consisting of elements, with electrolyte, in jar with cover.
- Electrolyte: The conducting fluid of electro-chemical devices; for lead acid batteries it consists of about two parts of water to one part of chemically pure sulphuric acid, by weight.
- Jar; The container holding the elements and electrolyte; typically glass and/or hard rubber, and later, plastic.
- Sediment: Loosened or worn out particles of active material that has fallen to the bottom of a cell, frequently called "mud".
- Short Circuit: A metallic connection between the positive and negative plates within a cell. The plates may be in actual contact or material may lodge and bridge across. If the separators are in good condition and mud is not allowed to build up in the bottom of the jar, a short circuit is unlikely to occur.
- Terminal: The part to which outside wires are connected.
- Corrosion: The attack by acid from the electrolyte on surrounding materials.
- Evaporation: the loss of water from the electrolyte caused by heating and charging.
- Gassing: The formation of Oxygen gas at the Cathode and Hydrogen gas at the Anode , which starts when the charge about half finished, depending on the rate of charge

- Post: A part extending through the cell cover, allowing connection of the elements to the terminal.
- Battery Edge Protectors: Are boots that cover the bottom edge of positive or negative battery plates. This prevents damage that may occur during manufacture to ensure a longer battery life.
- Battery Plate Protectors: are a thin shield that covers the top of the battery plates to prevent mossing. Mossing is the build-up of particles on the top edge of battery plates, which can cause a short circuit between the plates.
- Battery Vent Caps: allow gasses that build up during charging to vent harmlessly.

6.7 Battery Rests

Battery jars did great job providing electricity, but there were also problems to be overcome. Most of the problems were the result of the acid used in the batteries. The earliest (Primary) batteries were not sealed. This led to an acid laden atmosphere around the jar. Soon everything would be covered with the acidic moisture and dust. The result was electrical leakage. It was discovered that insulating the jar from its surroundings would decrease the amount of electrical loss. For a complete description of battery rests see Appendices 1 and 2. These are papers written by Charles and Sandi Irons on the subject.

Battery rests were manufactured by several companies, including ESB, Gould, National Battery, U.S. Light and Heating, Ware Battery Co. and M.T Co. (believed to be The Montreal Telegraph Co. Following are some pieces from my collection. It is also believed that the Elmer Glass Co manufactured some of the unembossed battery rests.



←**8.1** is a CD 36 battery Rest. It is embossed **THE E.S.B. CO. //MADE IN U.S.A.**, with B-/5993/-3 under the crown. Its dimensions are 6" diameter x 3.673" tall. **Courtesy of Walt Baumgardt.**



←**8.3** is a CD 31, from E.S.B. Co.. It is embossed **CHLORIDE ACCUMULATOR // THE E.S.B. CO.** **Courtesy of Walt Baumgardt.**



←**8.2** is an un-embossed CD 35 battery Jar. It's dimensions are 4.75" diameter x 3.675" tall. **Courtesy of Walt Baumgardt.**



←**8.4** is another **E.S.B. CO.** Battery rest. It is CD 20 and embossed. It's dimensions are 2 3/16" x 1.5" tall. **Courtesy of Walt Baumgardt.**



← **8.5** shows a picture of the 3-piece Gamewell Battery Support Insulator. **Compliments of Tommy Bolack.**

A complete article on the Gamewell system, by Elton Gish, is in Appendix C. It was in the Winter 2019 Issue of ALLINSULATORS Crown Jewels of the Wire.



8.6↑



8.7



8.8↑



8.9↑

I have added, here, what I believe may be another unlisted Battery Rest. **(8.6 through 8.9).**

The slots on the bottom would have fit over a support system of some kind, perhaps like the Gamewell system. **Courtesy of Walt Baumgardt**



←**8.10** is likely another previously unknown battery rest. It is smaller than CD 10 with dimensions of 1.75" diameter x 9/16" tall. **Courtesy of Walt Baumgardt.**

6.8 BATTERY TRAYS

Another problem with unsealed jars was corrosion. Acid laden moisture would run down the outside of the jar and corrode the base, which was usually. Battery Trays were used to prevent this. The earlier trays were made of wood, and later glass as the wooden trays could not stand up to the acid. They were shallow trays, filled with sand (they are commonly called sand trays). The sand collected and drippings, thus protecting the base.



←9.1 is embossed **E.S.B. Co. No. 5 // Made in U.S.A.** Note the BK Ns. Its dimensions are 6.75" x 10". It is Uranium Glass. **Courtesy of Baumgardt.**



←9.2 and 9.3 show an **E.S.B. Co. No. 5**, With Normal Ns.

Courtesy of Tommy Bolack.



←**9.4** is embossed
E.S.B. Co. No. 7-5 //
Made IN U.S.A. Note
the BKN. Its
dimensions are
10.25" x 13.5". It is
Vaseline glass
**Courtesy of Walt
Baumgardt.**



←**9.5** is embossed **E.S.B.**
Co. No. 7 // MADE IN U.S.A.
Its dimensions are 10.25 x
12.125. It is Uranium glass.
Note the Normal Ns.
Courtesy of Tommy Bolack



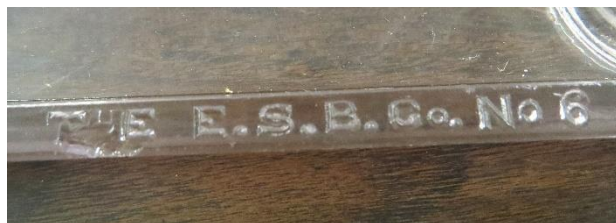
← **9.6** is embossed **E.S.B. Co. No. 7-1 // MADE IN U.S.A.** Its dimensions are 10.5" X 13..5". It is Uranium glass, also. Note the Normal Ns rather than BK Ns. **Courtesy of Tommy Bolack.**



←**9.7** is embossed **E.S.B. Co. No. 6 // Made IN U.S.A.** Its dimensions are 9.25" x 10". Note the BK Ns. It is Uranium Glass. **Courtesy of Walt Baumgardt.**

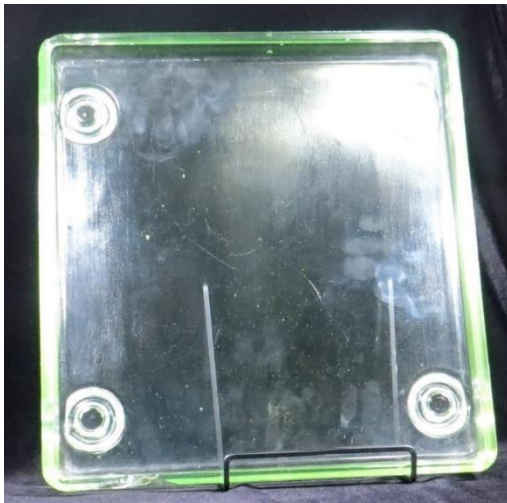


←**9.8 and 9.9** is another **ESB Co. No. 6** tray. Note the Blotted embossing on one side and the Normal Ns. Rather than Uranium glass, this is a light SCA. **Courtesy of Tommy Bolack.**





←**9.11** is embossed **E.S.B. Co. No. 2 / Made in U.S.A.** Its dimensions are 7.5" x 9" and is light SCA. **Courtesy of Nick Bergkessel.**



←**9.10** is embossed **E.S.B. Co. No. 9 // Made in U.S.A.** Note the BK Ns. Its dimensions are 12.5" x 13.5." **Courtesy of Walt Baumgardt.**



9.12 could be a previously unknown battery tray. The dimensions are 1.5" x 4" x 0.5", with a 0.125" lip. It could have been used with a jar like **94.1**.

The following notes summarize the embossing, embossing errors and colors of the battery trays identified to date. All were manufactured by The E.S.B. Co

<u>Model</u>	<u>Size (in)</u>	<u>Top</u>	<u>Bottom</u>	<u>Color</u>
E.S.B. 5	6.75 x 10	E.S.B. No. 5	MADE IN U.S.A.	Uranium
E.S.B. 5	6.75 x 10	E.S.B. No. 5	MADE IN U.S.A.	Light SCA
E.S.B. 6	9.25 x 10	E.S.B. No. 6	MADE IN U.S.A.	Uranium
E.S.B. 6	9.25 x 10	E.S.B. No. 6	MADE IN U.S.A.	Light SCA
E.S.B. 7 - 5	10.25 x 13.5	E.S.B. No. 7-1	MADE IN U.S.A.	Uranium
E.S.B 7	10.25 x 13.5	E.S.B. No. 7-1	MADE IN U.S.A.	Uranium
E.S.B 7 - 1	10.25 x 13.5	E.S.B. No. 7-1	MADE IN U.S.A.	Uranium
E.S.B. 9	12.5 x 13.5	E.S.B. No. 9	MADE IN U.S.A.	Uranium
E.S.B. 2	9 x 7.5	E.S.B. No 2	MADE IN U.S.A.	Light SCA

Notes:

- The mix of normal and BK Ns.
- The heights of the trays vary somewhat from 1.5” to 1.75”.
- Each tray has two short legs (0.375”).
- As expected, the Vaseline (Uranium Glass) trays, glow under UV light.
- Any embossing is on top of opposite sides of the tray

6.9 Battery Plate Separators

Those “U” shaped pieces of glass rod are reported by Lyons to be Battery Plate Separators, to keep the positive and negative plates from making contact. They were believed to be unsuccessful. I have heard other explanations of their use. Whatever they were used for it was in conjunction with battery jars.

They are usually unembossed. 6.9.1 are unembossed pieces. **Courtesy of Walt Baumgardt.**



In fact I'd never seen an embossed one until Wayne Duzinski sent me the pictures in 6.9.2 and 6.9.3. As you can see they are simply embossed MADE IN U.S.A. **Courtesy of Wayne Duzynski.**



6.9.2↑

6.9.3↓



7 Medical Batteries

A full discussion of Medical Batteries is found in Volume II. However the battery jars used in Medical Batteries are shown here.



7.1↑



7.2↑

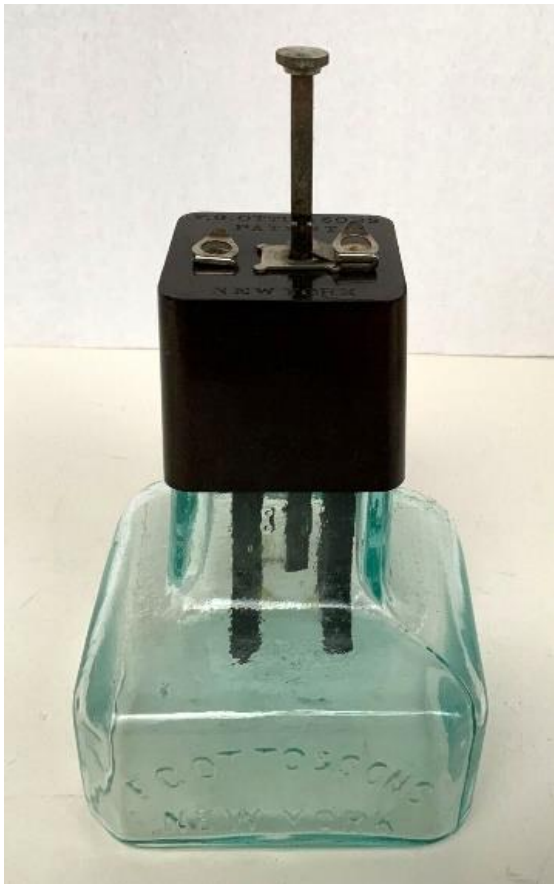


The unusually shaped object shown in 7.1 through 7.3 shows the closed cells used in the Smith & Shaw Closed Cell Pocket Battery. The actual dimensions are 1.75" x 1.25" x 2" tall. The battery connections were also revolutionary. One is the small metal button on the top cap shown in 2 - 36. The other is the small metal pin protruding from the bottom shown in 7.4.

←7.3



7.4↑



Whitall Tatum made a number of battery jars for medical batteries.

←7.5 is a Grenet type battery made by Whitall Tatum for use in F.G., Otto & Sons. Medical Batteries. Similar jars were embossed with an L (Luis Drescher) or Waite & Bartlett. **Courtesy of Walt Baumgardt.**

The Grenet Battery was invented by German inventor Christian Poggendorf in 1842. It was patented in 1859 by Eugene Grenet, Jr. of France who made it more practical. The Grenet cell is characterized by flask like glass container with a Hard rubber, wood or porcelain cover. It consists of two carbon or graphite electrodes in the center of which is a Zinc electrode. The electrolyte is a dilute solution of Sulphuric Acid. The nice feature of the Grenet Battery is that the Zinc rod could be withdrawn. Stopping all the reaction and suspending the battery until it was needed again.

For examples of their battery jars, see Whitall Tatum Catalogs from 1879 and 1880 at NIA.org. Other examples are shown below:



←7.6 is not shown in their catalogs. A square, light aqua jar, 3” square x 4” high, with a 2” diameter top. It is embossed on the front: **(arc) F.G. OTTO & SONS / Jersey City**. It is believed to have been used in an Electro Therapy device, (medical battery), very likely “The Mystic”.
Courtesy of Don Briel.

7.7→ is not shown in their catalog, either. It is 4” square x 5” high, with an off-set glass top, 2” square. It is light aqua and embossed, on the front, **(arc) F.G. OTTO & SONS / NEW YORK**. This one is known to have been used in an electro therapy device called “The Florence”.
Courtesy of Don Briel.





←**7.8** appears to be the same as **66 - 2**. It has been documented, however, that **66 - 3** is embossed on the neck: **LD / PATENT / JULY 4 / 1874**. The body is embossed (arc) **F.G. OTT & Sons / NEW York**. Courtesy of Walt Baumgardt

7.9 → was made by Whitall Tatum Co. It is un-embossed except for (arc) **W.T & Co. / U.S.A.** It is a very light aqua in color and is 1.25" square x 3.5" tall. This jar does not show either of the Whitall Tatum Catalogs. This may indicate that Whitall Tatum, and perhaps other companies, manufactured specialty items for specific customers. **Courtesy of Debbi Graham**





←**7.10** The jar embossed J.H. BUNNELL CO. / N.Y. was undoubtedly used in a medical battery of some kind. The manufacturer is unknown.

7.11 & 7.12 The porcelain jars below were used in medical batteries from Charles Chardin of France



←**7.11**



7.12 →



←**7.13** is a battery from a shock machine by Charles Chardin of France. Likely earlier than the porcelain ones shown above.



7.15↑



7.16↑

As batteries were further developed, many medical batteries used dry cells such as those pictured above (7.15 & 7.16) from The Chloride of Silver Dry Cell Battery Co. and Western Electric. As best I could determine, Chloride of Silver were the first Dry cells. **7.15 is courtesy of Walt Baumgardt.**



Just so you don't think all medical battery jars were small. We have this one (←7.14) from an Otto Flemming medical battery. It is 4" diameter x 6" tall. **Courtesy of Walt Baumgardt.**

10 Electric Vehicles

Electric Vehicles were discussed in Volume II. Vehicle batteries will be shown here. They required a lot of power. The electric vehicle from Edison had two 15 volt batteries, which powered a 30 volt electric motor. Most automotive batteries were comprised of approximately 45 cells. We show here known battery jars that were used for electric vehicles.



10.5↑ is a **Philco** battery for an electric vehicle. It consists of three – 3 cell units. Each unit is 10.5" x 4.5" x 6" tall making each cell 3" x 4" x 6" tall. Connected in series each 3-cell unit

would provide 6 volts, with the three units together providing 18 volts, approximately half of what was needed. **Courtesy of Tommy Bolack**



←**10.1** is a three cell jar in Uranium glass. Its dimensions are 4.5 x 10.5 x 6" tall. It would have provided 6 volts, wired in series.



←**10.2** is a five-cell jar in Uranium glass. It is embossed EXIDE with dimensions of 4.4" x 15 " x 8" tall. It would have provided 15 volts, wired in series, approximately half of what was needed.



←**10.6** This two cell PHILCO jar is also in uranium glass. With dimensions of 7" x 2.75" x 5.75" tall, (each cell 3" x 2" x .25" tall), it could have been a jar for an electric vehicle. I suspect, however that it is actually a radio battery. **Courtesy of Tommy Bolack.**

10.7↓



10.8↓



10.7 and 10.8 are 2-cell jars, found in both light blue and light green. It is totally unembossed with dimensions of 3 x 7.25" x 6.5" tall. Each cell is 2.5" x 3" x 6" tall. Each unit would have provided 4 volts. **Courtesy of Tommy Bolack.**

11 Street Cars / Trolleys

Street cars and Trolleys used huge power plants for power. Using Direct current each power house could only power a car within about a one mile radius of the plant. Thus, many cities had several power plants to power their system. The Electric Storage Battery Co. (E.S.B.) provided the power necessary. An example of such a power plant is shown in **15.1**. It shows one of three such power plants to power the system in Buffalo, N.Y.

This particular plant was the Niagara St. station, installed in April of 1898. It contained 270 cells, with a capacity of 1360 amperes. Additional plates were added in June of 1901 bringing the station to full capacity at 2480 amperes. In July of 1900 the Cold Springs sub-station was added with 280 cells. In Sept. of 1900 the Eagle St. sub-station was added. The capacity of each of these substations was 2080 amperes.

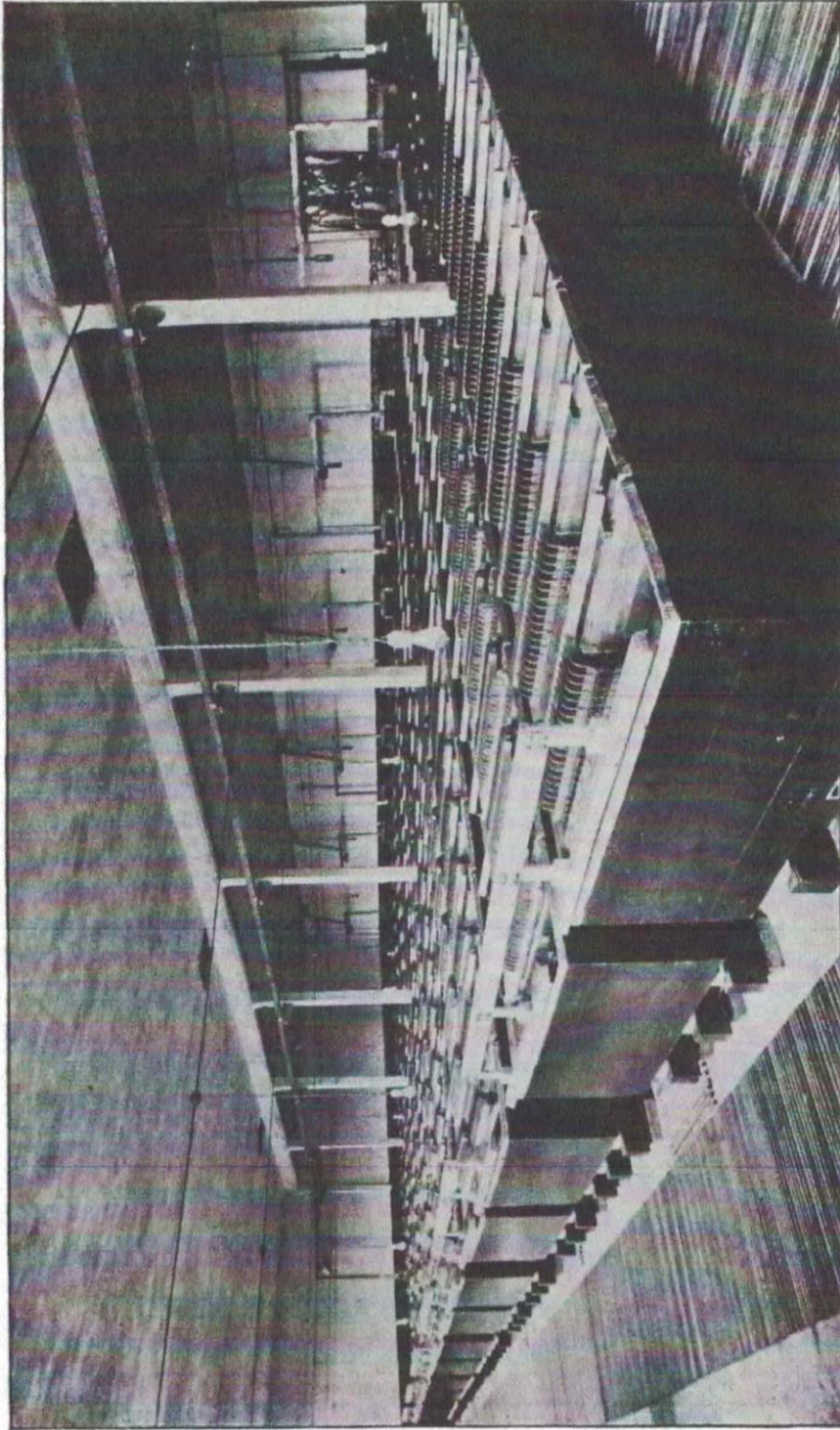
11.1 is typical of the sub-stations required to power the street car systems in various cities around the country. A presentation showing several of these sub-stations is included in Appendix. Due to the distance limitations of Direct Current, many cities required multiple plants. For Example:

- Detroit, MI: 3 power stations
- Philadelphia, PA: 6 Power Stations
- Camden, NNJ: 1 power station
- Hamilton, Ontario: 1 Power Station
- Pittsburg, PA: 10 power stations
- Indiana: 9 Power stations
- Boston, MA area: 2 Power stations
- Ohio: 2 Power Stations.
- Buffalo: 3 Power Stations

Imagine if you will, each power plant was a room like this, full of nothing but battery jars. With DC current, each power plant could power a street car for an approximate radius of one mile. Thus the need for multiple power plants in larger cities.

For the full discussion on Street Cars and Trolleys please refer to Volume II.

THE ELECTRIC STORAGE BATTERY CO.



BUFFALO RAILWAY COMPANY

The Buffalo Railway Company operates three Batteries of "Chloride Accumulators." The first was installed at Niagara Street, in April, 1898, and consisted of 270 cells, having a capacity of 1360 amperes. This was increased by the addition of plates in June, 1901, to the full capacity of the tanks and now has a capacity of 2480 amperes. The above photograph was taken before increase was made. In July, 1900, the Cold Springs Sub-Station was equipped with 280 cells, and in September, 1900, the Eagle Street Sub-Station with a similar number. The capacity of each of these Sub-Station Batteries is now 2080 amperes.

As we are primarily Insulator Collectors, I would be remiss if I did not point out the various insulators used by street cars and trolleys.

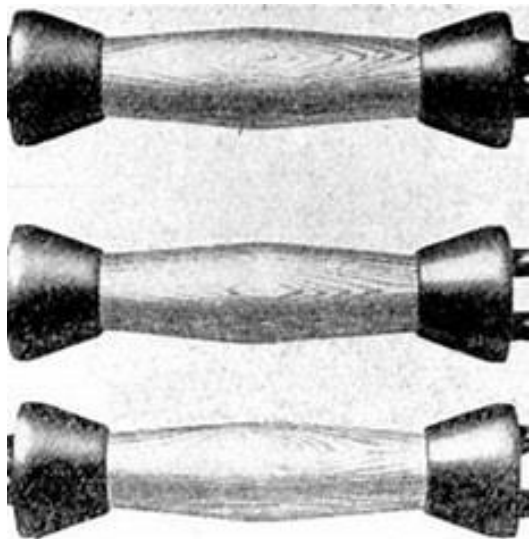


11.2



11.3

We are all familiar with the wooden insulators used on trolleys in San Francisco following the earthquake of 1906.



←**11.4** shows wooden strain insulators from Westinghouse that were used on trolleys.



11.5↑



11.6↑

11.5 and 11.6 show two different third rail insulators. 11.5 is courtesy of Walt Baumgardt.



11.7↑ shows porcelain discs that were used as equipment spacers on locomotives. They could have also been used in a similar capacity on street cars and trolleys.



11.8↑ shows an insulator system used to connect street cars and trolleys to an overhead power line.

12 Rail Road Signaling

Railroad signaling used battery jars kept in wooden boxes placed adjacent to the tracks at crossings. Most of what I've found have been made by Corning with porcelain lids.

As we learned in Volume II there were three associations involved in signaling:

- R.S.A., The Railway Signal Association
- A.R.A., The American Railway Association
- A.R.S., American Railway Signaling

These initials were found embossed on the jar lids:



←**12.1** Battery jars such as this were commonly used for railroad signaling. They were cylindrical in the range of 6-8" diameter x approximately 10 – 12" tall, larger than the "Quart" size jars.



←**12.2** Is an RSA Signal Cell lid from Edison, manufactured by the Battery Supply Co. (BSCO).



←**12.3** is a lid embossed RR EDISON LALANDE BATTERY / PAT. June 17, 1890



12.4 is an R.S.A. Signal Cell lid from the National Carbon Co. of Cleveland, Ohio.



12.5 is an A.A.R. lid embossed NATIONAL CARBON COMPANY, a Division of U.C. & C. Corporation. U.C. & C. is the Union Carbide and Carbon Corp.



12.6 is an A.A.R lid embossed A.A.R. SIGNAL CELL / L.S. Brach Mfg. Co, Newark, N.J.



12.7 is an R.S.A lid, embossed, R.S.A. SIGNAL CELL / MANF'D by The Waterbury Battery Co Waterbury, CONN. U.S.A.

13.0 Radios

Early radios were also powered by battery jars. The earliest required three batteries: Type A, Type B and Type C.

Type A were low voltage, and heated the filaments in the tubes.

Type B were high voltage for the plate circuit.

Type C merely improved the sound quality and were soon engineered around, leaving only the requirement for Types A and B

They came in many different styles:

Today we take radios for granted, but for rural American in the late 19TH and early 20TH centuries, the radio was your only link to the outside world.

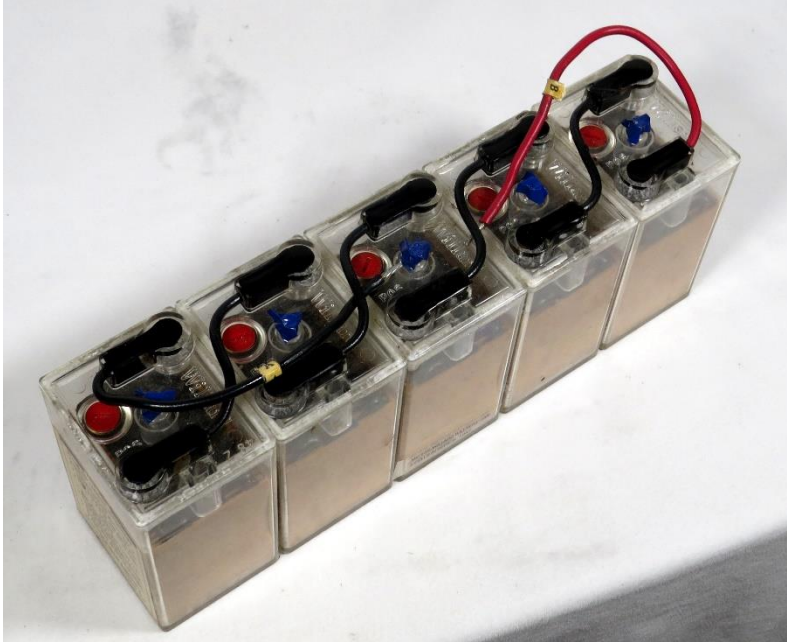
The early radios were generally large to accommodate the required tubes. Many times they were housed in elaborate wooden console models. I include a few pictures of early radios. They are all Zenith from the 1930s. One is a floor model console and the other is a table top farm radio.



13.1↓ is a radio battery array from WILLARD. It provided 48 volts. Courtesy of Walt Baumgardt.



←**13.02** is a similar radio battery array by Philco.



← **13.03** Courtesy of Walt Baumgardt



← **13.04** is a PHILCO radio battery.



←**13.05** is a Gamewell Radio Battery.
Courtesy of Tommy Bollack.



←**13.06** is a BALKITE Radio
Battery. Courtesy of Tommy Bolack



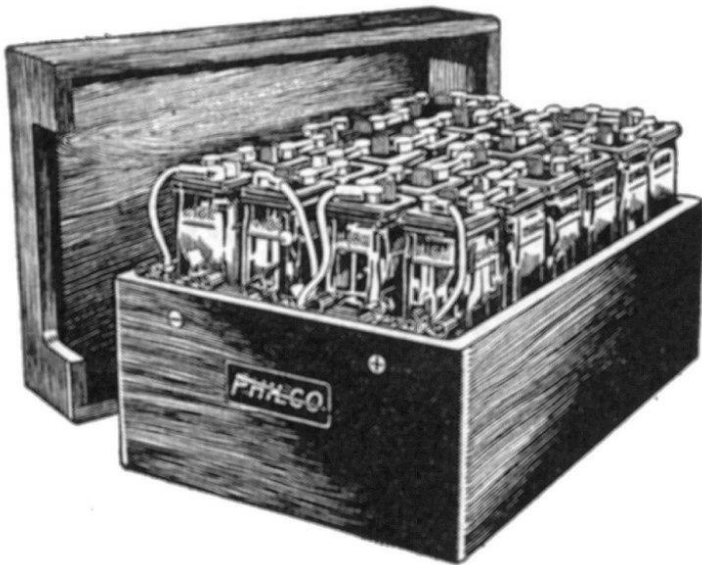
←**13.07** is trickle charger for radios, from Fansteel. Courtesy of Walt Baumgardt.



←**13.08** is a rectifier cell from Willard.



←**13.09** shows radio rectifier cells from Philco.



13.10↑ Is a Philco “B” radio battery array, while **13**.is a Ssingle “B” Radio battery from Willard, with dimensions of 1.5” diameter x 6.5” tall.



13.11↑

14 Phonograph

The earliest phonographs were wound with a crank on the side. When the built up tension wound down it was re-wound. With the advent of electricity they used battery jars. I include a few pictures of early manual phonographs.



14.1↑

14.2↓



14.3↑

14.4↓



14.1: 1903 Edison Home Phonograph for cylinders.

14.2: "His Master's Voice" trade mark of RCA Victor, for cylinders.

14.3: Early upright for &* rpm records


14.4: 1917 Edison home phonograph for cylinders.



14.1 The Grenet or Poggendorf batteries such as this from Whitall Tatum were used to power Edison phonographs.

Edison manufactured a line of phonograph batteries for the phonograph. These are shown in pictures 14.2 through 14.4.

EDISON EXHIBITION PHONOGRAPH BATTERY.



Consisting of 4 Liquid-Tight Steel Cells, Type "V," capacity 150 ampere-hours, in polished oak case, with strap for carrying same.

Price, Complete, = \$12.00

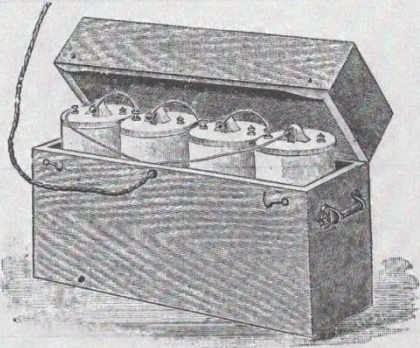
This battery will run the phonograph for 50 hours with single charge, and as it is absolutely liquid tight, it is specially recommended for travelling exhibition work.

Price of renewal parts for 4 "V" cells (see page 13), = = **\$3.08.**

Size, 13 x 13 x 9½ in.

←14.2

14.3↓



**The Edison
Phonograph . . .
Battery**
for
Stationary Work.

Consisting of four Edison-Lalande cells, Type "S" (300 ampere-hours), in lead-lined polished oak box, and battery cords, - \$15.00

This battery will run the phonograph for 100 hours with a single charge.

Price of renewal parts for four "S" cells, \$4.76

Size $25\frac{1}{2} \times 8 \times 15$ in.

←14.2

16

**THE EDISON
Portable Phonograph
and
Gas Engine Battery.
TYPE "O."**

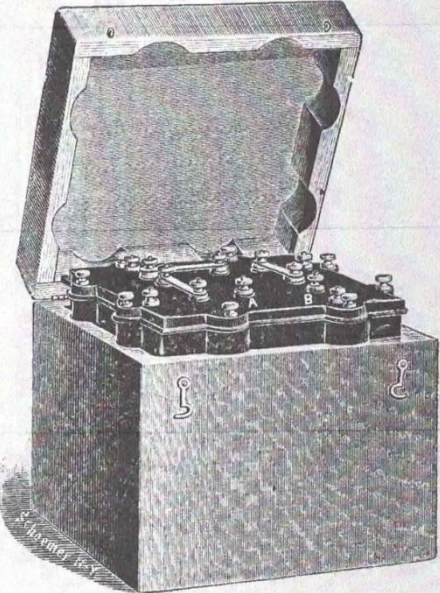
Price, complete, - \$20 00

Cost of Renewal Charge for Complete Battery, \$2.80.

Itemized as Under:

4 Oxide Plates, Type "O,"	
at 25c.	\$1.00
4 Zinc Plates, Type "O,"	
at 25c.	1.00
4 Cans Potash, Type "O,"	
at 17c. each. . . . .	.68
1 16-oz. Bottle Oil, at 12c.	.12
	<hr/>
	\$2.80

Extra Flat Rubber Gaskets for Cover, 25c. each.



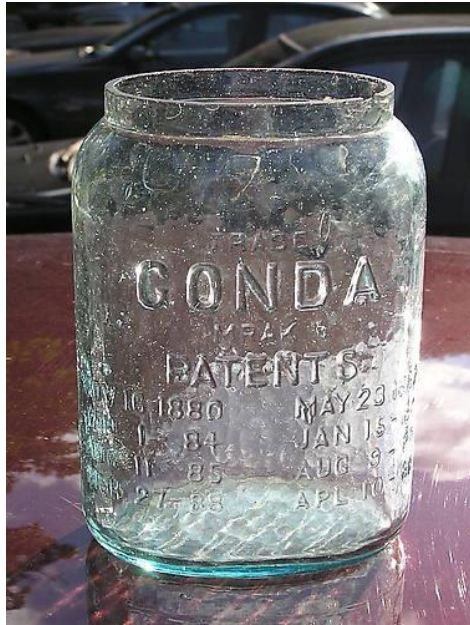
Size $9\frac{1}{2} \times 9\frac{1}{2} \times 9\frac{1}{2}$ in.

This battery is specially designed for the use of traveling phonograph exhibitors, and will run a phonograph for 30 hours before needing any attention, after which it can be recharged at a small cost. It consists of a square hard-rubber cell divided into four compartments. The cover is bolted to the body of the cell by eight long brass bolts, and the cell is rendered air-tight by a flat rubber gasket that fits between the jar and the cover. It is encased in a polished oak box provided with a leather strap for carrying it easily.

←14.3

15 Telegraph / Telephone

The early telephone and telegraph primarily used the “quart” size jar, which were manufactured by most glass houses. The following jars are typical of those used. Most of this style jar were unembossed except for the name of an Electric Company.



Gonda↑ L.B. CO.↓



L.C.&E.Co.↑ Ostrander↓



16 Farm / Home Batteries

These used the large battery jars and were sold as systems to powers farms and entire households. Such systems usually were comprised of 18n jars with sufficient cells to supply from 500 to 3000 watts of power. Pictured below are typical of the type.



Westinghouse↑

Delco↓



Universal↑

Exide↓



17 Water and Wind Energy Wind Energy

Having battery power was not necessarily the end of one's problems. If you had Primary batteries, they needed to be replenished, when spent. This meant new electrodes and electrolyte and a trip to the nearest town to have it done. Even with Secondary batteries, they needed to be recharged, meaning another trip to town, if you weren't fortunate enough to have a Farm/Home system. Even with a Farm/Home system, you needed fuel for the engine to recharge the system.

For rural America, where most farms did not have cars, horse and wagon was the common form of transportation. It was not uncommon to live many miles from the nearest town, where recharging and/or fuel services were available. By horse and wagon this may be a three or four day, or longer, round trip. Wincharger and Jacobs Electric Co offered solutions.

The Wincharger Corp. of Sioux City, IA started life as the Albers Propeller Co. making small wind driven power generators for home radios. The small 6-volt systems were an immediate success. In 1935 Zenith Corp. purchased controlling interest in Albers Propeller Co, and in 1936 they purchased it outright.

17.1 WINCHARGER



17.1.1 is an early advertisement for the Wincharger. The 6-volt systems were small and mounted on the roof



17.1.2 shows a 6-volt Wincharger mounted on a rooftop.



As time went on, Wincharger developed larger systems, that could recharge Farm/Home systems. These larger models were mounted on towers 70 feet in the air to clear obstacles such as buildings, trees etc.

←17.1.3 shows such a tower mounted Wincharger system.

They also had a line of Wincharger Farm batteries, which were designed to overcome most of the problems associated with other farm batteries:

- Excessive sediment
- Cracked or fallen plates
- Short circuits due to failed separators
- Their jars were larger to provide more room for sediment, used reinforced plate support rods, and used Port Oxford Cedar separators. A complete Wincharger farm battery system was 32 Volts, containing 16 glass jar cells of 2 Volts each.
- **17.1.4** through **17.1.5**, is such a Wincharger battery jar. Based on the connection above it may be a Zenith jar. It 9.5” 11” by 15.5” tall. It is embossed WATER LINE on 4 sides. The lid is embossed **WINCHARGER / Do Not Lift Cell By Posts / Made in U.S.A. / Glass Guard**.

17.1.4↓



17.1.5↓



17.2 Jacob Wind Electric Co.

The Jacob Wind Electric Co. also supplied propeller driven generators to charge Farm/Home systems. They got into the business out of necessity. Their ranch in Montana was 40 miles from the nearest source of fuel for the generator to recharge their Farm/Home System. Brothers Joe and Marcellus Wind started experimenting with alternative ways of recharging the batteries. By the mid 1920s they had perfected their propeller system and had installed one for all their neighbors. Around 1930, they moved to Minneapolis to be closer to their suppliers. Their units were tower based, approximately 70 feet tall to clear obstructions.

If this sounds familiar, you will recall the Zenith Wincharger from Chapter 17.1. The Wincharger system started out as a radio charging unit and grew to larger devices for Farm/Home systems. The Joseph Wind Electric Co. went straight to the larger generators for Farm/Home systems.



←17.2.1

17.2.1 shows a Jacob's Wind Propeller system mounted on a pick-up truck.

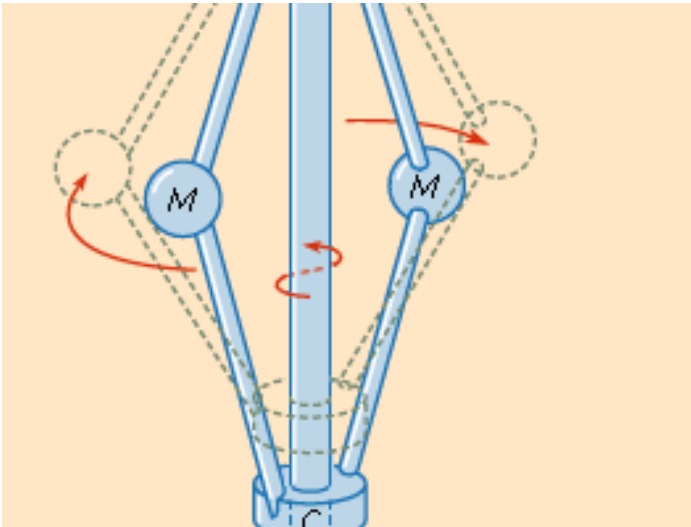
17.2.2↓ shows two Jacob's Wind Towers in use in Minneapolis.



Like Wincharger Jacobs Wind also offered entire systems, including battery jars. I couldn't find the Jar, but 17.2.3 shows a glass lid for one of their Farm/Home batteries. The dimensions are 7.5" x 8.5" and it is embossed JACOBS / WIND ELECTRIC.

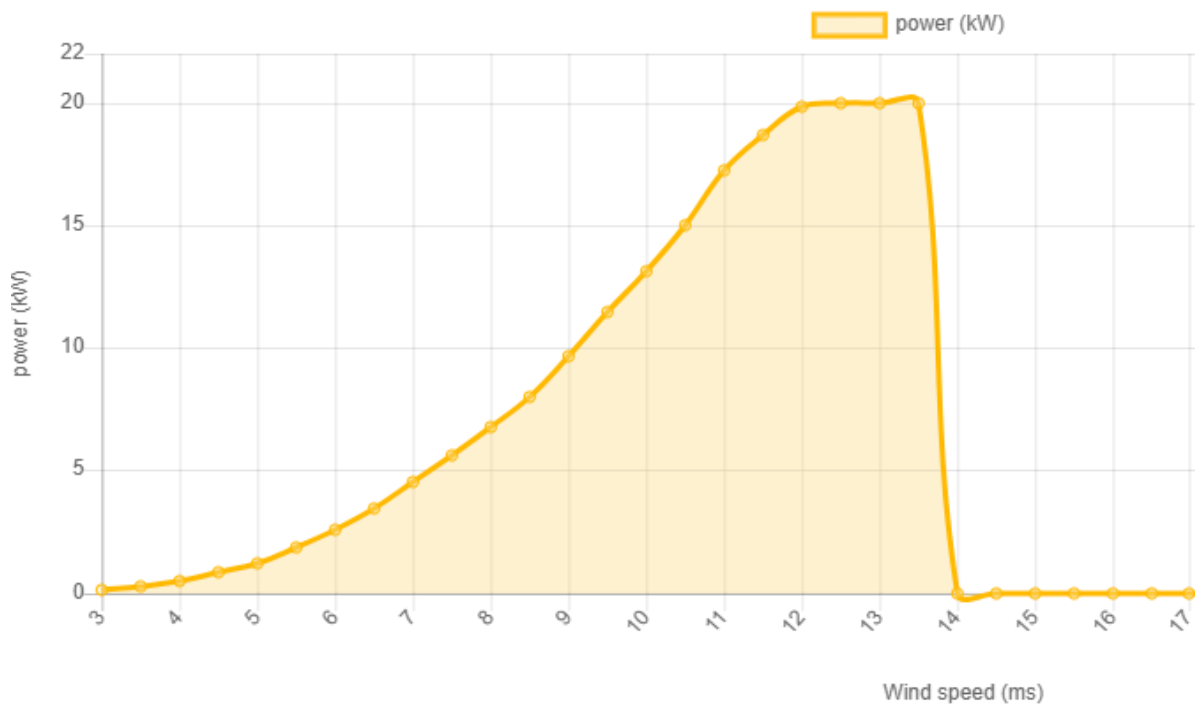
←17.2.3

In order to maintain a constant speed and to prevent damage to the system in high winds, they developed the fly-ball governor, shown in **16.1.3**. As the wind speeds varied the knuckles moved either in or out, thus maintaining a constant speed for the propellers, and preventing damage to the system. 16.1 4 shows the effectiveness of the fly ball governor in taming the wind, showing the power output in KW vs wind speed.



←17.2.4

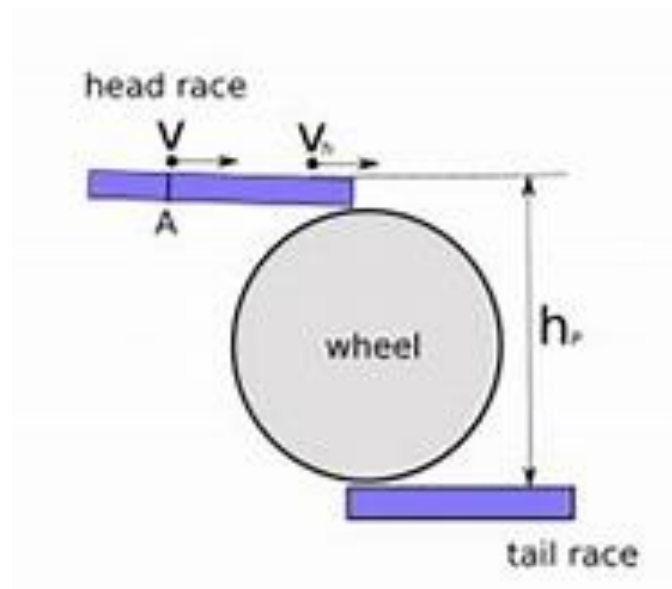
17.2.5↓



The success of the Rural Electrification Act had eliminated the need for most such charging systems by the mid 1950s to 1960. For approximately 35 years, however, they provided an inexpensive means of recharging the batteries of Farm/Home battery systems.

17.3 Water Power

Water has been used to create energy for years, Water wheels have been used for centuries, usually for grinding grain. One possible water wheel set up is shown in .



←17.3.1

Possibly a more common water wheel is shown in 17.3.2 where the wheel is placed in a flowing stream.

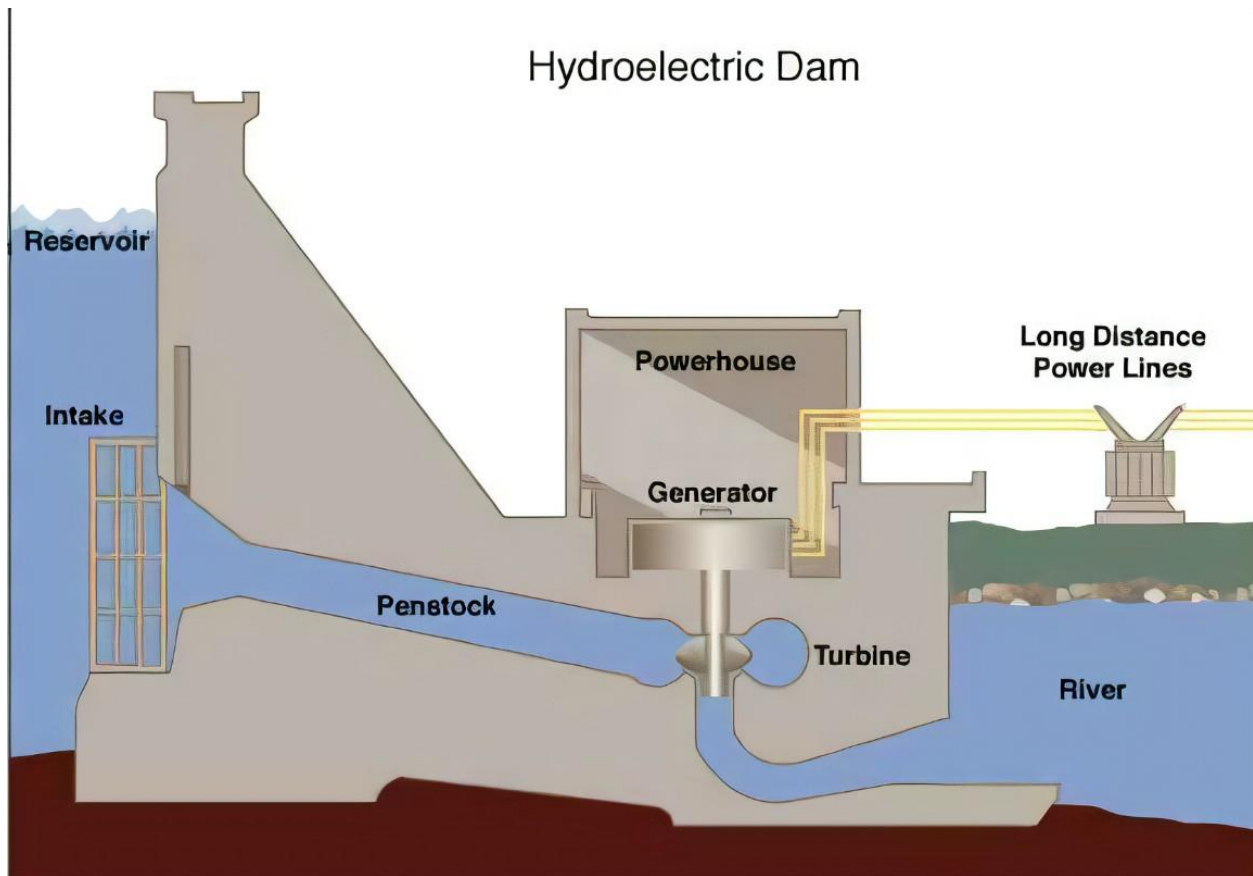


←17.3 2

You recall the 1901 Buffalo World's Fair was powered by electricity generated by water power in Niagara Falls, NY. It is one of the earliest commercial uses of AC current, starting in 1896.

Figure **17.3.3** is a schematic of the Niagara Power project. The flowing water turns a turbine which in turns a generator (magnet within a copper coil).

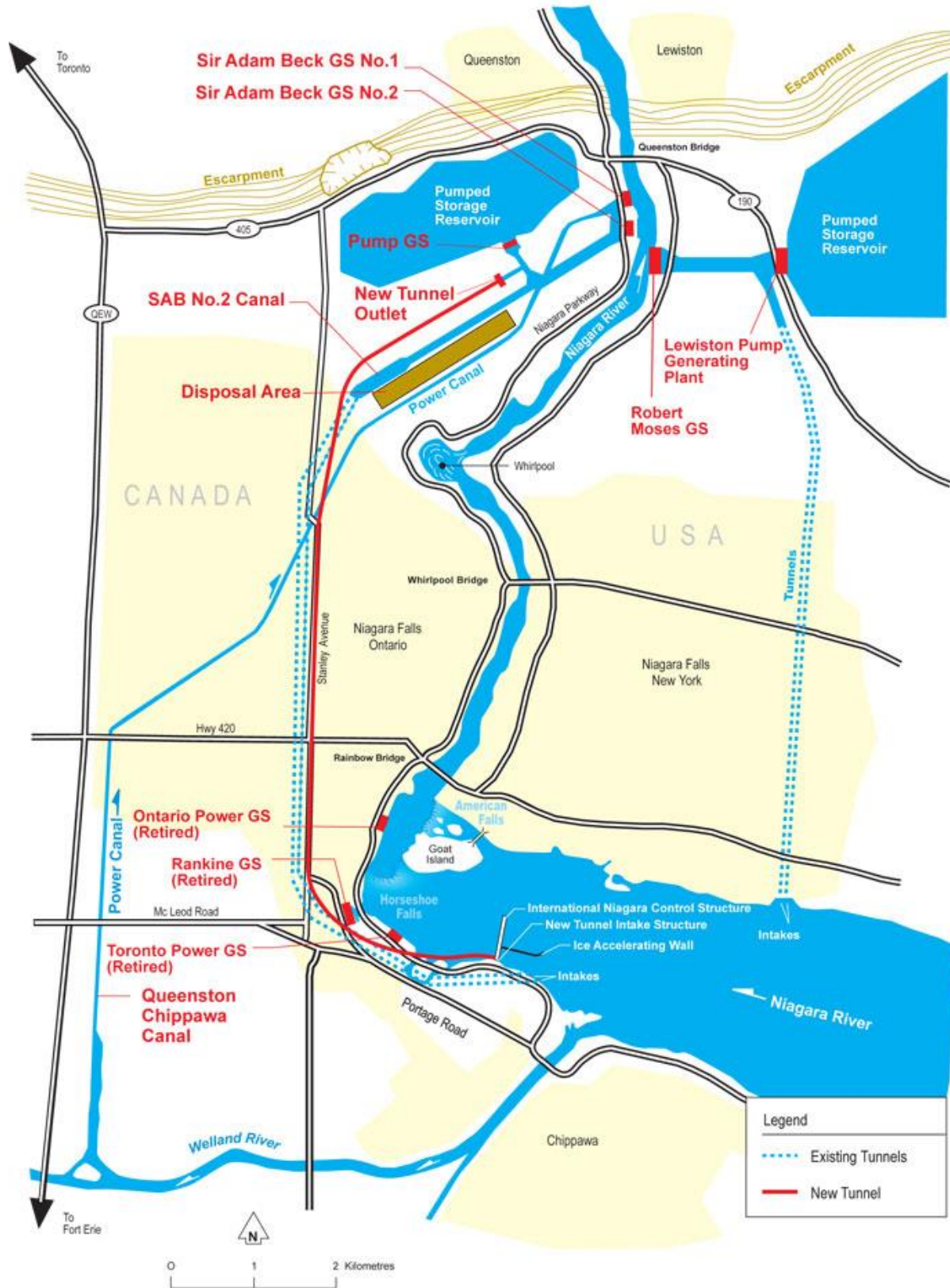
With the terrain of the area, gravity plays a large role. The Niagara Escarpment, over which the Niagara River flows at Niagara Falls is approximately 200 feet tall. At night, after the visitors to the Falls have left, water is taken from the Niagara River, above the falls to storage reservoir. It is estimated that the level of the Niagara River falls 3 - 4 feet while the reservoirs are being filled. Of the 750,000 – 800,000 gallons of water that go over Niagara Falls every second during daylight hours, this volume is reduced to 350-000 – 400-000 per second while the reservoirs are being replenished.



17.3.3↑

All this is shown in the schematic shown in **17.3.4↑** As you can see there is a similar power station almost directly across the river in Canada

Today, the Niagara Power station generates 2.6 Million kilowatts of electricity annually. Twenty- Five turbines are spun by approximately 750,000 gallons of water every second to generate this electricity.



17.3.4↑

18 AMERICAN SPEAKING TELEPHONE CO.

The American Speaking Telephone Company was formed 1875 as a subsidiary of the Western Union Co. After Bell's successful experiments with the telephone, Western Union formed a partnership with T.A. Edison to discover an alternative to Bell's invention. Working with Elisha Gray's inventions, they formed the American Speaking Telephone Company in New York to compete with the Bell Telephone Company of Boston. Bell successfully sued Western Union for patent infringement. In 1880 Bell Telephone merged with the American Speaking Telephone Co., becoming The American Bell Telephone Co.

15.1 is battery jar embossed with **American Speaking Telephone** It is 4" square x 6" tall. We can assume it was used to power an early telephone. **Courtesy of Tommy Bolack.**

18.1↓



19 The Ansonia Electrical Co.

The only Ansonia Electrical Co. I could find, was an electric company located in Ansonia, CT. I have no way of knowing if it's the right company. I am assuming it is, because of their proximity to New York City, and the fact that they were in business prior to 1900. Ansonia is a small city in New Haven County, about 12 miles northwest of New Haven. Not much could be found about the company, other than that they manufactured electrical equipment. There is currently a parking lot at their former location. There was an investigation in 2018 because of radiation discovered at the site, reportedly, from the Radium used in luminous dials and push buttons for doorbells. The investigation showed that the radiation was consistent with background radiation, and no action was recommended.



←19.1



19.2↑

We have two battery jars designated Ansonia. **19.1**, above, left, is an aqua, squared jar, with a ground lip. It is 5.875" tall x 4.375" square with a 4" mouth. It is embossed: **The / (arc) ANSONIA / ELECTRICAL / Co.** Courtesy of **Debbi Graham**.

19.2, above, right, is a round, aqua jar with a ground lip and pour spout. It is about 5" diameter with a 4" mouth and is 6" tall. It is embossed in a circular slug plate: **(arc) THE ANSONIA / (arc) ELECTRICAL CO.** Courtesy of **Debbi Graham**.

20 - BRACH, L.S., MANUFACTURING CO ., Newark, N.J.

L.S. Brach was founded in 1921 in Newark, NJ. They advertised as the leading manufacturer of radio antennas and associated equipment. They also supplied lightning protection, electrical supplies for railroad signaling, telephone and telegraph, a grounding devices. We know that they also manufactured porcelain battery jar lids. There is no record of their ever having made battery jars. It is believed their sole contribution was porcelain lids for use on battery jars manufactured by someone else. References: 119

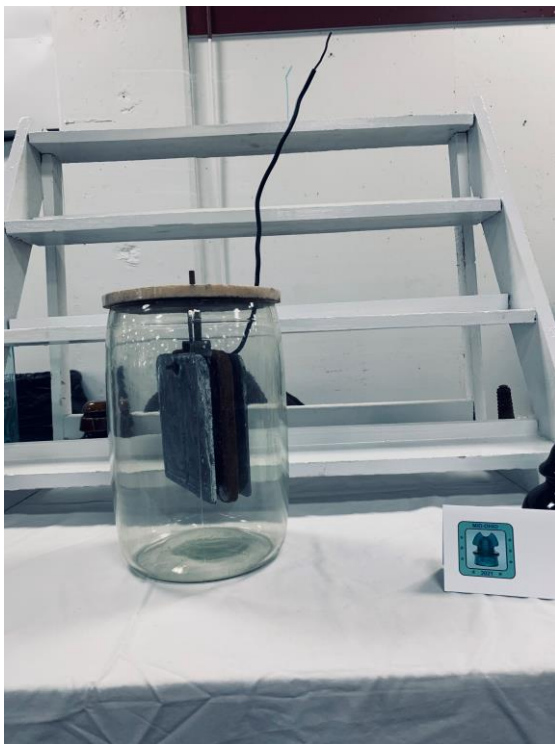
20.1: is a white, porcelain battery jar lid; embossed: (arc) **A.R.A. SIGNAL CELL / L.S. BRACH MFG. CO. / NEWARK, N.J.** Courtesy of Walt Baumgardt. This battery was used for railroad signaling.



←20.1

The jar pictured below, **20.2** is a mystery. The jar itself is embossed, as best we could tell: (Front) **L.S. BRACH CO. / <COBRA CO.> / NEWARK N.J.** (Embossing on jar was very faint, but black paint helped to bring it out). This is a bit confusing, as it is not believed that L.S. Brach manufactured glass battery jars. The jar could have been manufactured by an unknown glass house and embossed L.S. Brach. The dimensions of the jar are 7" diameter x 10.5" tall. It is clear with a ground top. The dimensions of the lid are 7" x 0.5" and is white. It is courtesy of **Jeff Hogan**

It is believed that the lid **20.3**, below, right, is original to the jar **20.2**. The lid is embossed: (arc) **GORDON PRIMARY CELL / PATENTED 7 / OCT. 27, 1896 / APR. 13, 1897 / FEB. 13, 1906 / GORDON PRIMARY BATTERY CO. / WATERBURY, / CONN. / U.S.A.**



20.2↑



20.3↑

I later found a similar battery jar **20.4** with more legible embossing. This embossing, **20.5** appears the same as on this jar, except it is more legible. The embossing on the jar is: **L.S. BRACH MFG. Co / <<GCBRAC >> / Newark N.J.** The significance of GCBRAC is not exactly known, although it is obviously some identity code for L.S. BRACH. Does this mean

that L.S. Brach did in fact manufacture battery jars? I don't believe so. I still believe jars were manufactured for L.S. Brach by a yet, unknown manufacturer. Perhaps the key is in the word FRY, found under the diamond, and visible in **20.5**. What FRY refers to and its connection is unknown. There is no record of H.G. Fry, if that is the reference, having made anything other than insulators, cut and pressed glass and a line of tableware.

We now have two jars, with similar embossing; one appears to be <<COBRA>> and the other is <<GCBRAC>>. Are they two distinct jars or did we interpret the embossing on **17.2**, incorrectly?

Note: After considerable research on BRACH battery jars, I now believe that due to the faint embossing on 20.2, we misinterpreted the embossing. I believe that the embossing on 20.2 and 20.4, 20.5 is actually the same <<GCBRAC>>. I am still of the belief that the jars were manufactured for L.S. Brach by an as yet unknown glass house.



20.4



20.5

This jar is the courtesy of Walt Baumgardt.



20.6↑

The lid to 20.4 is shown in 20.6. It is from Edison's Battery Supplies Co; embossed as follows: **EDISON / ,>BSCO< / PRIMARY BATTERY / PATENTED / July 28, '08 Sept. 6. April 4, '11 / Other Patents Pending/ TRADE /**(in script) **Thomas A. Edison / Reg. U.S. MARK Pat. Off. /** (arc) **THOMAS A. EDISON, Inc. ORANGE, N.J.** *Note:* We have two jars, made by the same manufacturer, with different lids. This shows that in many cases the jars and the lids were manufactured by different companies. Courtesy of Debbi Graham.

21 BROOKFIELD

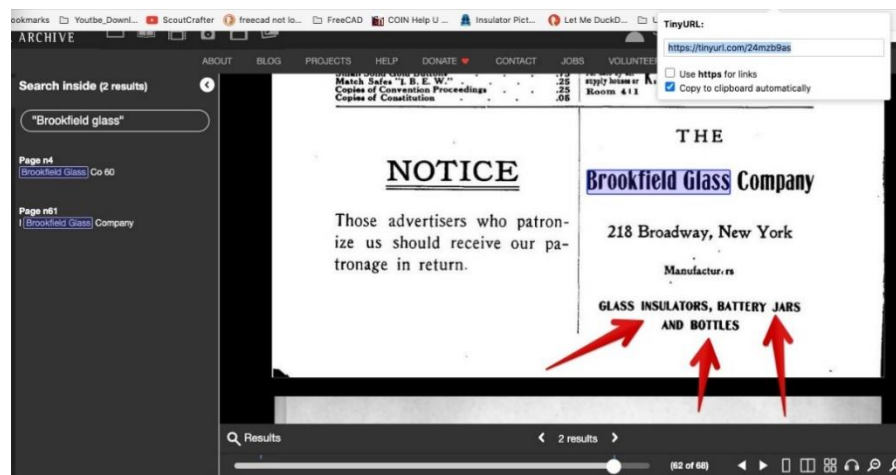
Following the flash flood which destroyed his plant in Honesdale, PA in 1861, James Madison Brookfield moved to Brooklyn. He worked for Martin Kalbfleisch, as plant manager of a glass plant he had built in 1864 to provide demijohns and carboys for his chemical business, Bushwick Chemical Works, which was across the street. In 1869, J.M. Brookfield, purchased the glass works from Kalbfleisch.

In addition to insulators, for which they are well known, They produced a multitude of bottles and jars. It is known that they provided almost all the bottles for Radway's Ready Relief, as well as Walker's Vinegar Bitters and the Minck Brothers Bottling Works.

Unfortunately, most of their items were unmarked, except for the product name or name of the company ordering the bottles. There are bottles and jars around with the "BGW" embossing, but very few. Much of what we know about their products, other than insulators, is from the literature.

We had assumed that Brookfield manufactured battery jars. We know; however, they manufactured glass products for G.E, Thomson Houston Electric Co, Pettingell-Andrews and others. It is not too much of a stretch to believe that they may also have manufactured battery jars for them.

Thanks to Lee Brewer, we now have definitive proof that they manufactured battery jars. **21.1** is a copy of a notice in the Electrical Workers Journal 1907-02



←21.1

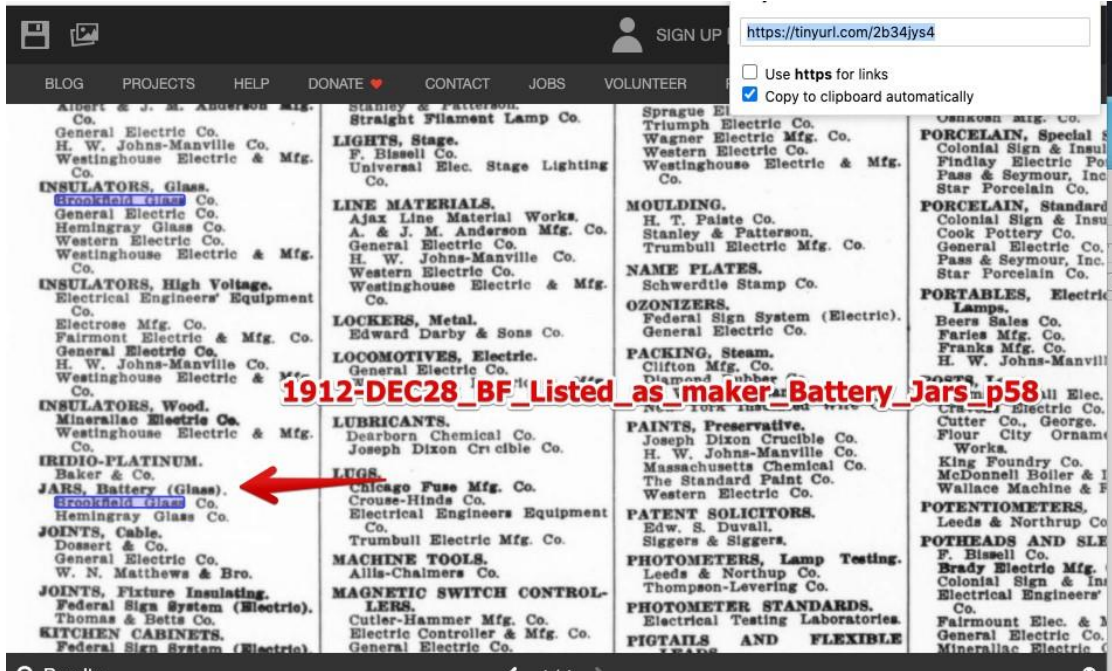
Electrical Workers Journal 1907-02

by International Brotherhood of Electrical Workers

Publication date
Topics

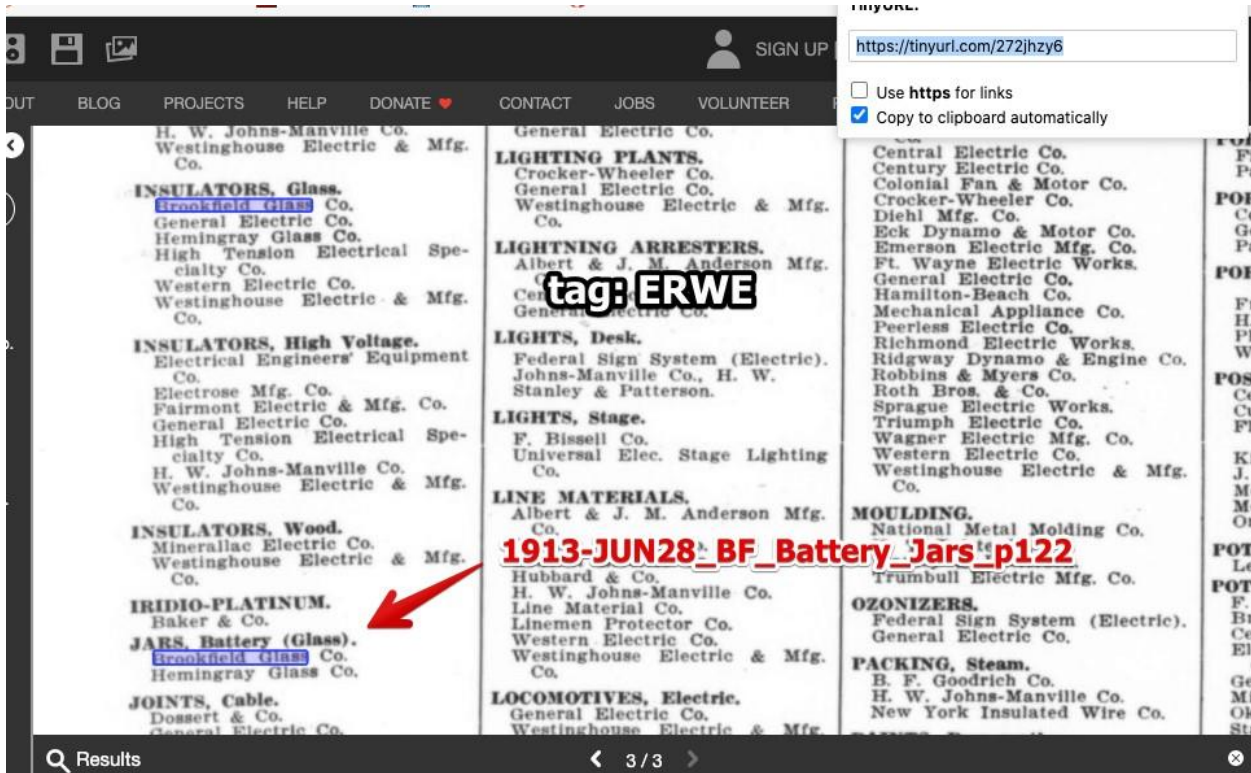
1907-02
Electrical Workers, IBEW.

140 Views



21.2↑

21.3↓



23.2 and 21.3 are references from the Electrical Workers of Dec. 28, 1912 and JUNE 28, 1913, also showing they manufactured battery jars. We still don't know what type of jars they manufactured.

22 - BUNNELL, J.H., & Co.; BUNNELL Telegraphic and Electrical Co. , New York

In 1878, Jesse Bunnell created the J.H. BUNNELL & Co. supplying equipment to the telegraph and telephone industries. Jesse was involved with the telegraph his entire life, starting by delivering them at age 13 in Massillon, OH in 1854. In 1856 he was a full-fledged telegraph operator, setting a speed record in 1861 of 32 words per minute, average, over a two-hour period. An 1884 article in Electrical World shows the Bunnell Co. providing Disque LeClanche batteries to telephone companies, claiming they would provide power for 18 – 30 months without replacement. (35) . On the NIA.org site you will find several catalogs for the J.H. BUNNELL Co., and a single catalog for the BUNNELL Telegraphic & Electrical Co. I would be remiss if I didn't explain the history of these companies.

Jesse Bunnell had a partner in The J.H. Bunnell Co., Charles McLaughlin. When Jesse passed away in 1899, Mr. McLaughlin was the sole surviving partner. Wanting to reassure customers that there was not a supply problem because of the death, McLaughlin and four others filed to re-incorporate as the J.H. BUNNELL Co.

McLaughlin's re-incorporating the J.H. BUNNELL co. did not set well with the BUNNELL family. Although the Bunnell family owned the patents, they could not stop the re-incorporation. The family countered by forming their own company using monies from the settlement of Jesse's estate. On January 27, 1900, the BUNNELL TELEGRAPHIC & ELECTRICAL Co. was formed. Three of the five incorporators were: Mary Bunnell (Jesse's widow), Dewitt Bunnell (Jesse's eldest son) and Albert Wise (Jesse's son-in-law).

The two companies were in major competition with each other in a massive game of one-upmanship until September of 1902, when Albert Wise approached Charles McLaughlin to buy his majority share of the J.H. BUNNELL Co. McLaughlin accepted and by the summer of 1903 Albert Wise was the president of J.H. BUNNELL Co. When it was over the BUNNELL TELEGRAPHIC & ELECTRICAL Co. was only in existence for three years.

In contrast to the J.H. BUNNELL Co. offering Disque LeClanche batteries, the BUNNELL Telegraphic and Electrical Co. Offered Edison LaLande batteries.

References: 10-14

EDISON-LALANDE BATTERIES

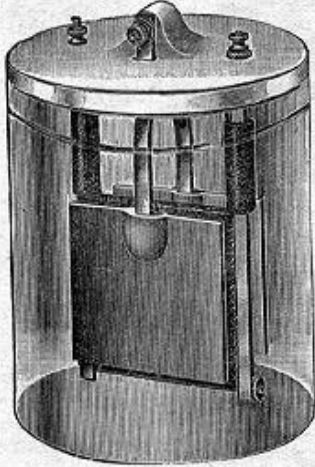


Fig. 165
Type RR.

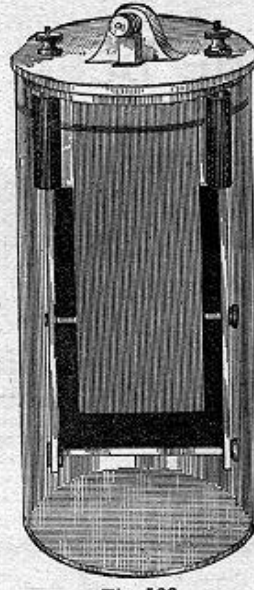


Fig. 166
Type S

The most reliable Primary Battery for Electric Lighting, Motor, Cautery and all other works requiring constant current. Working Voltage about .7 Volts.

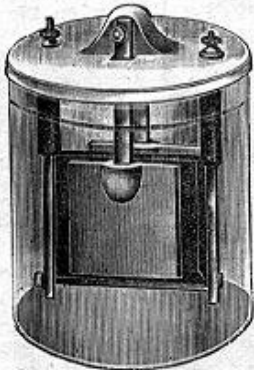


Fig. 164
Type Q

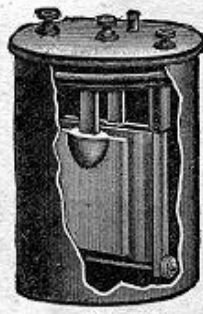


Fig. 167
Type Z

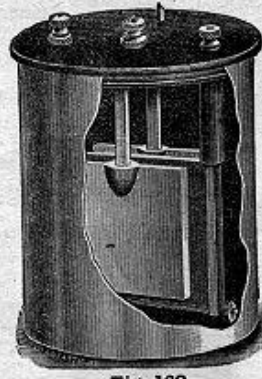


Fig. 168
Type V

Fig	Type	Maximum Efficient Amp. Discharge	Capacity Ampere Hours	Dimensions	Price per Cell Complete Porcelain Jars	Prices of Renewal Charges			
						Cop. Oxide	Zinc	Caustic Potash	Para- fine Oil
167	Z	2.0	100	4½x6¾ in.	\$2.00	\$0.24	\$0.28	\$0.15	\$0.05
168	V	1.0	150	5¼x8 "	2.50	.31	.35	.17	.06
164	Q	3.0	150	6¼x8¾ "	2.20	.31	.28	.17	.06
165	RR	4.0	300	7¼x10¼ "	2.90	.55	.50	.28	.07
166	S	6.0	300	5¼x13 "	3.00	.62	.50	.28	.06

←22.1 A Page from the Bunnell Telegraphic and Electrical Co. catalog of 1903, above, shows them offering Edison-LaLande batteries, whereas the BUNNELL Co. offered Disque LeClanche batteries.

The Microphone Carbon Battery.

Longer and stronger life than any Sal-Ammoniac Battery made.

For open Circuit work, and especially Gas Lighting purposes, it has no equal.



Fig. 184.

An Association of the "Microphone" with any other cell in any given piece of work and subject to similar conditions will show the superior merits of this battery, and justify the claims we make for it.

It has no equal.

No. 2 Carbon.



Fig. 185.

TRADE
MICROPHONE
MARK

In the Microphone No. 1. the Carbon element contains the depolarizing substance, Internal Resistance as its minimum, and current at its maximum.

The Microphone No. 2, with its great carbon surface, renders more effective service during a longer period of time than any other carbon battery.

No. 1 Carbon.

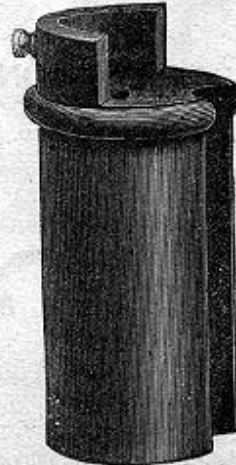


Fig. 186.

Price No. 1, cell complete.....	\$0.75
" No. 2 " " .....	.65

THE BEEKMAN DRY BATTERY.

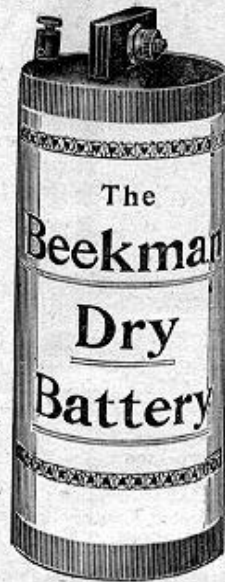


Fig. 162.

The improved form of Dry Battery having been thoroughly tested in comparison with all others, is presented to the Electrical Trade, and to all users of Open Circuit Battery, as the

VERY BEST YET PRODUCED.

It is very compact in form, being smaller than any other of equal capacity, and its

Great Strength, Durability and Recuperative Power are its chief merits.

Being without liquids, it is not subject to freezing in winter or to evaporation at any time, and is

ABSOLUTELY CLEAN.

Its connections are so arranged that no creeping salts whatever are at any time developed. For portable purposes, Railway Signals etc., where the battery is often placed outdoors, it is especially recommended.

Of all forms or dry cells yet attempted, ours is the only one produced which is capable of successfully competing with Leclanche Battery; hence we are presenting it to the public as a

FIRST CLASS DRY BATTERY

for Electric Bells, Telephones, Gas Lighting, Burglar Alarms, and all open circuit work.

PRICE, 20 CENTS PER CELL.

Special Prices to the Trade.

Guaranteed to be the best Dry Battery on the Market.

"CROW FOOT" GRAVITY BATTERY.

For Telegraph and Closed Circuit Work.

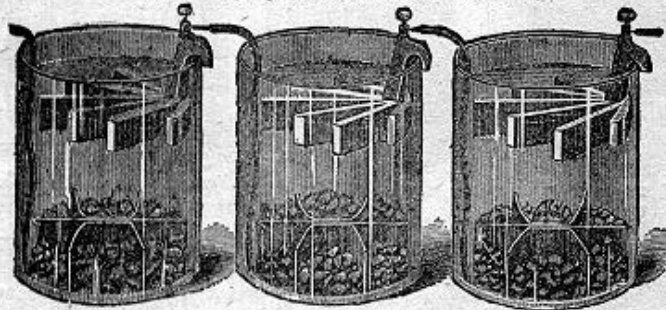
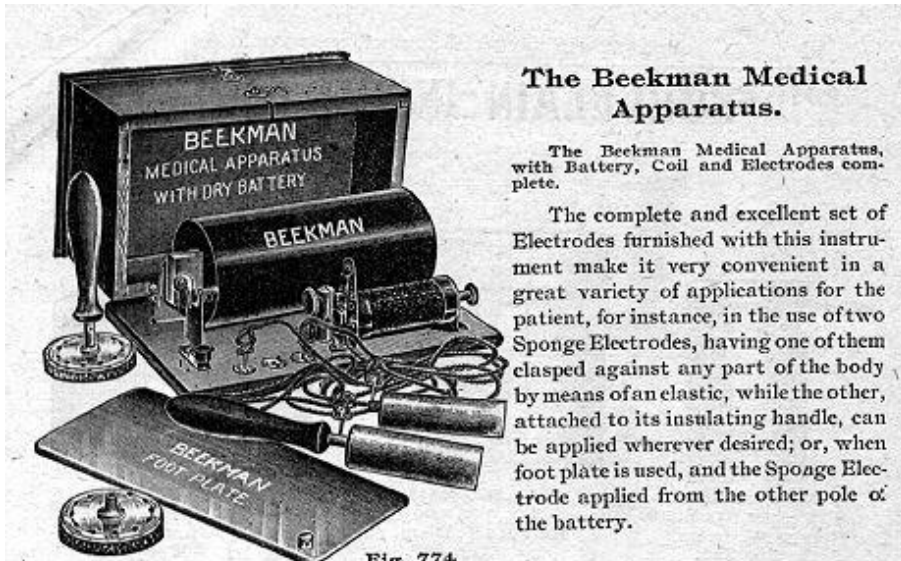


Fig. 179.

Cell complete, less vitriol, 6x8	\$1.20	Cell complete, 5x7	\$1.10
6x8 Zinc	.60	5x7 Zinc	.46
6x8 Copper	.20	5x7 Copper	.18
6x8 Jars	.50	5x7 Jars	.48

22.3↑

22.2 and 22.3, from the same catalog, show more batteries offered by Bunnell Telegraphic & Electrical Co. Note the microphone and Crows Foot" batteries.



The Beekman Medical Apparatus.

The Beekman Medical Apparatus, with Battery, Coil and Electrodes complete.

The complete and excellent set of Electrodes furnished with this instrument make it very convenient in a great variety of applications for the patient, for instance, in the use of two Sponge Electrodes, having one of them clasped against any part of the body by means of an elastic, while the other, attached to its insulating handle, can be applied wherever desired; or, when foot plate is used, and the Sponge Electrode applied from the other pole of the battery.

Fig. 774

	PRICES.
Beekman Apparatus, with Battery and Electrodes Complete.....	\$8.00
Extra Battery, per Cell.....	0.40
Sponge Electrodes, with 2 handles, per pair.....	1.00
Tube Hand Electrodes, with 1 handle, per pair.....	0.75
Connecting Cords, 4 feet with tips, per pair.....	0.40
Foot Plates, each.....	0.50
Hair Brush Electrodes (Extra), each.....	1.25
Special Flexible Sponge Electrode with binding strings attached (Extra), each	0.75

Beekman Double Cell Physician's Battery.

Double Cell, large coil instrument, especially constructed to furnish *more powerful currents* than can be obtained from any of the usual sizes or forms of Electro Medical Batteries.

It comprises an extra large sized and powerful induction coil operated by two Cells Dry Battery, Reversible Pole Changing Switch, Battery Switches, for reducing or increasing Battery Power, Conducting Cords, Hand Electrodes, Foot Plate, and Metallic Hair Brush Electrode.

Price Complete.....\$12.00



Fig. 775

MILFORD MEDICAL APPARATUS.

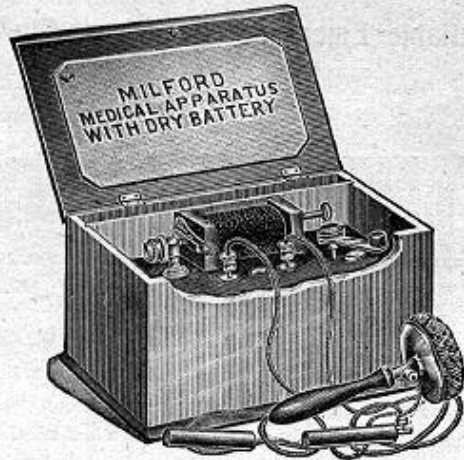


Fig. 776.

Cut shows Electro Medical Apparatus operated by one cell of Beckman Dry Battery, thus dispensing with acids, chemicals or liquids.

For Doctor or Patient this Electro-Medical apparatus is the most convenient and reliable. It is reliable because with its dry battery so much less care is required than is necessary with any other form. The entire absence of acids, liquids or salts will be appreciated by any one who ever had occasion to use a medical battery. The strength of the various currents range from those which are so mild as to be scarcely perceptible to the most powerful that can be endured by a strong man.

All the metal parts are nickel plated. Finely finished case. Two conducting cords; two nickel plated electrodes; one rosewood handle; one sponge holder; one foot plate with each apparatus.

Milford Medical Apparatus, complete \$6.00 | Extra Dry Batteries for above, ea. .30

Medical Induction Coils, without Battery.

LARGE SIZE.

A handsome and most powerful Medical Coil, with Cords and Handles. These Coils are best operated with "Sealed" Fuller or Grenet Battery.

Price.....\$3.60

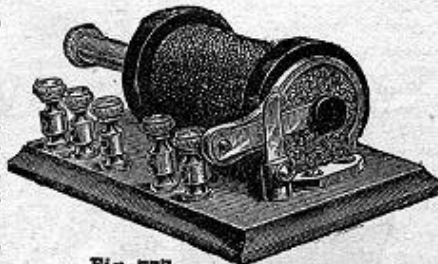


Fig. 777.

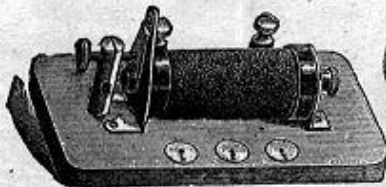


Fig. 779.

Standard Size Medical Coil, complete with Cords and Hand Electrodes.

Price.....\$3.15

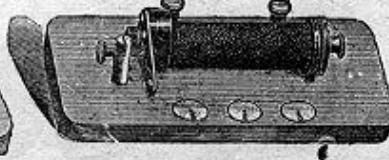
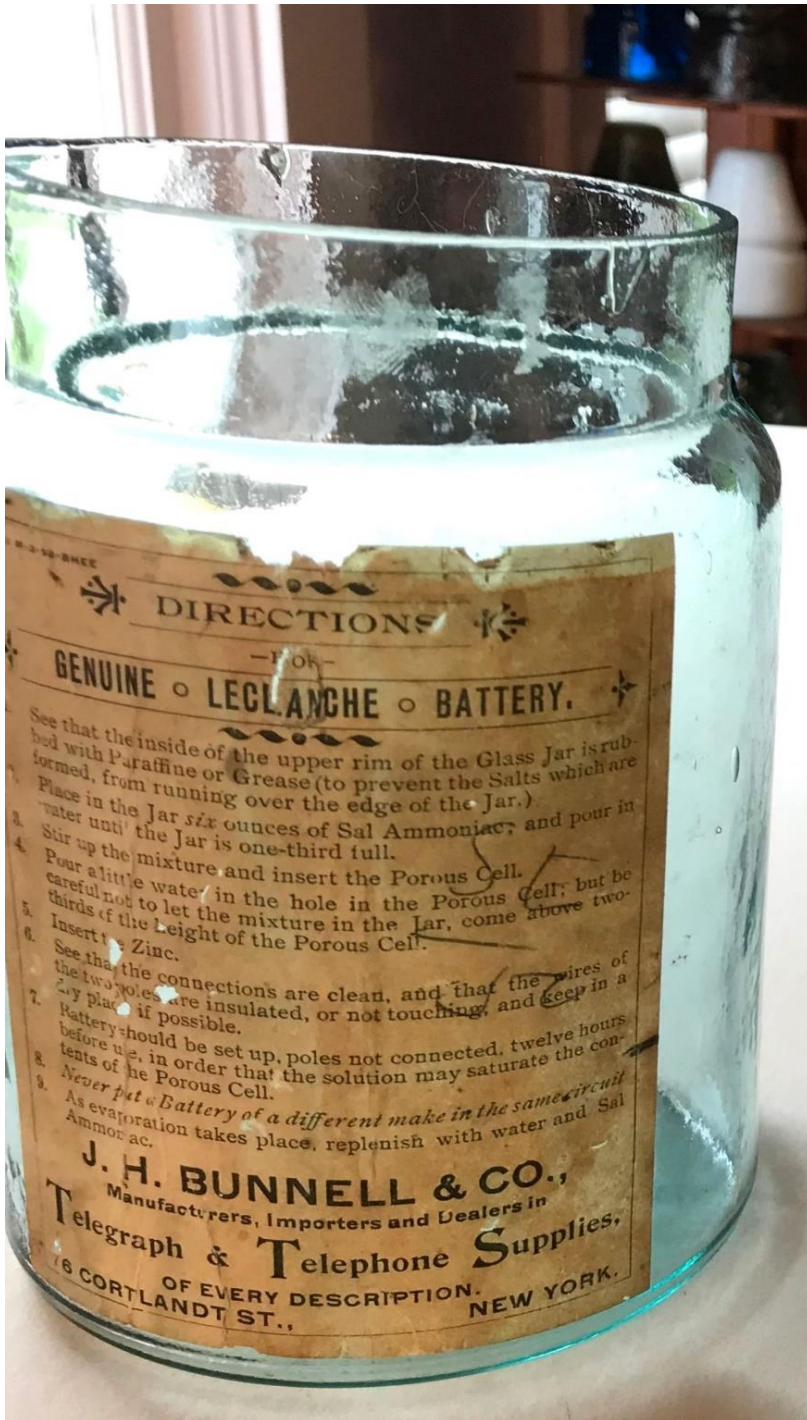


Fig. 778.

Small Size Medical Coil with Cords and Hand Electrodes. These coils and handles are well made and finely finished; nothing cheap looking about them. Price.....\$2.70

←22.5

22.4 and 22.5, pages from the same catalog show a few medical batteries offered by Bunnell Telegraphic and Electrical Co.



←22.6↑ is a LeClanche Battery distributed by **J.H. Bunnell & Co. / Telegraph & Telephone Supplies / of every description / 78 Cortland St., New York.** Courtesy of Debbi Graham.



←**22.** is a specialty battery jar, embossed **J.H. BUNNELL & CO. / N.Y.** It has screw top. The jar is 4" in diameter x 8" tall. **Courtesy of Tommy Bolack.**

Notice the similarity to the Novelty Electric jar, 69.1.

23 - Burns, Peter Cooper

I thought long and hard about where to place these batteries, as in what to call the chapter. I could have had a chapter for each of The Findlay Bottle Co., The Findlay Glass & Carbon Co., Peru Electrical Manufacturing Co., The Laclede Carbon and Electrical Co., American Electric Telephone Co. of Chicago, the St. Louis Electrical Co., and the St. Louis Battery Co. but that would have been impractical. Ultimately, I decided to name the chapter after Peter Cooper Burns. The Findlay Bottle Co. will have it's own chapter, as it is a separate Co.

As I pointed out earlier, in many ways the first batteries were a great idea looking for an application. Fire alarms, doorbells, etc. were nice but the telephone was the application that pushed the early development of the battery. Each individual telephone required power and the batteries needed to be small, efficient, and relatively safe.

Enter Peter Cooper Burns, an employee of the Bell Telephone Co in Chicago. He went on to form the American Electric Telephone Co. of Chicago, and to a lifetime of inventing. His first invention was for a battery, Patent # 393814. It was for the rarely seen Burns Microphone Cell. Peter contracted with the Findlay Bottle Co. to manufacture his microphone cell and its carbon electrode. Not content with that, he built his own factory on the grounds of the Findlay Bottle Co. to produce the carbon battery terminals. His company, the Findlay Glass and Carbon Co. went into operation in 1888 producing components for an unknown number of batteries. The manufactured parts were shipped back to St. Louis, which had become the St. Louis Battery Co.

A report from 1890 states that the Findlay Glass and Carbon Co. was making porcelain cut-outs, and cut-out rosettes for electrical lighting, in addition to their making carbon batteries, jars, insulators, etc. It is about this time that the city of Findlay had problems with its natural gas supply and began to restrict gas usage in local factories. A midnight inspection of the Findlay Bottle Co. on January 1, 1893 found that the plant was using more than its allotted share of gas. This started a litany of financial problems, and the Findlay Bottle Co. was forced to cease operations and declare bankruptcy on July 1, 1893. Having opened in 1888, it was only in operation for 5 years.

It seems ironic that in Findlay, OH they were rationing natural gas and 126 miles away in Peru, Ind they were giving it away, thinking it would never run out.

Fortunately for Mr. Burns, he had had decided, in 1890, to move his operation to Indiana where he was offered free land, free gas and a \$5,000. inducement. He relocated in Peru and opened the Peru Electrical Manufacturing Co. In 1892, he opened the Laclede Carbon and Electrical Co. in nearby Kokomo. In 1896 he was granted Patent # 514845. Although similar to the drawings of the Microphone Cell, it seemed to have been influenced by the Hercules and Laclede styles.

Both battery patents assigned to Mr. Burns (he has a total of 15) are included in the Patent Section, Chapter 75.



23.1↑



23.2↑

23.3↓



23.1 and 23.2. The top, 23.3, is embossed, but not decipherable. The paper label reads **HERCULES BATTERY, LACLEDE BATTERY CO. KOKOMO, IND.** Another side of the jar is embossed **L.B. CO.**, which likely stands for Laclede Battery Co



23.4↑

23.6↓



23.5↑



23.4 through 23.6 show another jar with the **L.B. Co.** embossing. If you recall, in the 1ST Edition of this work this second jar was in the Chapter of Unknowns as we did not know the manufacturer at that time. Both jars are 4.75" square x 6.25" tall, with a 3.875" diameter ground lip top. Notice the difference in electrodes between the two jars.



23.7↑

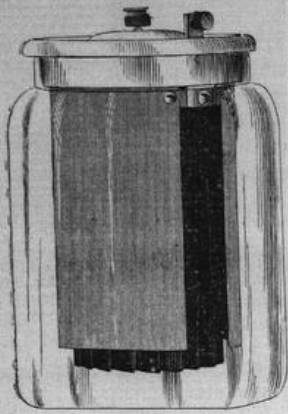


23.8↑

23.7 and **23.8** show a **No. 4 Laclede Battery**, also from the **LACLEDE Battery Co.** in **Kokomo, IND.** It, too, is 4.75" square x 6.25" tall, with a 3.875" diameter ground lip top.

As seen in **23.9** through **23.11** (below) the **Peru Electrical Manufacturing Co.** offered a line of batteries. These pages are from the 1898 catalogue of the **Peru Electrical Manufacturing Co.** A brief description of each is included. **Note** that the **No. 3 Round Laclede** battery is made to fit a **Leclanche jar**.

The New Peru Hercules Battery.

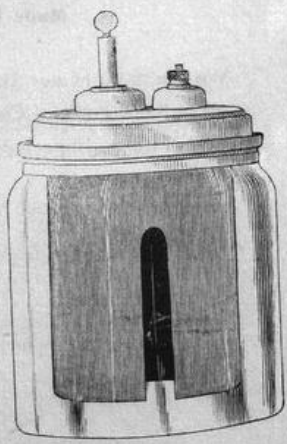


This Battery consists of a fluted carbon cylinder or vase filled with depolarizing compound. The large surface of zinc exposed makes it one of the best batteries for open circuit work. The cell is charged with 4 ounces of sal ammoniac and 28 ounces water, and has an E. M. F. of 1.47 volts; internal resistance .11 ohms, and current on short circuit about 13.4 amperes.

“Abate”--Complete Cell.....	\$.50
“About”--Carbon.....	.25
“Abaft”--Zinc.....	.15
“Abbey”--Glass Jar.....	.10
“Aback”--Porcelain Lids.....	.10
“Abash”--Sal Ammoniac, in bag	.07

New Peru Oval Laclede Battery.

The Oval Laclede Battery consists of an oval jar and a large cylinder of oval carbon, with opening in top through which the zinc hangs supported by a porcelain insulator. The carbon forms a perfect lid for the battery and prevents evaporation or the climbing of salts. The solution for the oval form consists of four ounces of sal ammoniac dissolved in one and a half pints of water.



“Abet”--Complete Cell, with Sal Ammoniac.....	\$.35
“Assort”--Carbon Cylinder.....	.20
“Assign”--Glass Jar.....	.10
“Abaft”--Zinc Rod.....	.05
“Abbot”--Porcelain Insulator.....	.02
“Abash”--Sal Ammoniac.....	.07

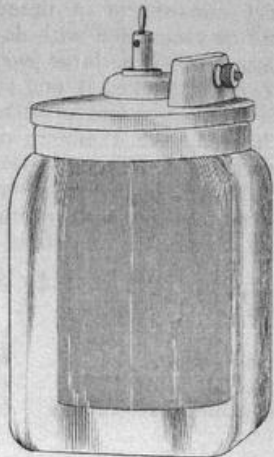
DISCOUNTS TO THE TRADE.

In ordering goods please use Trade Word. See page 5. Send for net price list.

23.9↑

New Peru No. 1 Square Laclede Battery.

Carbon Corrugated on Inside and Slotted.



A perfectly made battery for open circuit work, guaranteed as strong and long-lived as any Sal Ammoniac Battery.

The solution for the square form consists of four ounces of Sal Ammoniac dissolved in one and a half pints of water.

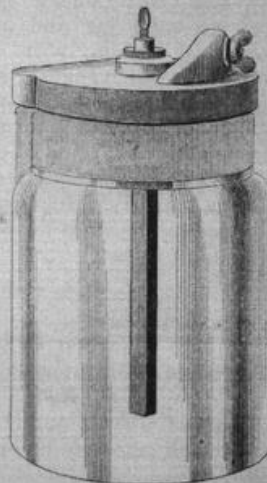
"Abide"--Complete Cell, with Sal Ammoniac.....	\$.35
"Attrite"--Carbon Cylinder.....	.20
"Augur"--Glass Jar.....	.10
"Abaft"--Zinc Rod.....	.05
"Abbot"--Porcelain Insulator.....	.02
"Abash"--Sal Ammoniac.....	.07

New Peru No. 3 Round Laclede Battery.

Made to Fit a Leclanche Jar.

We use in all of our Batteries Carbon made of finest grade of Coke, best quality of Rolled Zincs, Imported Sal Ammoniac.

"Able"--Complete Cell, with Sal Ammoniac.....	\$.35
"Vigor"--Carbon Cylinder.....	.20
"Virile"--Glass Jar.....	.10
"Abaft"--Zinc Rod.....	.05
"Abbot"--Porcelain Insulator.....	.02
"Abash"--Sal Ammoniac.....	.07



DISCOUNTS TO THE TRADE.

In ordering goods please use Trade Word. See page 8. Send for net price list.

23.10↑

New No. 4 Square Laclede Battery.



The Most Popular Form of
Battery Made by Us.
Strong, Long-Lived, Efficient.

BINDING POST WILL NOT RUST OR CORRODE.

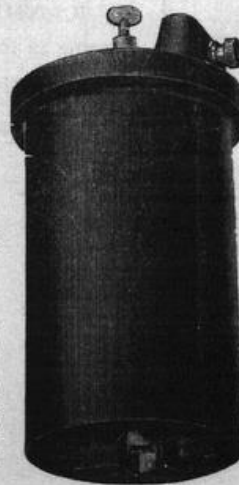
"Acute"--Complete Cell, with Sal	
Ammoniac.....	\$.35
"Value"--Carbon Cylinder.....	.20
"Augur"--Glass Jar.....	.10
"Abaft"--Zinc Rod.....	.05
"Abbot"--Porcelain Insulator.....	.02
"Abash"--Sal Ammoniac.....	.07

New No. 6 Laclede Battery.

Carbon Corrugated Inside.
Compact, Neat, Strong.

Binding Post will Not Rust or Corrode.

The No. 6 Laclede Battery consists of a corrugated cylinder of carbon with opening in top through which the zinc hangs supported by a porcelain insulator. The carbon forms a perfect lid for the battery and prevents evaporation or the climbing of salts.

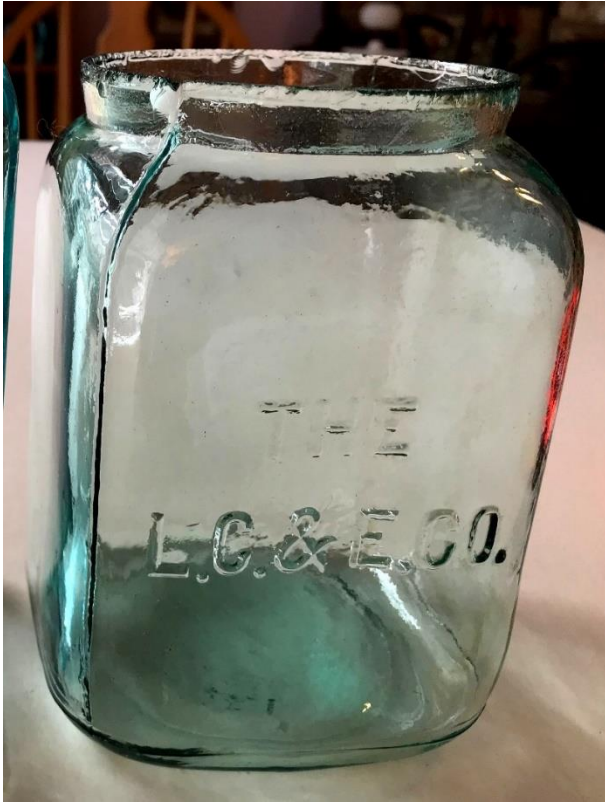


"Admire"--Complete Cell, with Sal	
Ammoniac.....	\$.35
"Vandyke"--Carbon Cylinder.....	.20
"Augur"--Glass Jar.....	.10
"Abaft"--Zinc Rod.....	.05
"Abbot"--Porcelain Insulator.....	.02
"Abash"--Sal Ammoniac.....	.07

DISCOUNTS TO THE TRADE.

In ordering goods please use Trade Word. See page 8. Send for net price list.

23.11↑



←**23.12**, is an aqua, square jar with a ground lip. Its dimensions are 4.25" square x 6.75" tall with a 3.675" diameter mouth. It is embossed: **THE / L.C. & E. CO.** Courtesy of **Debbi Graham**.



23.13 is from the LaClede Battery Co, embossed L.B. CO. Its dimensions are 4.25" square x 6.25" tall. It is in a darker shade of amethyst.



23.14 is embossed **MICROPHONE CELL / NEW YORK / PATENTED**. WE can assume it is made under the Burns patent.

Courtesy of Tommy Bolack.



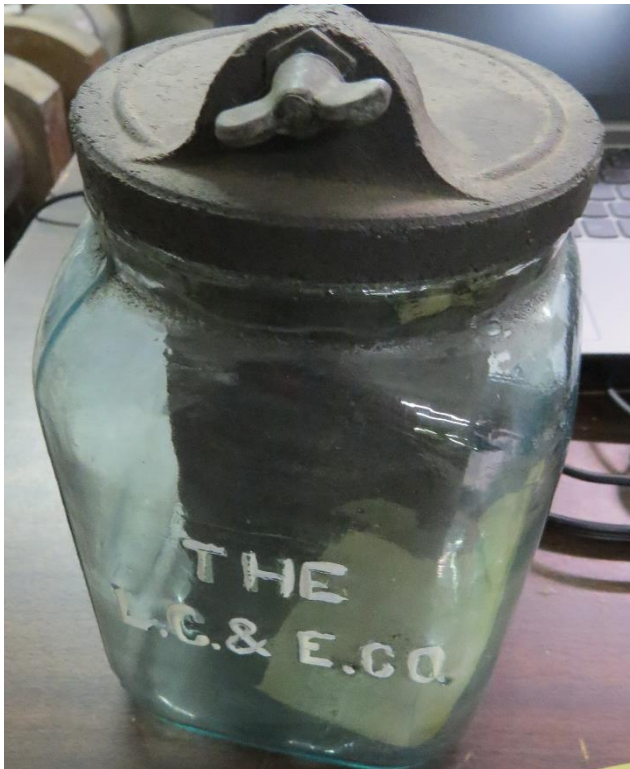
23.15 is the **BURNS MICROPHONE CELL** manufactured by the Findlay Bottle Co. It has a 4.5" diameter and stands 5.75" high.

Courtesy of Tommy Bolack.



←**23.16** is embossed **L.B. CO.** from the LACLEDE Battery Co.

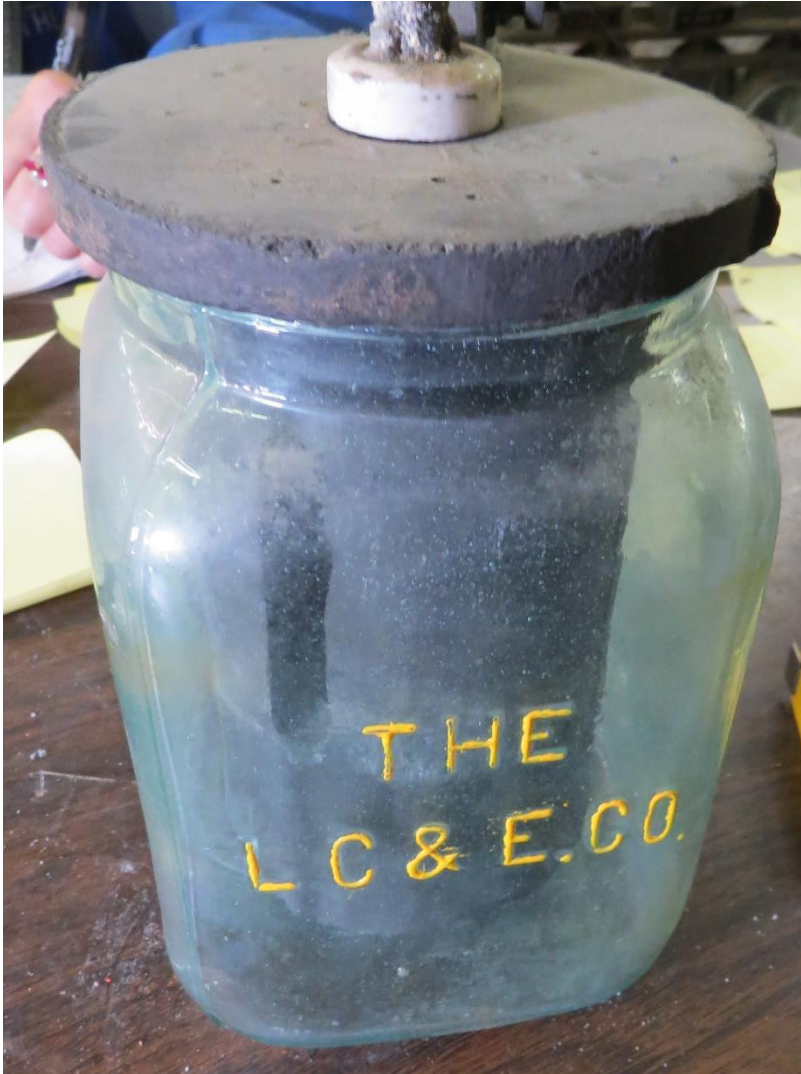
It is 4.25" square x 6" tall. It has a ground lip. **Courtesy of Tommy Bolack.**



←**23.17** is embossed **L.C.& E CO.** from the LACLEDE CARBON & ELECTRIC CO.

It is 4.75" square x 6.5" tall.

Courtesy of Tommy Bolack.



←**23.18** is also an **L.C.& E. Co** battery jar, with slightly different dimensions. This one is 4" square x 6" tall.

Courtesy of Tommy Bolack.

23.19 (below) is an article found in the *Electrical Engineer*, Vol. 16, no. 291, p. 480, November 29, 1893. It states that the Laclede Carbon and Electric Co, owned by Mr. P.C. Burns, formerly of Peru, Ind, but now of Kokomo. Ind, was making an improved Laclede Battery, Likely patent No. 514,845. This is the same information as found in the magazine of the FOHBC, November – December, Of 2010. It is interesting that there seems to be no consistency to the way in which Mr. Burns named his companies. It was the St. Louis Electric Co., which became the St. Louis Battery Co. His plant in Findlay, OH was the Findlay Glass and Carbon Co. When he moved to Peru, Ind. In was the Peru Electrical Manufacturing Co. and a few years later in Kokomo, Ind., it was the Laclede Carbon and Electrical Co.

25.19↓

New improved LaClede battery

[Trade Journal]

The Electrical Engineer

New York, NY, United States, Wednesday, November 29, 1893

vol. 16, no. 291, p. 480, col. 1,2

**TRADE NOTES AND NOVELTIES
AND MECHANICAL DEPARTMENT.**

THE IMPROVED LACLEDE BATTERY.

The accompanying illustrations show the improved LaClede battery just placed before the public by the LaClede Carbon and Electric Company, of which Mr. P. C. Burns is manager, formerly of Peru, but now located at Kokomo, Ind. The inventor, Mr. Burns, states that this is his latest and best effort and is far superior to the old style of cylinder battery. When it is considered that the inventor has had the most extended experience in the manufacture of open circuit batteries, the value of his opinion will not be doubted.

This illustration has not been processed yet.

The makers claim that the jar used in connection with this battery, being of large size and made of good, strong glass, will stand shipment much better than the old style; that the carbon is of the best quality for battery purposes; that the zincs and sal ammoniac are the best that can be secured for the purpose; that the porcelain cover is an improvement over the old style as it holds the carbons and zinc in position, overcoming an objectionable feature of the old style LaClede battery, and will also fit any jar, and that the carbon connection is a great improvement over the old style. It is guaranteed not to corrode.

Mr. Burns is also the inventor of the Microphone battery as well as the old styles of LaClede and Hercules batteries.

24 CALIFORNIA ELECTRICAL WORKS

The California Electrical Works was incorporated in 1877, by the reorganization of the Electrical Construction and Maintenance Co. (E.C.& M.) of San Francisco. It also incorporated The California Electric Power Co. and The Pacific Electro-Depositing Works. Paul Seiler was superintendent of manufacturing. In 1892 the California Electrical Works became the west coast agents for the Western Electric Co. It retained its own name until 1908 when it became Western Electric.

Seiler was discharged in 1888 for extending credit to people in violation of express orders of the board of directors. Seiler decided to go into business for himself, in direct competition with his former company. In 1889 He and James Braggs started the Paul Seiler Electrical Works.



←**24.1** is embossed **PRISM BATTERY / CALIFORNIA / ELECTRICAL WORKS**. The jar is oval with dimensions of 3.25" x 4.4" x 6" tall. **Courtesy of Tommy Bolack.**



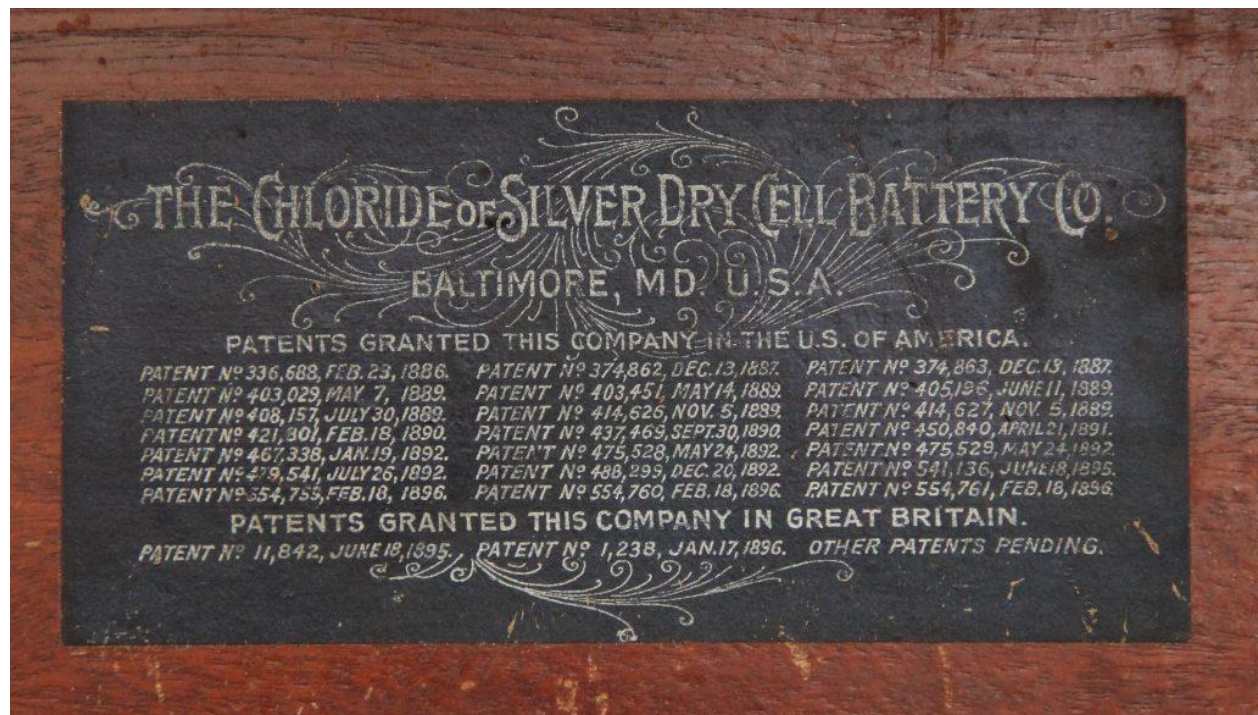
24.2↑ is a GONDA jar with a paper Labl from The California Electrical Works.

Courtesy of Tommy Bolack.

25 - Chloride of Silver Battery Co.

There is not much written about the history of the Chloride of Silver Dry Cell Battery Co., of Baltimore, MD. I decided to devote a chapter to them because their battery was different (Chloride of Silver), and it was a dry cell. From the dates it was likely the first dry cell, and one of the first Medical Batteries The Chloride of Silver used French batteries (Duchenne) as the American batteries at the time were too weak. References: 130

25.1↑ is the cover panel from 25.2, below.





←**25. 2** is an electro therapy device from the Chloride of Silver Dry Cell Battery Co. A close-up of the cover panel is shown in **25.1**.

←**25. 3** is a dry cell. It would have been used in the medical device, below. Its major embossing is: The **CHLORIDE of SILVER/. DRY CELL BATTERY Co. /**

Baltimore, MD. U.S.A. / CHLORIDE of SILVER DRY / CELL/ FARADIC CELL CASE. Courtesy of **Walt Baumgardt.**



26 - Corning Glass Works , CORNING, N.Y.

In 1851, Amory Houghton, Sr. founded what would become Corning Glass in Cambridge, MA, as Bay State Glass Company. By 1864 he had sold his interest in the company and purchased the Brooklyn Flint Glass Company in Brooklyn, N.Y. A few years later, in 1868, Labor problems forced him to re-locate to Corning, N.Y., where he set up shop as Corning Flint Glass Company. In 1870 it was renamed to Corning Glass Works of Corning, N.Y. Since then, they have been a driving force in so many areas:

- 1880's: Production of first light bulbs for Thomas Edison.
- 1900's: Creation of weather-proof glass for railroad lenses, which became the basis for clear "Pyrex".
- 1930's: Fabrication of telescope mirrors for California Institute of Technology.
- 1940's: Manufacture of durable dinner ware for the U.S. military, which evolved into opal "Pyrex".
- 1960's: Created safer Automobile windshields which fracture into small granules if broken.
- 1970's: Development of fiber optics for networking and telecommunications.

From the 1920's through the 1940's they produced a line of power insulators and, also a line of battery jars.

It appears that Corning had a mark that they used on some battery jars, which is not mentioned in any of the literature. It is an elongated 'C' (see **10 - 5**, below), with what appear to be the letters "NX" inside of the C (Cnx). This mark appears on several Corning manufactured battery jars.

Many of the round Corning Pyrex battery jars are barrel shaped where the center of the jar is larger than either the top or bottom.

References: 31



26.1↑

26.3↓



26.2↑



26.1 through 26.3 is a Corning battery jar with Edison Lid. Unlike other Corning jars this one is clearly marked E / Cnx I had previously thought the mark was Cxx. The dimensions are 6.5" diameter x 12" tall. The lid embossing is the same as 26.9: (arc) EDISON / <BSCO> / Primary Battery / Patented / x 10" tall. July 28, 08 Sept. 6, 10 April 4, 11 / Other Patents Pending / Trade / Thomas A. Edison (script) / Reg. U.S. Mark Pat. Off. / (arc) THOMAS A> EDISON, Inc. Orange, NM.J.

26.1 is a rectangular, clear glass jar with a ground lip. The dimensions are: 6.25 x 8 x 13." Tall (12" to the shoulder. The opening is 5.5" x 6.5". The jar is embossed: **(Front) PYREX / T.M. REG. U.S. PAT. OFF. / MADE IN U.S.A. / 50006**. The porcelain lid, **26.2**, is 8 x 6.5" x 0.75" thick. It is embossed: **EDISON / MADE IN U.S.A.** The lid is likely original to the jar. It is the courtesy of Don Briel



26.1↑



↑**26.2**

Some of these were used on the Erie Railroad, likely as power for railroad signals.



←26.3



26.4↑

26.3, is a clear, round glass jar with a ground lip; 7.5" diameter x 10" tall. It is embossed: **MADE IN U.S.A. / 9BJ11 / CORNING**. This

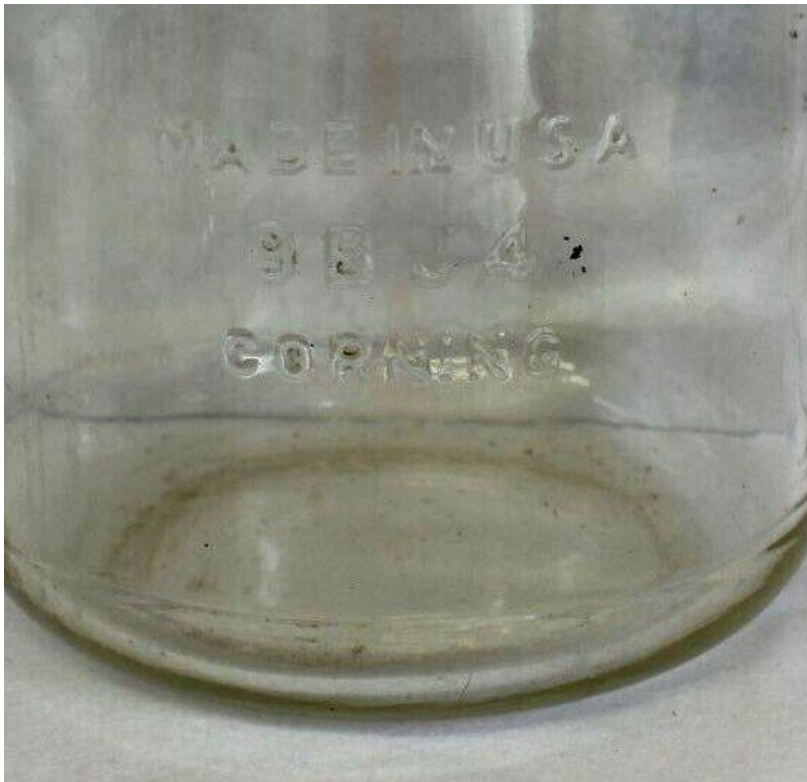
jar also has embossing on the rear **26.5**: **Cxx / Tm Reg U.S. Pat. Off.** The white porcelain lid, **26.4**, is 7.5" diameter x 11.75" high. It, too, is embossed: **(arc) EDISON / (arc) MADE IN U.S.A.** It is the courtesy of **Don Briel**.



26.5↑



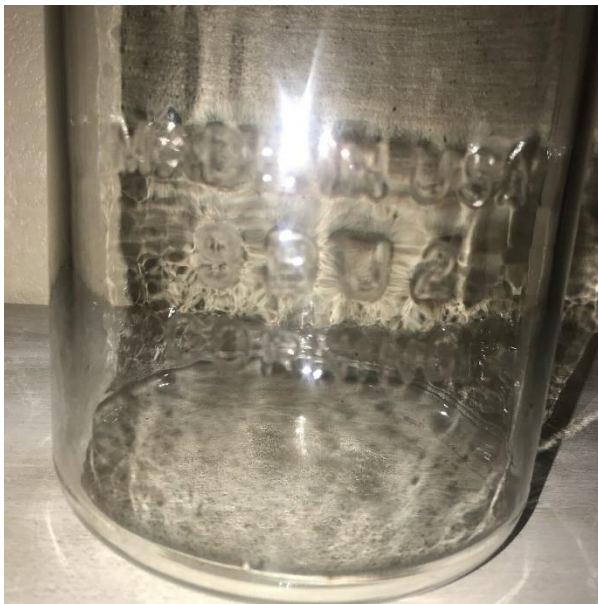
26.6↑



←26.7

26.6, is another Corning battery jar. The embossing, reads **MADE IN U.S.A. / 9BJ4 / CORNING.** It is 6.5" diameter x 10" tall with a ground lip. It, too, has an Edison lid, 26.7 embossed (arc) **EDISON / <BSCO> / Primary Battery / Patented / x 10" tall. July 28, 08 Sept. 6, 10 April 4, 11 / Other Patents Pending / Trade / Thomas A. Edison (script) / Reg. U.S. Mark Pat. Off. / (arc) THOMAS A> EDISON, Inc. Orange, N.M.J.** Courtesy of Shayne Potter.

26. 8 is a Corning battery jar with dimensions of 6.75" diameter x 11" tall. As seen in the pictures it has a convex shape, which seems to be a unique feature of Corning battery jars. The embossing reads **MADE IN U.S.A. / 9BJ2 / CORNING**, as seen in **29. 9**. The lid, **26.10**, has the same embossing as **26.7**. **Courtesy of Walt Baumgardt.**



←**26.9**



26.8↑



←**26.10**



←26.11



This corning jar, **26.11** and **26.12**, is square with round corners and a ground lip. It is embossed **MADE IN U.S.A. / 9BJ5 / CORNING**. Its dimensions are 6.5" x 5.5" x 10.5" tall. Courtesy of **joeamyc8iez**

←26.12

26.13↓



26.14↓

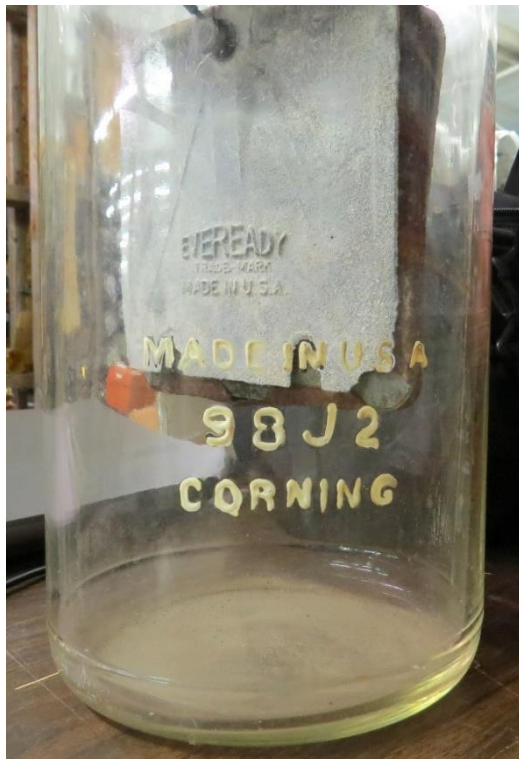


←26.15

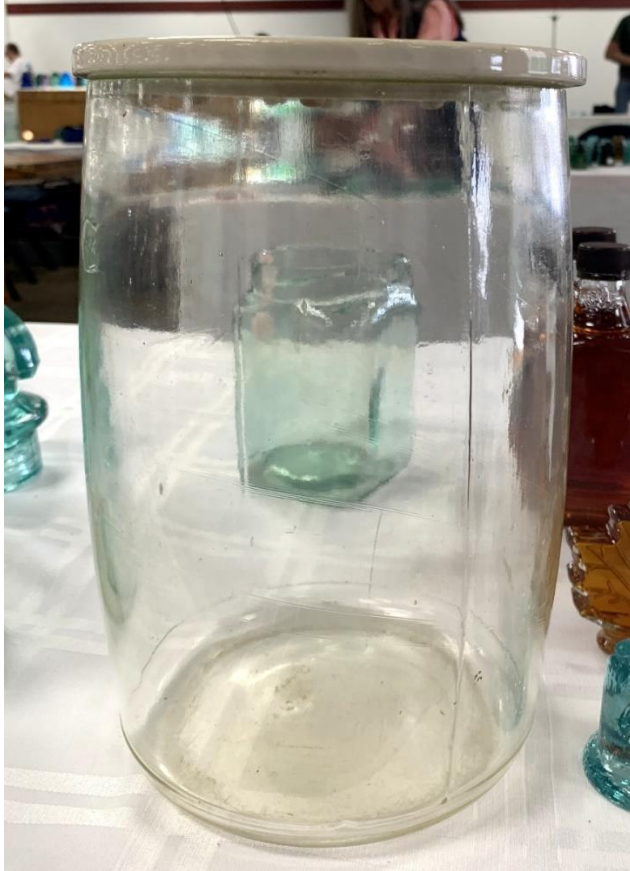
26.13 through **26.15** show one more of what appears to be a series of Battery jars manufactured by Corning. This jar is cylindrical in shape, with a diameter of 6.5" x 10.5" tall. The lid, which appears original to the jar is embossed (arc) **EDISON / (arc) MADE IN U.S.A.** The clear glass jar is embossed: **Cxx / T.M. REG. U.S. Pat Off. // MADE IN U.S.A. / 9BJ1 / CORNING.**



← **26.16** and **26.17**↑ show a huge Corning battery jar. It is 12" in diameter and stands 24" tall. It has a ground lip and the glass is a full 0.5" thick. You can see the handles formed in the side of the glass to facilitate carrying it.



←**26.18** is a Corning 9BJ2 battery jar with EVEREADY electrodes, embossed EVEREADY / TRADE MARK ? MADE IN U.S.A. This jar has the porcelain, GLADSTONE LALANDE lid seen in **40 - 2** and **40 - 3**. Courtesy of Tommy Bolack.



26.19 and **26.20** is a CORNING battery jar. The only embossing is Cxx as we've seen before. It is 6.75" diameter at the top. With its convex shape, however the diameter in the center of the jar is more like 7.25- 7.5". It is 10" tall. **Courtesy of Tommy Bolack.**

←**26.19**



26.20↑



← **26.21**, although appearing to be a battery jar is actually an ESB Charge Controller. The jar was manufactured by Corning for The Electric Storage Battery Co. (E.S.B.)



26.22↑



26.23↑

286.22 and 26.24 show a Corning jar embossed with the **Cxx** mark. It is 7" diameter x 10" tall. The porcelain lid is simply embossed (arc) **EDISON** / (arc) **MADE IN U.S.A.**



←26.24 is embossed **EXIDE** / **MADE IN U.S.A.** on 3 sides and **PYREX / REG. U.S. PAT. OFF** on a third side. The dimensions are 10" x 12" x 14.5", 15" including the lid.

This is the first indication we've had that Corning manufactured battery jars for the Electric Storage Battery Co.

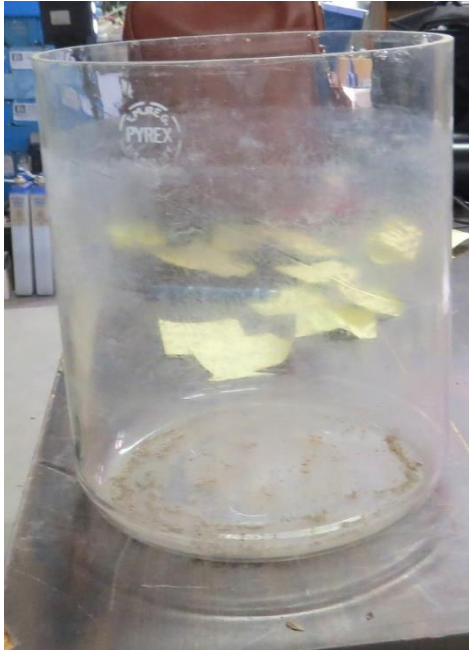


26.25 through 26.27 is a strange combination. The jar was manufactured by Corning (28.26) with a **PHILCO** embossing on opposing sides, The lid 28.28 is embossed Gould, and I assume is not original. The dimensions are 2.5" x 6.75" x 9" tall,; 9.5" with the lid. Courtesy of Tommy Bolack.

←26.26 26.26↓



26.27↑



←26.28

26.29↓



26.28↑ through **26.30↓** show a Corning manufactured battery jar, again with an Edison lid (**28.31**). The jar is embossed (arc) **T.M. REG. / PYREX / (arc) U.S. PAT. OFF. / (arc) MADE IN U.S.A.** The jar has a diameter of 8.75” and a height of 10”. The lid is identical to the one shown in **26.6**. **Courtesy of Tommy Bolack.**



←26.30



←**26.31** is a Corning jar with the same embossing as **26.29**. This jar, however has dimensions of 12" diameter x 12" tall, with a ground lip. The glass is .0375" thick.

Courtesy of Tommy Bolack



←**26.32**

26.33↑

26.32 and **26.33** show a Corning battery jar with a ground lip and an Exide lid. The jar is rectangular and merely embossed **Cxx**. The lid is embossed **EXIDE**. The dimensions are 7" x 9.5" x 11.5" tall; 12.5" with the lid. Courtesy of Tommy Bolack



←**26.34** is a Corning battery jar, It has a ground lip and is embossed **Cxx / MADE IN U.S.A. / 9BJ13 / CORNING** on one side only. The dimensions are 3.5" x 5.785" x 10.5" tall. **Courtesy of Tommy Bolack.**

26.35 is an array of six **9BJ13** jars in a steel case made for them. It came from an old Post Office in New Jersey. There is no idea what it was used for. **Courtesy of Walt Baumgardt.**

26.35↓





28.37↑

←26.36 and 26.37 is a Corning Jar as shown in 28.31. The dimensions are 6" diameter x 16" tall. Courtesy of Tommy Bolack



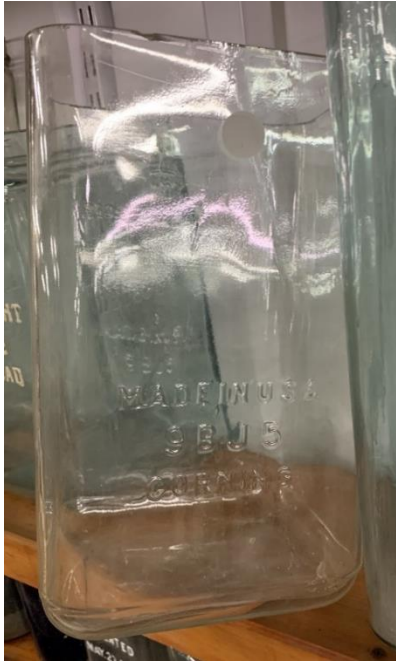
←26.38 is a Corning jar, embossed **MADE IN U.S.A. / 9BJ11 / CORNING**. The dimensions are 8" diameter x 10.25" tall. Courtesy of Tommy Bolack



←**26.39** is Corning jar embossed **Cxx / 9BJ4 / TAUNTON U.S.A.** It is 9" diameter x 13" tall with an Edison Lid we've seen before (**26.6**). Courtesy of **Tommy Bolack**



←**26.40** is Embossed **MADE IN U.S.A. / 9BJ11**, with dimensions of 7" diameter x 10". The lid is the same as **26.6**. Courtesy of **Tommy Bolack**



←**26.41** is a rectangular jar embossed 9BJ5, with dimensions of 5.5" x 6.5" x 10.5" tall. **Courtesy of Tommy Bolack**

9BJ #(if known)	Rectangular	Cylindrical
13	3 x 5.875 x 10.5	
??	5.5 x 6.5 x 10.5	
??	6.25 x 8 x 13	
??	6.5 x 5.5 x 10.5	
??	7 x 9.5 x 11.5	
Exide	10 x 12 x 14.5	
Philco	2.5 x 6.75 x 9	
2		6.75 x 11
4		6.5 x 10
5		9 x 13
11		7.5 x 10
??		8.75 x 10
??		6 x 16
??		12 x 12
??		12 x 24

27 – CROWN TRADE MARK

As best I can determine, the “CROWN” Trade Mark jars were produced in Canada, by either the North American Glass Co. or one of the Diamond Glass Companies. They are the only companies I could find that used the “Crown” logo. The history of some of the Canadian glass companies goes like this. The history prior to 1878 is somewhat uncertain, involving the St. Johns Glass Co. and The Foster Bros. Glass Co. In 1878 the Yuile Brothers reorganized the St. Johns Glass Co. of Quebec into the Excelsior Glass Co., moving to Montreal in the process. In 1883 they reorganized Excelsior into the North American Glass Co. NAGC used a “Crown” Logo. In 1890 they reorganized again as the Diamond Glass Co., still using the Crown logo. Over the next 12 years the Diamond Glass Co. acquired 8 different glass companies: North American Glass Co. of Montreal, The Nova Scotia Glass Co., The Hamilton Glass Co., The Burlington Glass Co. of Hamilton, Ontario, The Foster Glass Works, The Lamont Glass Works of Nova Scotia, The Dominion Glass Co. of Montreal, and the Toronto Glass Co. We know that the Lamont Glass Co of Nova Scotia manufactured battery jars. It is likely that this plant manufactured the Crown logo jars.



←27.1 shows a Crown Logo battery jar. The exact embossing reads **THE / (arc) CROWN / TRADE (CROWN LOGO) MARK / NEW YORK CHICAGO.** The dimensions of the oval jar are 4" x 5.25" x 6" tall.



The lid to **27.1** is shown in **27.2↑**. It clearly shows the oval shape. The lid is embossed (arc) **"CROWN"** / (arc) **PAT. JULY 1, 90** and **J.F.W. / CHICAGO**. There was a J.F.W. Electric Co. in Chicago at that time. I could find no information on them. It is likely the jar was manufactured by The Nova Scotia plant of the Diamond Glass Co. (Lamont Glass Works) of Montreal for the J.F.W. Electric Co. of Chicago.

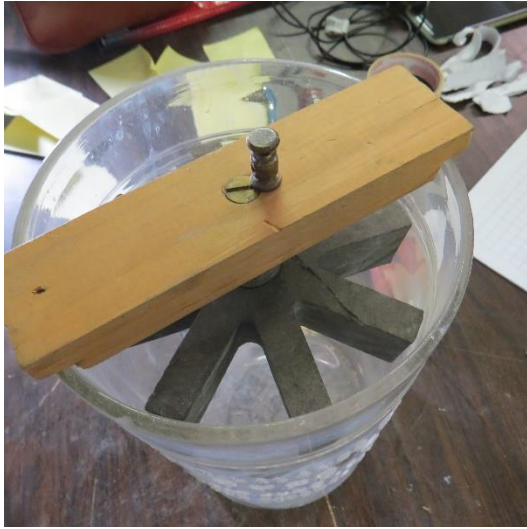
28 – Crows Foot Battery

After Volta demonstrated his battery in 1799, many versions were made, the most popular and most widely used was the Crow's Foot or Gravity Cell. It was so named because of the unique crow's foot shaped Zinc electrode.

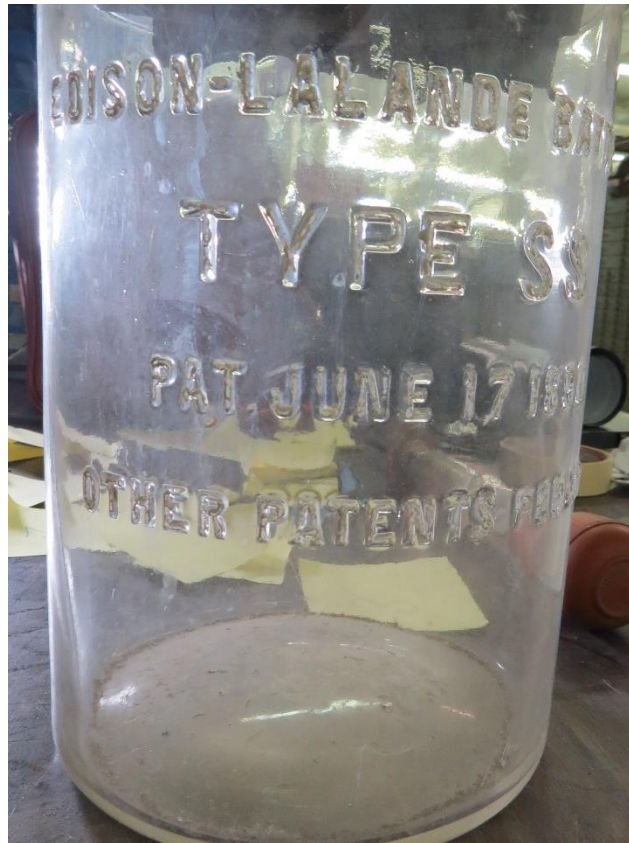
Crow's foot batteries were usually contained in cylindrical quart sized battery jars. A copper star shaped electrode was placed on the bottom of the jar with an insulated wire fed up the side and out of the jar with the positive voltage. A zinc "Crow's foot" shaped electrode was suspended in the upper part of the jar. The jar was half filled with water and a considerable amount of copper sulfate (blue vitriol) was added. After some time a voltage of about 1 volt was produced.

The following description of how the Crow's Foot battery worked is from: "Electric Wiring" by Albert Schuhler, McGraw Hill, 1943. Section: "Telegraph Wiring, Job 208, Gravity Cell".

"The electrolyte is derived from a blue vitriol and water solution. The blue vitriol must completely cover the copper element, and sufficient water added to cover the zinc element. A teaspoonful of sulfuric acid is added to this solution to give the best results. In order to prevent creeping of the electrode salts, the top of the jar is generally dipped into hot paraffin. Best results are obtained by pouring a layer of pure mineral oil over the top of the electrolyte, because it prevents evaporation as well as the creeping of salts. To put the battery into service after these steps have been taken, it is necessary to place the cell in a short circuit for about 24 hours. This action produces a light liquid called sulfate of zinc, which forms around the zinc element and protects it. The copper sulfate solution, which remains at the lower end of the jar, is the heavier liquid. Very little care is required for the maintenance of gravity cells, because all they require is an abundant supply of blue vitriol and water. The best results are obtained when both liquids meet at a point midway between the zinc and copper elements. When the blue line falls too low, that is, on the level with or below the top of the copper element, blue vitriol and water should be added. When the copper sulfate begins to fade in color to a light blue, it indicates that blue vitriol should be added. Care must be taken that the blue vitriol crystals fall to the bottom and do not rest on the zinc crow's foot. The blue line should never be permitted to reach the zinc element. If the line rises anywhere near the zinc, the copper sulfate should be siphoned out by means of a hydrometer syringe, or the cell placed on a short circuit. As long as the cell continues in action, the quantity of sulfate of zinc increases. When this becomes too dense, or above 1.15 specific gravity, the top of the liquid should be siphoned out and water added to the remainder."



28.1↑ shows such a crow's foot element in a jar. **28.2**→ is the jar, 6.5" diameter x 10.75" tall, with a ground lip. It is embossed: **EDISON LALANDE BATTERY / TYPE SS / PAT. JUNE 17, 1890 / OTHER PATENTS PENDING.** Courtesy of Tommy Bolack



←**28.3** shows just the plain zinc crows foot electrode. The picture makes it look larger than it is. Remember these fit in a quart size jar.

Courtesy of Tommy Bolack



←**28.4** shows a used Crow's Foot electrode in a formed lip jar. The jar is unembossed with dimensions of 6" diameter x 8"

Courtesy of Tommy Bolack



←**28.5** looks to be a home made Crow's foot. The unmarked jar is 5" diameter x 7.25" tall.

Courtesy of Tommy Bolack

29 - The CUMBERLAND GLASS MFG. Co ., Bridgeton, N.J.

The Cumberland Glass Mfg. Co. started small, but quickly grew to be one of the largest glass houses in N.J. Unfortunately they rarely used any kind of markings to identify their products. "Columbia " and "D&O" appear to be two markings that were used exclusively by the company. It was started as the Joseph A. Clark Co. in 1880. Mr. Clark also started the Clark Window Glass Co. in 1882. In 1885 they were re-organized as the Cumberland Glass Mfg. Co., manufacturing a large variety of bottles and jars. It is known from a 1915 catalog that they manufactured battery jars. In 1920 they were purchased by the expanding Illinois Glass Co .

To date, there are no known battery jars that can be attributed to the Cumberland Glass Mfg. Co, likely because the bulk of their product line was unmarked.

It is also known that they manufactured Fruit Jars, including," Leotric".

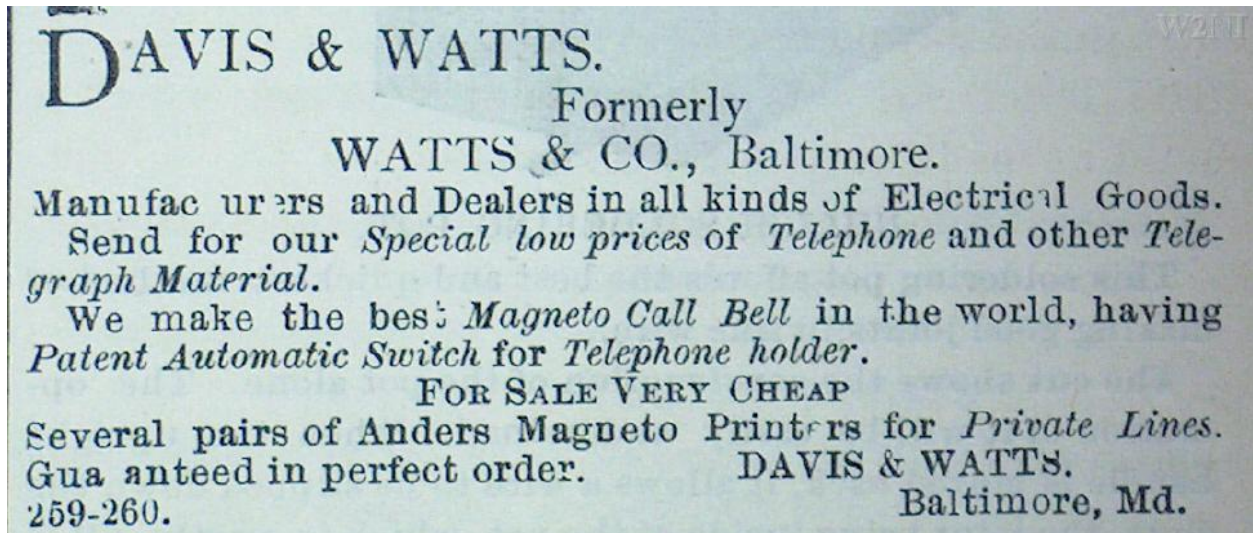
They deserve mentioning, however, as a major supplier of glass for 35 years.

References: 33

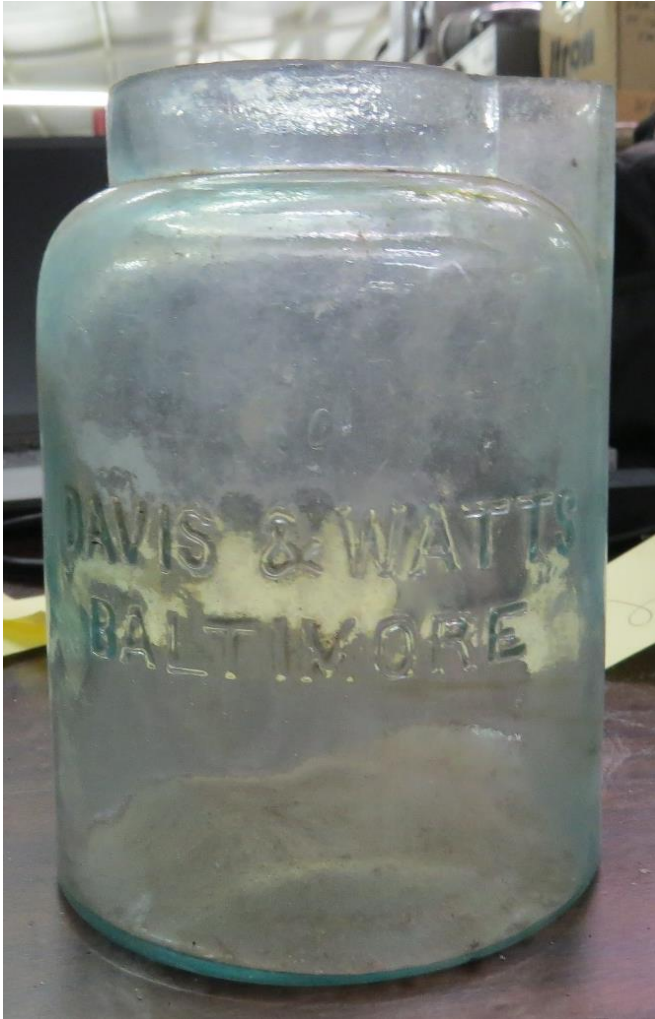
30 DAVIS & WATTS

There was not much to be found on Davis & Watts, other than the ad seen in **32.1**. We do know that they were both very active in the telegraph business in the 1870s before they went into the electrical supply business. We also know that they were the predecessors of The Viaduct Electric Co. (see Chapter 90).

30.1↓



We have this one battery jar, shown in **30.2** and **30.3** with their name embossed, **DAVIS & WATTS / BALTIMORE**. The dimensions are 4.25" diameter x 6" tall. The pour spot on this jar is different and seldom seen. It looks more like a scoop than a spout. **Courtesy of Tommy Bolack.**



←30.2



←30.3

31 DELAWARE & ATLANTIC TEL & TEL Co

We don't know much about the Delarae & Atlantic Telegraph & Telephone Co. other than they were incorporated in Pennsylvania in 1904. In 1927 they became part of the New Jersey Bell Telephone Co.n We do have this square manhole cover (33.1)with their logo, "D. & A. T. & T. Co" and a jar (31.2)embossed DELAWARE & ATLANTIC TEL. & TEL. Co. The dimensions are 4.5" diameter x 5.5" tall. **Jar is courtesy of Tommy Bolack.**



←31.1



33.2→

The name DELCO comes from the DAYTON ENGINEERING LABORATORIES Co. founded by Charles Kettering and Edward Deeds in 1906. In 1911 Kettering approached E.S.B. for a suitable automotive battery to complement his new electric starter. This produced the first automotive battery of the modern era and gave Delco the Exide technology. In 1918 General Motors (GM) acquired the UNITED MOTORS COMPANY which included Delco, Dayton-Wright, and Dayton Metal Products Company; all of which were associated with Kettering and Deeds. Charles Kettering became president of General Motors Research Corporation in 1920, a position he held for 27 years. They were responsible for the Delco and Delco-Light batteries.



←**32.1**: The jar, **32.1** and lid, **32.2** is a DELCO LIGHT Battery Jar. The jar is embossed **WATER LINE / DELCO LIGHT** on 4 sides. One side near bottom is **MADE IN U.S.A.** The dimensions are 6.5" x 7.5" x 10" tall. The bottom is embossed **KXG - 13**.

The lid is embossed **DELCO LIGHT** towards the front and rear.

Courtesy of **Walt Baumgardt**.

32.2→

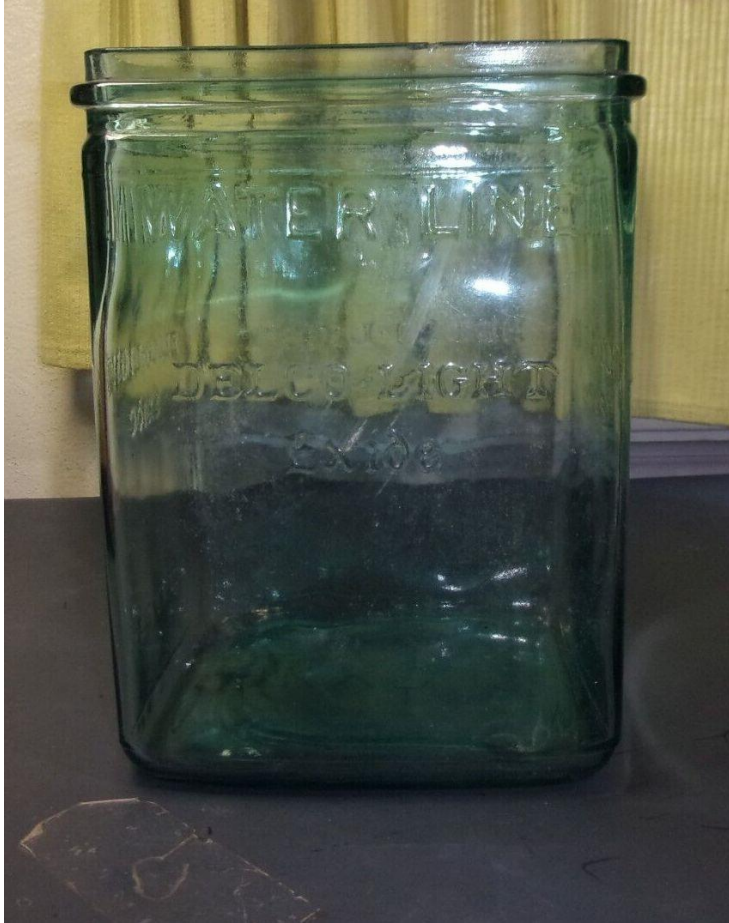




←**32.3** is aqua with a formed top, Its dimensions are 6"x 7.25" x 10.75" tall. The embossing is **WATER LINE / DELCO LIGHT** on 4 sides. The bottom is embossed **KXG 13**. Note the rounded sides on **32.3** vs. the beveled corners on **32.1**. Courtesy of mmmama



←**32.4** a lid for a KXG -13 jar. . It is clear and embossed **DELCO Light** on opposing sides and **PATENTED** on a third side. Note the embossing differences from **32.2**.



←**32.5** is yet another KXG – 13 battery jar, similar to 15 – 3. The differences are: 1. Rather than DELCO LIGHT embossing, this jar is **embossed DELCO LIGHT / EXIDE** on 4 sides. 2. **WATER LINE** is in very large letters, much larger thanm the size of Delco Light. Again the WATER LINE appears on all 4 sides.

32.6↓ shows the base embossing of **32.5**.

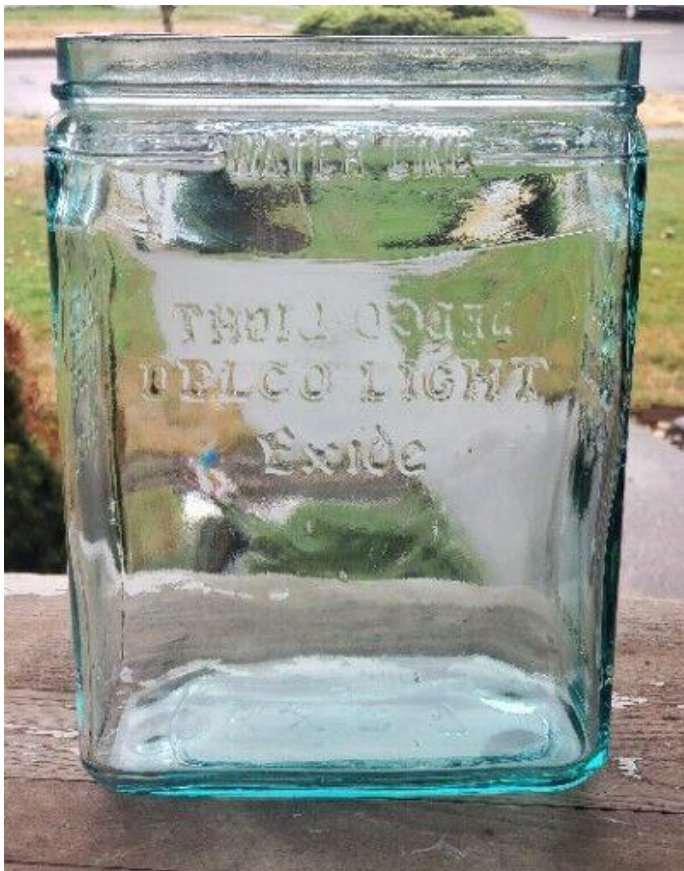




←**32.7** is embossed
KXG – 13 which
should make it a
DELCO LIGHT
battery jar. The jar
itself is un-embossed
except for **WATER
LINE** on four sides
and **KXG – 13** on the
bottom. **DELCO
LIGHT** appears on the
lid with a **patent date
of Aug. 9, 1911**. The
dimensions are
consistent with other
KXG – 13 jars.



←**32.8** is also embossed KXG – 13 on the bottom. It, however has handles and is embossed WATER LINE on four sides; DELCO LIGHT / EXIDE on three sides and MADE in U.S.A. on one side.



←**32.9** IS EMBOSSED DIFFERENTLY ON OPPOSING SIDES. The shorter opposing sides are embossed WATER LINE / DELCO - LIGHT / EXIDE / Made in U.S.A.. The longer opposing sides are embossed WATER LINE / DELCO- Light / EXIDFE. The bottom is embossed KXG – 7. The dimensions are 4.75” x 7.5” x 10.5”.



32.10↑



32.11↑

32.10 and **32.11** are pictures of yet another Delco battery jar, It is aqua with a formed lip. It is embossed **WATER LINE** on four sides, with **DELCO / LIGHT / EXIDE** on only one side. The bottom is embossed **KXG 5**. The dimensions are 4" x 7.5" x 10.5" tall. Delco Light Exide is a bit of a strange embossing. We know that ESB CO. manufactured EXIDE batteries. We also know that DELCO manufactured Delco and Delco Light. The combination obviously came from the 1911 agreement between ESB and DELCO. Why the combined embossing is not on all Delco jars is unknown. We don't have enough information, at this point, to know if we can use it for dating battery jars. The Delco Light Exide embossing will be included under Delco, as the "KXG" numbering system seems to be a Delco numbering system.



32.12↑

32.13↓



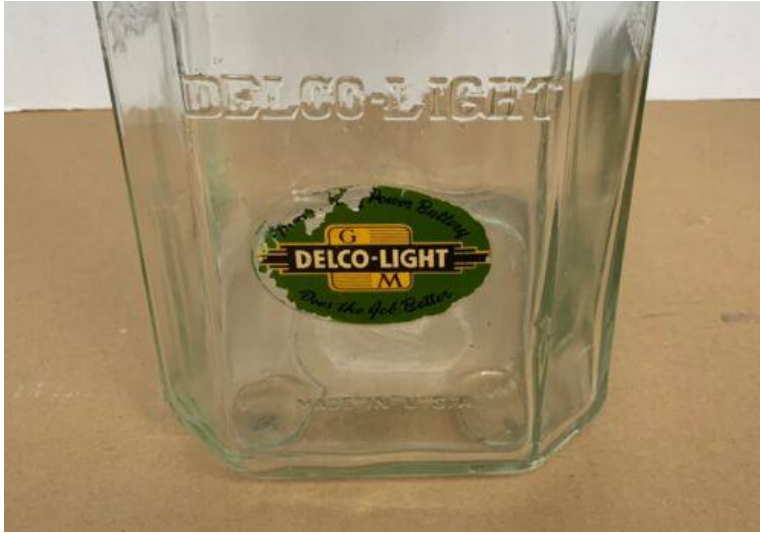
32.12 and 32.13 show a lid for a **Delco-Light EXIDE** battery. It is further embossed: **PATENTED / AUG, 8, 1911 Jun. 6, 1916 / MAR. 6, 1917 Oct. 30, 1917.** Courtesy of Perichbrothers.



←**32.14** shows a DELCO LIGHT battery jar lid. Its dimensions are 8" x 7", indicating it fit a jar with top dimensions of 7" x 6". It is embossed **DELCO – LIGHT / MADE IN U.S.A.**, with numbers **46 – 1** and **21959**.



←**32.15** is a Delco Light Exide battery jar with dimensions of 3.5" x 7.25" x 10'25" tall. It is embossed **KXG – 7** on the bottom. It is embossed on 4 sides: **WATER LINE / DELCO LIGHT / EXIDE**. On 2 sides it is embossed **MADE IN U.S.A.** near the bottom.



←**32.16**

The Delco Light battery jar shown in **32.16** and **32.17** has the same dimensions as other Delco jars we've seen, namely, **323** and **32.9**. **32.3** is a IronClad jar where this One is not. **32.3** has **Water Line** on all 4 sides, where this one only has **Water Line** on 2 opposing sides.



←**32.17** is the same as **32.3** with the exception of **KXG – 13** embossed on the bottom of **32.9**.

The jar shown here has **Water Line** on 2 opposing sides, **DELCO LIGHT / Made in U.S.A.** on 4 sides with no embossing on the bottom. It also has a paper label on one side with the initials **GM**. Like the others it is octagonal with dimensions of 6.5" x 7.5" x 10.5" tall.



←**32.18** is a Delco Light vjar. It is embossed **WATER LINE / DELCO LIGHT** on 4 sides with beveled corners. The dimensions are 6.25" x 7.25" x 10.5" tall. **Courtesy of Tommy Bolack.**

Figures **32.19** and **32.20** depict a Delco Light Exide Battery of a slightly different size. The jar is 5" x 7" x 11" tall, inn a light Aqua color. It is embossed on all 4 sides: **Water Line / Delco Light / Exide.**



32.19↑



32.20↑



←**32.21** is embossed **KXB – 13** on the bottom, as opposed to KXG. It has the same dimensions as a KXG – 13. This one has a sight glass or bulb on one side to facilitate assessing the condition of the battery. It is embossed **WATER LINE** on four sides / **DELCO – LIGHT / EXIDE** on three sides. The side with the bulb has **PAT. June 25, 1921/ MADE IN U.S.A.** Courtesy of Tommy Bolack



32.22↑



32.23↑

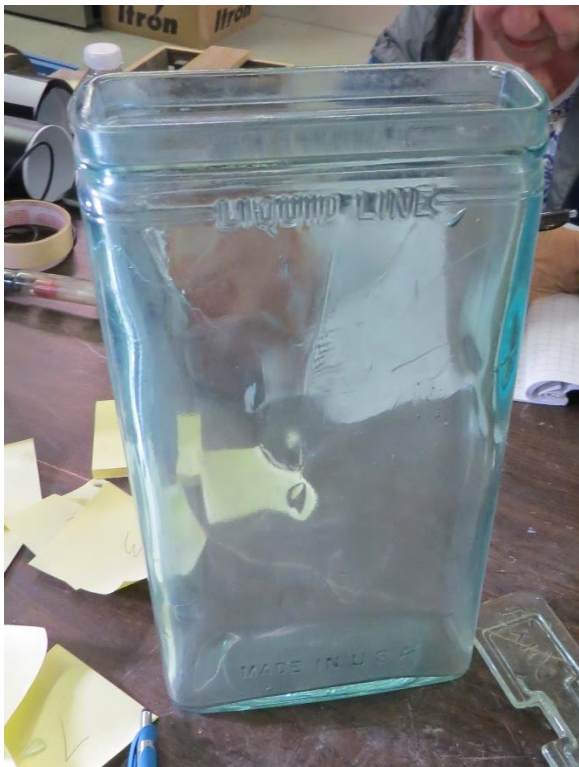
32.22 and **32.23** show an EXIDE jar, embossed **EXIDE / Made In U.S.A.** on opposing sides. There are lines for Water Level but no embossing. The lid, original to the jar, is embossed **DELCO LIGHT**. The dimensions are 6.75” x 8” x 11.5” tall, 12.5” with the lid. Courtesy of Tommy Bolack.



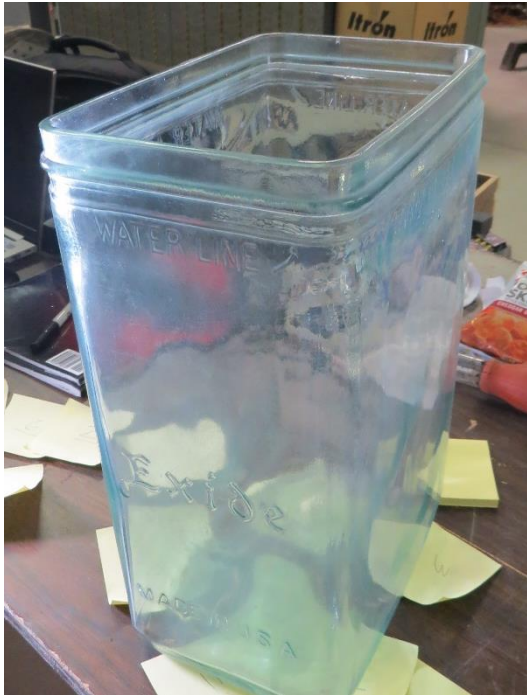
←32.24

32.25↑

32.24 and **32.25** is embossed **EXIDE / Made In U.S.A.** on opposing sides with **DMG 9** on the lid. The dimensions are 6" x 8" x 11.5" tall. **Courtesy of Tommy Bolack..**



←**32.26** and **32.27**↑ is embossed **EXIDE** on the lid, with **WATER LINE** on opposing sides on the jar. The dimensions are 2.25" x 6.785" x 12.5" tall with the lid. P-1 is embossed on the bottom. **Courtesy of Tommy Bolack.**



← **32.28** is embossed **WATER LINE** on 4 sides with **EXIDE** on opposing sides, and **EMG 9** on the bottom. The dimensions are 6" x 9.25" x 14" tall. Courtesy of Tommy Bolack.



← **32.29** is a Delco battery jar. It is embossed on all 4 sides: **WATER LINE / DELCO LIGHT**. The lid (**32.30**) is embossed **DELCO LIGHT / MADE IN U.S.A.** Courtesy of Tommy Bolack.



←32.30



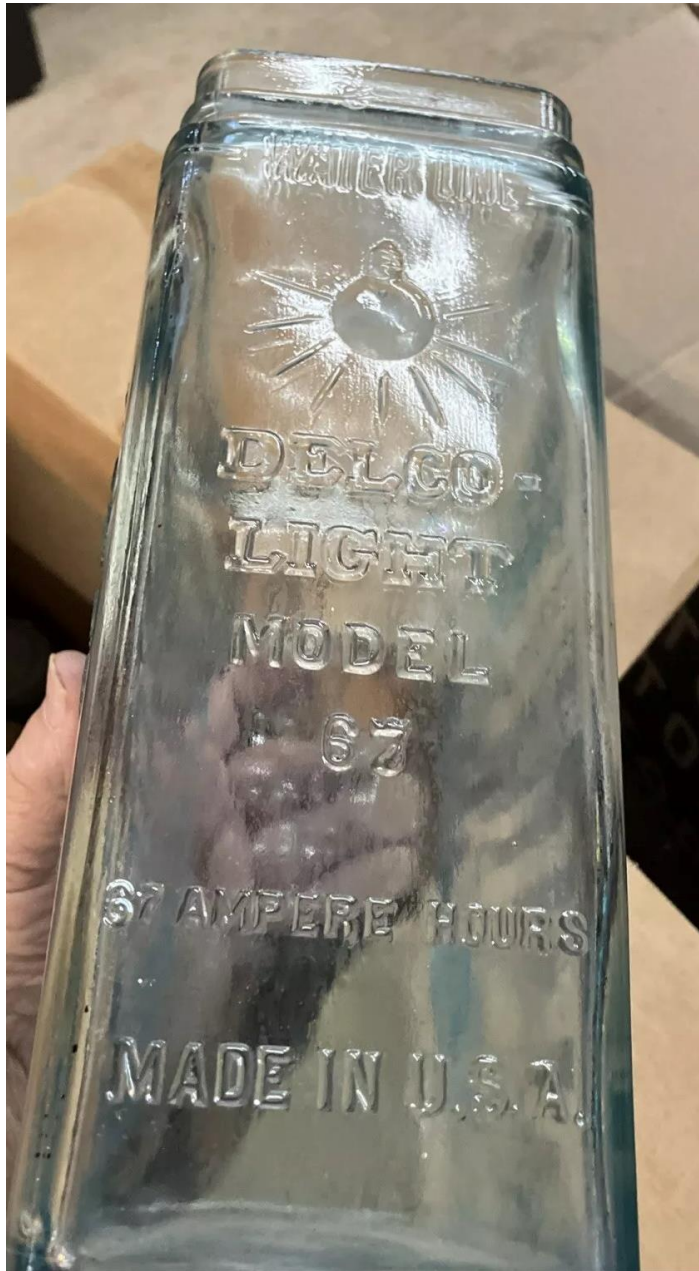
←32.31 is embossed **WATER LINE** / **DELCO LIGHT** / **EXIDE** on opposing sides. Note the sight glass on the side. Dimensions are 6" x 7.25" x 10.25". Courtesy of Tommy Bolack.



32.32↑ is embossed **WATER LINE / DELCO LIGHT / EXIDE** on all four sides. The dimensions are 6" x 7" x 11" tall.



32.33↑



The Delcop Light jar shown in 32.33 and 32.34 is unique because of the amount of embossing on the jar. It's as if they were trying to emboss the warranty on the jar. It is embossed on adjacent sides. Side 1": THIS BATTERY SOLD UNDER / A 6 MONTH WARRANTY / AND 30 MONTH ADJUSTMENT / FULLY WHEN INSTALLED / AND USED UNDER CONDITIONS / GIVEN IN PRIMARY INSTRUCTIONS / TO THIS BATTERY / AND COVERED IN ORIGINAL / PURCHASER'S BOND.

Side 2: WATER LINE / Logo / DELCO- / LIGHT / MODEL / 67 / 67 AMPERE HOURS / MADE IN U.S.A.

Bottom: 24749

The dimensions are 3.5" x 7" x 10" tall.

32.34↑

32.1 Delco Light IRONCLAD

Even in the early days it appears manufacturers had a product for all ranges of buyers. For Delco, Delco-Light was the standard battery. The Ironclad technology in the next few pages provides for a more heavy duty battery. The Ironclad technology offers 84% more positive plate surface area, providing a higher amp-hour rating and longer run times. A brochure on IRONCLAD is in Appendix.



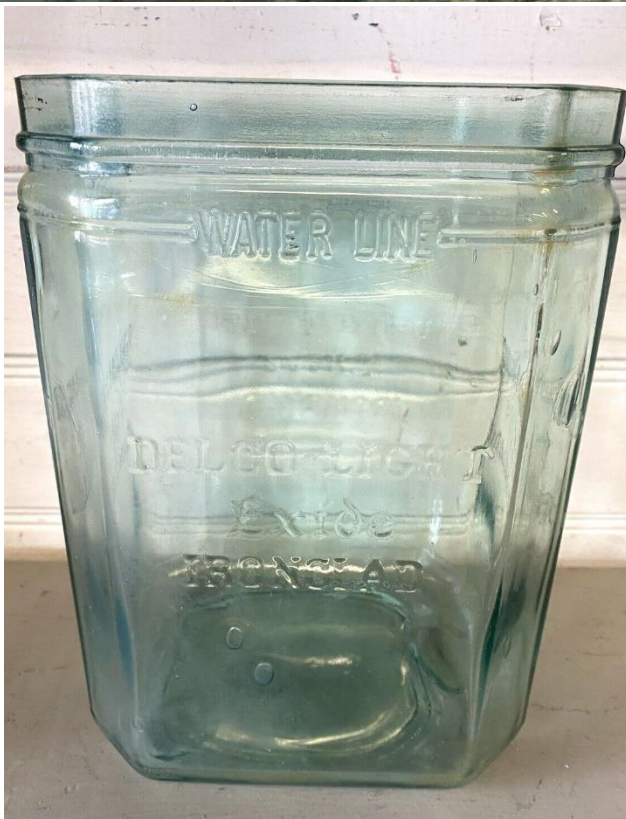
← **32.1.1** is embossed **WATER LINE** on opposing sides, and **DELCO-LIGHT / EXIDE / IRONCLAD** on 4 sides. The dimensions are 6.75" x 7.75" x 10.5" tall. **Courtesy of Tommy Bolack.**



← **32.1.2** is embossed **WATER LINE** on 4 sides. On two opposing sides it is embossed **DELCO LIGHT / EXIDE / IRONCLAD**. On the other two sides it is embossed **DELCO LIGHT / EXIDE / IRONCLAD / MADE IN U.S.A.** The dimensions are 7.25" x 10" x 14".



← 32.1.3 shows a Delco Light Exide Ironclad battery jar. This jar is embossed **WATER LINE / DELCO - LIGHT / EXIDE / IRONCLAD** on all 4 sides. **U.S.A.** is embossed only on the two short opposing sides. The lid is embossed **DELCO - LIGHT / EXIDE / IRONCLAD**. The jar dimensions are 7" x 8" x 10.5". Courtesy of Tommy Bolack.



←32.1.4 is another Exide battery jar. The embossing is: **WATER LINE (four sides), DELCO - LIGHT / EXIDE / IRONCLAD / Made in U.S.A.** (on front and two sides). The dimensions are 6" x 7.5" x 10.5" tall. Courtesy of kennycoke99.



←**32.1.5** is embossed WATER LINE / DELCO LIGHT / EXIDE / IRONCLAD. Its dimensions are 5.5" x 7.5" x 12" tall.



32.1.6 is only embossed DMG – 7 on the bottom, with dimensions of 4.5" x 7" x 10" tall.

Based on size and shape, the six IRONCLAD battery jars shown in this section were part of Farm/Home Systems.

I have attempted to correlate the coding on the bottom of some Delco battery jars with their dimensions. After listing them, I'm not sure there is any.

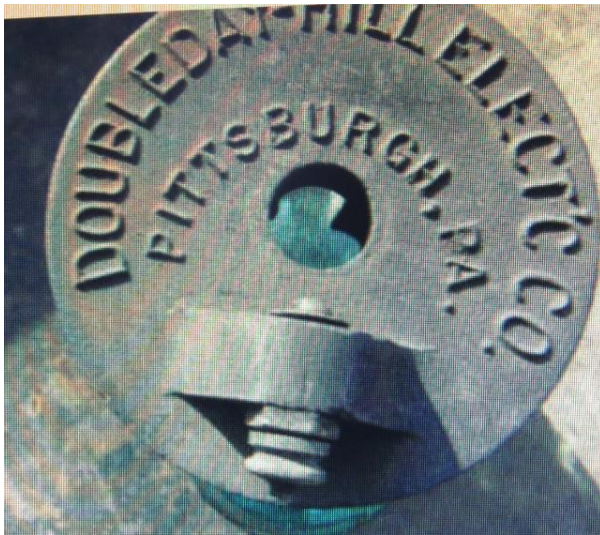
<u>BOTTOM Code</u>	<u>Dimensions (in.)</u>
KXG 5	4 x 7.5 x 10.5
KXG 7	4 x 7.5 x 10.5
KXG 7	3 x 7.5 x 10.5
DMG 7	5.5 x 7.5 10
DMG 9	6 x 8 x 11.5
EMG 9	6 x 9.25 x 14
KXG 13	6 x 7.5 x 10.75
KIXB 13	6 x 7.5 x 10.75

33 - Double Day Hill Electric CO., Pittsburg, PA

Double Day Hill Electric Co. was a supplier of radio equipment and other electrical supplies in the early 1900's. Not much could be found on them, other than that they had offices in Pittsburg, PA and Washington DC. Their product line must have been extensive as their 1916 General Catalog #7 was a book of 1475 pages.

References: 34

We know of at least one carbon graphite electrode, **33.1**, with the **Double Day Hill Electric Co. / Pittsburg, PA** embossing. The jar it was found with is totally un-embossed with dimensions of 5.5" diameter x 6.5" tall. Picture **33.2** shows the usual cylindrical shape of the electrode

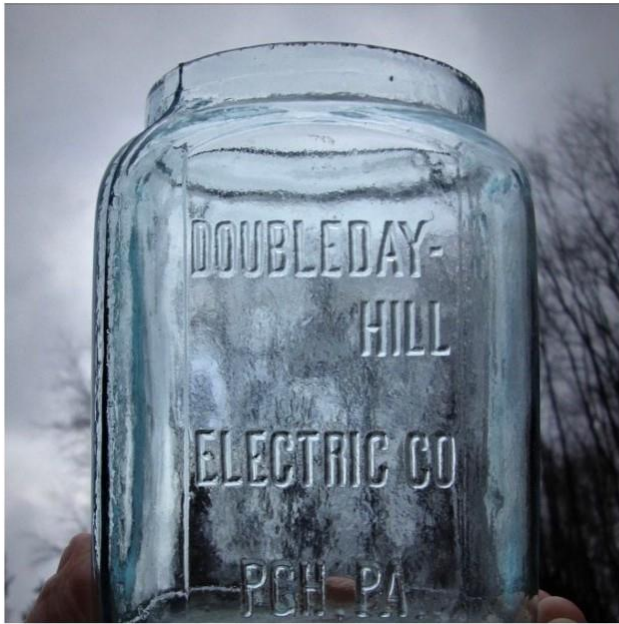


33.1↑



33.2↑

33.3 (below) is a jar embossed Double Day Hill. It is approximately 4.5" diameter x 6.5" tall. The mouth is approximately 3.75" diameter. It has a ground lip and no pour spout. The exact embossing is: **DOUBLEDAY - HILL / ELECTRIC CO / PGH. PA.** Courtesy of Richard Baldwin.



33.3↑



←**33.4** is the jar that was found with the Double Day Hill lid, **34.1**. It is aqua with dimensions of 5.5" diameter x 6.5" tall. There is no embossing. It is unknown if the jar and lid are original. Courtesy of **Debbi Graham**

34 - Eagle Charger Corp.

With the many electric devices that became available with the advent of electricity via battery jars, came a need to ensure the batteries maintained their charge. We are likely talking smaller electrical items such as radios. I found one such Trickle charger and online research revealed a second. The companies are Eagle Charger Corp of Philadelphia and Fansteel Products Co. of N. Chicago, IL. Fansteel products were under the trade name "BALKITE" Both date from the early 1920s and appear to be very similar.

Radio sets in the 1920s had tubes and so most required two different batteries, Type A and Type B. A few required Types A, B and C. Type A batteries were low voltage and merely heated the filaments in the tubes. Type B batteries were higher voltage supplying power to the rest of the radio. Voltage on Type B batteries ran up to 90 volts or higher.

Some of the units simply trickle charged the Type A and B batteries, while others replaced the A and B batteries.

Eagle Charger Corp. was incorporated on January 1, 1925. It was founded by Walter Eckhardt and his sons, Milne E and Walter Jr. for the sole purpose of supplying battery chargers. It is still an active company in Philadelphia. There is little else to be found on the company.

Radio advertising from the time identify Majestic "B" battery eliminator by Grigsby-Grunow-Hinds of Chicago and The "Kingston" B battery eliminator by The Kokomo Electric Co. of Kokomo, IN. of also offering similar service. This information is from Radio Merchandising Magazine, April, 1927.

34.1 (below) shows the complete product line of Eagle Chargers. The "Trickler" is in the lower left corner and is also highlighted in **34.2** from a page of The Talking Machine World of October 15, 1926.

Announcing the New and Complete Line of Eagle Chargers

The long-experienced radio merchant knows that his average customer is a crank, and has been forced to keep his shop looking like a national radio exposition in order to satisfy these exacting buyers. There are, perhaps, a hundred different makes of chargers on the market, good, bad and indifferent; but each commands a few sales because it claims to do a certain job differently or better than the others. Here, then, is a way out of the profitless overstocking of "ten brands to please ten customers"—a comprehensive and complete line of chargers that not only meets all present-day demands but anticipates those of the future.

Quality—Performance—Price—Whatever customers ask for, there's an Eagle Charger to satisfy their wants. Furthermore, the increasing number of charger buyers will be "Eagle" buyers when our nation-wide newspaper campaign "talks" to your customers this Summer and Fall. Study these pages carefully, compare the performance of these instruments with the demands of your customers, bear in mind the growing popularity of chargers and place an order with your jobber to take care of the mighty profitable business that this Fall will bring. If your jobber can't supply you, get in touch with "Charger Headquarters" at once.



SENIOR—6 AMP.

EAGLE SENIOR—Tube type rectifier—charges automobile and radio six-volt batteries at six (6) ampere rate. Charges 8 batteries in 150 volts in series at 250 milliamperes. Finished in Green Crackle with copper and black background plate. Battery leads, properly marked, with strong rubber clips. List Price—\$20.00 without tube.



MASTER

EAGLE MASTER—The charger of the future! A complete power unit. Charges A batteries, full or half, and at a turn of the control becomes a charger for B batteries of all standard ratings. It is not necessary to disconnect any wires—simply POINT THE ARROW AND THROW THE SWITCH! All connections are made in rear. No variable resistors in the form of lamps or coils for various size B flats. Entirely automatic. Particularly adapted for the new TAB re-chargeable batteries. Charging range for A Batteries—cracks to 2 amperes. Charging range for B Batteries—45 to 135 volts. Green crackle finish with copper and black background panel. List Price—\$25.00 without tube.



JUNIOR—2 AMP.

EAGLE JUNIOR—Tube type rectifier—charges automobile and radio six-volt batteries at full (2) ampere rate. Charges 8 batteries up to 150 volts in series at 250 milliamperes. Portable transformer winding—cannot burn out tubes. Finished in green crackle with copper and black background plate. Simple cubic and rectangular. List Price—\$14.00 without tube.



TRICKLER

EAGLE TRICKLER—Eagle has incorporated in this popular type charger an absolutely exclusive feature. In addition to charging 500 A batteries it also charges B batteries. Another big advantage is the fact that the Trickler is completely dry. Particularly adaptable for new TAB re-chargeable dry B batteries. Charges A batteries at half ampere rate, B at 250 milliamperes. Charges 8 batteries while charging in. Beautiful crackle finish. List Price—\$10.00 complete.



5 B

EAGLE 5B GANG CHARGER—Tube type rectifier, service station charger. Charges from one to five 6-volt automobile and radio batteries at six-ampere rate. Has patented magnetic control which permits charger to accommodate any line voltage from 105 to 140, thus eliminating over charging and under charging. Beautiful black crackle finish with gold raised letters and border, and accurate reading ammeter. One set of battery leads and tube complete. NET Price, \$54.00.



16 B

EAGLE 16B GANG CHARGER—Tube type rectifier for service station work. Will charge from one to sixteen automobile or radio batteries at six ampere rate. Will charge sixteen in same time it takes to charge one. Equipped with ammeter, double coil, double throw switch and fused toll in A.C. line and in Battery Circuit. Finished in black crackle with gold raised letters and gold border. Battery leads and tube complete. 110 Volts—40 cycle—NET price, \$85.00. 220 Volts—60 cycle—NET price, \$105.00.

EAGLE CHARGER CORPORATION, 121 North 8th St., Philadelphia, Pa.

**Eckharmonic Announced
by Walter L. Eckhardt**

Widely Known Talking Machine and Radio Executive Starts Production of New Six-Tube Single-Dial Control Receiving Set

PHILADELPHIA, PA., October 6.—Immediately upon his return from Europe Walter L. Eckhardt, prominent radio and talking machine executive, presented his newest contribution to the radio field, the Eckharmonic, a radio receiving set.

Mr. Eckhardt's connection in the past with both the Columbia and Pathé organizations gained for him a wide acquaintanceship throughout the talking machine industry, and later as president of the Music Master Corp. he attained even greater prominence as one of the dominant figures in the radio industry. The Eckharmonic, which has just been publicly announced, has been for many months secretly in the process of development. Associated with Mr. Eckhardt in the development of this new product were W. F. MacFadden and Arnold Zilger, whose inventive genius has contributed to the advancement of radio in the past.

The Eckharmonic, which derives its name from Eckhardt and harmonic, is being produced in one model only, known as type X. It is a one-dial six-tube set and is completely shielded and employs both regular tubes and power tubes. A simplified panel contains but one control operating all condensers and one volume control. Mr. Eckhardt points to this control as one of the features of the set, making it "a set that you can play." An electrically lighted window dial provides for the dial settings.

A distinctive feature of the Eckharmonic is the built-in Eckophon horn. This horn differs in construction from any other on the market and provides a wide range of tone, both high and low. Type 10 is a very attractive floor cabinet providing space for batteries or battery eliminators.

The Eckharmonic is made by the Eckhardt Corp., a newly formed corporation, consisting of Walter L. Eckhardt and his two sons, Milton E. and Walter Eckhardt, Jr. The headquarters of the corporation are at 213 South Broad street, this city. A factory has been secured and production has been started.

**St. Louis Cardinals Make
Visit to Liberty Music Shop**

Pennant-Winning Baseball Team Hear Returns of Heavyweight Championship Fight at New York Music Store—Three Players Buy Sets

On the night of the battle of the Sesqui, which for those of short memory was Thursday, September 23, when Gene Tunney dethroned Jack Dempsey, the members of the National pennant-winning St. Louis baseball team, or rather the greater part of them to the number of fifteen, listened to the fight returns in the handsome demonstration rooms of the Liberty Music Shop, as the guests of Arthur Hill and Benjamin Kosowitz, proprietors. The party of ball players was headed by Assistant Manager Williams and included Messrs. Sherdel, Blades, Haines, Thevenow, of the Cardinals, and Jim Tierney, of the New York Giants. The fight returns were very clearly heard over the new Garod electric set and the guests expressed their enthusiasm in no uncertain terms over the working of the receiver. It so impressed the party that three orders were received for identical models, so that's where part of the World Series money went. In return for the hospitality of the personnel of the Liberty Music Shop, Messrs. Hill and Kosowitz and their entire staff attended the second of the World Series ball games as the guests of the St. Louis team.

In addition to the official guests of the evening, some 1,500 people listened to the re-

turns of the heavyweight championship fight through the courtesy of the Liberty establishment, which fitted a Western Electric outside the door, and the crowds braved the rain outside to hear the blow-by-blow description.

**Big Bethel Negro Choir
Heard on Columbia Records**

The Big Bethel Choir, the race choir from Atlanta's finest race church, recently recorded two of its famed renditions of well-known Negro spirituals for Columbia New Process records. "Little David, Play on Your Harp," and "Shout All Over God's Heaven" were the coupled selections. The pulse-quickenng harmonies effected by this organization of sixty voices adds a note that is decidedly distinctive.

The Charles Parker Music Co., Houston, Tex., has been chartered with a capital stock of \$100,000, the incorporators being Charles Parker, Sr., Charles Parker, Jr. and C. L. Albie.

**Dry Storage Battery Co.
Occupies a New Factory**

Heavy Orders for Tab "B" Battery Made Imperative Larger Production—Old Plant Inadequate—To Enlarge Line

PHILADELPHIA, PA., October 2.—The Dry Storage Battery Co., of this city, maker of the Tab "B" battery, has taken possession of its new factory at 3860 Coral street, Frankford. The Tab "B" battery is a 45-volt dry cell battery which may be recharged six or seven times. The initial announcement of this battery several months ago resulted in an influx of orders, making necessary larger manufacturing facilities. The new factory provides 42,000 square feet of space with 28,000 additional square feet of storage space situated across the street. Raymond B. Rosen, president and general manager of the company, reports that when demand has been caught up with other sizes of rechargeable batteries will be produced.



Here Are the Eagle Chargers That Were the Sensation of the New York Radio Show



Eagle "TRICKLE"

This little wonder not only charges an "A" Battery but also will charge any type of storage "B" Battery or TAB rechargeable dry "B" Batteries.

Eagle "TRICKLER" is shipped dry—just add plain water—no chemicals to mess with. Economical, too, costing less than 2 cents a day to operate.

This is "trickle year," take advantage of the special sales features of the Eagle "TRICKLER" and offer your customers the most for their money.



Eagle "MASTER"

The Eagle "MASTER" is a complete power unit. It requires no auxiliary variable resistances for various size batteries and it is permanent. Connect it to your batteries once and let it stay.

If you want to charge your "A" Battery on Treble or at the rate of 34, 1, 1 1/2, or 2 amperes just set the knob and throw the switch. To charge 45, 67, 90 or 115 volts of any type of storage "D" or TAB rechargeable dry "B" Batteries, turn the knob and reverse the switch.



This shows how Eagle "TRICKLER" is hooked up to charge "A" batteries at half-ampere rate and rechargeable "B" batteries at 250 milliamperes.

List Price
\$10.00
Complete

Connect Eagle "MASTER" to your batteries and set and let it quietly go to work. Once installed there are no wires to connect or disconnect.

List Price
\$25.00
(with bulb)



If your jobber can't supply you with Eagle Chargers write to us

EAGLE CHARGER CORP.

121 NORTH EIGHTH STREET

PHILADELPHIA

EAGLE CHARGERS



←34.3

Pictures 34.3 through 34.5 show the “Trickler”, courtesy of Walt Baumgardt, who acquired it from Russ & Marge

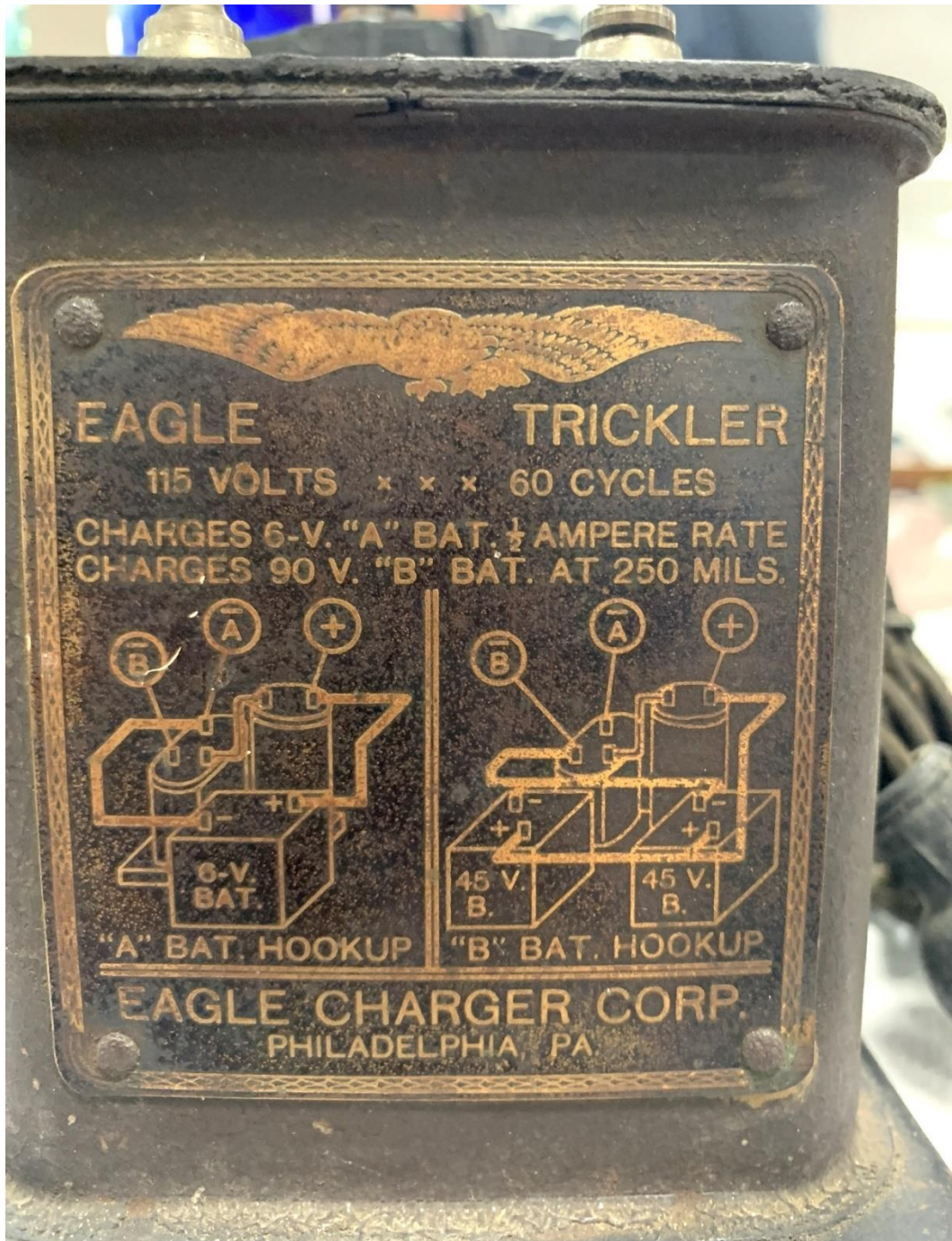
The jar was manufactured by Hazel-Atlas Co. and is embossed 16 Fl. Ounces



The only other embossing is on the side of the transformer (34.5). This “Trickler” charger was used to keep the batteries in a radio fully charged.

←34.4

34.5 ↓



35 – E. Edelman & Co.

E. Edelman & Co. was founded in Chicago in 1909, by Erich Edelman. It was a wholesale business selling air valves, air cocks, steam gauges etc. to plumbing and heating contractors.

Today they are a leading designer and manufacturer of automotive parts and tools



of

←35.1 and 35.2↑ is a **Utility Battery Filler**, manufactured by the **Edelman Co. Chicago**. It is fitted with a gallon jug from Owens – Corning. **Courtesy of Tommy Bolaxk**

36 - The Edison Companies

Rather than attempting to devote chapters to the individual Edison Companies, I will lump them all together with a brief biography of Thomas A. Edison, himself.

T.A. Edison was born in 1847 in Milan, MI and grew up in Port Huron, MI. He attended formal school for only a few months. His mother, a teacher by profession, taught him reading, writing and arithmetic. A chemistry class at the Cooper Union for the advancement of science and art is his only known enrollment of any kind at an institution of higher learning. He was a curious child and learned most things by reading on his own. An early bout with Scarlet Fever caused the loss of hearing in one ear and most of the hearing in the other. Edison believed that his hearing loss allowed him to avoid distraction and to concentrate more easily. If anyone is interested in learning more about his career, I refer you to:

<https://edison.rutgers.edu/company.htm>

Throughout his career he received 1,093 patents in his name and formed many companies. A partial list is:

Battery Supplies Company	Edison Wiring Co.
Edison Manufacturing Company Edison	United Edison Manufacturing Co.
Storage Battery Company	Mining Exploration Co. of N.J.
Edison Storage Battery Garage, Inc.	Edison Industrial Works
Edison Storage Battery Supply Co.	Edison Manufacturing Co.
Edison Crushing Roll Co.	Edison Manufacturing Co. Ltd.
Edison Portland Cement Co.	Edison Phonograph Co.
Edison Company for Isolated Lighting	Edison Phonograph Works.
Edison Electric Light Co.	Electric Railway Co. of the U.S. ,
Edison General Electric Co.	
Edison Lamp Co.	
Edison Machine Works	
Edison United Manufacturing Co.	

I didn't attempt to sort them all out. Some of them are Holding Companies, and most are interconnected in some way or another. In all Edison started almost 200 companies, so the list above is truly partial. If we break the companies down by category we find:

Battery:	7	Phonograph, Domestic:	14
Cement & Cement Products:	7	Phonograph, Foreign:	16
Electric Light, Domestic:	15	Railway:	6
Electric Light, Foreign:	24	Telegraph & Telephone,	
Mining:	11	Domestic:	28
Miscellaneous:	11	Telegraph & Telephone,	7
Motion picture:	13	Foreign:	14
Office Machinery & Supplies:	6		

For a total of 172 companies

Some information about the various battery companies:

Thomas A. Edison, Inc, originally the National Phonograph Co., was the main holding company for the various manufacturing companies established by Edison. It was the successor to the Edison Mfg. Co. and operated between 1911 and 1957 when it merged with McGraw Electric to form McGraw Edison.

The **Edison Mfg., Co.** was incorporated in 1900, as Edison's personal business. It manufactured and marketed the Edison-LaLande primary battery, as well as batteries for telegraph, telephone, phonograph. It also sold X-Ray equipment, medical instruments and electric fans as well as having a motion picture branch. The LaLande (ESBCOOO CO) was an alkaline primary battery developed by Edison from an earlier design by Felix LaLande. It consisted of copper oxide and zinc plates in a solution of potassium hydroxide.

The **Battery Supplies Co.**(BSCO) was formed in 1903 by former Edison Employees to manufacture primary batteries. Edison sued, alleging patent infringement. A settlement called for the Edison Mfg. Co. to purchase it in 1905. It was officially dissolved in 1908.

The **Edison Storage Battery Co.**(ESBCo) was formed in 1904 to produce Edison's nickel-iron battery. Edison's life-long dream was the electric vehicle, and the Battery Supplies Co. was to make it happen. He refined the nickel-iron battery first patented by Swedish inventor, Ernst Waldemar Jungner in 1899. It was so revolutionary that even Henry Ford wanted it. He struck a deal with Edison in 1914, to release the "Ford Electric", selling for \$900.00 with a range of 100 miles. However, the Edison Battery was big, heavy, expensive and required frequent charging. By the time Edison's project was complete, consumers had spoken in favor of the fossil fuel-powered Model T. The nickel-iron battery never became very successful.

As a side note, Edison championed Direct Current for many years, claiming its superiority over alternating current. Westing House and The Thomas Huston Co. championed the alternating current. Edison used what some might consider un-ethical means to combat AC current, which didn't sit well with his Board of Directors. In 1892 J.P. Morgan engineered a merger between Edison General Electric and Thomas Huston that put the Board of Thomas Huston in charge of the new company; General Electric. Edison was essentially forced out of controlling his own company. General Electric now controlled 75% of the U.S. Electrical business and would compete with Westinghouse for the AC market. See Chapter 1 for more details.

You will find equipment from the Edison Companies highlighted in **BOLD** (above) featured in this chapter. I will try to keep the equipment from the individual companies separated for your convenience.

References: 49-58



Among other things the Edison Companies manufactured porcelain battery jar lids, which were found on many other jars. The lids came with several different embossings.
←**36.1**, is simply embossed: **(arc) EDISON / (arc) MADE IN U.S.A..**
Courtesy of Walt Baumgardt



← **36.2** is embossed **(arc) EDISON / (arc) R S A.** Courtesy of Walt Baumgardt.

This lid was used with a jar for railroad signaling.



←**36.3** is simply embossed EDISON in large letters



36.3↑ is another RSA lid , used for Railway signals. Unlike the rather simple and minimal embossing of **36.2**, this is embossed (arc) **R.S.A. Signal Cell / EDISON / <BSCO> / Primary Battery / PATENTED / July 20, 08 Sept. 6, 10 Apr. 4, 11 / Other Patents Pending / REG. U.S. TRADE PAT. OFF. / (script) THOMAS A. EDISON / MARK / (arc) THOMAS A. EDISON INC. ORANGE, N.J.**



←**36.4** is a set of 5” square electrodes. This set of electrodes is simply marked **EDISON**. Courtesy of **Walt Baumgardt**

36.5→

36.5 is a white, porcelain, battery jar. The jar itself is un-embossed. The original lid, **36.6**, below, is embossed: **(arc) B S CO / PRIMARY BATTERY / SIGNAL MODEL / (arc) BATTERY SUPPLIES Co. NEWARK, N.J.** Courtesy of **Walt Baumgardt**.



←**36.6**



←**36.7** is an Edison lid with another embossing variation. It is embossed: (arc) **EDISON** / <BSCO> / **PRIMARY BATTERY** / **Patented** / **July 28,'08** / **Sept. 6,'10** / **April 4,'11** / **Other Patents Pending** / **Trade** / **THOMAS A. EDISON** / **Reg. U.S. Mark Pat. Off.** / (arc) **THOMAS A. EDISON, INC.,** / **ORANGE, N.J.** Courtesy of Walt Baumgardt



←**36.8** is yet another embossing variation. It is embossed (arc) **EDISON** / (arc) **MADE IN U.S.A.,** with a third hole embossed "OIL", for adding battery oil.

36.9↓ (below) is yet another lid embossing variation: (arc) **BSCO / PRIMARY BATTERY / SIGNAL MODEL / BATTERY SUPPLIES CO., NEWARK, N.J**



36.10↑ is a totally unembossed porcelain battery jar. The lid, **36.11**, is embossed: (arc) **EDISON PRIMARY BATTERY / Trade / Thomas A. Edison (script) / Mark / Pat. June 17, 1890 / Other Patents Pending / Manf'd. by / (arc) EDISON MFG.Co., ORANGE , N.J.** Courtesy of Wayne Duczynski.



←**36.11**, is the original lid to the battery jar **36.10**,



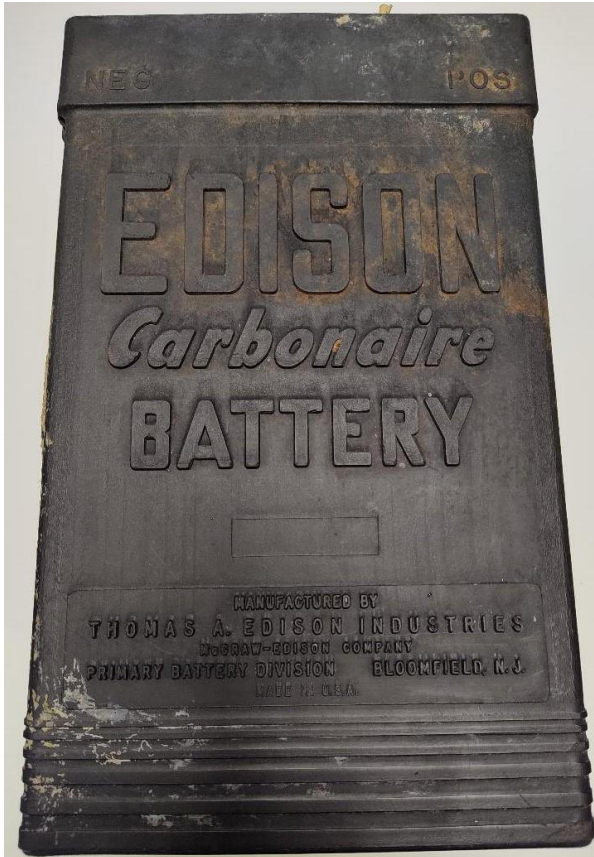
36.12↑ is an Edison Lid of Porcelain. It is 7" in diameter and embossed as follows: (Arc) ** B S C O ** / Primary Battery / No 1 / (Script) Thomas A. Edison / Manf'd By / (arc) Edison Mfg. Co., Oranbge, N.J. U.S.A.



←**36.13** shows an Edison Alkaline Battery from the early 1900s.



←**36.14** shows an early Edison Battery Tube Radio. Note the array of batteries.



36.15 ↑

←36.16, left is battery jar that was found along the tracks west of Minneapolis, MN, indicating it probably powered a switch or something similar. It appears to be made of hard rubber and is 7.75" square x 12.5" tall. Courtesy of **WayneDuzynski**

It is embossed: **NEG POS / EDISON CARBONAIRE BATTERY / manufactured by / THOMAS A. EDISON Industries / McGraw-Edison Company / Primary Battery Division Bloomfield, N.J. / Made in U.S.A.** The lid shown in 36.15 is merely embossed **EDISON**. The fact that it is listed as a McGraw Edison Company would date this battery to post 1957.



←**36.17** shows two Carbonaire battery jars, in glass, with the original shipping box. The jars are 7" diameter x 10.25" tall, with no embossing.



←**36.18** shows one of the original lids from the Carbonaire jars in 8. The lids are white porcelain and embossed: **(arc) FOR OVER-SIZE JARS / MADE IN U.S.A.** Like we've see on other lids these, too, have separate a separate hole for adding battery oil. It is so marked.



←**36.19** is a round, aqua jar with a pour spout and ground lip. Its dimensions are: 4.5" diameter x 6.25" tall with a 3.75" diameter mouth. Courtesy of **Debbi Graham**.



36.20↑ is another EXIDE Battery jar. As there is no Delco embossing It is likely an EDISON product. It is approximately 4" square x 10" tall. What is unique is the carry handle designed to fit this particular battery jar. Embossing is **Acid Level / EXIDE / DFG /** . DFG is another prefix designation of Exide batteries.



←36.24

36.25↓



36.24 and 36.25 show a barrel shaped porcelain battery jar.

The lid is embossed: **EDISON LALANDE BATTERY / PAT. MAR., 20-1885 / Other Patents Applied For**

Edison LaLande Battery, a type of alkaline primary battery developed for Edison from an earlier design by Felix Lalande and Georges Chaperon. It consists of plates of copper oxide and zinc in a solution of potassium hydroxide. The cell voltage was low, about 0.75 volts; but the internal resistance was also low so they were capable of delivering large currents.



←36.26

36.27→





←36.28

36.26 – 36.28 is another Edison LaLande battery. The jar is 7.25" diameter x 10" tall. The lid is embossed (arc) EDISON LALANDE BATTERY / TYPE 2 / (arc) EDISON MFG> CO. ORANGE N.J. U.S.A.



←36.26

36.27↓



36.26, 36.27, and 36.28 show the Gladstone LaLande battery. It is essentially the same battery as the Edison LaLande, except that the Gladstone jar, rather than being porcelain, is enamalized steel. The lid is still porcelain. The Gladstone LaLande seems to have been offered by Ewing-Merkle Electric Company. It is 5.5" diameter x 8.5" tall.

←36.28

The lid, 36.27 and 36.28, which is original, is embossed: (arc)

GLADSTONE LALANDE BATTERY / Pat. Aug. 2, 1902 / June 2, 1903 / Nov. 3, 1903



36.29↑

←36.30

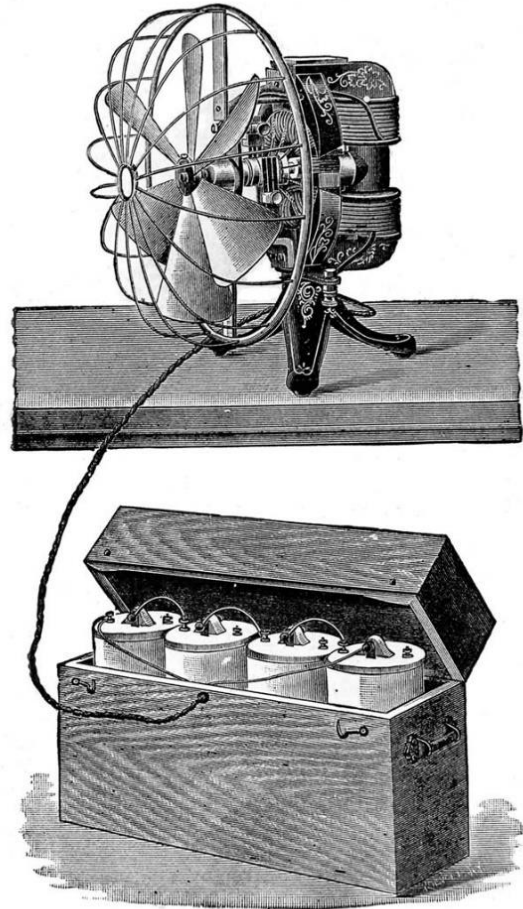
The Gladstone Lalande Batteries were also made in Cobalt Blue, as seen in **36.29** and **36.30**. The dimensions and embossing are the same as the white Gladstone Lalande Battery seen in **36.26 through 36.29**: It is 5.5" diameter x 8.5" tall. The lid is embossed (arc) **GLADSTONE LALANDE BATTERY / Pat. Aug, 2, 1902 / June 2, 1903 / Nov. 8, 1903.**



36.31↑

36.31 shows an array of Gladstone-LaLande Batteries which were used to power an electric fan.

36.32 is a sketch of an array of Gladstone LaLande batteries powering an electric fan.



No. 1.

36.32↑



36.33↑



36.34↑



IP NATIO

←36.35

The battery jar shown above (36.33 thru 36.35) is rectangular and unmarked and tapered from top to bottom. Its dimensions are 5" x 8" x 13", with molded in handles on opposite sides. The only place we've seen the molded in handles is on a Corning battery jar. It is likely that this is a Corning made battery jar. The porcelain lid appears to be original to the jar. It is embossed **EDISON / <BSCO> / PRIMARY BATTERY / PATENTED / July 28, '08 Sept. '10 Apr. 4, '11** / other patents pending / Trade / Thomas A. Edison (script) / Reg. U.S. Mark Pat. Off. / **THOMAS A. EDISON, Inc. / Orange, N.J., U.S.A.** It was common to find Exide lids on Corning jars.



←**36.36** is a rectangular Edison lid in Porcelain. It is simply embossed **EDISON / MADE IN U.S.A.**



←**36.37** is an un-embossed porcelain battery jar. It is cylindrical in shape with dimensions of 6.5" diameter x 10 " tall with the lid; 9.5" without the lid. The lid , **36.42**, appears to be identical to the one shown in **36.7**.

36.38 ↓



←36.39 is porcelain jar and lid. The jar is unembossed, while the lid is identical to 36.7. The dimensions are 7" DIAMETER X 10" TALL.



36.40↑ shows a porcelain Edison Lid. It is embossed (arc) **B. S. C. O. / PRIMARY BATTERY / No. / Trade / Thomas A. Edison (script) / Mark / MANFD By / (arc) EDISON MFG. Co. ORANGE, N.J. U.S.A.** It is 7" in diameter.

The jar it is with is a 9BJ1 by Corning, which we've seen before.



36.41 and **36.42** show a Corning jar with the Cxx mark. It is 7" in diameter x 10" tall. The lid is of white porcelain, simply embossed (arc) **EDISON / (arc) MADE IN U.S.A.**

36.41↑

36.42↓





←**36.43** and **36.44**↑ show a quart size battery jar embossed, in a circular slug plate: (arc) **SOUTHER ELECTRICAL CO. / EVERYTHING ELECTRICAL / LOS ANGELES, CA & NEW YORK, N.Y.** The jar has a spout and a ground lip, with dimensions of 4.5” diameter x 6” tall. The top diameter is 3.75”. **Courtesy of Tommy Bolack**

I could find very little information on the Souther Electrical CO. I don't believe Southern is a spelling error, in spite of the fact that there is a Southern Electric Co. all across the southern states. From what little I could find, The Souther Electrical Co. was one of the Edison companies, likely part of Edison International. It likely can be traced back to Holt and Knupps, a company formed to provide street-lights in 1886.

The information offered above may not be accurate. Like I said, information was hard to find, so the brief history offered above is put together from snippets of information from many sources. I apologize if it's in error.



←**36.45** and **39.46** show another Southern Electrical Co. jar. It is 4.25" diameter x 6" tall. The embossing is the same as **36.43**. It was found with a BEACON LID (36.50), that is not original to the jar. I could find no references for the BEACON.

Courtesy of Tommy Bolack



36.46↑

36.47 through **36.49** show a porcelain jar with an EDISON lid. The jar is 5.75" diameter x 7.75", 8.25" with the lid. The lid (**36.49** and **36.50**) is from Edison, embossed: (arc) **EDISON PRIMARY BATTERY / PATENTED / June 17, '90, APR. 4, '11 / OTHER PATENTS PENDING / REG. U.S. TRADE PAT. OFF. / (Script) THOMAS A. EDISON / MARK / (arc) THOMAS A. EDISON, INC. , ORANGE, N.J. U.S.A.** Courtesy of Tommy Bolack



36.48→



36.47↑

36.49↓



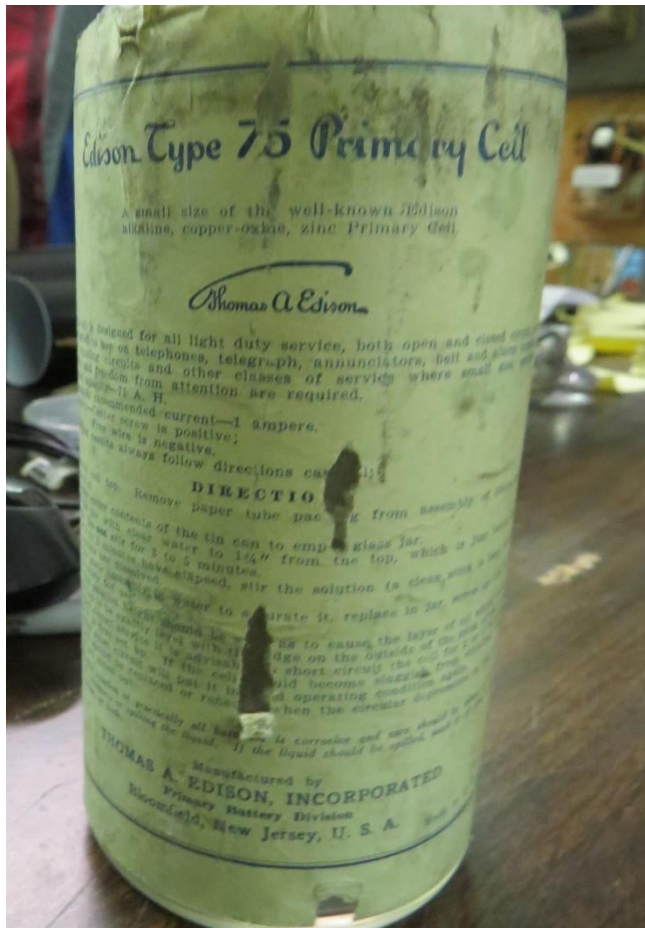
36.50 and 36.51 , is a Corning jar with an Edison lid. The porcelain lid is embossed BSCO/
PRIMARY BATTERY / No. XX / **TRADE** (script) **Thomas A. Edison** / **MARK** / **Manf'd. by**
/ **Edison Mfg. CO. Orange, N.J. U.S.A.** The jar dimensions are 6.5" diameter x 11" tall.



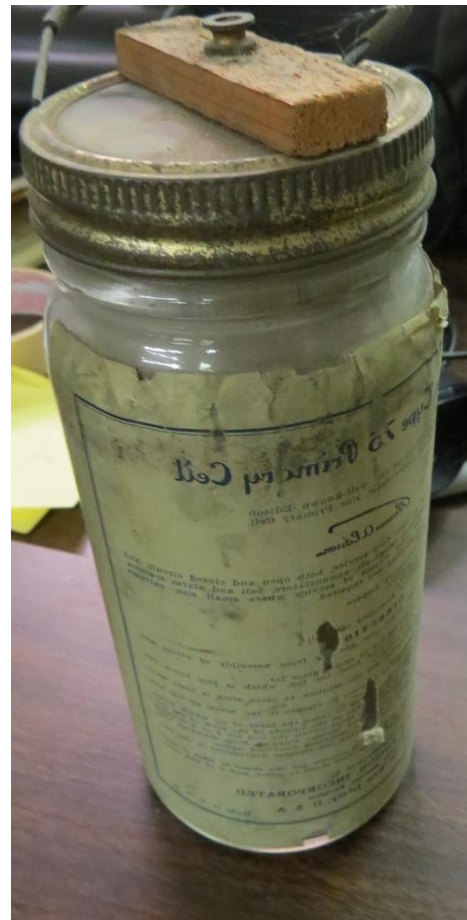
←**36.50**

36.51↓





36.52↑



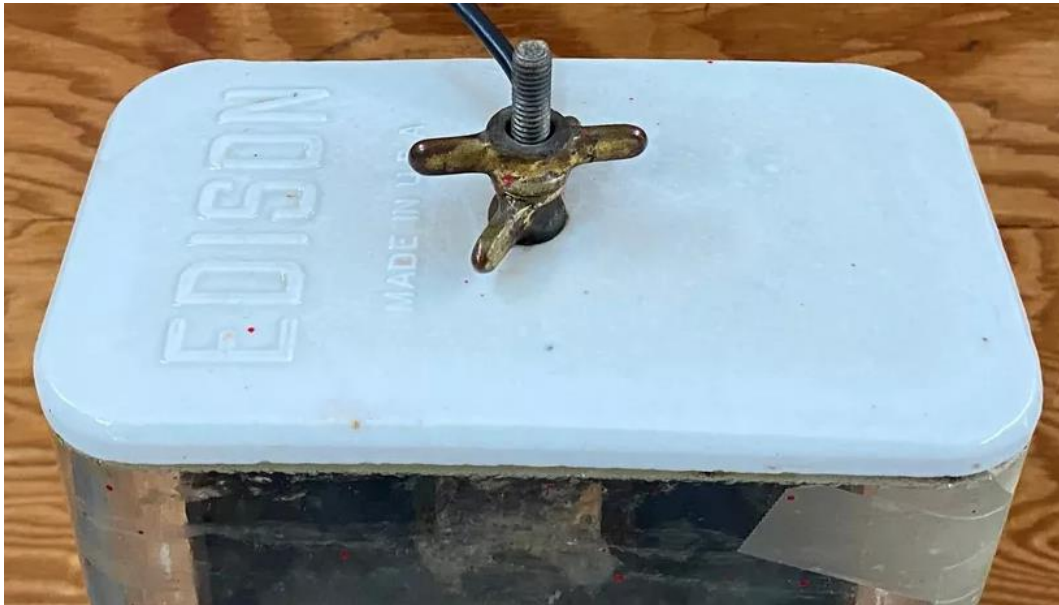
36.53↑

223

36.52 and 36.53 show an **EDISON Type 75 Primary Cell**, Manufactured by Thomas A. Edison Inc. of Bloomfield, N.J.. It is entirely wrapped with a paper label, and appears to have a screw top from a mason jar. The dimensions are 3" diameter x 7" tall. **Courtesy of Tommy Bolack**



36.54↑ is a glass jar with a porcelain lid. The lid is embossed **EDISON – LALANDE BATTERY / PQT. MAR. 20, 1882, / Other Patents Applied For**. I suspect the jar was made by Corning. **Courtesy of Tommy Bolack**



36.55↑

36.56↓



The jar shown in **36.55** and **36.56** is unmarked with approximate dimensions of 3" x 8" x 12". It has a rectangular EDISON lid in a light blue color. It is simply embossed EDISON / MADE IN U.S.A.,

36.1 Consolidated Edison

The next jar (**36.1.1** through **36.1.2**) was likely manufactured by Consolidated Edison or a subsidiary. I am putting it under Edison because of the connection between the two.

- In 1881 Edison formed Edison Electric Illuminating .
- In 1884 Edison controlled Edison Light and Edison Electric Illuminating.
- In 1899 Consolidated Gas starts buying as many electric companies as it can.
- 1901 Consolidated Gas merges with Edison Electric Illuminating To create The New York Edison Company.
- By 1932 Consolidated Gas is the largest electric service company in the world.
- In 1936 with electric sales outstripping gas sales the name was changed to Consolidated Edison Company of New York, Inc.



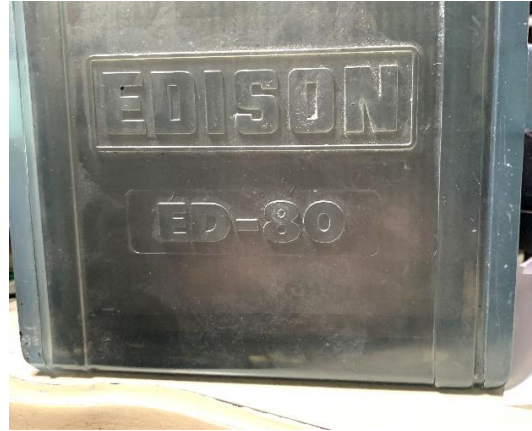
36.1.1↑



36.1.2↑



36.1.3↑



36.1.4↑

The jar is made entirely of plastic and likely dates to the 1960s or 70s. The only markings are **EDISON / ED – 80** on the front and rear and the serial number on the top (36.1.3). The rear (36.1.4) also has **MADE IN U.S.A.** The ED – 80 was a Nickle Cadmium battery and was part of a series; ED-80, ED-120, ED-160 and ED-240. The numbers refer to the 0-hour discharge rate to 1.10 volts/cell. The dimensions are 3” x 6” x 10.5”. It was used for Railway signaling in an arrangement as shown below (36.1.5) . **Courtesy of Tommy Bolack**

36.1.5↓



37 - ELECTRICAL ENGINEERING CO. Minneapolis, Minn

Googling this company produced no information. We do know that in 1882 Thomas A. Edison wrote to the president of Columbia University, urging him to introduce courses in Electrical Engineering. That same year, Edison created the first Central Electric Station in Lower Manhattan, creating the need for young engineers with an understanding of electrical sciences. We can only surmise that the ELECTRICAL ENGINEERING CO. of Minneapolis was a new company formed between 1882 and 1895 specializing in the new science of electricity

References: 54



37.1↑ is the lid from the jar, below. The jar is totally un-marked. The carbon graphite lid/electrode combination is embossed: **(arc) ELECTRICAL ENGINEERING CO. / (arc) MINNEAPOLIS / MINN.** Courtesy of **Walt Baumgardt.**



37.2↑



37.3↑

37.2 and **37.3** show the battery jar itself as well as more detail on the cylindrical carbon-graphite electrode.

38 - The EGL Co – Electric Gas Light Co Boston, MA.

The Electric Gas Lighting Co., usually referred to as E.G.L. Co, was formed in the late 1800's, about the time the city of Boston was switching from gas lights to electric lights. It manufactured electrical switches and batteries for telephone systems and gas lighting. In 1906 it changed its name to Electric Goods Manufacturing Company, usually referred to as E.G.M. Co. E.G.M. Co. was a general electrical supplier: battery cut-outs, open-circuit wet batteries (such as the SAMSON), telephones, etc. In 1911 the company left Boston in favor of Canton, MA. In 1917 the company changed its name again, to the Samson Electric CO.



←**38.1** is a round aqua jar, 4.5” diameter x 6” tall with a ground lip and pour spout. The embossing on the front of the jar is: (arc) **DISQUE LECLANCHE / THE EGL Co. / BOSTON MASS.** It has a hard rubber lid, with no embossing. The lid appears original to the jar. From the picture the electrode was threaded and would screw onto the bottom of the lid.

Courtesy of **Walt Baumgardt.**

38.2 and **38.3** give more detail of the lid.



←38.2

38.3→



←**38.4** is an aqua, squared jar with a ground lip. It is 4.5" square x 6.5" tall. There is no pour spout. The jar top is round, 4" diameter. The jar is embossed on three sides: **(Side 1) THE / SAMSON / BATTERY / N^o 2 Side 2) THE / EGL Co. / BOSTON / MASS (Side 3) WATER LINE / WITHOUT ELEMENTS .** The lid, **38.5**, is hard rubber, 3.875" diameter, with fused cylindrical carbon-graphite, fluted, electrodes. The lid embossing is: **(Circle) SAMSON N^o. 2 BATTERY / (arc) PAT. JULY 8, 90. / (arc) PAT. SEPT. 22. 96 / (arc) THE / (arc) E.G.L. CO. / (arc) BOSTON, MASS. (Center Connector) (Circle) MADE IN FRANCE / SAMSON.** In this instance, the lid and

electrodes are original to the jar.
Courtesy of Walt Baumgardt.



←38.5

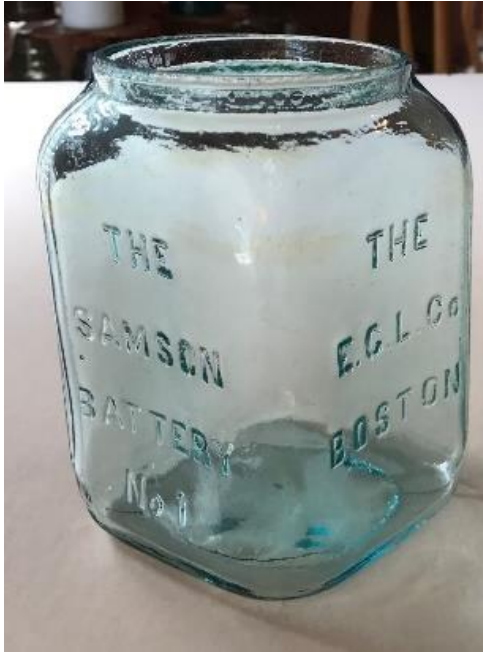
38.6↓

38.7↓



The two batteries above are labelled BEACON batteries from The E.G.L. Co. **38.6** is aqua with ground lip It is 4.75" diameter x 6.25" tall with a 3.75" and pour spout. The paper label reads: **The BEACON BATTERY / use & care instructions / The ELECTRICAL GAS LIGHTING Co. / 195 Devonshire St., Boston, MASS.** The lid is un-embossed and includes a cylindrical electrode. Courtesy of **Debbi Graham**.

38.7 is almost the same size as **38.6**, being 0.25" taller. The paper label reads: **The BEACON BATTERY / care & use instructions / E.G.L. Co. logos / 115 Purchase St., Boston, MASS.** Courtesy Of **Debbi Graham**.



←**38.8** is aqua with a ground lip. It is square with rounded corners. It is 4.5" square x 6" tall with a 3.25" mouth. It is embossed: (side 1) **THE / SAMSON / BATTERY / No. 1** (side 2) **The E.G.L. Co. / Boston** Courtesy of **Debbi Graham**.



←**38.9** is an aqua, cylindrical jar with a ground lip. It is 5" diameter x 6.675" tall. It is embossed: **NO 3 / SAMSON / BATTERY / EGL CO / Boston.**

Courtesy of **Debbi Graham**.



←**38.10** and **38.11** show a **NO 3 / SAMSON BATTERY / EGL CO. / BOSTON** battery jar with a (arc) **GLADSTONE LALANDE BATTERY** lid. It has three patent dates and is the same lid as 40 - 5. **Courtesy of Tommy Bolack**



←**38.11**



←**38.12** is a square, aqua jar with round corners and a ground lip. Its dimensions are 4.75" square x 6" tall with a 3.875" mouth. It is embossed: (side 1) **THE / SAMSON/ BATTERY / No 2** (side 2) **The / EGL CO / Boston / Mass** (Side 3) **water line --- without elements.** Courtesy of **Debbi Graham.**

38.13 shows a **Samson #3** battery jar with **Nosmas** jar. Note that Nosmas is Samson spelled backwards. Is it an engraving error?

38.13↓



←**38.16**

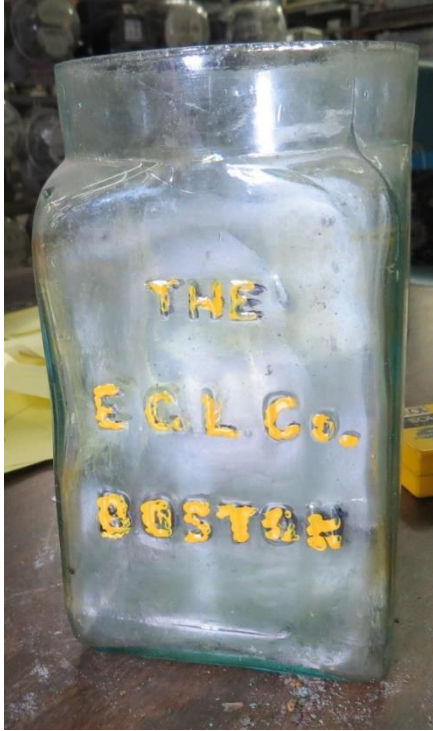


38.18↑ shows the Samson #1, #2 and #3 battery jars side by side. You can see the size difference between them. Likely the larger #3 produced a higher charge. #1 and #3 are embossed **E.G.L.** It is likely #2 is also marked E.G.L.



←**38.19** is embossed **THE / SAMSON / BATTERY / No. 1**. It is 3.5" square x 6" tall. **38.20** shows another side of **38.19**. Courtesy of Tommy Bolack

of



←38.20 is embossed **THE / E.G.L. Co. / BOSTON**. It too is 3.5" square x 6" tall. **Courtesy Tommy Bolack.**



←**38-21** is a SAMSON #3 battery jar, embossed **No 3 / SAMSON / BATTERY / EGL CO. / BOSTON**

38.1 NOSMAS

There are battery jars embossed NOSMAS which is SAMSON spelled backward. In my research I found an ad that showed The E.G. L. Co offering both SAMSON and NOSMAS batteries. I now wonder why if it was an embossing error they would have advertised it. Either, it was not an error, or it was and they decided to embrace it rather than destroy the jars.

The embossing “NOSMAS” is a bit of a mystery. Obviously NOSMAS is SAMSON spelled backward.. Is it an error, meant to be SAMSON? The popular theory has been that these were embossing errors. It may have started as an error, but E.G.M. sold a line of NOSMAS battery jars. Was this intentional or did they decide to sell the errors as a line of battery jars. We may never know for sure. What we do know is that the Classified Directory of Manufacturers shows The Electric Goods Mfg. Co. of Canton, Mass. Offering both SAMSON and NOSMAS jars.



←**38.1.1** and **78.1.2** ↑ is a carbon electrode. It is embossed **MADE IN FRANCE / NOSMAS**. Note: NOSMAS is SAMSON spelled backwards. Courtesy of Tommy Bolack.

Edison Mfg. Co., Orange, N. J.,
"B S C O."
Jonas Battery Co., Toledo, Ohio, (Dry.)
National Carbon Co., Cleveland, Ohio,
"Columbia."
Nungesser Electric Battery Co., 27
King St., Cleveland, Ohio.
Waterbury Battery Co., Waterbury,
Conn., "Excelsior," "Schonemehl."
*Wesco Supply Co., The, St. Louis,
Mo.

BATTERIES, DRY

American Carbon & Battery Co., St.
Louis, Mo., "American" & "Reliance."
American Electric Co., State and 64th
Sts., Chicago, Ill., "X-Cel."
Bunnell & Co., J. H., New York, N. Y.,
"Standard," "Mascot," "Jove."
Electric Goods Mfg. Co., Canton, Mass.
Electric Mfg. Co., St. Paul, Minn.,
(Sealed,) "Emco"
Englewood Carbon Works. Englewood.

**BATTERIES, OPEN CIRCUIT
WET**

American Carbon & Battery Co., St.
Louis, Mo., "Phoenix."
Banks Electric & Mfg. Co., 2862 Web-
ster Ave., New York, N. Y., "Banks."
Burn-Boston Battery & Mfg. Co., Bos-
ton, Mass., "Burn-Boston."
Edison Mfg. Co., Orange, N. J.,
"B S C O."
Electric Goods Mfg. Co., Canton, Mass.,
"Samson," "Nosmas."
Leclanche Battery Co., New York, N.
Y., "Axo" "Gonda."
Manhattan Electrical Supply Co., 17
Park Pl., New York, N. Y.
National Carbon Co., Cleveland, Ohio,
"Klondike," "Duplex."
Waterbury Battery Co., Waterbury,
Conn., "Victor."
*Wesco Supply Co., The, St. Louis,
Mo.

**BATTERIES, STORAGE (FOR IG-
NITION AND OTHER PUR-**

38.1.3[↑] is the article from the Classified Directory of Manufacturers, mentioned earlier.



←**38.1.4** is a round aqua jar, 4.5” diameter x 6” tall with ground top. The top of the jar is round, 3.675” diameter. The jar embossing is: **(Front)** **NOSMAS / E.G.L. CO. / BOSTON / BATTERY** (Note: NOSMAS is **SAMSON** spelled backwards). The lid, **38.1.2**, is 4” diameter x 0.75” thick with cylindrical fused carbon electrodes ; embossed as follows: **(Top) (arc)** **SO. BELL. TEL. & TEL. CO** The lid is not original to the jar.

Courtesy of **Walt Baumgardt**



←**38.1.5**

For Information on Southern Bell see Chapter



←**38.1.6** shows a “NOSMAS” battery jar, embossed: (arc) **NOSMAS / E.G.L. Co. / BOSTON / BATTERY**. The jar is 4.5” diameter x 6” tall with a 3.5” diameter top. It has a ground lip. **Courtesy of Tommy Bolack.**

The lid, **38.1.7** is embossed (arc) **FRANK STEWART / (arc) PHILADELPHIA** (with hidden embossing.) **Courtesy of Tommy Bolack.**

For more information on the Frank Stewart Electric Co. see Chapter 56.

↓**38.1.7**



39 - Electrical Goods Mfg. Co. (E.G.M.)

The Electrical Goods Manufacturing Company is the successor to the Electric Gas Lighting Co. (E.G.L.). E.G.L. was formed about 1883 and in 1906 changed its name to The Electrical Goods Manufacturing Co, remaining at the same address until 1911, when they moved to Canton, MA. In 1917 they changed their name to SAMSON ELECTRIC Co.

References: 59



39.1↑



39.2↑

39.1 shows a jar from the E.G.M. Co. The jar is aqua with a ground lid. It is 5.125" diameter x 6.875" tall. The intact paper label reads: **The / SAMSON / BATTERY / No 3**. The rest of the label lists instructions / **The E.G.M. logos / 144 Pearl St./ Canton, Mass. U.S.A.** Courtesy of **Debbi Graham**.

The lid **39.2**, is embossed: (arc) **SAMSON No. 3 BATTERY / (arc) The E.G.M. Co. Boston Mass / (arc) UD PAT. July 8 '88**. Courtesy of **Debbi Graham**.



←**39.3** is an E.G.M. jar. It is a squared, aqua with a formed lip. Its dimensions are 4.75" square x 6.375" tall, with a 4" diameter mouth. It is embossed on 3 sides:

Side 1: THE / SAMSON / BATTERY / No 2

Side 2: THE / E.G.M. Co / BOSTON / MASS

Side 3: Water Line without elements

Courtesy of **Debbi Graham**.

39.4 through **39.7** (below) show a **Samson # 2 battery jar from E.G.M.** All Four sides are either embossed or have paper labels. Its dimensions are also 4.75" square x 6.375" tall, with a 4" diameter mouth. It, too, is embossed on 3 sides.



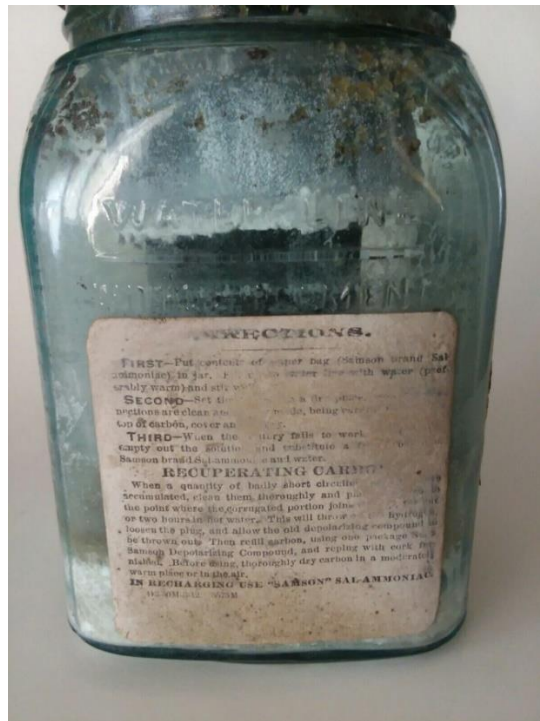
39.4↑



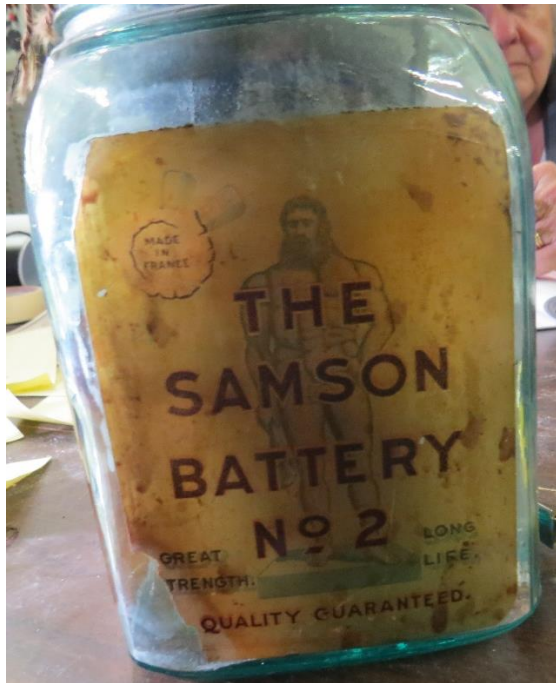
39.5↑



39.↑



39.7



39.8



39.9



39.10



39.11



39.12↑

39.8 through **39.11** show a SAMSON No. 2 battery jar with slightly different dimensions than 21.4 through 21.7. This jar is 4.25" diameter x 6.75" tall with a 3.75" diameter top. There is embossing on 4 sides. Side 1: Paper label with **THE / SAMSON / BATTERY / No. 2**. Side 2: **SAMSON / BATTERY / No. 2**. Side 3: **THE / E.G.M. Co. / BOATON / MASS.** Side 4: **WATER LINE / BATTERY ELEMENTS** / paper label with instructions. The Lid **39.12** is embossed (around 3 sides) **SAMSON NO. 2 BATTERY / (arc) PAT. July 8, '90 / (arc) PAT. SEPT. 22, '96 / (arc) THE / (arc) E.G.L. Co. / (arc) BOSTON, MASS.** Courtesy of Tommy Bolack.

40 - The ELECTRIC STORAGE BATTERY CO (E.S.B. CO., Gloucester, N.J.)

Exide Corporation's predecessor was the **Electric Storage Battery Company**, founded by W.W. Gibbs in 1888. Gibbs purchased the ideas and patents of inventor Clement Payen to make the storage battery a commercial product.

In 1893, the Electric Storage Battery Company was producing chloride accumulators for stabilizing electric grids. Nine years later there were 220 lead chloride accumulator installations in service enabling electric street rail.

In December of 1894, W.W. Gibbs, president of ESB CO, stated that the company had completed the purchase of all patents and patent rights concerning the manufacture and use of electric storage batteries of the General Electric Co., The Edison Co., the Thomas-Huston Co., the Brush, the Accumulator company, the Consolidated Electric Storage Co. and the General Electric Launch Co. Mr. Gibbs assured everyone that this gave the Electric Storage Battery Co. exclusive rights to supply the country with electric storage batteries of the various types previously developed, as well as the protection of every decision rendered by the federal courts in the interpretation of patents of this kind.

In 1898, an Exide battery provided the submerged power for the USS Holland, the U.S. Navy's first submarine. Electric Storage remained a significant supplier of the U.S. Navy's submarine through WWII. Isaac Rice, president of Electric Storage in 1899 was instrumental in founding the Electric Boat Company.

In 1900, the Electric Storage Battery Company developed a product of greater capacity and less weight for electric taxicabs. This battery was the first to bear the name, **Exide**, short for "Excellent Oxide". Exide is a Nickel Cadmium battery:

In 1902, The Electric Storage Battery Co formed Willard Storage Battery Co., when they acquired the battery -making assets of a jewelry manufacturer in Cleveland, OH and incorporated them. By 1950 Willard automotive batteries were outselling Exide automotive batteries although The Electric Storage Battery Co. was larger due to diversification.

It was at this time that Delco approached E.S.B. to develop a battery to complement its new electric starter. This project yielded the first car battery of the modern type and gave Delco the Exide technology.

The members only pages on the NIA web site contains a copy of the 1917 sales catalog of The Electric Storage Battery Co. You are encouraged to look at it, as they offered a complete line of storage batteries and associated equipment. The following page, from that catalog, better describes the extent of their line of batteries and associated equipment. They also had a complete line of Battery (Sand Trays) See Chapter 5 for more details.

References: 61, 62

"Exide" Accumulator

"Chloride Accumulator"

"Tudor Accumulator"

THE ELECTRIC STORAGE BATTERY CO.

[Manufacturer of Storage Batteries for All Classes of Service

Factory, Allegheny Ave. and 19th St., PHILADELPHIA, PA.

BRANCH OFFICES:—PHILADELPHIA, NEW YORK, BOSTON, CHICAGO, ST. LOUIS, CLEVELAND, ATLANTA, DENVER, DETROIT, SAN FRANCISCO, PORTLAND, ORE., LOS ANGELES, SEATTLE, TORONTO

BATTERY DEPOTS:—NEW YORK, BOSTON, CHICAGO, ST. LOUIS, CLEVELAND, ATLANTA, DENVER, SAN FRANCISCO, KANSAS CITY.

PRODUCTS	STORAGE BATTERIES AND AUXILIARIES. THE PLATE is the vital component of the cell, and the <i>type</i> of plate should be determined with reference to the conditions of operation and character of service. The Electric Storage Battery Co. manufactures the following types:
PLATE	TUDOR POSITIVE, } Plante formation, for heavy regulating MANCHESTER POSITIVE, } service and peak work. BOX NEGATIVE for use with Tudor or Manchester positives of large size. SHELF NEGATIVE for use with Tudor or Manchester positives of smaller size. EXIDE POSITIVE AND NEGATIVE, "pasted" type for heavy Stand-by service, and portable cells. IRONCLAD-EXIDE POSITIVE—the most noteworthy advance in the storage battery art in recent years—for Electric Vehicles, Locomotives, Storage Battery Cars, Train Lighting, etc.
PLATE SUPPORTS	In glass jars, plates are supported by plate lugs integral with the grid, resting on the edges of the jar. In lead-lined tanks, the plate lugs rest on vertical sheets of glass. In rubber jars, the plates rest on ribs cast on the bottom of the jar.
SEPARATOR	THE WOOD DIAPHRAGM SEPARATOR, in the smaller stationary cell in glass jars, is supported by slotted dowels, resting on the bottom of the jar. In larger cells in lead-lined tanks the separator is supported by a hard rubber pin passing through the middle dowel near the top and resting on the tops of the adjacent plates, the dowels extending only to the bottom of the plates, leaving the space below free for removing sediment. In portable cells no dowels are used, the wood separators are grooved vertically, and usually a perforated sheet rubber separator is also inserted between the wood separator and the adjacent positive plate.
GLASS JARS	GLASS JARS—Style A for smaller cells, Style B, heavier, for larger cells—high-grade, uniform in quality and dimension, thoroughly annealed, carefully inspected.
WOODEN TANKS	LEAD-LINED WOODEN TANKS—Shell manufactured of specially selected resinous yellow pine, dove-tailed and doweled together without metallic fastenings, bottoms drained and ventilated under lining, protected inside and out, before lining, by two coats of acid resisting composition. Linings of sheet lead, with overlapping seams, lead-burned with hydrogen flame, upper and lower corners reinforced, upper edges carried over clear from the shell and finished with drip points. Lead linings are thoroughly tested before placing in the shells.
CELL SUPPORTS	CELL SUPPORTS—Cells in Style A glass jars are supported on glass sand trays provided with glass feet. Cells in Style B glass jars are supported on wooden sand trays resting on glass petticoat insulators. Cells in lead-lined tanks rest on glass oil insulators, provided with circular trough half-filled with oil, and covered by a lead cap extending down around, but free from the sides, and provided with an internally beaded edge. The oil-insulator rests on a heavy truncated cone of acid proof earthen ware, set on the battery room floor. Perfect insulation under cells in lead-lined tanks is vital to prevent electrolytic leakage and corrosion of tank linings.
ELECTROLYTE AUXILIARIES	ELECTROLYTE, of dilute sulphuric acid, free from injurious impurities, is all tested at The Electric Storage Battery Company's factory before shipment. AUXILIARIES—This company also manufactures switchboards, end cell switches, carbon regulators, average adjusters, automatic cell fillers and other auxiliary apparatus. Write for bulletins describing in detail the application of the "Chloride Accumulator," "Tudor Accumulator" or "Exide" BATTERIES to the service in which you are interested, also suggestions for Battery Room Construction, etc.

See Chapter for known E.S.B. battery (sand) trays.

The information on the next three pages is extracted from the 1917 catalog of ESB CO., which was mentioned earlier. The dimensions were provided by Nick Bergkessel. There are also glass trays for the Exide Accumulator and Hyray-Exide Battery. The same page also includes a

complete line of wood sand trays for Chloride and Tudor Accumulators; types BT, CT, PT, ET and H cells.

**Glass (Sand) Trays for the
Chloride and Tudor Accumulators**

<u>Type</u>	<u>Dimensions (in.)</u>	<u>Catalog #</u>
C-3	3 ½ x 5 ¼	9250
C-5	4 ¼ x 5 ¼	9250
C-7	5 ¼ x 5 ¼	9250
D-3	3 7/8 x 7 3/8	9254
D-5	5 3/8 x 7 3/8	9254
D-9	8 ¼ x 7 3/8	9256
D-11	9 ½ x 7 3/8	9256
D-13	11 x 7 3/8	9258
E-5	5 7/8 x 9 1/8	9259
E-7	6 ¾ x 9 1/8	9260
E-9	8 ¼ x 9 1/8	9260
E-11	9 ½ x 9 1/8	9262
E-13	11 x 9 1/8	9262
E-15	12 ¼ x 9 1/8	9269
F-9	8 ½ x 12 3/8	9265
F-11	9 ¾ x 12 3/8	9265
F-13	11x 12 3/8	9265
F-15	15 ½ x 12 3/8	9268

For information on known ESB battery trays, please see Chapter 4, page 33 - 36.

Electric Storage Batteries from ESB CO.

Glass and Rubber

<u>Type</u>	<u># Plates</u>	<u>Glass</u>	<u>Rubber</u>	<u>Dimensions (O.D. in, L,W,H)</u>	<u>Cat. #</u>
B	3	XX		2 ½ x 4 x 4 ½	248
	3	XX		2 ½ x 4 x 5 ½	251
	3	XX		2 ½ x 4 x 6 ½	252
B	3	XX		1 ¾ x 3 11/16 x 5 1/16	249
C	3	XX		3 ¼ x 5 ¼ x 7 1/8	259
	5	XX		4 ¼ x 5 ¼ x 7 1/8	322
	7	XX		5 ¼ x 4 ¼ x 7 1/8	325
C	3	XX		1 ¾ x 4 ½ x 7	260
	5	XX		2 ¾ x 4 7/16 x 7	323
	7	XX		3 ¾ x 4 7/16 x 7	326
D	3	XX		3 7/8 x 7 3/8 x 10 ¾	273
	5	XX		5 3/8 x 7 3/8 x 10 ¼	275
	7	XX		6 ¾ x 7 3/8 x 10 ¼	277
	9	XX		8 ¼ x 7 3/8 x 10 ¼	279
	11	XX		9 ½ x 7 3/8 x 10 ¼	281
	13	XX		11 x 7 3/8 x 10 ¼	283
D	3	XX		1 ¾ x 6 7/16 x 9	433
	5	XX		2 ¼ x 6 7/16 x 9	436
	7	XX		3 13/16 x 6 7/16 x 9	445
	9	XX		5 x 6 ½ x 9	472
	11	XX		6 3/16 x 6 7/17 x 9	476
	13	XX		7 ¼ x 6 ½ x 9	479
E	5	XX		5 3/8 x 9 1/8 x 12 ¾	345
	7	XX		6 ¾ x 9 1/8 x 12 ¾	347
	9	XX		8 ¼ x 9 1/6 x 12 ¾	349
	11	XX		9 ½ x 9 1/8 x 12 ¾	351
	13	XX		11 x 9 1/8 x 12 ¾	353
	15	XX		12 ¼ x 9 1/8 x 12 ¾	355

Electric Storage Batteries from ESB CO.

Glass and Rubber (cont'd)

<u>Type</u>	<u># Plates</u>	<u>Glass</u>	<u>Rubber</u>	<u>Dimensions</u> (<u>O.D. in, L,W,H</u>)	<u>Cat. #</u>
E	5		XX	2 13/16 x 8 1/2 x 11	494
	7		XX	3 7/8 x 8 1/2 x 11	495
	9		XX	5 x 8 1/2 x 11	496
	11		XX	6 1/8 x 8 1/2 x 11	497
	13		XX	8 7/16 x 8 1/2 x 11	498
	15		XX	8 1/2 x 8 1/2 x 11	499
F(A)*	9	XX		8 1/2 x 12 3/4 x 17	582
F(A)*	11	XX		9 3/4 x 12 3/4 x 17	583
F(A)*	13	XX		11 x 12 3/4 x 17	584
F(A)*	15	XX		12 3/8 x 12 3/4 x 17	595
• F(B)*	13	XX		13 5/8 X 12 3/8 X 18	589
F(B)*	17	XX		16 3/4 x 12 5/8 x 18	591
F(B*)	21	XX		20 3/4 x 12 5/8 x 18	593

-
- The letter in () is the battery style. Eg., Type F, Style A.
-

LEAD LINED WOOD TANKS

9	13 7/8 x 15 x 20 1/4	690
11	15 7/8 x 15 x 20 1/4	691
13	16 3/4 x 15 x 20 1/4	692
15	18 3/8 x 15 x 20 1/4	693
17	20 X 15 x 20 1/4	694
19	21 3/4 x 15 x 20 1/4	695
21	23 3/4 x 15 x 20 1/4	696
23	25 x 15 x 20 1/4	697
25	26 5/8 x 15 x 20 1/4	698
27	8 3/8 x 15 x 20 1/4	699

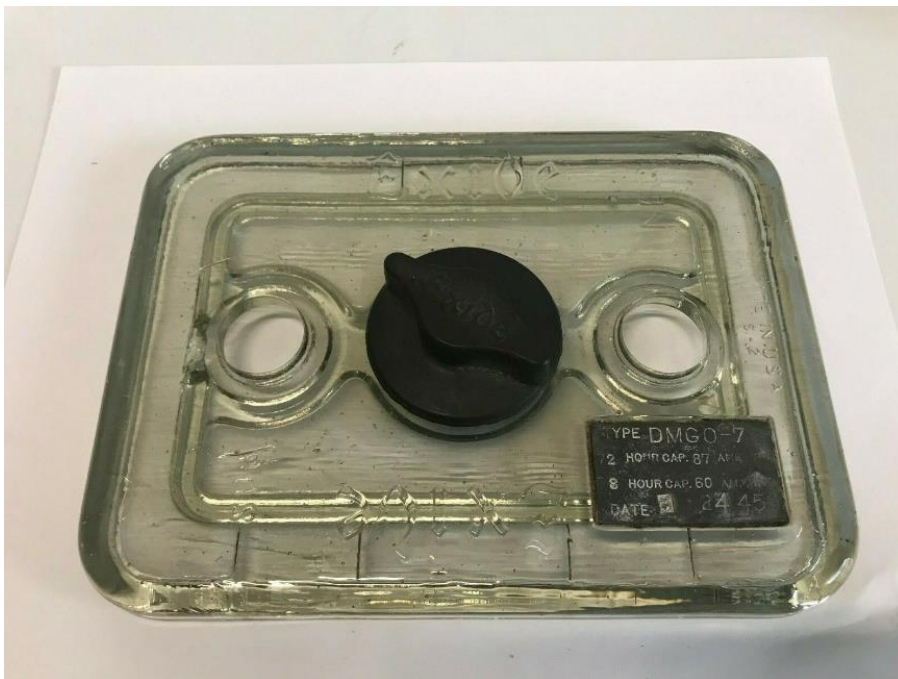
Following is actual equipment from the ESB Co. :



←**40.1**, is an Exide battery jar, also courtesy of **Walt Baumgardt**. It is Blue Aqua with dimensions of 2.5" x 8.75" x 11.75" tall. It is Embossed Front and Rear: **(near top) WATER LINE / (Middle of jar) EXIDE.**



←**40.2** is an Exide battery jar in clear glass. The front is embossed **EXIDE / Exide / Manchex**. The rear is embossed **EXIDE**. The Lid, **40.4**, is embossed **EXIDE (front and rear) with Patented on the right**. The dimensions are 5" x 7" x 12" tall. The name plate identifies it as **Type DMGO7**, with a 1945 date.

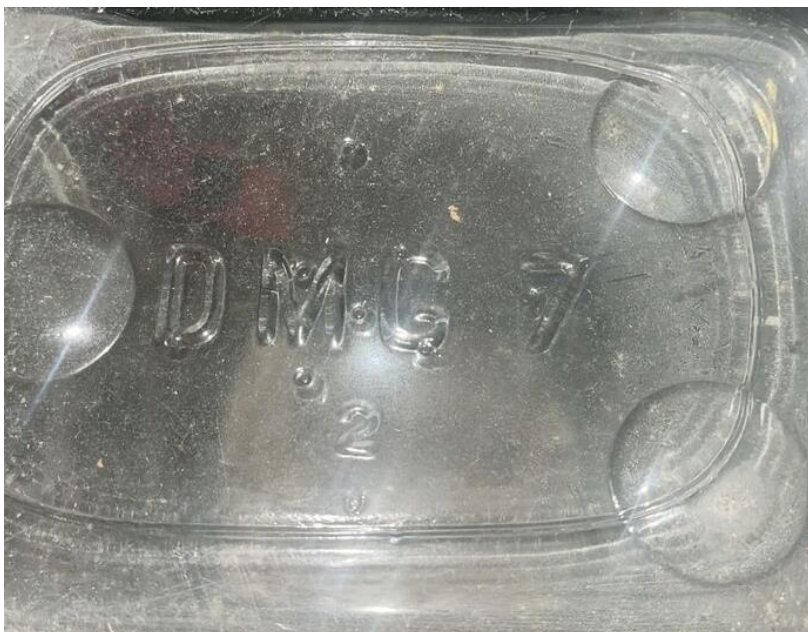


←**40.3**



←**40.4** and **40.5** show a **DMG – 7** battery jar as opposed to **DMG -07** of **40.3**. There is no **WATER LINE** embossing and **EXIDE / MADE IN U.S.A.** appears on the front and back. The dimensions are the same as 40.3, 5” x 7” x 12” tall.

This just demonstrates the different embossings that can be found for the same battery jar. You will see this a lot as you go through this book.



←**40.5**



←**40.6** is another EXIDE battery jar. The lid, **40.7** is also embossed **EXIDE**. The name plate identifies it as **Type EOS 9**, dated April 29, 1943. Its dimensions are 6" x 11" x 15" tall.

If it seems a little strange that battery jars were still being used in the 1940s, consider the data from the Introduction and from Chapter 4. Just prior to WWII, 50% of rural America did not have electricity, which was up from the 10% of rural America, that had electricity in 1930. In 1935 the Government started the Rural Electric Administration. Significant progress had been made. This explains why during the 1940s and into the 1950s, battery jars were the only source of power for a significant part of the U.S.



←**40.7**



40.8↑ is a wooden shipping crate for Exide batteries. I'm not sure of the dimensions, but it appears it would hold 3 or 4 batteries, depending on the size. Courtesy of **Wayne Dudzinski**.

40.9 through **40.14**, below, are pictures of a Charge Control Unit offered by the Electric Storage Battery Co. They are also known as charge controllers, charge regulators or battery regulators. They were used on secondary batteries to protect against electrical overload, and or overcharging. This prevented conditions that would reduce battery performance, or lifespan or that may cause a safety issue.



40.9↑



40.10↑



40.11↑



40.12↑



40.13↑



40.14↑

The paper label on the unit reads: **EXIDE Two Rate Charge / Control Unit. Electric Storage Battery Co. The jar itself, manufactured by Corning, is embossed (arc) T.M. REG. / PYREX / (arc) U.S. PATENT.** This further reinforces the point that battery jars, themselves, were manufactured by glass houses for the various electrical companies. (Also see Chapter 60.)



←**40.15** is an Exide battery jar. The dimensions are 7.25" x 7.5" x 10.25". It has a formed lip, with clear glass. It is embossed with high and low liquid levels on four sides. On opposing sides, it is embossed **EXIDE / Made in U.S.A.** The base is embossed **12260**.

The Ectured below and right (40.16 through 40.18) is clear, with dimensions of 4" x 10" x 14.75" tall. It is embossed **EXIDE / MADE IN U.S.A. on the two opposing 10" sides**. Although a line is there, it has no **WATER LINE** embossing. The bottom is embossed **25576 / 3**.



40.16→



40.17↑



40.18↑

40.19↓



40.20↓



The jar shown to the left (40.19 & 40.20) is embossed **Liquid Level / EXIDE / Made in U.S.A.** On the bottom, it is embossed **KXH 13**. This is the first we've seen the KXH designation, and I could find no information on its significance. The dimensions are 6.5" x 7.5" x 10.5" tall. **Courtesy of Tommy Bolack**>.



40.21↑ is a 6-cell Exide Battery. Each cell is embossed **EXIDE / MADE IN U.S.A.** and is 2" x 4" x 7" tall with a ground lip. There is no indication of its use. **Courtesy of Tommy Bolack.**



40.22↑

40.22 and 40.23 are embossed **EXIDE** / **MADE IN U.S.A.** on opposing sides. Note the absence of any water line marking.

40.23↓





←40.24 and 40.25 is an Exide battery, unique because of its size, and, to some extent color. You don't see a dark green jar very often. Its dimensions are 3.75" x 1.75" x 7.5" tall. It is embossed EXIDE / Made in U.S.A. on front and back.

40.25↓





40.26↑ is a 5 cell EXIDE battery jar. It is light aqua with overall dimensions of 4" x 7.5" x 5" tall. Each cell is 1.5" x 4" x 5" tall. It is embossed on the front: (-) **ACID LEVEL** (+) / **EXIDE** / **BATTERY / TYPE WT 10 VOLTS** . The rear embossing (40.27) is embossed: (+) **ACID LEVEL** (-) / **FILL TO ACID LEVEL LINE WITH / SULPHURIC ACID 1.125 SP. GR. / MAINTAIN LEVEL WITH DISTILLED WATER / CHARGE AT ½ AMPERE.**

It appears from tar like residue around the top that the lid had been sealed.



←40.27



←40.28 is an EXIDE battery jar with dimensions of 4.5" x 9.5: x 15". It is embossed **EXIDE / MADE IN U.S.A.** on the front and rear.



←**40.29** is another EXIDE jar with dimensions of 2" x 6" x 9" tall. The **EXIDE** embossing is very faint.

40.30↓

40.31↓



The thin jar shown in **40.30** and **40.31** is merely embossed **EXIDE**. Its dimensions are 2.5" x 7.5" x 10" tall.



←40.32



←40.33

40.32 ad 40.33 is five Exide battery in a box. The jars are identical to 40.31. It is apparent it was offered as a multi-cell unit. The name plate on the side of te box reads: EXIDE / BATTERY / Type 5-BTMP3 / Sq. in. 25000 / POS. 26140 / ELECTRIC STORAGE BATTERY CO. / PHILADELPHIA. It was likely an automotive battery.



←**40.32** is embossed **EXIDE / MADE IN U.S.A.** near the bottom of the front. The bottom has a number, 25578. The dimensions are 7.5" x 10" x 14./75" tall.



←**40.33**



←**40.34**

40.33 and **40.34** is an EXIDE jar, per the **EXIDE** emb4ssed on the lid and on 2 sides. The jar is also embossed **18628 / EMGO 11** on the base. It is a large jar with dimensions of 10" x 10.5" x 15.5" tall, including the lid. Note the absence of WATER LINE. **Courtesy of Tommy Bolack.**



40.35↑ is Embossed **EXIDE / Made In U.S.A.** on 2 sides. There is a line at the top signifying the Water Line, but no **WATER LINE** embossing. The dimensions are 9" x 10" x 15" tall. **Courtesy of Tommy Bolack.**



←**40.36** is an **EXIDE** jar with 8 sets of electrodes. It has a line signifying Water Line on 4 sides and **EXIDE** on the lid. The dimensions are 8" x 8.5" x 12" tall; 13" including the lid. **Courtesy of Tommy Bolack.**



←**40.37** is an EXIDE jar, embossed **EXIDE / MADE IN U.S.A.** on 2 sides. Like the previous jars there is a line but no Water Line embossing on 4 sides. The bottom is embossed **EMGO 13**. The dimensions are 10" x 10.5" x 15" tall. **Courtesy of Tommy Bolack.**

Note the dimensions are the same as **40.35** and, yet the designation is different. I can only conclude that the designations **EMGO 11** and **EMGO 13** have nothing to do with the dimensions of the jar.



←**40.38** is an Exide jar embossed **EXIDE / MADE IN U.S.A.** on 2 sides and **PYREX / REG. U.S. P:AT. OFF.** On a third side. This is the first indication we've had that CORNING made battery jars for EXIDE. The dimensions are 10" x 12" x 15", including the lid. The jar itself is 14.5" tall. **Courtesy of Tommy Bolack.**



Except for the dimensions, ←**40.39** is the same jar as **40.37**. The embossing is the same. The dimensions, however, are 10" x 10" x 15" tall. **Courtesy of Tommy Bolack.**



← **40.40** is embossed **KXG - 13** on the bottom, which makes it an **EXIDE** battery jar, even though the name **EXIDE** doesn't appear. It is embossed **WATER LINE** on 4 sides and **MADE IN U.S.A.** on two opposing sides. The dimensions are 6.5" x 7.5" x 10" tall; 11" including the lid. **Courtesy of Tommy Bolack.**



←**40.41** and **40.42**↑ show a narrow Exide jar with lid. It is embossed **WATER LINE / EXIDE** on two sides. The dimensions are 2.5" x 9.25" x 11.5" tall.

Courtesy of Tommy Bolack



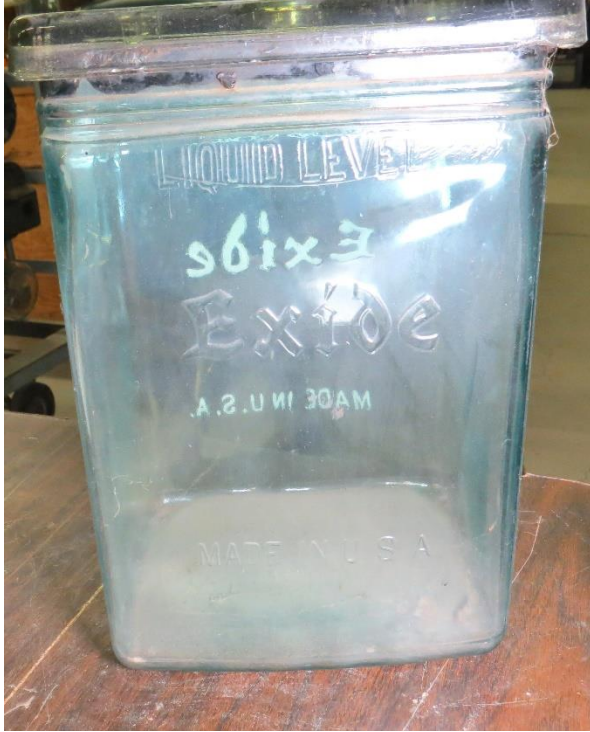
←**40.43** is an **EXIDE** radio battery in light lavender (purple). The dimensions are 2.25" diameter x 6" tall.
Courtesy of Tommy Bolack.



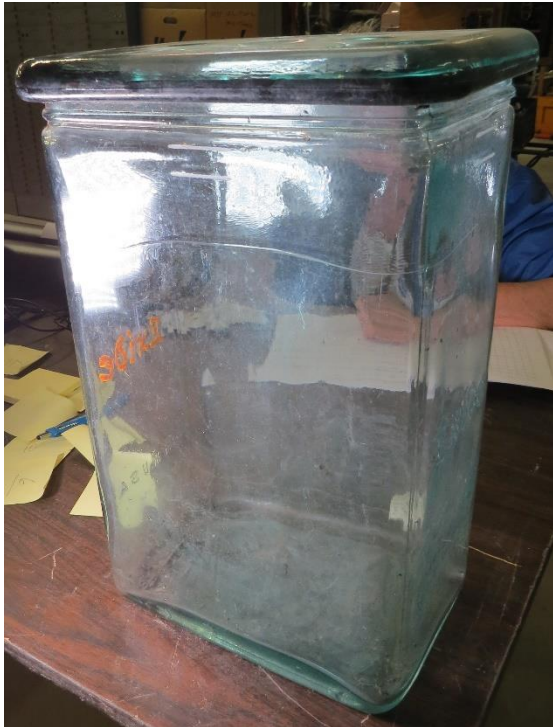
←**40.44** is a tall Exide battery jar. It is embossed **EXIDE / MADE IN U.S.A.** on two opposing sides. There is a Water Line but no embossing to indicate it. The dimensions are 9.75" x 13" x 19" tall. It has a ground lip. **Courtesy of Tommy Bolack.**



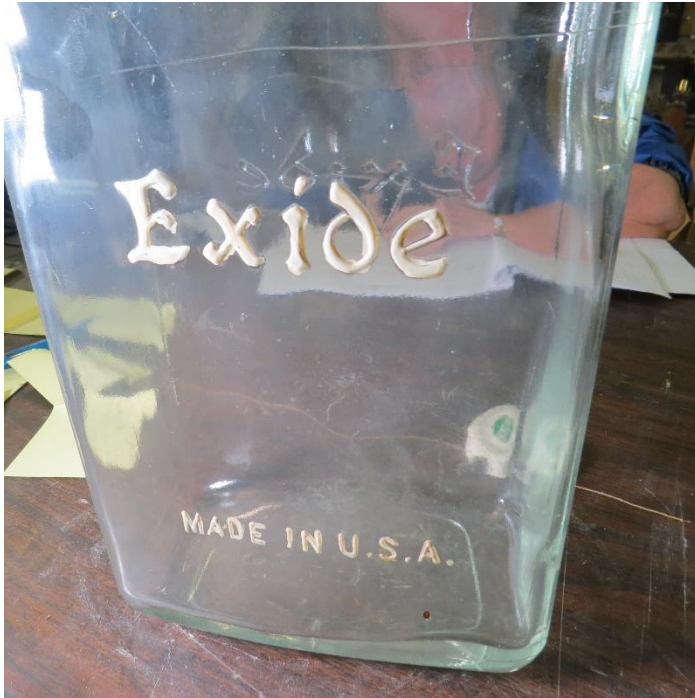
←**40.45** is embossed EXIDE on two opposing sides. The dimensions are 6" x 8" x 10"; 11" including the lid. **Courtesy of Tommy Bolack.**



←**40.46** is embossed **Liquid Level** on 4 sides and **EXIDE / MADE IN U.S.A** on 2 opposing sides. The dimensions are 5" x 8" x 11" tall; 12" including the lid. It is embossed **DMG 3 – 5** on the bottom. **Courtesy of Tommy Bolack.**



←**40.47** is embossed **EXIDE / MADE IN U.S.A.** on opposing sides. It is embossed **EMGO-7** on the base. The dimensions are 7" x 10" x 14.5" tall; 15.75" with the lid. **Courtesy of Tommy Bolack.**



←**40.48** is embossed **Exide / MADE IN U.S.A** on two opposing sides. It is embossed **DMG 3-5** on the bottom. The dimensions are 4.75" x 8" x 11" tall; 12" including the lid. **Courtesy of Tommy Bolack.**



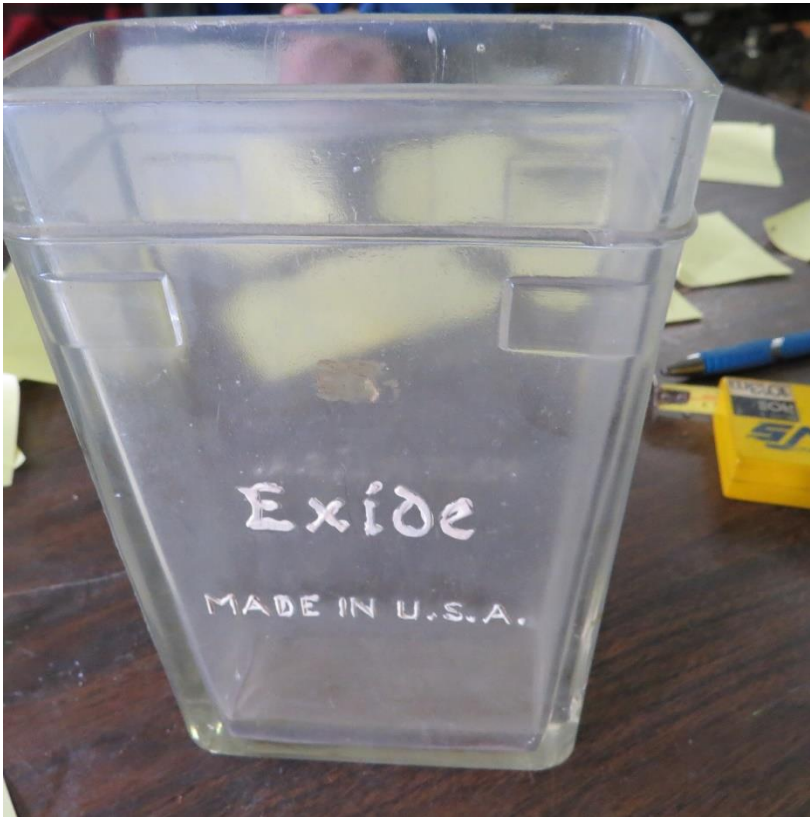
←**40.49** is embossed **EXIDE** on opposite sides. Dimensions are 2" x 6" x 10" tall. **Curtesy of Tommy Bolack.**



←**40.50** is embossed **WATER LINE** on 4 sides, with **EXIDE** on 2 opposing sides. There is no Made in U.S. The bottom is embossed KXH 7. The dimensions are 4" x 7.5" x 10.75" tall. **Courtesy of Tommy Bolack.**



←**40.51** is an unembossed jar with an **EXIDE** lid. Their dimensions are 6.25" x 6.75" x 6.25" tall. **Courtesy of Tommy Bolack.**



←**40.52** is embossed EXIDE / Made In U.S.A. on opposing sides. The dimensions are 1.75" X 4" x 6.65" tall. **Courtesy of Tommy Bolack.**



←**40.53** is embossed EXIDE / Made In U.S.A. on opposing sides. Dimensions are 5" x 9.75" x 14.75" tall. **Courtesy of Tommy Bolack.**



←**40.54** is embossed EXIDE on opposing sides, with BMGKX5 on the bottom. Dimensions are 4.125 x 7.25 x 11.75" tall.

Courtesy of Tommy Bolack.



←**40.55** is not a battery jar at all, but rather an automatic water fill unit to maintain the liquid level in the batteries. It is a quart size; 5.5" diameter x 3.5" high. The neck is 1.75" diameter x 1.5" high. Aqua in color it is embossed: **(F- Readable UD) PILOT CELL AUTOMATIC / WATER FILLER / STYLE A - ONE QUART / To Refill - Invert bottle and / Unscrew Goose Neck at Sleeve / THE ELECTRIC STORAGE BATTERY CO.** This is the courtesy of **W. Baumgardt**, who acquired it from **Phil Mayhew**.



←**40.56** appears to be a 2 GAL version of an Automatic Water Fill jug. It is embossed (arc) ESBCO / (arc) 2 GAL. A larger version of 40. Courtesy of Tommy Bolack.



←40-57 is merely embossed EXIDE / Made In U.S.A. on opposite sides. It is embossed KXH 7 on the bottom. The dimensions are 4" x 7.5" x 10.5" tall.



40.58↑



40.59↑

40.60↓



36.21 through 36.23 show a green battery jar embossed **EXIDE / MADE IN U.S.A.** on opposite sides. It is an unusual size at 1.75" x 3.75" x 7.5" tall. It has a formed lip.



40.61↑



40.62↑

The Exide jar shown above (**36.36 & 36.37**) is manufactured by the Edison Manufacturing CO., as shown on the bottom. Its dimensions are 9" x 6" x 13.5" tall. It is embossed **EXIDE / MADE IN U.S.A.** on the two opposing short sides. It is embossed **WATER LINE** on 4 sides. The bottom is embossed **EMC-9**.

40.63 and 40.64 (below) is a small battery jar, simply embossed **EXIDE**. Its dimensions are 4" x 1.75" x 7.75" tall. There is no base embossing.



40.63↑



40.64↑



←**40.65** is merely embossed **EXIDE / MADE\$ IN U.S.A.** on one side. The dimensions are 7.5" x 10" x 14.75" tall. There are two lines embossed near the top on all four sides to denote High and low water levels.

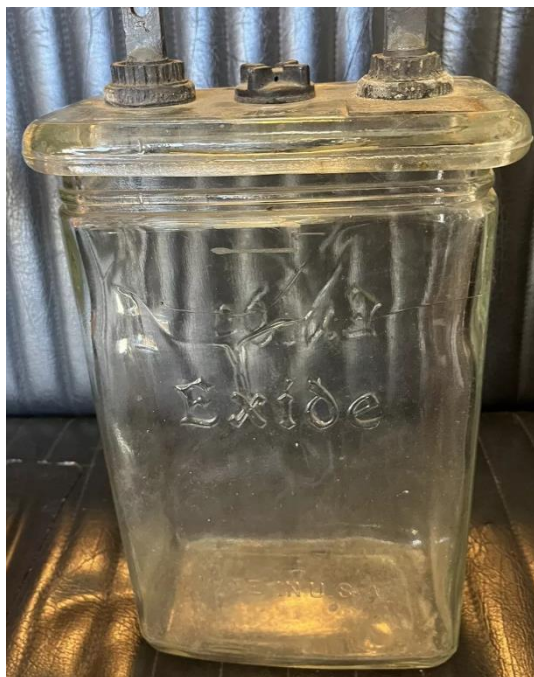


←**40.66** has dimensions of 5.5" x 7.5" x 12" tall. It is embossed **EXIDE / MADE IN U.S.A.** on two. opposing sides



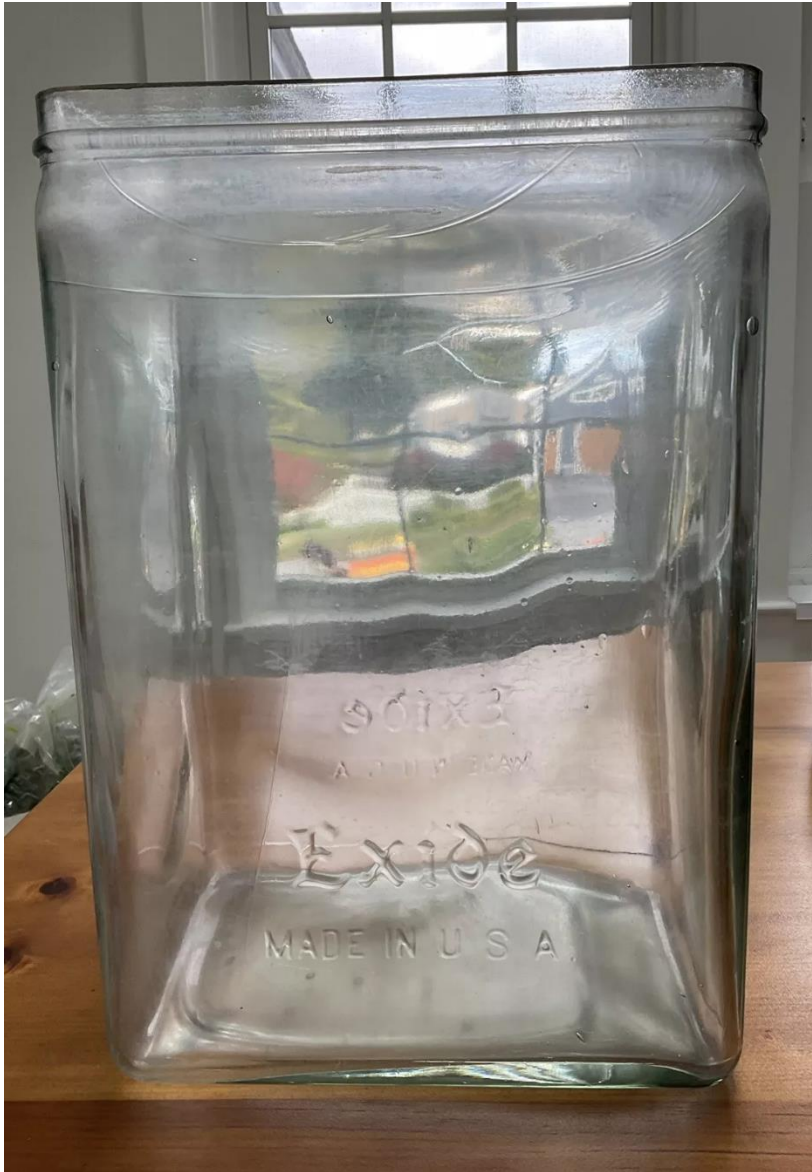
40.67→

40.67 is merely embossed **EXIDE** on one side The dimensions are 2.5" x 7.5" x 10" tall



40.68 is embossed **EXIDE** on opposite sides / **MADE IN U.S.A.** The dimensions are 4.5" x 8" x 14" tall.

I have attempted to make some sense out of the numbers on the bottom of some ESB battery jars. After listing them all (below) I'm not sure there is a correlation.



←40.69

40.69 is embossed EXIDE / MADE IN U.S.A. on opposite sides. The dimensions are 7" x 10" x 15" tall.

Again, I have attempted to correlate battery code with dimensions. , to no avail.

<u>Bottom Code</u>	<u>Dimensions (in.)</u>
DMG 3	5 x 8 x 11
DMG 07	5 X 7 X 12
KXH 7	4 x 7.5 x 10.5
EMG 7	7 x 10 x 14.5
EOS 9	6 x 11 x 15
EMC 9	6 x 9 x 13.5
EMGO 11	10 x 10.5 x 15.5
KXH 13	6.5 x 7.5 x 10.5
EMGO 13	10 x 10.5 x 15
KXG 13	6.5 x 7.5 x 10
No Code	1.75 x 4 x 7.5
No Code	7.5 x 10 x 14.75
No Code	5.5 x 7.5 x 12
No Code	2.5 x 7.6 x 10
No Code	7 x 10 x 15

41 Fansteel Products Co.

With the many electric devices that became available with the advent of electricity via battery jars, came a need to ensure the batteries maintained their charge. We are likely talking smaller electrical items such as radios. I found one such Trickle charger and online research revealed a second, with pictures. The companies are Eagle Charger Corp of Philadelphia and Fansteel Products Co. of N. Chicago, IL. Fansteel products were under the trade name "BALKITE". Both date from the early 1920s and appear to be very similar.

Radio sets in the 1920s had tubes and, so, most required two different batteries, Type A and Type B. A few required Types A, B and C. Type A batteries were low voltage and merely heated the filaments in the tubes. Type B batteries were higher voltage supplying power to the rest of the radio. Voltage on Type B batteries ran up to 90 volts or higher.

Some of the units simply trickle charged the Type A and B batteries, while others replaced the A and B batteries.

Fansteel Products Co. started as Pfanstiehl Electrical Laboratory in 1907. In 1918 it became the Fansteel Products Co, and in 1935 it became the Fansteel Metallurgical Corp. During the 1920s sales of radio battery chargers pushed annual revenues past \$5 million. As far as I know it is still in operation in the Chicago area.

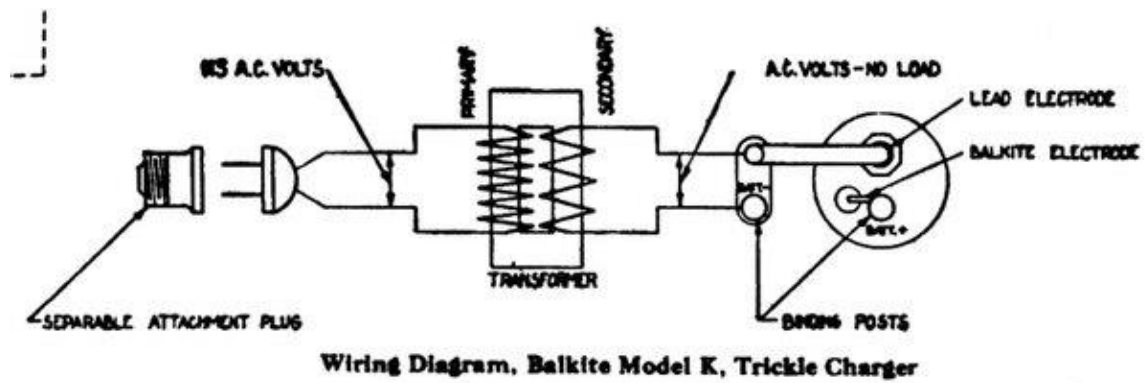
Radio advertising from the time identify Majestic "B" battery eliminator by Grigsby-Grunow-Hinds of Chicago and The "Kingston" B battery eliminator by The Kokomo Electric Co. of Kokomo, IN. of also offering similar service. This information is from Radio Merchandising Magazine, April, 1927.



←**41.1** and **41.2** show the Fansteel “Balkite” trickle charger (Model K). The label shows a patent date of May 27, 1924.

↓**40.2**





41.3↑ is a schematic diagram illustrating the proper connections of the Model K Trickle Charger.

41.4↓



41.5↓



Fansteel also made rectifier cells, one of which is shown in **41.4** and **41.5**. The jar is aqua with dimensions of 2.375" diameter x 3.25" tall. It has a formed lip and a screw on lid. The jar is embossed HIGH / LOW on both front and back. On the base is <I>. The lid, **41.5**, is embossed: **FANSTEEL / BALKITE / RECTIFIER CELL / Type C-5 / Pat in U.S.A. / May 27, 1924 / Made in U.S.A.** In an arc around half of lid: **FANSTEEL PRODUCTS CO. INC. NORTH CHICAGO, ILL.** Courtesy of **Debbi Graham**.

Rectifier cells, powered by an AC power line in association with a capacitor were used as a substitute for Type B batteries in the 1920s and early 1930s.



←**41.6** is a Balkite battery jar in clear glass with dimensions of 4.5" x 8" x 9.75" tall, 10.25" with the lid. The jar is embossed **HIGH ELECTROLYTE LEVEL / BALKITE / LOW ELECTROLYTE LEVEL** . Courtesy of **Tommy Bolack**.



41.7 is the lid for **41.6**. It is embossed PAT. NOS. 164387(?) 680210 1124065 / BALKKITE , ELECTROLYTIC RECTIFIER CELL / MADE IN U.S.A. MANUFACTURED By / FANSTEEL METALLURGICAL CORPORATION N. CHICAGO, ILL. Courtesy of Tommy Bolack.

Figures **41.8** shows the line-up of Fansteel “Balkite” charging units. **41.9** shows “Balkite” trickle chargers and two units that will replace the Type A and Type B batteries completely. The Model K trickle charger is the second unit from the top.

Balkite has pioneered but not at the expense of the public or the radio trade



Balkite "AB" Contains no battery. A complete unit, replacing both "A" and "B" batteries and supplying "A" and "B" current directly from the light socket. Operates only while the set is in use. Two models: "AB" 6-135, * 135 volts "B" current, \$59.50. "AB" 6-180, 180 volts "B" current, \$67.50.



Balkite "A" Contains no battery. The same as Balkite "AB" above, but for the "A" circuit only. Will serve wherever 6-volt "A" batteries are now in use. Not a battery and charger but a perfected light socket "A" power supply. Price \$32.50.



Balkite "B" Has the longest life in radio. The accepted tried and proved light socket "B" power supply. 300,000 in use. The first Balkite "B," 5 years old, is still in service. Three models: "B" W, 67-90 volts, \$22.50; "B" 135, * 135 volts, \$32.50. "B" 180, 180-volts, \$39.50. Balkite now costs no more than the ordinary "B" eliminator.



Balkite Chargers Standard for "A" batteries. The standard charger for radio "A" batteries. Noiseless. Can be used during reception. Prices drastically reduced. Model "J,"* rates 2.5 and 5 amperes, for both rapid and trickle charging, \$17.50. Model "N"* Trickle Charger, rate .5 and .8 amperes, \$9.50. Model "K" Trickle Charger, the most popular of all chargers, \$7.50.

*Special Model for 25-30 cycles at slightly higher prices. Prices are slightly higher West of the Rockies and in Canada.

First noiseless battery charging. Then successful light socket "B" power. Then trickle charging. And today, most important of all, Balkite "AB," replacing both "A" and "B" batteries and supplying radio power from the light socket. The great improvements in radio power have been made by Balkite.

This pioneering has been important. Yet alone it would never have made Balkite one of the best known names in radio—nor have made Balkite the leader in the radio power field.

Balkite has become the leader because over a period of years Balkite performance at the hands of its owners is unequalled in radio. Because with 2,000,000 units in the field Balkite has a record of freedom from trouble seldom equalled even in the oldest and most soundly established industries. Because Balkite Radio Power Units last longer than any other devices in radio. Because Balkite is today synonymous with quality.

Balkite has pioneered. But not at the expense of the public, nor of the radio trade. Balkite owners have been satisfied owners; Balkite dealers have

always made money. No Balkite product has ever failed to be a best seller.

The famous Balkite electrolytic principle

Balkite success has been based on the Balkite principle of electrolytic rectification. This principle is so reliable that it is today standard on the signal systems of most American as well as European and Oriental railroads. It is this principle that accounts for Balkite long-life, that makes Balkite radio power units permanent pieces of equipment.

Don't gamble with untried devices

Time was when one radio device looked as good as another. Today there is no longer any need for gambling with your own or your customer's money—you need no longer sell experiments. Balkite—the tried and reliable—offers you a complete line, to serve all requirements, at the lowest prices in Balkite history, backed by one of the largest advertising campaigns in radio. Concentrate on Balkite and make money.

FANSTEEL PRODUCTS CO., Inc., NORTH CHICAGO, ILL.

Balkite Radio Power Units



The New Balkite Charger
MODEL J. Has a low trickle charge rate and a high rate for rapid charging and heavy duty use. Can thus be used either as a trickle or as a high rate charger and combines their advantages. Noiseless. Large water capacity. Visible electrolyte level. Rates: with 6-volt battery, 2.5 and .5 amperes; with 4-volt battery, .8 and .2 amperes. Special model for 25-40 cycles. Price \$19.50. West of Rockies \$20. (In Canada \$27.50.)



Balkite Trickle Charger
MODEL K. With 6-volt "A" batteries can be left on continuous or trickle charge thus automatically keeping the battery at full power. Converts the "A" battery into a light socket "A" power supply. With 6-volt batteries can be used as an intermittent charger. Or as a trickle charger if a resistance is added. Charging rate about .5 ampere. Over 200,000 in use. Price \$10. West of Rockies \$10.50. (In Canada \$15.)



A New Balkite "B" at \$27.50
 Balkite "B" eliminates "B" batteries and supplies "B" current from the light socket. Noiseless. Permanent. Employs no tubes and requires no rechargers. Three new models. The new popular priced Balkite "B"-W at \$27.50 for sets of 5 tubes or less requiring 67 to 90 volts. Balkite "B"-X, for sets of 8 tubes or less; capacity 30 milliamperes at 135 volts—\$42. Balkite "B"-Y, for any radio set; capacity 40 milliamperes at 150 volts—\$69. (In Canada "B"-W \$39, "B"-X \$59.50, "B"-Y \$96.)



Balkite Combination
 Supplies automatic power to both "A" and "B" circuits. Controlled by the filament switch on the set. Entirely automatic in operation. Can be put either near the set or in a remote location. Will serve any set now using either 4 or 6-volt "A" batteries and requiring not more than 30 milliamperes at 135 volts of "B" current—practically all sets of up to 8 tubes. Price \$59.50. (In Canada \$83.)

All Balkite Radio Power Units operate from 110-120 volts AC current with models for both 60 and 50 cycles. The new Balkite Charger is also made in a special model for 25-40 cycles.

No Balkite product has ever failed to be a best seller

The public is through with experiments, even in radio. It is turning as never before to standard nationally advertised lines which have proved themselves.

In the radio power field the standard line is Balkite. For no Balkite product has ever been offered to the public which has not been an outstanding success. No Balkite product has ever been put on the market which has not resulted in enormous volume and steady profit for both the radio dealer and jobber. The faith of the public in Balkite reliability and the Balkite trade mark is one of the finest tributes ever paid a manufacturer.

Balkite dominates the radio power field as never before. The Balkite Trickle Charger is easily the most popular charger on the market. Balkite "B" stands alone in a field only too crowded with experiments, as the "B" that has stood the test of time. The new Balkite Charger with both trickle and high charging rates, and the new Balkite Combination supplying all radio power automatically from the light socket, are selling faster than any new items ever introduced by Balkite. Balkite is backed by Balkite broadcasting and by one of the most powerful advertising campaigns in radio. These factors make Balkite one of the three or four best selling lines in radio today.

This is the greatest of all seasons for radio power devices. Make sure you get the maximum profit out of it by selling a line you know will stay sold, on which you know your profit will be clean. Turn it into the maximum profit by pushing Balkite.

FANSTEEL PRODUCTS COMPANY, Inc.
 North Chicago, Illinois

FANSTEEL
Balkite
 Radio Power Units



41.10↑ is a Balkite wet cell battery. The only embossing I can read is **BALKITE**. Its dimensions appear to be about 6" x 8" x 12" tall. **Courtesy of Tommy Bolack**



←**41.11** is similar to 41.6 with the embossing: **High Electrolyte Level / Low Electrolyte Level / FANSTEEL / BALKITE**. It's dimensions, however, are: 7" x 7.5" x 10" tall. **Courtesy of Tommy Bolack.**



←**41.12** is another Balkite batter jar with only slightly different dimensions, again demonstrating the lack of and standardized battery jar sizes. It is embossed on opposing sides **HIGH ELECTROLYTE LEVEL / BALKITE / LOW ELECTROLYTE LEVEL**. Fansteel seems to be the only company that embossed its battery jars with High and Low Electrolyte, likely denoting the electrolyte level with and without electrodes. The dimensions are 3.75" x 7" x 10.25" tall.

42 – FINDLAY BOTTLE CO.

The Findlay Bottle Co. was only in existence for 5 years. It blew its first glass on September 24 1888. According to several references the plant was successful and could hardly stay up with the demand for its bottles. During the summer of 1889 they were reportedly making the Burns Microphone Cell (a battery jar) and its carbon electrode for the Findlay Glass & Carbon Co. (see chapter) The Burns Microphone cell was patented by Peter Cooper Burns in 1888. It is patent No. 383,814.

About 1890 Findlay experienced problems with its supply of natural gas and started to restrict the use of gas in local factories. A midnight inspection of the Findlay Bottle Co. on January 1, 1893 discovered that the plant was using more than its allotment of Natural gas. Financial problems soon followed, including lawsuits from The Ball Bros Glass Mfg. Co. The plant declared bankruptcy and ceased production on July 1, 1893.

The natural gas boom of the 1860s and 70s didn't last long. The Ball Bros. Glass Mfg. Co. left Buffalo, NY in 1867 for the inexhaustible supply of free natural gas in the mid-west.

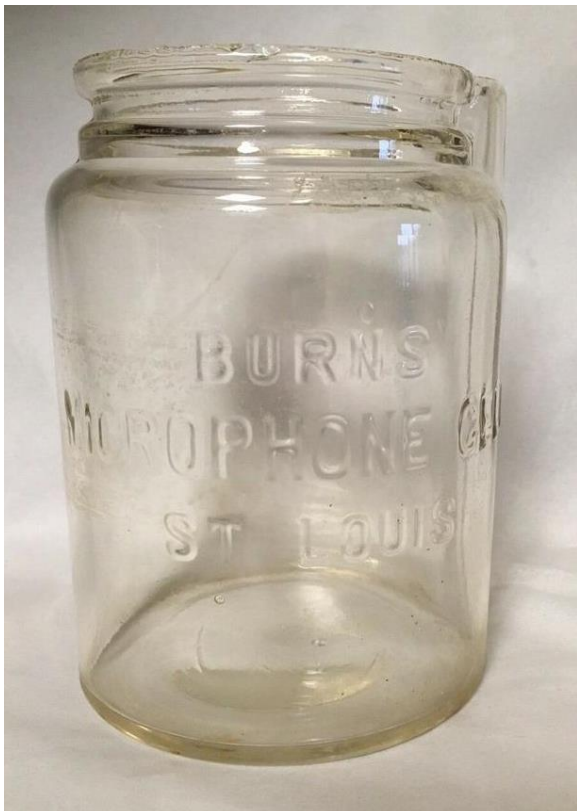


42.1↑ is a microphone cell battery jar, with dimensions of 4.5” diameter x 6” tall. The top 3.25” diameter. It has a ground lip and a spout. The exact embossing, is: **MICROPHONE CELL / NEW YORK / PATENTED.** Courtesy of Tommy Bolack.



The lid to **42.1** is shown in ←**42.2**. It is embossed **EASTERN No. 1 / PATENTED / DEC. 24, 1897 April 29, 1901**. It is assumed that Eastern is an Electric Co, although that is an assumption on my part. There was an Eastern Electric Co. of Pennsylvania that was incorporated in 1912. That is the oldest reference I could find.

Of course, there is no proof that this is the jar patented by Peter Cooper Burns, or that it was manufactured by the Findlay Bottle. Co.



←**42.3** is embossed **BURNS / MICROPHONE CELL / ST LOUIS**. It, too, is 4.5” diameter x 6” tall. This, with the Burns embossing was likely manufactured by the Findlay Bottle Co.

The patent for the Microphone cell is 393,814 of Dec. 4, 1888

43 - D.H. FITCH CO .

Very little is known about D.H. (Derrick Hollenbeck) Fitch (1837 – 1922), other than he was a telegrapher for several southern railroads. While in that capacity, he developed a liquid for the Galvano batteries used in telegraphy, obtaining a patent, June 16, 1863. Returning to his hometown of Cazenovia, NY, he founded a company (incorporated Oct. 6, 1885) to make the “Perfect” battery. Manufacturing facilities were at 107 East 34th Street in NY City. The company became a major manufacturer of medical batteries. Although their name appears on battery jars, they did not manufacture them. Records show that on at least one occasion they ordered the jars from Whitney Glass Co.

References: 3, 66, 68

43.1 is a square jar; 4 x 4 x 5.75” tall. Its round, ground, top is 4” diameter. Embossing is: **D.H. FITCH / PERFECT / BATTERY / TRADE / CHLORINE / MARK / EXCITANT / PATENTED** Courtesy of **Jeff Hogan**

There is a lid with electrodes for the jar (also pictured below). The lid, **43 - 2** is embossed: **(arc) FITCH PERFECT BATTERY / (arc) MANUFACTURED BY / (arc) VAN HUTEN TENBROECK / (arc) NEW YORK**



43.1→

←**43.2**





←**43.3** is another variant of the Fitch Battery. It is an aqua, round jar with a ground lip and pour spout. Its dimensions are 4.25" diameter x 6.675" tall with a 3.675" diameter mouth.

It is embossed on the front: **CHLORINE BATTERY / FITCH'S PATENT / SEPT. 16, 1879 / PARTRICK and CARTER / PHILA, PA.** Courtesy of Debbi Graham.



43.4 and **43.5** have the same embossing and dimensions as 42.1. The embossing is easier to read, however. Note the ground lip and absence of a spout. Courtesy of Tommy Bolack.

←**43.4**



←43.5

44 – Otto Flemming

Otto Flemming was a Doctor in Philadelphia in the latter half of the 19th century. Unfortunately, all we know about Dr. Flemming is from paper titled “Electricity in Medicine”, by Harrison Allen, M.D. It was delivered at the International Electrical Exhibition, Sept. 30, 1884. They were dealing with Electrical Cautery, and Dr. Harrison describes the battery developed by Dr. Paul Seilers and Otto Flemming. It employs stationary plates with the electrolyte brought into contact with them by the operator applying pressure upon a treadle. The major advantage being that the current ceases as soon as the operator removes pressure from the treadle, thus giving the operator critical control during a cautery procedure. The battery is covered under patent 320,547 assigned on June 23, 1885, titled “Medical Battery”.



←**44.1** is a jar embossed **O. FLEMMING**. Its dimensions are 5” diameter x 6.25” tall. It has a ground lip. It is with a crows foot electrode.

Courtesy of Tommy Bolack

44.2→

44.2 is a battery jar from an Otto Flemming medical battery. See Vol.II. Courtesy of Walt Baumgardt.



45 - Fuller, Seth W., Boston

Charles Holtzer founded the company in 1875. In 1880 Seth W. Fuller partnered with Holtzer and the company became Seth W. Fuller & Holtzer. They manufactured a variety of telephone, telephone and electrical devices, including doorbells, electric igniters, etc. They invented a shunt-type fire alarm system, where a local fire alarm pulled in a building would also trigger the nearest municipal street fire alarm box. Most of their fire alarm systems were installed in hospitals, factories, and institutions. The company finally closed its doors in 1972.



45.1↑

44 - 2↓



The jar shown in **44.1** and **45.2** is embossed (arc) **S.W. FULLER / BOSTON** in a circular slug plate on the front. It is 4.5" in diameter x 6.5" tall, with a ground lip and pour spout.



←45.3 and 45.4 show a **S.W. FULLER / BOSTON** jar. It has a **SAMSO No. 2** lid, from the **E.G.L. Co., Boston**. Courtesy of **Tommy Bolack**



←45.4

46 - GAMEWELL

In the early days of this country, fire was a constant threat, particularly in the densely populated cities. The biggest problem was the lack of a notification system to alert residents and authorities of a fire. The invention of the Morse telegraph helped to solve this problem. The first plan for such a notification was put forth by DR. William F. Channing and Moses G. Farmer in 1847, and the first installation in the city of Boston in 1851.

In 1855 John N. Gamewell of S. Carolina, believing in the possibilities of the Boston system, purchased the rights to use their invention in the south. In 1859, he purchased all the patents associated with the system. In 1866, immediately following the Civil War, actual manufacturing began by Kennard & Co. John F. Kennard was a partner of John N. Gamewell. The Gamewell Fire Alarm Telegraph Co. was formed in 1879 and grew rapidly. BY 1886 the system was installed in 250 cities, and in 500 cities by 1890. In 1910 Gamewell held a market Share of 95% of Fire Alarm Systems.

It is not believed that Gamewell manufactured the battery jars to power their systems, but that an unknown manufacturer produced the battery jars with the Gamewell Name.

References: 72, 74-77



←**46.1** is the lid from a small Gamewell battery jar. It is white milk glass with dimensions of 2" x 5". Both the lid and the Jar, **46.2**, are embossed **TRADE / GAME (logo) WELL / MARK**. Courtesy of **Walt Baumgardt**.



←**46.2** is the clear glass jar with the lid shown in **45.1**. It is 2" x 5" x 5.75" tall. The **Gamewell** logo is a clenched fist holding lightning bolts. Courtesy of **Walt Baumgardt**.

46.3 is five of the same Gamewell jar as in **46.2**. Courtesy of **Tommy Bolack**.



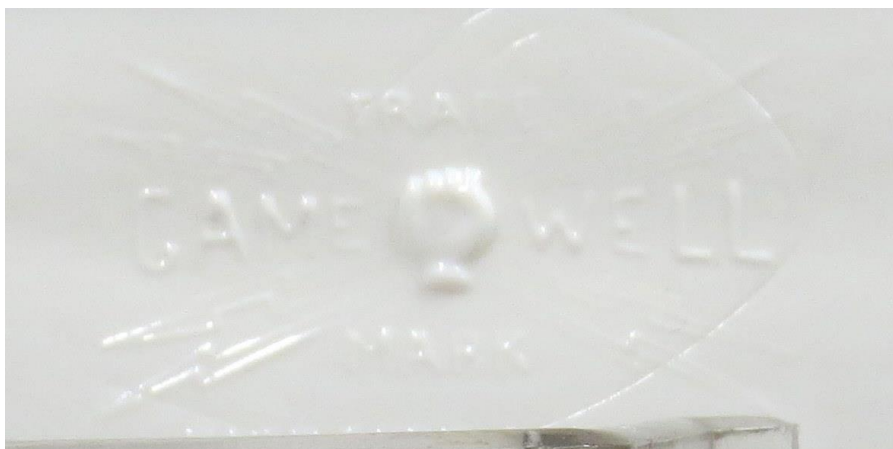


←**46.4** is another Gamewell jar like **64.1**.

. This one, however is shown with Porcelain battery rests, also offered by Gamewell. The battery rests were used upside down with the channel on top fitting a support of some kind. See Chapter 80 for more information on Gamewell Battery rests. **Courtesy of Tommy Bolack**



←**46.5** and **46.6** are close-ups of the Gamewell logo. **46.5** is likely a later version than that of **46.6**.



←**46.6**



← **46.7** shows a Gamewell battery jar with the electrodes. The **Gamewell logo** is visible, and it is the same size as the jar in **45.2**. Apparently, the milk glass cover was more decorative. **Courtesy of Tommy Bolack**



← **46.8** is a vintage Gamewell Fire Alarm Call Box.



46.9↑ is a large, straw-colored battery jar. It is 7" x 4" at the base and the side flare outward to 9.5" x 6.5" at the top. It stands 12" tall. The **GAMEWELL logo** is on either end of the jar.

The Gamewell jar seen in **46.10** and **65.11** is similar to the others but with different dimensions. Its dimensions are 5" x 2.875" at the top x 7" tall. The Gamewell logo is on the side.

embossed **TRADE / GAMEWELL / MARK / PATD. JUNE 4, 1923**. Courtesy of Tommy Bolack.

46.10↓



46.11↓





←**46.12** is Gamewell battery Jar embossed on opposing ends, with the Gamewell logo. It is 6.75" tall, while the sides flare. The base is 2.375" x 4.75", while the top is 2.875" x 5.375". It is straw colored with a formed lip. **Courtesy of Tommy Bolack**



←**46.13** is a GAMEWELL battery jar in light purple. It is embossed **ACID - LINE / GAMEWELL / PATD. SEPT. 4, 1923**. The dimensions are, Bottom: 2.75" x 5", Top: 4" x 5.5". It is 7" tall. The lid is white milk-glass. **Courtesy of Tommy Bolack**

46.14↓



46.15↓



46.16↓



45.14 through **45.16** are porcelain battery rests for the Gamewell battery jars. Appendix is a report from Elton Gish on them and their use. Note that **46.15** and **46.16** are 2-piece units, 1-piece of which is **46.14**. **Courtesy of Tommy Bolack**

47 - Gayner Glass Works , Salem, NJ

With S. Pardusses as a partner, John Gayner Sr. established the John Gayner Glass Manufactory in 1874 in Waterford, NJ, manufacturing what is termed “large ware”, consisting of large bottles, carboys, battery jars, etc. In 1879 they moved to Salem, NJ. The plant was destroyed by fire in 1884. In 1885 Pardusses withdrew as a partner and Gayner built a new factory. In 1891 Gayner applied for a patent for a “Mold for Battery Jars” and received Patent No. 478,792 in 1892. I was unable to find a copy of the patent. It was in 1898 that, with family members, The Gayner Glass Works was incorporated. S.B. Roberts reports in the American Glass Review of Dec 24, 1927, that the average annual production of battery jars was 500,000.

I could find only one glass house that used a “G” marking that existed in the late 18TH and early 19TH centuries. That is the Gayner Glass Works. The Glenshaw Glass works was formed in the end of the 19TH century. There is a battery jar with a G 7 on the bottom and the name Grant embossed on the lid. Like the other battery suppliers, Grant did not manufacture the jars . A search of patent literature shows several patents assigned to Gayner for the large Farm and Home batteries like Grant. The same search revealed no battery jar patents assigned to the Grant Battery Co. It is not conclusive, but it is likely that Gayner manufactured the “G” marked battery jars. On that basis I am going to list all “G” marked battery jars under the Gayner Glass Works. The “G” is consistent with known Gayner markings.

There is no way of knowing if unmarked battery jars with a Grant Lid were also manufactured by Gayner. I will continue to list them under Grant.

47.1↓



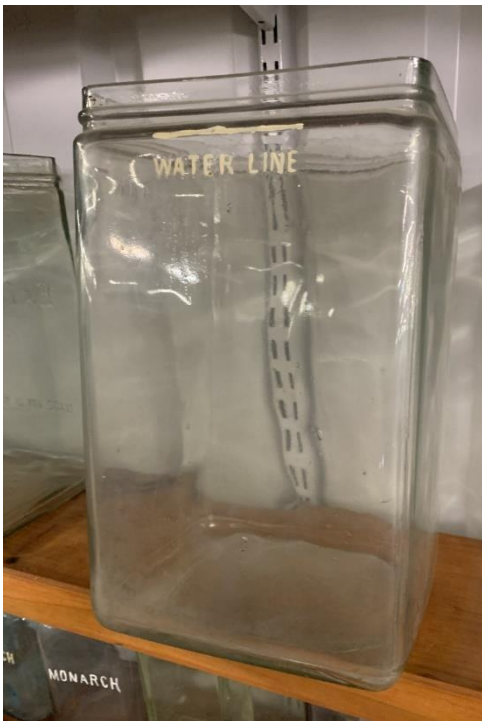
47.2↓



The Water Line is marked on 4 sides.

47.1 through 47.4 are all embossed **G -13** on the bottom. With the same number, you would expect the jars to be the same size, yet they are not. **47.1** has dimensions of dimensions of 6" x 7.5" x 10" tall, **47.2** has dimensions of 6" x 7.5" x 13.5" tall, **47.3** has dimensions of 6.75" x 8" x 11.25" tall (12.25" including the lid and **47.4** has dimensions of 6.5" x 8" x 12" tall.. The Water Line is marked on 4 sides. All are Courtesy of Tommy Bolack

47.3 is embossed **Water Line** on 4 sides and **G 13**, likely from Gayner on the bottom. The jar dimensions are 6.75" x 8" x 11.25"



←47.3

47.4↓



47.4 is an Exide Jar with a G-13 on the bottom, with dimensions of 7.5" x 6.5" x 12" tall.

←47.5



←47.6



47.7→

47.6 and 47.7 show another jar with the G prefix; in this case **G 16** on the bottom. The only other embossing is **Water Line** at the top. The dimensions are 8" square x 13.5" tall. Likely from Gayner. 47.6 ad 47.7 is another G-16 battery jar . Here, however, the dimensions are the same



←47.8



47.9→



←**47.10** and **47.11** is marked **G - 1** on the **bottom (47.9)** on the bottom. The dimensions are 4" x 7.5" x 12.5" tall. Note the wire carry handle. Likely from Gayner.

47.11↓



←**47.12** and **47.13**↑ is another Gayner battery jar. This one is embossed **G 7** with dimensions of approximately 7.5" x 10.5" x 14" tall. Likely made by Gayner.





←47.14

47.15↓



47.14 is an Exide battery Jar, It is embossed **WATER LINE** on 4 sides and **EXIDE** on 2 opposing sides, with **G – 20** on the bottom. The Lid (**47.15**) is embossed **POWER KING**. The dimensions are 8.5” x 9.25” x 14” tall; 14.5” including lid . This might also indicate that Gayner made at least some of the Exide battery jars. Note the presence of an upper and lower water level

-
- I could find no information on **POWER KING**. It is likely an improved version of an Exide battery, similar to the **IRONCLAD**. **Courtesy of Tommy Bolack**



←47.16



47.17↑

This Gayner jar is embossed **HIGH** and **LOW WATER LINE / PHILCO** on 4 sides, with **G-617** on the bottom. The dimensions are 6.25" x 9.25" x 14" tall. **Courtesy of Tommy Bolack**



←**76.18** is also embossed G-617 on the bottom, but with different dimensions, 3" x 10" x 14" tall. It is embossed **Water Line / PHILCO** on all 4 sides. The bottom is embossed **G-617**, likely made by Gayner.

This is not the first jar we've found with the identical "G" embossing, but with different dimensions. Is there another company the manufactured battery jars with a "G" coding. If we assume they were made by Gayner, then Gayner had the same number on different size jars



←**47.19**, 1 is unembossed except for **WATER LINE** on four sides. **G 13/3** is on the bottom, likely from Gayner. Dimensions are 6.5" x 7.5" x 12" tall. **Courtesy of Tommy Bolack.**



←**47.20** is embossed High and Low **Water Lines** on 4 sides and **PHILCO** on two opposing sides with **G - 12** on the bottom. The dimensions are 6" x 7.75" x 10.25" tall. **Courtesy of Tommy Bolack**

Like **47.14**, it has two water lines, indicating high and low levels.



←**47.21** is a GAYNER jar, embossed WATER VLINE / PHILCO on opposite sides. The dimensions are 6" x 8" x 10" tall. It is embossed G-2 on the bottom. Note, however, that the dimensions are essentially the same as the G-12 in **47.20**.



←**47.21** is unembossed except for **WATER LINE** on four sides and **G 703** on the bottom. The dimensions are 7.25" square x 10.25" tall. **Courtesy of Tommy Bolack.**

47.21 and 27.22 and show a Philco Battery jar embossed **G-11** 47.21 on the base. The top dimensions are 7" x 3.25" x 10" tall. Other embossing is: **Upper and Lower water lines on 4 sides, and PHILCO on the Front and Rear.** This too, is likely a Gayner jar.



↑76.11



76.12↑

48 - General Electric

General Electric had its beginnings in the laboratories of Thomas Edison. In 1878 Edison had formed the Edison Electric Light Company. Edison received half of the company's shares on the agreement that he develop an incandescent lighting system. He succeeded a year later when he found that carbonized thread or carbonized bamboo worked in the laboratory. However, developing a lighting system for an entire community involved much more than developing a light bulb; the devices that generated, transmitted and controlled electric power also had to be invented. In 1879 he had developed the first dynamo, or direct current (DC) generator. The first application of electric lighting was the steamship Columbia in 1880. The first full scale public application of the Edison Lighting System was in London at the Holborn Viaduct. The first public application in the United States was when the Pearl Street Station opened in New York City.

While these things were going on with Edison, the Thomson-Houston Company was formed from the American Electric Company, founded by Elihu Thomson and Edwin Houston. Many of their systems differed from Edison's in that they used alternating current (AC), which can transmit over far longer distances than DC systems. By the early 1890s the spread of electrification was threatened by conflict between the competing technologies.

By 1889, Edison had consolidated all his companies under the name Edison General Electric Company. In 1892 Edison was manipulated into a merger of Edison General Electric Company and the Thomson-Houston Electric Company to form The General Electric Company. As a result of the merger, Edison resigned from the Board of Directors, clearing the way for the development of AC current.

By 1900 GE was manufacturing everything involved in the electrification of the United States; generators to produce electricity, transmission equipment to carry power, industrial electric motors, electric light bulbs and electric locomotives. It should be noted that GE operated in the virtual absence of competition. In 1896 they had entered a patent pool with Westinghouse Electric, their only competitor at the time.

By the early 1900s GE had expanded into the appliance market etc. They continued to grow and expand, and today are diversified into many markets.

Genco and/or Genco Light were brand names used for GE battery jars.

References: 83-84



48.1↑



48.2↑

48.1 is a General Electric Battery Jar. It is aqua with a ground lip. It is straight sided, 3.125" diameter x 6.875" tall. The lip is threaded and the top screws on. It used a zinc band with a white porcelain insert, like a fruit jar. The lid has 2 positive and 2 negative electrodes, and is embossed: **G.E. Co./ U.S.A./ Type K**. The GE logo appears 3 times around the jar. Courtesy of **Debbi Graham**. **48.2** shows the jar with the cylindrical electrodes, while **48.3 and 48.4** show the battery posts and embossing on top of the jar. **48.5 and 48.6** show the serial number on the electrodes, and also their unusual cylindrical shape. Pictures of **48.1** through **48.6** are the courtesy of **Evertoys**.



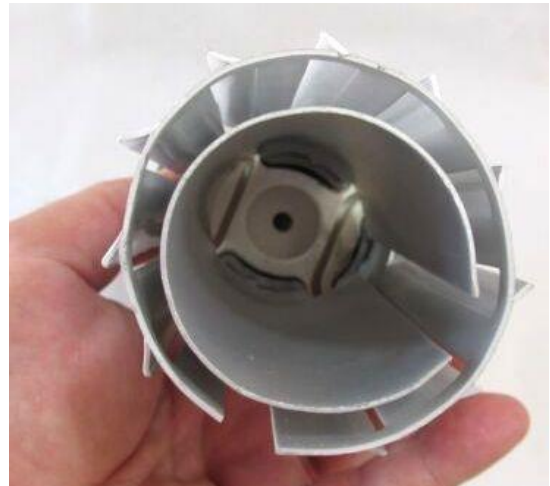
48.3↑



48.4↑



48.5↑



48.6↑



←**48.7** appears to be a battery jar very similar, if not the same as the jar in **48.1**. It does have a different electrode system. **Courtesy of Barrett Nipcon.**



←**48.7** is another **GE** battery jar. This one is rectangular in shape, with a formed lip. It is clear glass, with dimensions of 2" x 4.5" x 7" tall.

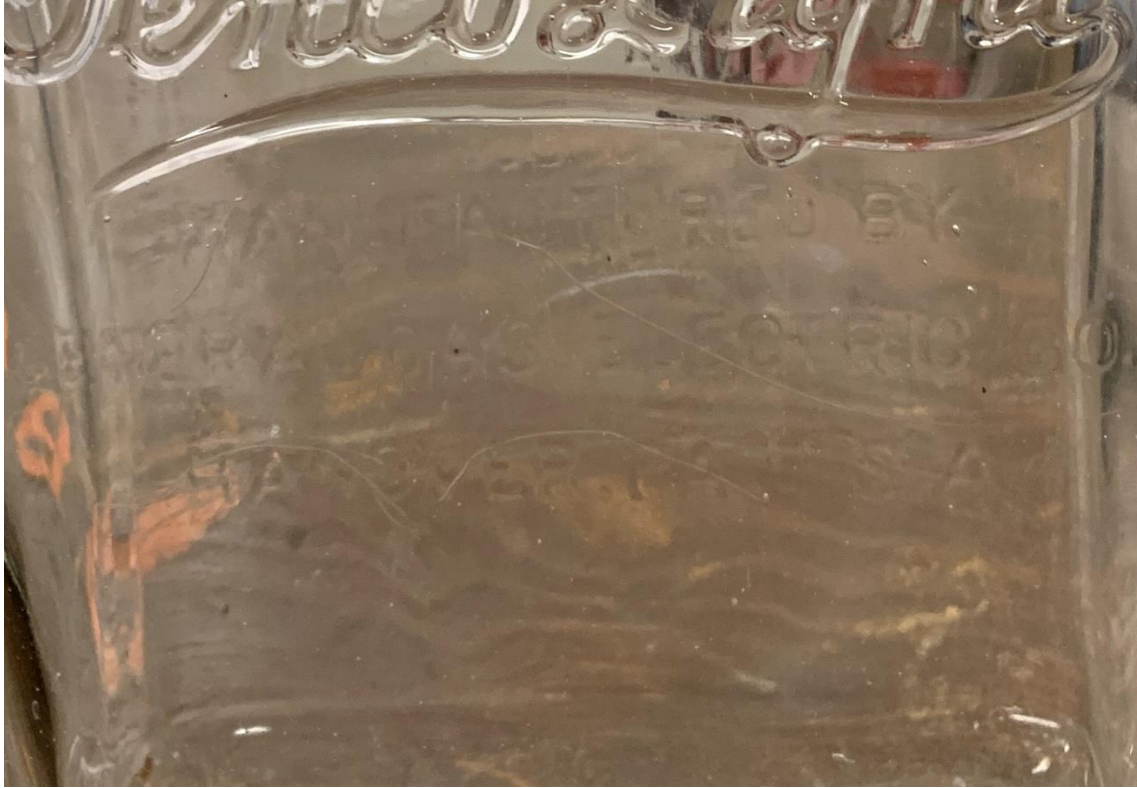
The **GENCO LIGHT** battery jar by General Electric is shown in **48.8** through **48.9**.



48.8↑



48.9↑



↑**48.10** is a close picture of faint embossing on 48.8. It is clear glass with dimensions of 4" x 7.75" x 12" tall. The **GENCO LIGHT** embossing is in script and appears on opposite sides of the jar. Below Genco Light is faint embossing that reads: **Manufactured By / General Electric / Hanover, PA. U.S.A.**



←**48.11** is embossed with the **GE** logo, with dimensions of 4.25" diameter x 11.5" tall. It appears to be very similar to, if not the same as the jar in **48.1** and **48.7**.

49 - GORDON BATTERY CO .

Gordon Battery Co. was formed in the 1880's, in Waterbury, CT. to produce glass and porcelain battery jars. In the same period, Waterbury Battery Co., also in Waterbury, CT., produced glass and porcelain battery jars. Very little is known about the two companies other than what they produced, making it difficult to find information. It seems very likely that there was a relationship between the companies, but there is nothing to indicate what that relationship was. It appears that Gordon had a maker's mark that appeared on some battery jars. It is like the Corning mark (an elongated C with two letters inside the C).

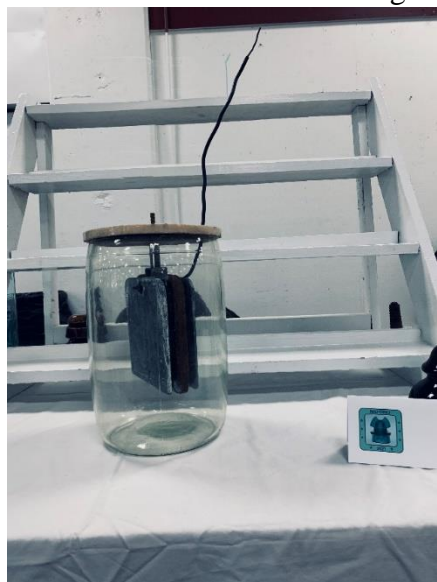
The home office of the Gordon Battery Co. was in New York City; 439 – 445 East 14TH Street, New York. There is also a GORDON BURNHAM Battery Co. at 82 West Broadway, New York City, NY. Should I find additional information about the various Gordon Battery Companies, this section will be updated.

References: 117

The jar pictured below, **49 - 1** is a mystery. The jar itself is embossed: (Front) L.S. BRACH CO. / <COBRA CO.> / NEWARK N.J. (Embossing on the Jar was very faint, but black paint helped to bring it out). This is a bit confusing as it is not believed that L.S. Brach manufactured glass battery jars. The jar could have been manufactured by an unknown glass house and embossed L.S. Brach.

The dimensions of the jar are 7" diameter x 10.5" tall. It is clear with a ground top. The dimensions of the lid are 7" x 0.5" and is white. It is the courtesy of **Jeff Hogan**.

It is believed that the lid is original to the jar. The lid is embossed: (arc) **GORDON PRIMARY CELL / PATENTED / (arc) / OCT. 27, 1896 / APR. 13, 1897 / FEB. 13, 1906 / PRIMARY BATTERY CO. / WATERBURY, / CONN. / U.S.A.** I could find no information on The Primary Battery Co. of Waterbury, CT. In fact, googling Primary Battery Co. of Waterbury yielded the Waterbury Battery Co. Perhaps when we have more jars in the mix it will become clear.



←49.1

The lid, **49.2**, below, in white porcelain, is original to the jar and is embossed (arc) **GORDON PRIMARY CELL / PATENTED / OCT. 27, 1896 / Apr. 13, 1897 / Feb. 13, 1906 / GORDON PRIMARY BATTERY Co. WATERBURY, / CONN / U.S.A.** Courtesy of **Jeff Hogan**. References:



49.1 and 49.2 are the same as 49.3. 49.3 and 49.4 however have crisper embossing. The jar is 7" diameter and embossed L.S. BRACH Co. / <<GBRAC>> / Newark, N.J. is somewhat of a mystery in that it is not generally believed that L.S. Brach manufactured glass. They are generally known for their porcelain strains and similar products and electric railway signals. It is likely the jar was manufactured by a third party and put Brach's name on the jar. Courtesy of Jeff Hogan.

←49.2

49.3↓



49.4↓





The “GBRAC” is more logical for an L.S. BRACH jar. I’m not sure of the significance of “FRY” under the embossing.

←49.5, The lid is embossed (arc) **GORDON BATTERY / (arc) patented / (arc) Oct. 27, 1896 April 13, 1897 FEB. 13, 1906 / GORDON PRIMARY BATTERY CO. / WATERBURY / CONN / U.S.A.**

Due to the faint embossing on 49.1, and knowing that a similar jar with good embossing is embossed GCBRAC, it is believed that a mistake was made in deciphering the embossing of 49.1. It is much more logical that the embossing on 49.1 is actually GCBRAC, as well.



←49.6, below, shows a jar and lid. The lid is the same as 49.5, above. It is 7” diameter and 10” tall. The jar is simply marked Cxx, which we’ve seen on Corning battery jars, As the Cxx and Corning have appeared together on the same jar, it is likely that the plain Cxx embossing belongs to Corning. The lid, on the other hand is embossed: (arc) **GORDON BATTERY / (arc) Patented / (arc) Oct. 27, 1895-Apr. 12, 1897-Feb.13, 1906 / GORDON PRIMARY BATTERY CO. / Waterbury / CONN / U.S.A.** Courtesy of Walt Baumgardt.

49.6↑



The Gordon lid, **49.7**↑ further adds to mysteries around the battery Companies of Waterbury, CT. It is embossed: (arc) **GORDON PRIMARY CELL / Patent/ Dec – 27 – 1896 / Feb – 12 – 1897/ Feb – 12 – 1906 / The LUTZ LOCKWOOD MFG. CO./ Aldene, Union Co, N.J./ (arc) successor to / (arc) GORDON BATTERY CO.** Courtesy of Debbi Graham.

Unfortunately, Lutz-Lockwood is one of those companies about which little is known. What we do know is found in chapter We don't know when Lutz Lockwood took over the Gordon Battery Co.



49.8↑ is a Gordon cell. It is aqua, with a ground lip, 4.75" diameter x 6" tall with a 4" diameter mouth. It has a combination lid and cylindrical, carbon graphite electrode. It is embossed: **Water Line / THE / GORDON CELL / M'FD BY / GORDON _ BURNHAM BATTERY CO./ NEW YORK / PATENTED.** Note the absence of a spout. **Courtesy of Debbi Graham.**



←49.9

49.9 and 49.10 is the same jar as in 49.8 the dimensions and embossing are identical. The difference is in the lid, as seen in 49.9. Rather than carbon and sitting on top of the ground lip, this lid appears to be composite and fits over the sides of the lip. This lid is embossed: **GORDON CELL / PAT. NOV. 17, 1886, April 17, 1888 / & July 2, 1895 / Others Pending.**



←49.10



49.11 and **49.12** show a cobalt Blue, porcelain jar and lid. The jar is unembossed, while the lid is embossed: (arc) **GORDON BURNHAM BATTERY CO. NEW YORK / GORDON / BATTERY / PAT. NOV. 17, 1888 / April 17 , 1883 / JUL 2, 1885 / OTHERS PENDING / PATENTED**
Courtesy of Tommy Bolack

49.12↓



49.12←

50 - H.J. GORKE Electric CO . Syracuse, NY

Not much is known about them, but we know a little of their history. In 1893 The Engineering & Supply Co. opened a branch in Syracuse, at 308 – 310 West Jefferson St. H.J. Gorke was the Manager, and a Jesse Lorenzo was superintendent. In 1897 H.J. Gorke established his own company which was to become the H.J. GORKE Electric Co. In the same year, Jesse Lorenzo left to start The Crouse Hinds Electric Co.

There is an un-embossed battery jar with the H.J. GORKE name on the lid.



← **50.1** is un-embossed, with a pour spout and a ground lip. The lid **50.2** is embossed as follows:

(arc) **OAKLEAF / H.J. GORKE / SYRACUSE, N.Y.**

There seems to be no significance to the term OAKLEAF. Courtesy of **Debbi Graham**.

50.2→



51 - Gould Storage Battery Co.

The origins of Gould Electronics date to the late 1800s. Charles J. Gould started a small foundry to forge couplers for railroad cars. When a fire destroyed a plant in 1895, he rebuilt on a larger scale, and established a town around the factory. The community of Depew was founded on 1,200 acres, just east of Buffalo, NY. The growing market for storage batteries prompted Gould to expand his product line, and to change the name to Gould Storage Battery Co. Gould produced batteries for trains, electric utilities, subways, elevators and farms. Gould was also a major supplier of submarine batteries (see Chapter). By 1930 Gould was one of the largest manufacturers of industrial batteries in the U.S.

Meanwhile in St. Paul, Minnesota, another company was carving a niche in the battery business. The Electric Manufacturing Company, originally a distributor of electrical accessories, realized success was in manufacturing and expanded into batteries. It was renamed to the National Lead Battery Company. The combination of a small customer base, a fire that destroyed the battery plant, and a recession following WWI caused great financial problems. The company went after a single customer with a national presence, Montgomery Ward. When Montgomery Ward visited National Lead Battery, they hired workers for a few hours the day of the meeting. They only had enough materials to run the plant for a few hours. The staged production was convincing, and Montgomery Ward signed a contract with National Lead Battery, allowing it to escape financial ruin. As the company grew through the 1920s, it removed Lead from its name and became simply National Battery.

In the late 1930s, to get control of a patent owned by Gould, National Battery acquired Gould. In the late 1930s they changed the name again to become Gould-National Batteries. In the late 1960s as the world was switching to electronics, Gould followed suit and in the 1970s became Gould Electronics.



←**51.1** is a large Gould battery jar with clear glass and a formed lip. It is embossed **WATER LINE / GOULD** on all four sides. Its dimensions are 5" x 11" x 17" tall.



←**51.2** is another **Gould** battery jar with dimensions more in line with other Farm battery jars. Its dimensions are 4" x 7.5" x 10" tall. It is aqua, and embossed **Water Line / Gould** on the front and rear



←**51.3** is a blue battery jar also with the Gould name. It is embossed **WATER LINE / GOULD** on all four sides. Its dimensions are 6" x 9" x 13" tall. **Courtesy of Tommy Bolack**



←**51.4** is a clear glass GOULD battery jar. It has dimensions of 3.75" x 8" x 13" tall. It is embossed **WATER LINE / GOULD** on two sides.



←**51.5** and **51.6**↑ show yet another Gould Battery jar. It is 1Aqua with tapered sides. It is 10" tall with top dimensions of 7" x 4". It is embossed **WATER LINE / GOULD** on 4 sides. There is a **60** on the bottom.



51.7↑



51.8↑

The Gould battery jar above (**51.7 & 51.8**) is embossed on 4 sides **WATER LINE / GOULD**. It is Clear glass with dimensions of 5.75" x 9" x 13.25" tall.



51.9↑
51.10→



The Gould battery jar shown in **50.9** and **50.10** is clear glass with dimensions of 4.5" x 9.5" x 13.5" tall. It is embossed Water Line on 4 sides and **GOULD** on two opposing sides, with **120** on the bottom. The same jar exists with 200 on the bottom.



←**51.11** is a GOULD battery jar, marker **WATER LINE / GOULD** on four sides. The dimensions are 5.5" x 8.5" x 12" tall.



←**51.12** is a Gould battery jar embossed **WATER LINE / GOULD** on all four sides. The dimensions are 5" x 7.5" x 10" tall. It is marked 80 on the bottom.



51.13 is embossed **GOULD** on 4 sides. There is line near the top of 4 sides indicating a Water Line, but no embossing. It has a formed top with dimensions of 9.25" x 12.25" x 15.75" tall. **Courtesy of Tommy Bolack**



51.14↑ is an unembossed jar with, the exception of **WATER LINE** on 4 sides. ↑**51.15** is the original lid to **51.14**. It is hard rubber and embossed **GOULD**, **MADE IN U.S.A.**, / **PATENTED / 21710**. Its dimensions are 7" x 8" x 11" tall; 11.5" including lid. **Courtesy of Tommy Bolack**



←**51.16** and **51.17**↑ show a jar similar to **51.14**. The embossing and lid are the same. This jar, however, is larger with dimensions of 6.75" x 10" x 13.5" tall; 14" including lid. It, too, is **courtesy of Tommy Bolack**.



51.18↑



51.19↑

51.20↓



51.18 through 51.20 are GOULD battery jars. All are embossed on all four sides < Water Line / Gould.

51.18 has dimensions of 4" x 9" x 13.75" tall.

51.19 has dimension s of 4" x 9" x 13" tall.

\
51.20 has dimensions of 5" x 9" x 13.5". There is a G code on the bottom, indicating it was likely manufactured by Gayner.

52 - Grant Storage Battery Co.

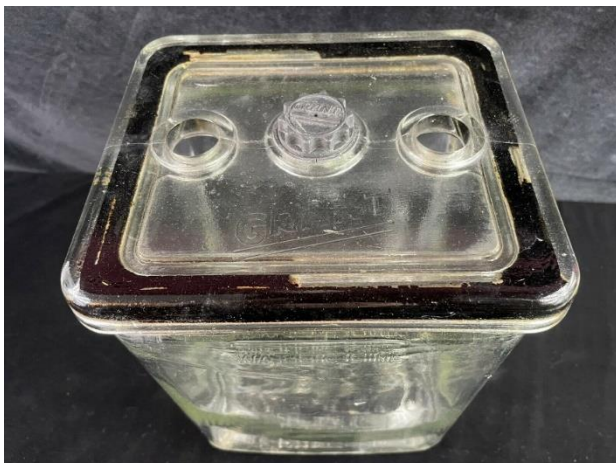
The Grant Storage Battery Company was incorporated in Minnesota on Sept. 24, 1919. That is about all we know about this company.

We determined in Chapter 46 that Gayner is likely to have manufactured the Grant battery jars.



52.1, left, is assumed to be a Grant battery jar. It is un-embossed except for **WATER LINE** on all four sides. The only way we know it is **GRANT** is from the embossing on the original lid **52.2**

The dimensions of the jar are 6.25" x 7.5" x 11" tall, with the lid. Without the lid the jar is about 10" tall. Based on its size it was most likely part of a Farm Battery System. (See Chapter 3).



←**52.2**



52.3↑ is a lid for a Grant battery jar. The lid measures 9" x 10", making it for a slightly larger battery jar than the shown in **52.1** and **52.2**.

The jar shown in **52.4** through **52.7** is embossed **GRANT** on the lid, with **WATER LINE** on all four sides of the jar. The jar is also embossed **G 7** on the bottom. The jar is large with dimensions of 7.5" x 10" x 13". As the lid matches the jar it is safe to assume the jar is **GRANT** also. Based on its size it was obviously a Farm Battery. It was likely

manufactured by Gayner.



52.4↓



52.5↑

52.6↓

52.7↓



The jar shown in **52.8** and **52.9** is embossed GRANT on the lid, G-13 on the bottom and Water line on four sides. The dimensions are 6.5" x 7" x 12.5". Again, likely, manufactured by Gayner.

52.8↓



52.9↓

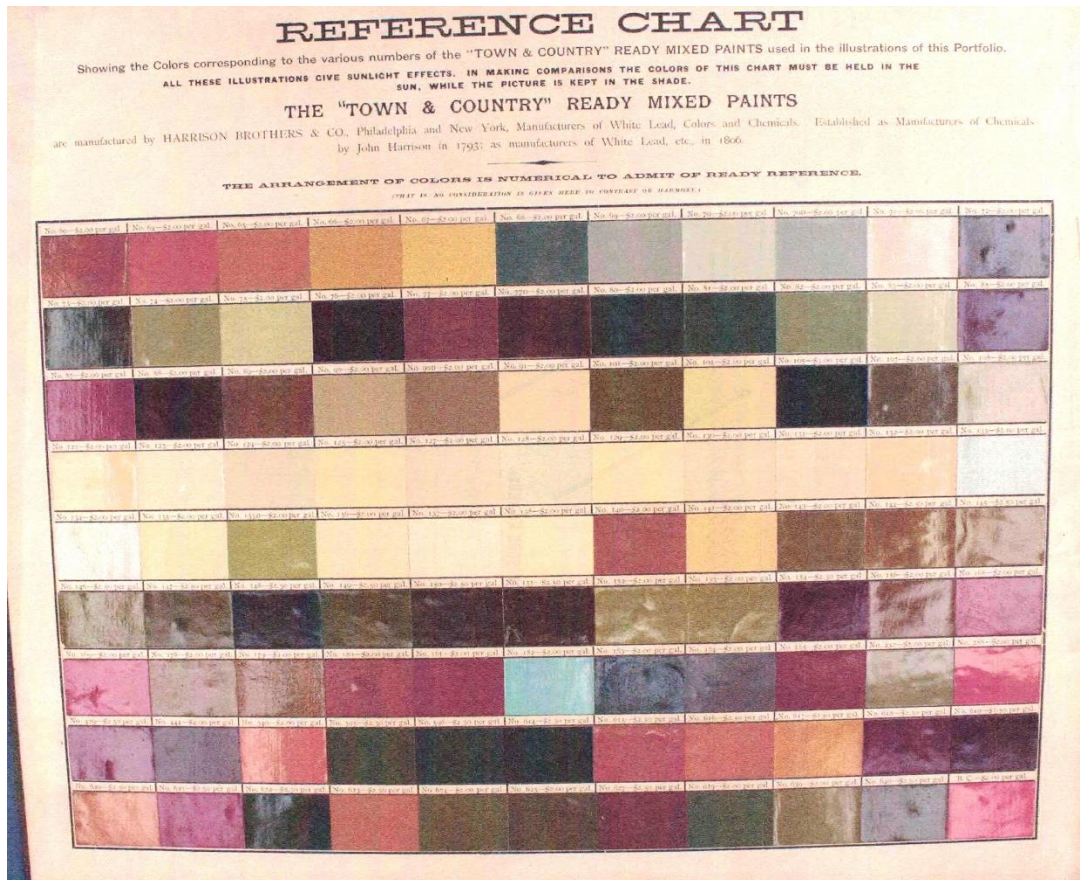


53 HARRISON BROS. & CO.

The Harrison Bros. & CO. was, basically, a chemical company, and the first manufacturer of sulphuric acid in the United States. John Harrison. He began producing sulphuric acid in 1793 and continued to refine and improve the process. His sons Thomas, Michael and George continued the business after his death in 1833. In 1894 they employed 400 people, including 40 children, and the facilities covered 30 acres. The company was known by different names through the years. It started as the Gray's Ferry Chemical Company as it was on the site of the George Gray's ferry service on the Schuylkill River, the southern entrance to Philadelphia. It was also the Harrison Brothers Chemical Co. before incorporating as the Harrison Bros. & Co. in the 1860s.

One of their products was white lead, a mineral used to tint paints and cosmetics. This led to their selling a line of ready mixed paints starting in 1870. Prior to this, paint was hard to come by for the average person, so this enabled people for the first time to easily paint their houses.

In 1917 they were acquired by E.I. du Pont de Nemours & Company, becoming a laboratory for DuPont's new Paints and Finishes Department.



←53.1 is a paint chart of their "Town & Country" Ready Mixed Paints from the 1870s.

There is a battery jar with their name, advertising their business. The actual manufacturer is unknown .



53.2↑



53.3↑



←53.4

53.2 through 53.4 show the Harrison Brothers battery Jar. It is embossed on one side (arc) **HARRISON / BROS. & CO. / PHILADELPHIA / CHICAGO / NEW YORK**. The opposing side is embossed **1793** at the top of a wreath, with an **H** inside the wreath. Underneath is **TRADE MARK**. The jar is small, with dimensions of 3” square x 4.75” tall. The top is 2,75” diameter Note the unusual glass top in 53.5. Another side (53.6) is embossed **PATENTED / MAY 23, 1882 / B.** Courtesy of Tommy Bolack

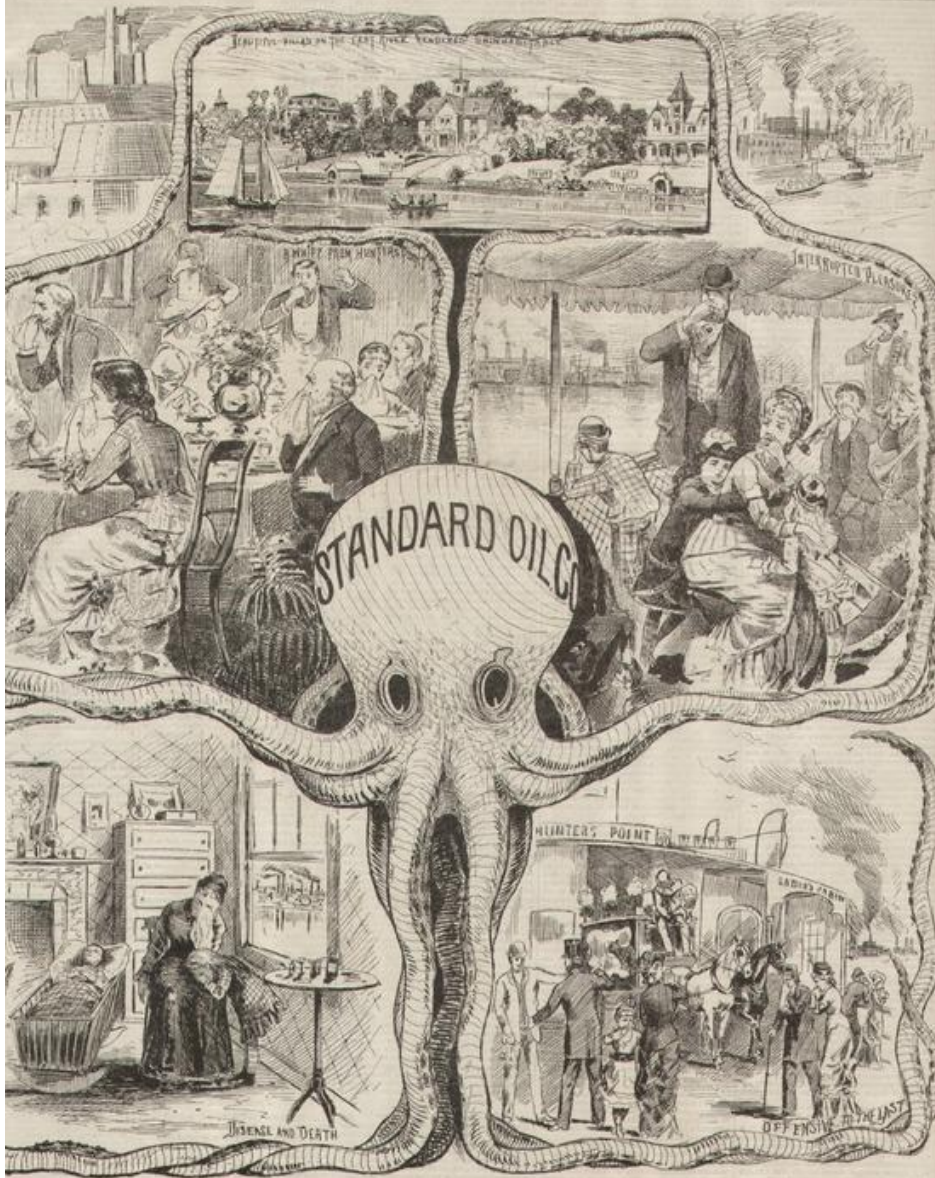


←53.5



53.6↑

The area in which the Harrison Bros. was located was highly industrialized. The latter half of the 1800s it became a major petroleum hub. One of the earliest was the Atlantic Refining Co. It was owned by Standard Oil. By the 1890s, 50% of the world's illuminating fuel came from The Philadelphia. In 1907, the Atlantic refining Co. made up over 20% of the area's exports. At one time Gulf oil produced approximately 335,000 barrels of crude oil daily. This led to the first known concerns about pollution. The published cartoon (52.7) from 1894, shows Standard Oil as an octopus "Horrible Monster", spreading poverty, disease and death.



A HORRIBLE MONSTER,
WHOSE TENTACLES REACH POVERTY, DISEASE AND DEATH, AND WHICH IS THE PRIMAL CAUSE OF THE SUICIDES AT HUNTER'S POINT.

←53.7

54 HEMINGRAY GLASS Co.

You are all familiar with the Hemingray Glass Co., the largest manufacturer of glass pin-type insulators. The company was started in 1848 in Cincinnati, OH, by Robert Hemingray and Ralph Gray. It was known as Gray, Hemingray & Bros. and manufactured salt and pepper shakers, dishware, and various knick-knacks, but became famous for insulators. In 1852 it moved across the Ohio River to Covington, KY. Ralph Gray died in 1863, and the company was renamed to Hemingray, Bros. & Co. in 1864. In 1868 it became R. Hemingray & Co., and in 1870 it became The Hemingray Glass Co. In 1888 they built a plant in Muncie, IN, taking advantage of the natural gas boom, which essentially closed the Covington plant. The Covington plant was re-opened for a short time in 1892 when a fire closed the Muncie plant for repairs. The Hemingray Glass Co. remained a separate entity until 1933 when it was purchased by Owens-Illinois Glass CO. It became the Hemingray Division of Owens-Illinois.

Although it was best known for insulators Hemingray also produced many other glass items, including battery jars, kerosene jugs, bottles, fruit jars, oil lamps, etc. Although you won't find Hemingray's name embossed on many battery jars, you will find jars made by them. Bob Stahr's collection of Hemingray items includes battery jars; **54.1**, embossed L.B. Co. and <BSCO> (Battery Supplies Co.). The <BSCO> embossing would indicate that they may have made battery jars for Edison Companies. Or it could have supplied jars to <BSCO> for the few years when it was not under Edison control. Their catalog from May 1, 1903, shows battery jars embossed Pile LeClanche and Gonda, as well as un-embossed LeClanche jars. The L.B. embossing indicates they made battery jars for the LACLEDE Battery Co. See chapter 25.
Courtesy of Bob Stahr.



54.1↑

Christian Willis provided information on two battery jars manufactured by Hemingray. They are shown below: 53.22, through 52.5.



54.2↑ 54.3↓



54.4↑ 54.5↓



Both jars are 4.75" diameter with 3.875" diameter mouths. They have ground lips and pour spouts. Both are embossed: (Towards top on front) **PILECLANCHE** (note no spacing): (Base): **H.G. CO.**

55 - Illinois Glass Co.

The Illinois Glass Co. was started in Alton, IL in 1873, by William Smith and Edward Lewis. It started to expand in 1900 and by the time it merged with Owens Bottle Co. in 1929, it was one of the largest glass companies in the U.S. They produced bottles, fruit jars and battery jars among other glass products. The page from one of their catalogs gives us a hint of what they supplied. Their catalog from 1906 has been added to the NIA members only site.

References: 99

72 ILLINOIS GLASS COMPANY.

MISCELLANEOUS ARTICLES.



**BATTERY JAR—
SQUARE,
HEAT OR GREEN.**

Height to top 7 1/2
Height to shoulder 5 1/2
Diameter of body 4 1/2
Shoulder diameter 3 1/2
Flat 1/2

Price \$1.00 per gross.

**WESTERN BATTERY
JAR.**

HEAT OR GREEN

Height to top 7 1/2
Height to shoulder 5 1/2
Diameter of body 4 1/2
Shoulder diameter 3 1/2
Flat 1/2

Price \$1.00 per gross.



**WESTERN BATTERY
JAR.**

HEAT OR GREEN

Height to top 7 1/2
Height to shoulder 5 1/2
Diameter of body 4 1/2
Shoulder diameter 3 1/2
Flat 1/2

Price \$1.00 per gross.



**LE CLANCHE
BATTERY JAR.
HEAT OR GREEN.**

Height to top 7 1/2
Height to shoulder 5 1/2
Diameter of body 4 1/2
Shoulder diameter 3 1/2
Flat 1/2

Price \$1.00 per gross.



**ROUND BATTERY
JAR—HEAT,
TUNG STONE,
OR GREEN.**

Height to top 7 1/2
Height to shoulder 5 1/2
Diameter of body 4 1/2
Shoulder diameter 3 1/2
Flat 1/2

Price \$1.00 per gross.



LeClanche.



Round Battery.

SQUARE LECLOCHE BATTERY JARS.

WITH TIGHT-ON. HEAT OR GREEN.

TECHNICAL:

Height to top	7 1/2 inches.
Height to shoulder	5 1/2 "
Diameter of body	4 1/2 "
Shoulder diameter	3 1/2 "
Long diameter of mouth outside	4 1/2 "

Test Price, \$1.00 per gross.

25 cents extra for Enamelled Tops.



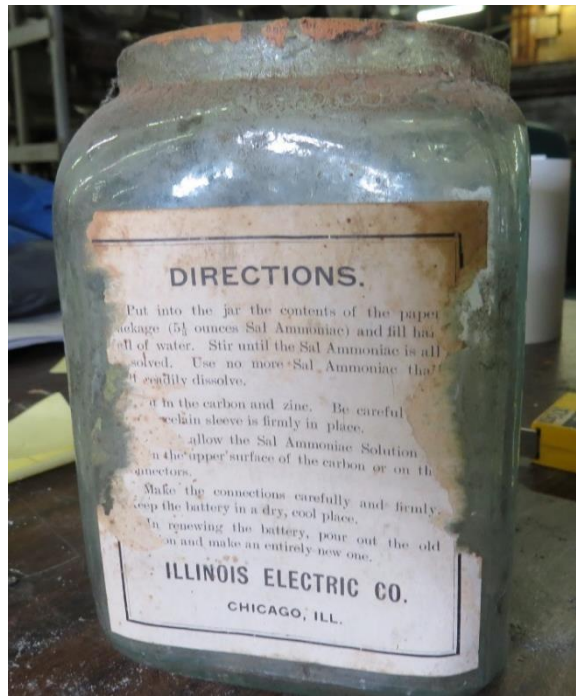
L. C. L.

The BATTERY JARS listed above are all regular stock and are packed for the general trade in cases holding 50 jars each, except the larger round ones. The 6-8 Round are now packed in cases holding two dozen jars each with corrugated paper partitions, thus reducing breakage to the minimum.

Our facilities for executing large and exacting orders on Battery Jar Equipment are very complete, and we invite correspondence from all Battery Jar Buyers.

55.1 has a paper label with the **Illinois Electric Co.** name. It is 4.25" x 6" tall. Courtesy of Tommy Bolack

55.1→



56 - Johnson Electric Service Co., Milwaukee, WI

Today we know the company as Johnson Controls. In 1883 it was a college professor who like to invent things.

Warren Seymour Johnson was born in Rutland, VY but grew up in Wisconsin. He was many things, but his primary interest was his laboratory, where he experimented with electrochemistry. In 1883 he produced the first room thermostat for which he received a patent. He persuaded William Plankinton, heir to the Plankinton Packing Company, to become his first financial backer in the Milwaukee Electric Manufacturing Company. This allowed Johnson to resign as Professor at the State Normal School and spend full time on his inventions. In 1885 the company was reorganized as the Johnson Electric Service Company with Plankinton as President and Johnson as Vice-President and treasurer.

Johnson Continued to invent Control devices, but also designed products as chandeliers, springless door locks, puncture proof tires thermometers and a hose coupling for providing steam heat to passenger railcars. The inventions for which he received the most recognition were Tower Clocks. He invented a system powered by air pressure that greatly increased the reliability of the clocks.

At the Paris World's Fair of 1900, Johnson's wireless communication exhibit won second prize. In 1901 Johnson was elected President. In 1902 the name was changed to Johnson Service Company. During the Great Depression Johnson's dual thermostat, which allowed for fuel savings by automatically lowering temperatures when the building was not occupied was in demand. The company continued to grow and thrive. Johnson Controls is still in business today.

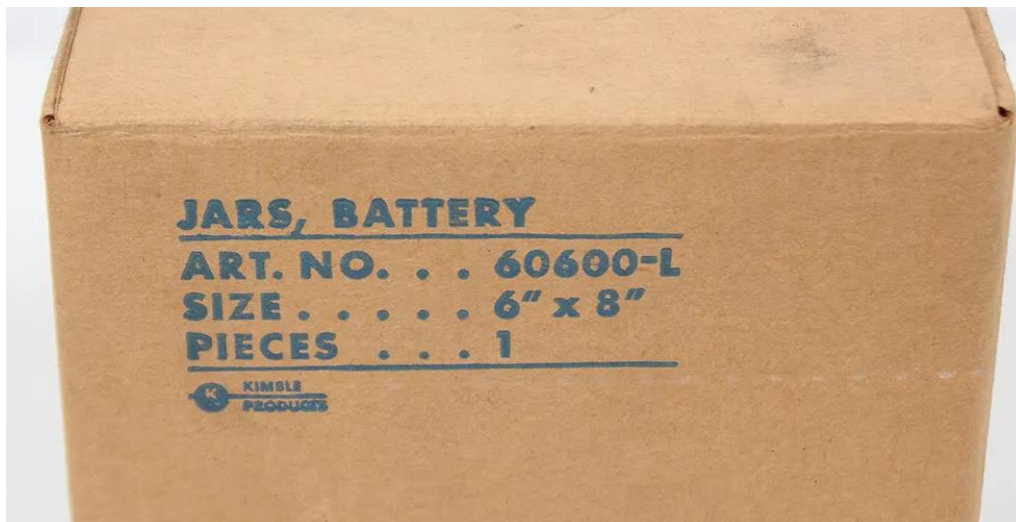


←**56.1** is a battery jar labelled Johnson Electric. The exact ebossing is **JOHNSON / ELECTRIC / SERVICE CO. / MILWAUKEE**, on the front. The jar is 4.175" square with a 3.75" diameter top. . It is 7" tall with a ground lip and no spout. Courtesy of Tommy Bolack.

56A Kimble Glass Co.

The Kimble Glass Co was started in 1901 in Chicago, by Evan Kimble, a former employee of the Sheldon-Foster Glass Co. The primary product was laboratory glassware. After an on again / off again relationship with the Vineland Flint Glass Mfg. Co. of Vinland, NJ, Kimble purchased the Vineland operation in 1931. The relationship is unclear, but the 1926 Illinois Glass Co. catalog offered Kimble glass ware.

In 1946 Owens-Illinois purchased controlling interest in The Kimble Glass Co. and organized the American Structural Products Co to manage the Kimble assets. Kimble continued to manufacture laboratory glassware, but vials and prescription bottles to its product list. Their laboratory glassware was offered under the names Neutraglas (1941-1955) and Kimax (1956=2017). We know they also manufactured insulators, and apparently battery jars at some point.



56A.1↑



←56A.2

S6A.1 and 56A.2 show a Kimble battery jar with dimensions of 6” diameter x 8” tall. It appears to have a ground lip.

57 – LaLande Batteries

The term LaLande Battery refers to the Primary battery invented by Felix LaLande and Georges Chaperon in 1850. It used Zinc and Copper Oxide electrodes with Potassium Hydroxide electrolyte. As improvements were made, their name was added as a descriptor. The Edison – LaLande battery used Zinc Oxide Briquettes rather than powdered Zinc Oxide. The Edison - LaLande had low voltage (about 0.75 volts) but the resistance was also low, enabling it to generate large currents. The internal resistance of a battery is the resistance to the flow of electrons or electrical current through the system.

The Wedekind – LaLande battery a Copper Oxide paste was applied to the inside of a cast iron pot.

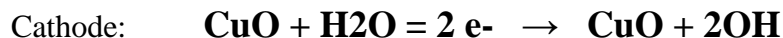
The Gladstone -LaLande battery has been something of an enigma. There was a Gladstone Battery Co. in England, and another in Australia, however from what I could find, they were formed much later. The most definitive explanation of the Gladstone – LaLande is that rather than using a porcelain container it uses a steel container with a porcelain coating. Even this explanation is lacking as the first Gladstone LaLande jar we see is made of glass and not steel and/or porcelain. The correct answer is out there somewhere.

As an interesting aside; the French submarine “Gymnote” (Q1) was built in 1887, using 540 LaLande – Chaperon batteries. Other uses of the LaLande battery were railway signalling and powering fans and phonographs.

For those that are interested the reactions are as follows:

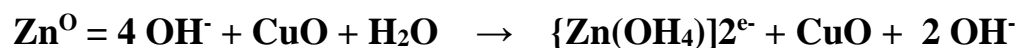


The zinc anode dissolves in the Hydroxide solution forming Zincate anions, releasing 2 electrons.



Cathode: Half of the hydroxide ions are replenished by hydration and reduction of the copper oxide cathode to copper metal.

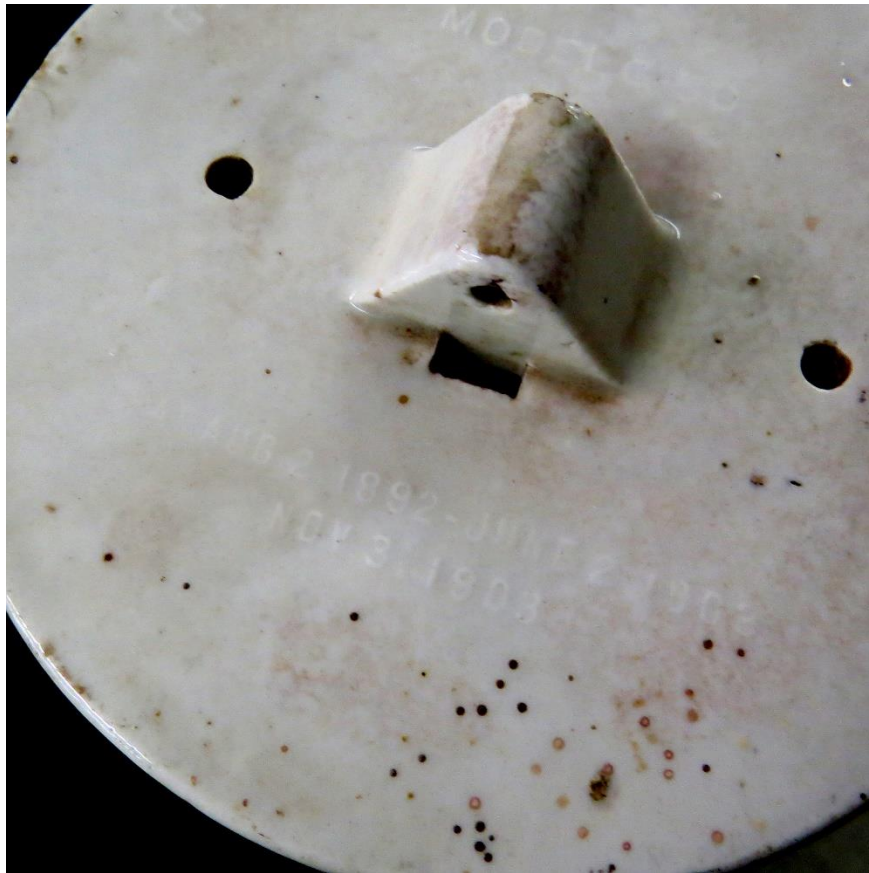
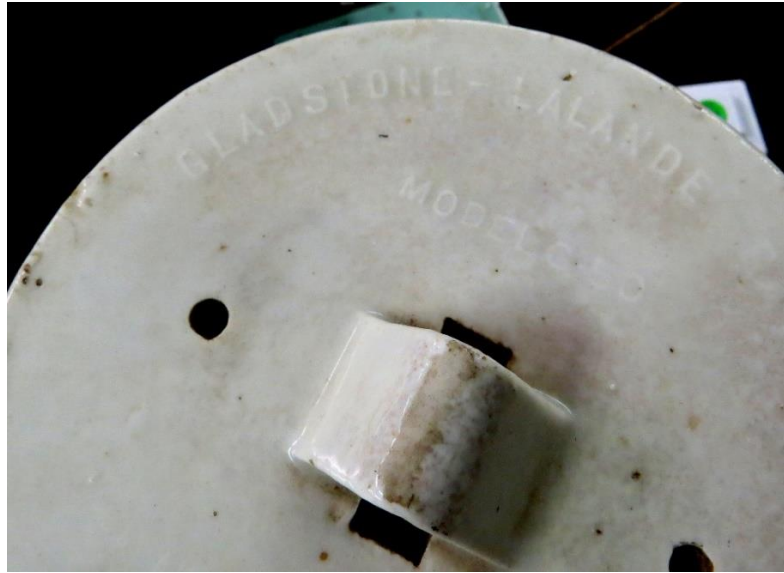
The entire reaction is:





←57.1

57.2 ↓



←57.3

57.1 through 57.3 show a Gladstone -Lalande battery jar. It is an unembossed glass jar with a porcelain lid. The dimensions of the jar are 7.5" diameter x 10" tall. The lid is embossed (arc)
**GLADSTONE LALANDE
BATTERY / Model G – 50 /
PATAUG 2, 1892 – JUNE 2,
1902 / NOV. 3, 1903.** Courtesy of Tommy Bolack



←57.4 seems to meet the criteria of a steel jar with a porcelain coating. The lip of the jar appears to be far thinner than a porcelain jar, likely steel. The jar itself is unembossed and in a Cobalt Blue, as is the lid (57.5). The lid is embossed (arc) **GLADSTONE LALANDE BATTERY / PAT. AUG. 2, 1882 / June 2, 1903 / NOV. 3, 1903**. The dimensions are 5.5" diameter x 7.5" tall, with the lid. **Courtesy of Tommy Bolack**



←57.5

58 - Law Telegraph Co

This company was started in 1874 by William A. Childs to provide a system for lawyers to communicate with the courts quickly and easily and especially each other. Thus, the Law Telegraph Company was formed. By April of 1875 it was up and running. There was a Central office and a signaling system. Each lawyer was assigned a number and, it used a system of bells for them to reach whomever they wanted.

Although Alexander Graham Bell described ideas for a central exchange system, the Law Telegraph Co applied telephones to the exchange system before Bell did, and preceded Bell in New York City with a functioning telephone exchange. The Law Telegraph Co. received patent 220,874 (Frank Shaw) for the adoption of the call-wire principle to telephones, on Oct. 21, 1879.

For a time there were three telephone companies in New York City; The Gold & Stock Telegraph Co. (Controlled by Western Union), The Bell Telephone Co. of New York and the Law Telegraph Co. When the courts caused Western Union to give up the Telephone Business, and the first two companies merged as The Metropolitan Telephone and Telegraph Co., the Law Telegraph Co. became the sole independent company in New York City, though its customers were able to communicate with the Metropolitan Company. Under an agreement with Bell, it was limited to 600 subscribers. It lasted until 1884 when it was bought by Metropolitan. It is about that time that the Law Battery Co. was formed. They did not manufacture the jars themselves. We know from The Electrical World of May 19, 1888, Vol. 11, no. 20, p.259. that they placed an order for 15,000 battery jars from the Whitney Glass Works of Glassboro, N.J.

References: 107-109



←**58.1** is a Law battery jar. It is clear glass, with a formed lip. The jar is 4.5" square x 7.125" tall. The mouth of the jar is 4" diameter. Exact embossing is **LAW / BATTERY / NEW YORK / PATENTED**. Courtesy of **Debbi Graham**.

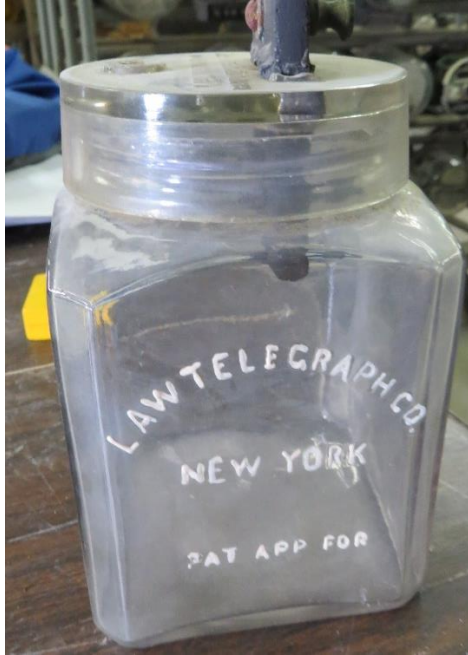


58.2↑

58.3↓



58.2 and 58.3 show a porcelain lid from the LAW Battery Co. It is embossed (arc) **LAW BATTERY CO. / (arc) 85 JOHN ST. NEW YORK**. It was found with a Johnson Electric Service Co, jar identical to 40 – 1, which it did not fit. *Courtesy of Tommy Bolack.*



58.4↑



58.5↑

58.4 and **58.5** show a Law Telegraph Co. jar with a glass lid. Dimensions are 4.25" x 6.25" tall. The jar is embossed (arc) **LAW TELEGRAPH CO. / NEW YORK / PAT APP FOR**. The lid is embossed **LAW TELEGRAPH CO. / PATENTED MCH. 22, 1882**. Courtesy of Tommy Bolack

59 - LeClanche Battery Co., New York

LeClanche was a French company, founded by relatives of Georges LeClanche, who invented the LeClanche cell in 1866. Rather than using Lead-Acid, which was invented by Gaston Plante in 1859, the LeClanche cell used Zinc -Ammonium Chloride. This is discussed briefly in the Introduction. There is no record of LeClanche having built plants in this county, so it is likely they licensed the technology to the U.S. GONDA was a trade name associated with LeClanche batteries. "Gonda" batteries were used by Waite & Bartlett in their Medical Batteries. Waite & Bartlett were also distributors for "Gonda" batteries according to early catalogs. We know from Hemingray's catalog of May 1, 1903, that the Hemingray Glass Co. manufactured jars embossed: Pile LeClanche and "Gonda", as well as other un-embossed LeClanche jars. The E.G.L. Co. of Boston sold LeClanche battery jars, as well. The LeClanche Battery Co had a New York, N.Y. address, and we know they were in business prior to 1900. I found a reference that claimed the difference in a LeClanche cell, was that the LeClanche cell had a pour spout. Below, you will see some LeClanche cells without a pour spout. So always check your sources for accuracy.

References: 113-116



← 59.2

←59.1 is a DISQUE LECLANCHE battery jar in a light aqua. It is embossed (arc) DISQUE LECLANCHE / The E.G.L. CO./BOSTON, MASS. Its dimensions are 4.375" diameter x 5.875" tall. The jar top 3.675" diameter, with a ground lip. The lid, 59.2, is un-embossed. If you look carefully, you can see that the cylindrical electrode would screw onto the underside of the lid. This is a feature that is not often seen. Courtesy of **Walt Baumgardt**.



←**59.3** is a TM."GONDA" battery jar. manufactured by the LECLANCHE BATTERY CO. It is an aqua, squared jar with a round, ground, top. It is approximately 5" square with a 4" diameter top It is approximately 10" tall.

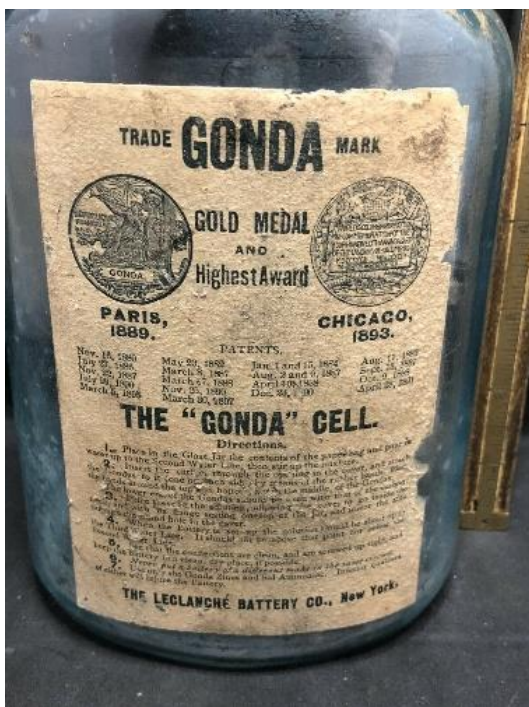
Embossed on the front, only. **TRADE / GONDA / MARK / THE / LECLANCHE / BATTERY CO. / NEW YORK.**

Courtesy of **Debbi Graham.**



←**59.4** is another LeClanche battery jar with the name **LeClanche Battery Co. New York.** This one has a paper label Courtesy of **Debbi Graham.**

This jar has a paper label with the **GONDA** trade name. A close-up of the label is shown in **59.5.** Courtesy of **Debbi Graham**



Note the Gold Medal awards in Paris in 1889 and Chicago in 1893, as well as the 18 patent dates: Nov. 16, 1880; May 23, 1882; Jan. 1, 1884; Jan 15, 1884; Aug. 11, 1885; July 27, 1896.

March 8, 1887; Aug. 2, 1887; Aug. 9, 1887; Sept. 13, 1887; Nov. 22, 1887; March 27, 1888; April 10, 1888; Oct. 9, 1888; July 29, 1890; Nov. 25, 1890; Dec. 28, 1890; April 28, 1891; March 5, 1895; March 30, 1897

←59.5



←59.6 is the lid to 58.4. It is embossed: (arc) TRADE GONDA MARK / (arc) PATENTED MARCH 27, 1888. JULY 29, 1890.



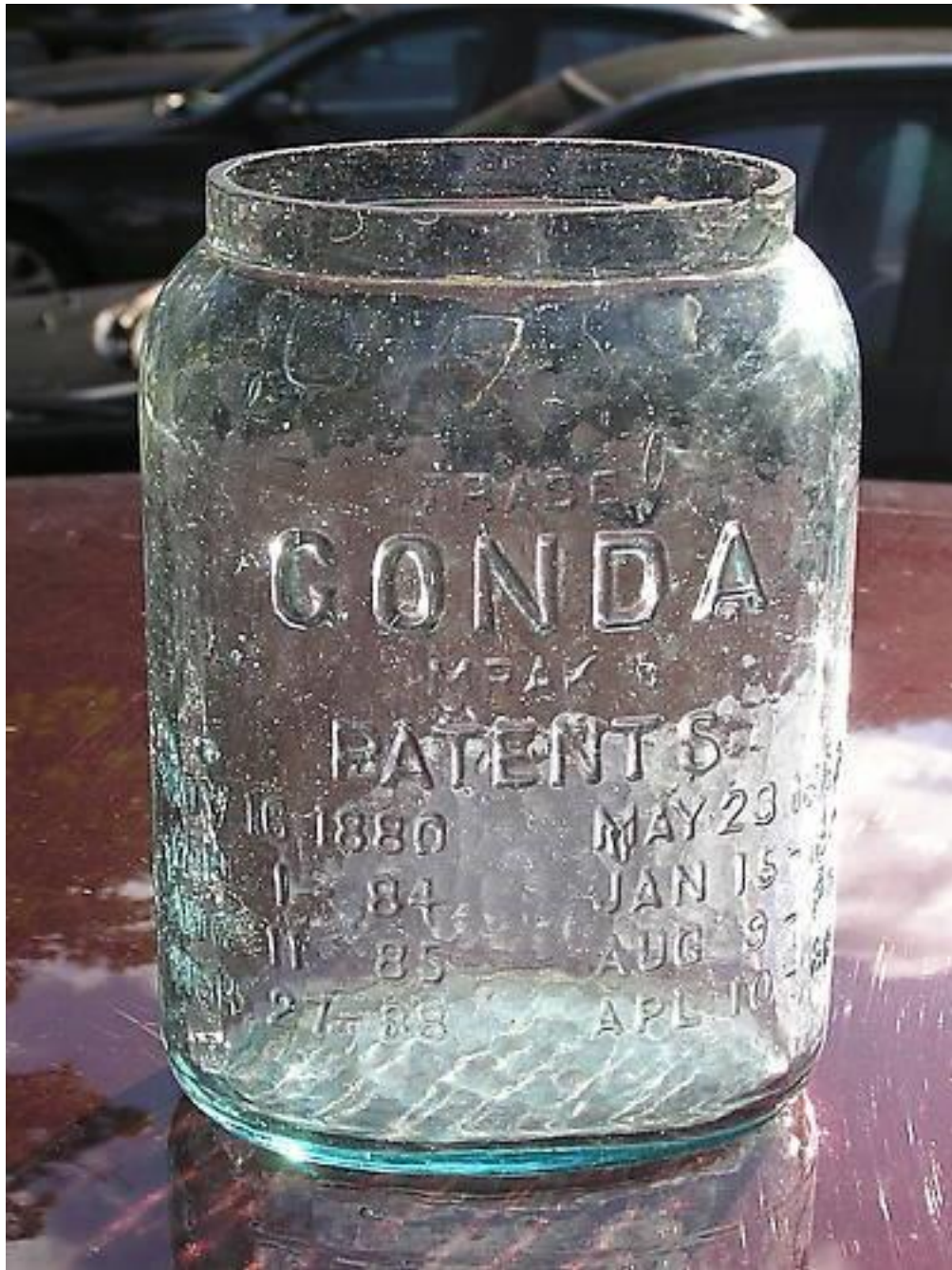
←**59.7** is embossed **PILE/ LECLANCHE**. IN French DISQUE means cell, while PILE means battery. Essentially, it means the same thing; LeClanche Cell vs. LeClanche Battery. There are no dimensions for the jar. It is approximately 4.5” diameter x 8” tall with a ground lip and a pour spout. Courtesy of **Debbi Graham**.



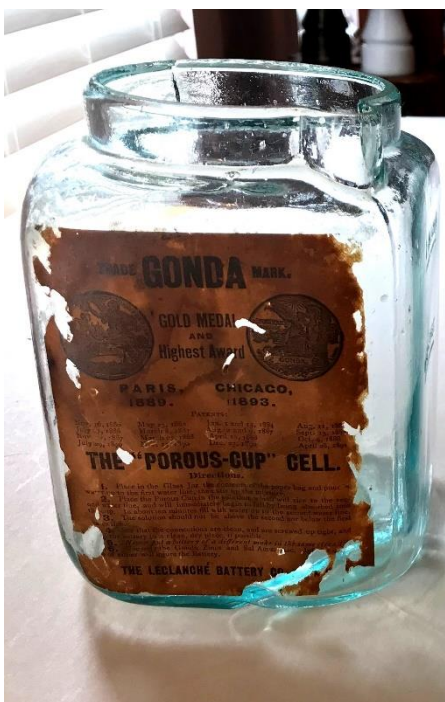
←**59.8** is a GONDA trademark battery jar with a ground lip. The jar itself is oval, measuring 4” x 3.25”. The mouth is 3” diameter and it is 6.675” tall. It is embossed: **Trade / GONDA / Mark / Patents / Nov. 16, 1880. May 23, 1882 / Jan. 1, 84 JAN. 15, 84 / Aug. 11, 85 Aug. 9, 87 / MCH. 27, 88 APL. 10, 88**. There are **WATER LINEs** marking the lower and upper levels for the electrolyte.

The lid, which appears to fit over the top of the jar is embossed: **Trade / GONDA / Mark / Patented March 17, 1887**. Courtesy of **Debbi Graham**.

59.9 is a Gonda Trademark battery that appears to be the same the sane as **58.8**. It is unique in that **MARK** is misspelled as **MRAK**. Other than that, the embossing and the 8 patent dates are the same.



59.9↑



←**59.10**, is a trademark **GONDA** battery jar. It is 4.25” square with a round mouth, 3.25” diameter. It has a ground lip and a pour spout. Courtesy of **Debbi Graham**.

Its paper label is the same as the one in **59.4**, except for the term “**The POUROUS-CUP CELL**.” A porous cup cell is one in which one of the electrodes has been enclosed in a porous container, called a salt bridge. This arrangement allows one to measure the activity at each electrode, independently from the other. Other than that, the cell works as any other.



←**59.11** is yet another variation of a LeClanche cell. The jar itself is oval shaped, 4.75” x 3.75” x 6.625” tall. It is aqua with a ground lip and lid and electrodes. Courtesy of **Debbi Graham**.

The embossing is **GONDA / PRISM BATTERY / Pat'd. NOV. 16 - 1880 / & JAN. 15 - 1884 / PILE LECLANCHE**

The lid is embossed: PILE LECLANCHE / PATENTED / Nov. 16, 1880 & Jan. 15, '84 / Trade / GONDA / Mark

There are two different types of battery construction, cylindrical and prismatic. The cylindrical is as it sounds, while prismatic batteries are oval or rectangular in shape. The cylindrical batteries are less expensive to manufacture, but the prismatic offers definite advantages. It is more compact, lighter in weight and much better able to resist over-charging and/or dis-charging. They have also proven to be more reliable.



←**59.12** is a trademark GONDA battery jar. It is a round, aqua, jar with a ground lip and pour spout. Its diameter is 4.5" with a 3.75" diameter mouth x 6" tall. Courtesy of **Debbi Graham**.

The embossing is: **PILE LECLANCHE / Trade / GONDA / Mark**. The side has two water level lines, designating the low and high levels of electrolyte.



59.13↑



59.14↑



←59.15

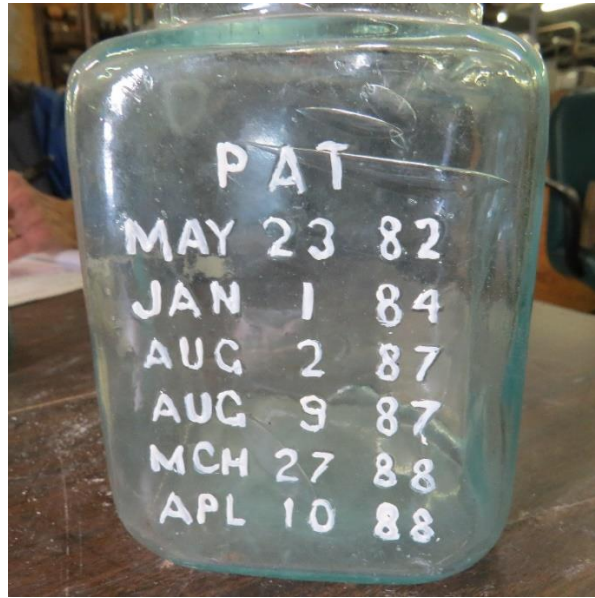
58.14 through 58.16 is a Pile LeClanche battery jar, not unlike others we've seen. This one is unique, however, as the embossing is vertical on the jar. It is a light green with a ground lip and dimensions of 4" square x 6" tall. Looking carefully at the top you can see that the spout is incorporated into one corner while the other three corners are round. The embossing reads (vertical) **PILE LECLANCHE** on one side and (vertical) **TELEPHONE / BATTERY** on a second side.



59.16↑ and 59.17↑ show a “GONDA” Trade Mark battery jar from the LeClanche Battery Co. of New York. The jar has a paper label with several patent dates, The term “GONDA CELL” and **LeClanche Battery Co.** The lid is embossed on the rim: (arc) **GONDA / (arc) PATENTED MARCH 27,1888 JULY 29, 1900**. The jar itself is oval shape, with a ground lip and dimensions of 4.25” x 5” x 7” tall. **Courtesy of Tommy Bolack.**



59.18↑



59.19↑

59.18 and 59.19 are two adjacent side of the same jar. AXO is the trade mark of a new pourous cup battery offered by LEClanche in 1889. The jar is 4.5” sq. x 7.25” tal, . with a ground lip. One side is embossed **TRADE / AXO / MARK**. An adjacent side has 6 patent dayes: It is embossed: **PAT / MAY 23 82 / JAN 1 84 / AUG 2 87 / AUG 9 , 87 / MCH 27 88 / APL 10 88**. Courtesy of Tommy Bolack.



←59.20

59.21→



←**59.20 and 59.21** are different sides of the same jar. is a GONDA jar, embossed **TRADE / GONDA / MARK / THE / LECLANCHE BATTERY CO. / NEW YORK**. With the AXO trade mark The lid, original to the jar, is embossed (arc) **SELF WINDING CLOCK CELL / (arc) HAYDEN CELL No. 4. / PATENTED**. Courtesy of Tommy Bolack. See Chapter 51.



59.22↑



59.23↑

59.22 and 59.23 is embossed **PILE LECLANCHE / TRADE / GONDA / MARK**. The lid is embossed **P. & C. Co.**, on which I could find no information. **Courtesy of Tommy Bolack.**



←**59.24** is a cylindrical jar, embossed (arc) **DISQUE LECLANCHE / H / (arc) NEW YORK**, with dimensions of 4.25" x 6" tall. **Courtesy of Tommy Bolack**

60 LEEDS & NORTHRUP

Leeds & Northrup was started in 1899 by Morris Leeds. It was called The Morris E. Leeds & Co. In 1903 Leeds took Dr, Edwin Northrup, a physicist as a partner. It was incorporated as Leeds & Northrup. They manufactured high quality galvanometers, potentiometers, and other laboratory type electrical equipment. In 1878 they were acquired by General Signal Corporation of Connecticut as the Leeds & Northrup Metallurgical Products Division. In 1995 the Metallurgical Div. was sold to GmbH of Hanau, Germany.

The Standard cells were actually manufactured by Marion Epley. The Epley Laboratory was founded in Newport, RI in 1917 for the purpose of Supplying the Weston Standard Cell at the request of Leeds & Northrup. The Epley firm is still in business supplying the aerospace industry.



←**60.1** is a **STANDARD CELL** from **Leeds & Northrup**. The dimensions are 3" diameter x 5.5" tall. Courtesy of Tommy Bolack

61 Little Giant

We don't know who manufactured The Little Giant. WE do know, however that the Rhode Island Telephone and Electric Co. bought them out. See **59.1**↓

Little Giant Battery

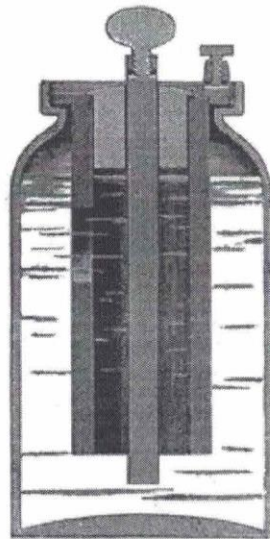
[Trade Journal]

Electrical Review

New York, NY, United States, Saturday, August 1, 1885
vol. 6, no. 22, p. 8, col. 4

The Little Giant Battery.

Improvements in batteries for telephone, burglar alarm and annunciator use are of frequent occurrence. The Rhode Island Telephone and Electric Company, of Providence, have just brought out a battery, known as "The Little Giant," that for durability, compactness and strength is one of the best ever brought to our notice. Wherever the battery has been tried it has given perfect satisfaction, and it is particularly praised for its excellent work with the telephone. One cell has been found to be abundantly powerful enough to work an automatic gas burner, and four is the largest number ever required, although six of other makes are generally found necessary. This battery has been adopted as their standard by the Telegraphic Time Company, which fact is strong proof of its excellence. The jar can be sealed, should it be desired. We expect to see quite a demand for this new battery, as its value becomes known to the electrical field.



THE LITTLE GIANT BATTERY.



←**61.2** is embossed **WATER LINES / LITTLE GIANT / No. 3**. The dimensions are 4" diameter x 6.25 " tall. **Courtesy of Tommy Bolack**



←**61.3** has the same embossing and is the same size, with an unembossed lid. **Courtesy of Tommy Bolack**

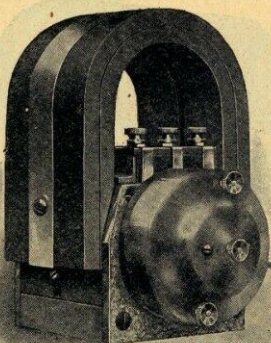
62 - Lutz Lockwood Mfg. Co.

Not much information is available on Lutz Lockwood. All I could find is this ad dating from circa 1910. It verifies that they were indeed located in Aldene, Union County, N.J. The ad does indicate that they were active in the electrical industry. Like so many other companies, we need more information before we can put the pieces together. The lid from GORDON (Chapter 29) indicates that Lutz Lockwood, at some point acquired the Gordon Battery Co. The full embossing of **62.1**, below, is (arc) **GORDON PRIMARY CELL / PATENTED / Oct. - 27, - 1896 / Apr. - 13, - 1897 / FEB. - 13 - 1906 / The Lutz - Lockwood Mfg. Co. / Aldene, Union CO. N.J. / (arc) Successor to (arc) GORDON BATTERY CO.**



62.1↑

SX MAGNETO



**Designed
Right
Simple
Efficient**

**Built
Right
Reliable
Durable**

Do you want the best ignition system on your car? The "SX" MAGNETO is the peer of all others.

The "SX" MAGNETO when once installed will without any attention outlive your car. We have made records of 30,000 miles and "still running."

Do you want to start your car on MAGNETO.

The "SX" MAGNETO will generate a hot spark at 50 revolutions per minute and run 2500 per minute without overheating.

Do you want two systems in one without double sets of plugs, extra coil, timers, switch, and wiring? You have a double system in the "SX" MAGNETO without these troublesome extras.

Do you want a MAGNETO that moisture won't make "lie down"? We don't claim to make MAGNETOS that will run under water, but we have had on exhibition for the past two weeks at the Palace and Garden Shows in New York an "SX" MAGNETO **running under water.**

If you want to be convinced write us and we will show you.



SX IGNITION DRY CELL BEST FOR SPARKING

Voltage, 1.6 Volts. Initial Amperage, 28 to 35

Will produce the best and most permanent results under the most trying conditions. Every step in the manufacture, from the selection of raw materials to the last test, subjected to the most minute inspection.

High voltage, longer life, and producing more current than any other battery on the market. Try them and be convinced.

PRINTED MATTER ON REQUEST

THE LUTZ-LOCKWOOD MFG. CO.
ALDENE, UNION CO., N. J. (P. O., ROSELLE, N. J.)

All we really know about the company is from the ad pictured on the left.

←62.2

63 MONARCH

WE know very little about the Monarch jar. It is believed to be a Canadian manufacturer. We know that by the 1890s The Diamond Glass Co. Ltd. controlled most of the Canadian Glass Companies, including”

- The North American Glass Co.
- The Nova Scotia Glass Co.
- The Hamilton Glass Co.
- The Burlington Glass Co.
- The Foster Glass Works
- The Lamont Glass Co.
- The Dominion Glass Co. Ltd.
- The Toronto Glass Co. Ltd.

Each glass company operated under their own name by Diamond determined what would be made where, etc. We know that the Lamont Glass Co. of Nova Scotia made battery jars, so it is felt that they likely manufactured the Monarch Battery jars.



The jar (**63.1**↑) is simply embossed **MONARCH** with dimensions of 4” square x 6” tall. **63.2**↑, the lid, is not believed to be original to the jar. It is embossed **V.B.E. Co. / PHILA. PA.**

64 - National Carbon Co.

The National Carbon Co. was founded in 1886 by W.H. Lawrence, formerly with Brush Electric Co., in association with Myron Herrick, James Parmelee, and Webb Hayes, son of President Rutherford B. Hayes. In 1890 National Carbon merged with Thomas-Houston, Standard Carbon and Faraday Carbon.

In 1894 they began marketing LeClanche wet cells, while at the same time pursuing research into dry cells. In 1896 they marketed the first battery intended for widespread consumer use; a sealed, 6-inch, 1.5-volt dry cell battery. The trademark was Columbia, which served as the basis for all dry cells for the next 60 years

In 1899, 11 companies, including National Carbon Co., incorporated as the National Carbon Co. In 1906 the American Ever Ready Company shortened its name to EVEREADY, and in 1914 the Eveready company became part of National Carbon. In 1917, National Carbon was acquired by Union Carbide. National Carbon eventually evolved in the Energizer Corp.

References: 128-130



←**63.1** is the lid is for **63.2**. It is embossed as Follows: **(arc) A.A.R. SIGNAL CELL / CONTAINS CAUSTIC / NATIONAL CARBON COMPANY / A DIVISION OF U.C. & C. CORPORATION / NEW YORK, N.Y.**

The fact that it is labeled as "Division of U.C. & C. Corp. would date it to post 1917.



←**63.2**, is the battery jar associated with the lid, **60.1**. The jar, left, has a story. It is embossed **Cxx**, which indicates it is a Corning jar.



←**63.3** left, is a National Carbon Battery Jar, with a partial paper label. It is 4.75" diameter with a 3.875" diameter mouth x 6.75" tall. It is aqua with a ground lip and pour spout. The paper label is embossed **NATIONAL CARBON CO. / CLEVELAND / O.** Courtesy of **Debbi Graham**.



62.4↑

66.4 is an un-embossed jar, with an embossed, combination lid and electrode. Because of the angle, reading can be difficult, but most of it is able to be deciphered. (arc) **NATIONAL CARBON CO. CLEVELAND, O. / (arc) NATIONAL FULLER.** Courtesy of Debbi Graham.

63.5 is a National Carbon Co. jar Lid. (arc) **R.S.A. SIGNAL CELL / NATIONAL CARBON CO. / CLEVELAND, O.** It was used on a jar for Railway signaling.

63.5 ↓



65 NATIONAL TELEPHONE CO. Ltd.

The National Telephone Company was a British telephone company from 1881 to 1911, bringing together many smaller local companies. Under the TELEPHONE TRANSFER ACT of 1911 it was taken over by the General Post Office (GPO) in 1912



←**65.1** is like a British made battery jar, embossed **The / National / Telephone / Co. Ltd.** Its dimensions are 3.5" square x 6" tall. It has a ground lip and spout. **Courtesy of Tommy Bolack**

66 - Ness, Ness, McLaren & Bates Electrical Supplies,
Montreal, N.W. & B.I.T. Co.

Thomas Wood Ness was born in King City, Ontario, the first of his family to be born in Canada. They had emigrated from Scotland the previous year. In 1885 the family moved to Montreal, Quebec, where Thomas started his business: T.W. NESS Co., which manufactured Thymo-cresol, which was used in vaporizers. By 1889 the company had shifted to making pulleys, electrical supplies, typewriters, cash registers and office specialties. Until 1893 the company was known as T.W. Ness. In 1893 the name changed to T.W. Ness & Co. In 1895 it became Ness, McLaren and Bates, which was later modified to N.W. & B.I.T. Co. which, we, as insulator collectors, know. Courtesy of **Chris Minicola**

References: 119



←**66.1** **66.2**↑

The T.W. Ness jar, **66.1**, would have been manufactured between 1885 and 1893. It is simply embossed **T.W. NESS / MONTREAL**. The lid, **66.2** although faint, appears to say Pat Appl. For. The jar is 4'5" x 7" tall with a ground lip and pour spout and appears original.

67 - New York, Westchester and Boston Railway (NYW&B)

The New York, Westchester and Boston Railway was incorporated in 1871 to run from what was then the southern edge of Westchester County, (now the BRONX) New York) to the county seat in White Plains New York. It lost financing during the panic of 1873 and entered foreclosure in 1875 and was liquidated in 1881.

Starting in 1874 parts of Westchester county were made part of New York City. This process was complete by 1898, placing much of the NYW&B franchise under the control of the City of New York, meaning the New York Democratic Association, Tammany Hall. The NYW&B emerged from receivership in 1904 and by 1910 had acquired the Hudson River & Port Chester Railroad (HR&PC). Passenger service started in 1912 and continued until 1935 when it declared bankruptcy.

Strangely, the New York, Westchester & Boston Railway ran from the Southern Bronx to White Plains, N.Y., never getting close to Boston.

The battery jar shown in pictures **67.1** through **67.4** was used on the NYW&B. It was assumed that JWP Jupiter to the electric company that supplied the battery.



67.1 ↑



67.2 ↑



67.1 through 67.4 are believed to be from the NYW&B railway. It is cylindrical in shape with a 4.25" diameter. The height is 6.375". The jar has a circular slug plate on the front with a BK 36 on the bottom. The top of the jar is 3.75" diameter with a pour spout.

The lid, with attached carbon electrode, is embossed on the top: (arc) **JUPITER J.W.P. JUPITER** / (arc) **BOSTON, MASS. / N.Y.C.W.**

67.3 ↑ 67.4 ↓



The lid appears to be original to the jar. This entry will be repeated in the Chapter of Unknowns, as it is unknown if the jar was used on the NYW&B Railway.

68 - Northern Electric Ltd

The Bell Telephone Company (Bell) of Canada was formed in May 1880. The first Bell Telephone factory and repair shop in Canada was opened in Montreal in 1882, and a new company was incorporated for this business in 1895 under the name of Northern Electric and Manufacturing Company Ltd. This company merged with the Imperial Wire and Cable Co., also owned by Bell, in 1914 to form the Northern Electric Company Ltd. (NE), with the majority of NE stock owned by the Bell Telephone Company of Canada.



As part of the Bell system, Northern was a pioneer in the early days of the telephone. In the picture on the left of an early phone, the box on the bottom held the wet cell batteries that powered the unit.

The Northern Electric catalog from 1920 (mentioned earlier) contains several pages of battery jars which were sold by the company. Most of these batter jars had the Edison embossing.

It is not believed that Northern Electric manufactured the battery jars. It appears that they may have been an outlet for the Edison Battery Co.

At this time, no battery jars have been attributed to The Northern Electric Co.

References: 120

69 - NOVELTY Electric Co., Philadelphia, PA



←69.1

Very little could be found on the NOVELTY Electric Co. of Philadelphia. We know they were formed in the latter half of the 1800's, as they had a product catalog published in 1885. We know they manufactured electric motors, fans, and other electrical equipment. Their product catalog shows a line of battery jars.

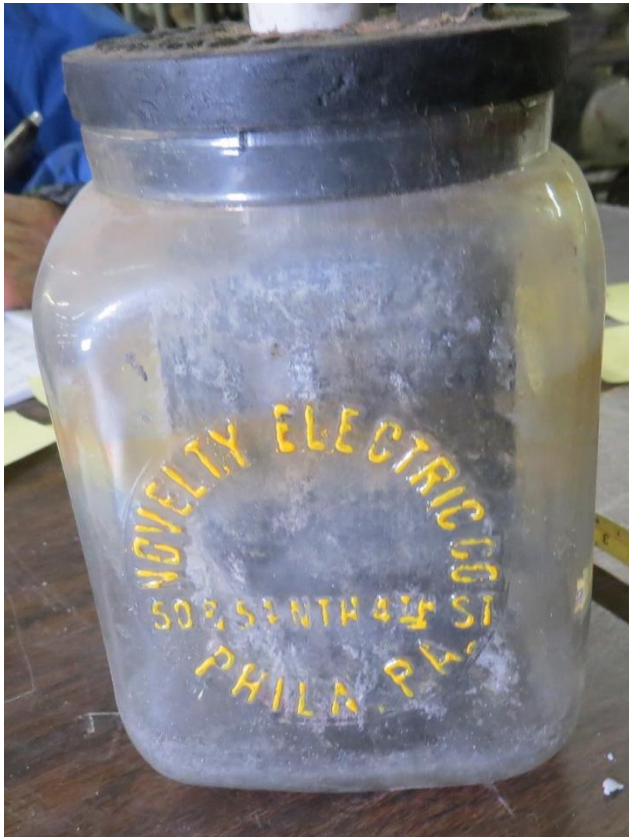
This round, blue aqua, jar, **69.1**, is 4" Diameter x 8" tall. The top of the jar narrows to 3". It has a screw lid which holds the electrodes, which are 1.5" x 6". The lid, **69.2**, is un-embossed. The jar is embossed on the front: **(In a Keystone) (arc) NOVELTY / ELECTRIC / CO. / (arc) PHILA. (rear) SIZE A / (paper label) From / J. ELLIOTT SHAW & CO. / Dealers in / ELECTRICAL SUPPLIES / 682 ARCH STREET / Philadelphia.** It is doubtful that Novelty Electric manufactured the jar. Courtesy of **Walt Baumgardt**



←69.2



69.3↑ is a battery Jar lid embossed (arc) **NOVELTY ELECTRIC CO. / PHILADELPHIA**. It was found on a jar embossed Frank Stevens Electric Co, **Courtesy of Tommy Bolack**



←**69.4** is a battery Jar embossed (arc) **NOVELTY ELECTRIC CO. / (arc) PHILA, PA**. The lid is embossed **Standard Tel & Electric Co / Madison, WIS**. **Courtesy of Tommy Bolack**

70 - Old IRONSIDES,

It is difficult to determine exactly what the term Old Ironsides refers to. There is not much written on it.

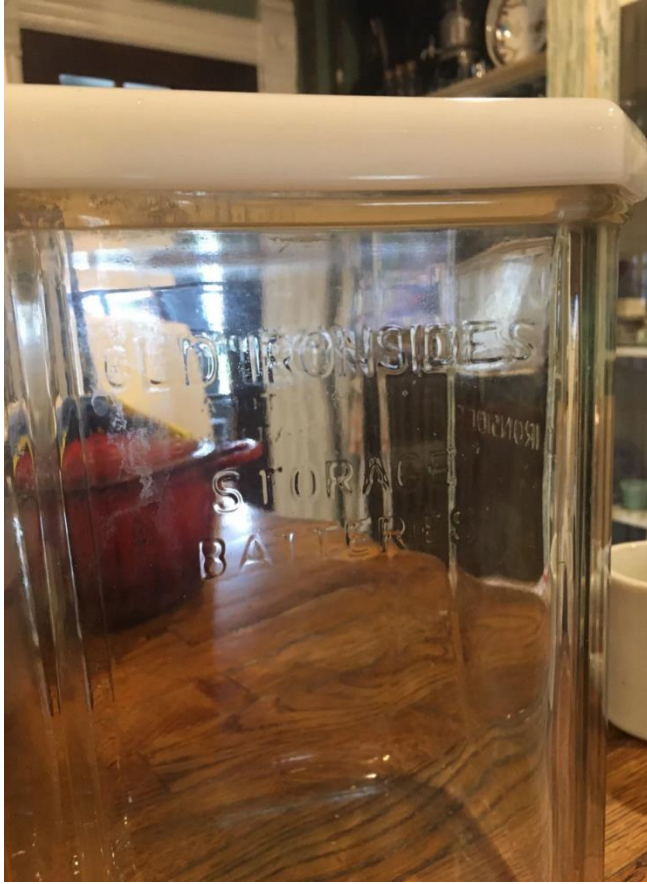
There is an abandoned building in Ashford, WI that claims to be the site of the Old Ironsides Battery Co. It supposedly started as car repair facility about 1930 by soon started production of Old Ironsides and Farm Light Batteries. It is now an EPA Remediation site.

Somehow, I'm not sure that story is credible, Ashford is a rural area in Wisconsin, about an hour from Milwaukee and 2 hours from Green Bay. The current population is about 1800 people. Considering transportation, etc. in the early 20TH Century, it doesn't sound like the home of a major battery Manufacturer.

Another story maintains that they were made in England by the Crystal Porcelain Pottery Co. Ltd. In Cobridge, Stoke-on Trent. The company was in fact in business in the 1880s, but any Old Ironsides battery jars I've seen are glass and not pottery or porcelain.

Another story has them being manufactured in the U.S., supposedly by the Bloom Jar Co. of San Francisco, which merged with the California Glass Insulator Co. in 1913. This seems plausible until you consider that Bloom seems to have manufactured nothing following the merger and the C.G.I. Co. was destroyed in a flood in 1916 and was never rebuilt.

I'm not sure any of the stories will stand up to close scrutiny. My personal opinion, based on not much other than that I've lived battery jars for a year or so, is that Old Ironsides is a name given to an improved performance battery manufactured by a company such as The Electric Storage Battery Co. or another large manufacturer batteries. This argument is strengthened by the fact that we have seen battery companies do this. Delco has their IRONCLADS Western Electric has their HYRAYS, etc. .



←**70.1** and **70.2** show an OLD IRONSIDES battery jar. It is 8" x 9" x 12" Tall. It is embossed **OLD IRONSIDES** on three sides and **OLD IRONSIDES / STORAGE / BATTERY** on the fourth side. The lid is milk glass and also embossed OLD IRONSIDES.



←**70.2**



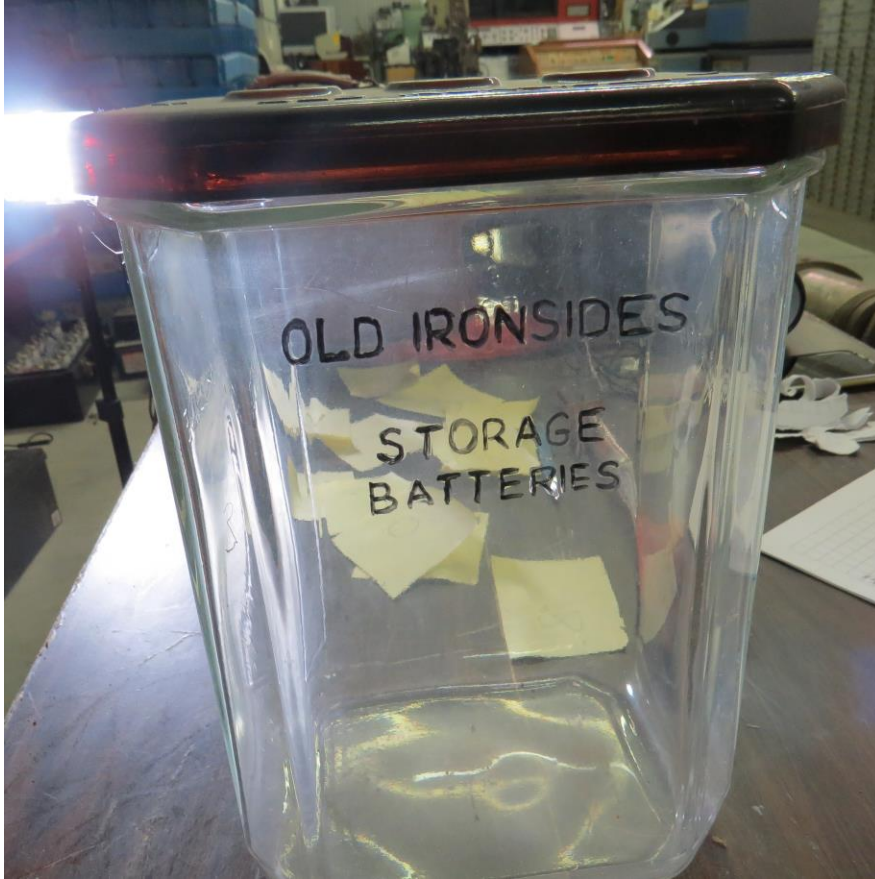
←**70.3** and **70.4** also show an “**OLD IRONSIDES**” battery jar. The embossing is **OLD IRONSIDES** on three sides and **OLD IRONSIDES / STORAGE / BATTERIES / M.J. FITZGERALD, CO. / MADISON, WIS.** on the fourth side. The dimensions are 8.5” x 7.75” x 11.75” tall.

M.J. Fitzgerald CO., was a radio manufacturer in Madison, WI, making large console radios. It is assumed that “Old Ironsides” was used to power such radios.

The lid is red glass and also embossed **OLD IRONSIDES**.



←**70.4**



70.5↑ is embossed **OLD IRONSIDES / STORAGE / BATTERY**, with no other embossing on one side only. The lid is red like 68.4. **Courtesy of Tommy Bolack**

71 - Ostrander, W.R. & Co., New York & Brooklyn

Like many other Electric Companies of the time W.R. Ostrander & Co. supplied fire alarms, burglar alarms, tank alarms and outlet boxes, battery and combination switches. Strap key and push signaling systems complete for public, parochial and private school use, signal systems complete for alternating current, primary or secondary circuits. They were also jobbers of batteries, conduit, all kinds of electrical novelties, etc.



71.1↑



71.2↑

71.1 and **71.2** show a battery jar with Ostrander embossing. It is 4" diameter x 6.5" tall with a ground lip. Exact embossing, inside of a circular slug plate is: (arc) **W.R. OSTRANDER & CO. / NEW YORK / (arc) & BOSTON.**

72 - Otto, F. G., & Sons

Ferdinand G. Otto came to the U.S from Germany in the late 1840s. He worked for George Tiemann & Co., then had a partnership with Augustus Koehler (1853 – 1860), and a partnership with John Reynders (1860 – 1875). In 1875 he went into partnership with his sons, Albert and Gustav. The company continued until 1914 when his son, Edmund, died. The company is best known as a supplier of surgical supplies. They have an instrument sales catalog which can be accessed at: <https://collections.nlm.nih.gov/catalog/nlm:nlmuid-101204651-bk>
<https://collections.nlm.nih.gov/catalog/nlmuid-101204651-bk>

What is not generally known is that by 1895 New Jersey had become the music box manufacturing center of the U.S. It is generally acknowledged that the top three manufacturers were The Regina Music Box Company, F.G. Otto & Sons. and The Aeolian Company. F.G. Otto introduced the Capital Cuff Brand of music boxes, followed by the Criterion and the Olympia.

They were a diverse company and through some kind arrangement with Whitall Tatum were a supplier of medical batteries for electro-shock therapy and cures for all types of ailments. It is believed that Whitall Tatum provided the battery jars. I believe there is a deeper connection between the two companies, but, to date, have not determined what it is.

References: 122



It is generally believed that Whitall Tatum made the battery jars used and offered by F. G. Otto.

←**72.1** has a square base, ground lip, and off-set square neck. The base is 5.125" square, with a 2" square mouth. It is embossed: **Neck: LD/ PATENTED / July 4TH 1871**
Base: (arc) F.G. Otto & Sons / New York
Courtesy of Courtesy of **Debbi Graham.**

This jar has been found in the Florence, Medical Battery.



←**72.2**, is the same size and shape as **67.1**, with dimensions of 5.125" square base with a 2" square mouth. It is embossed:

Neck: LD / PATENTED / July 4TH / 1871

Base: (arc) F.G. Otto & Sons / Jersey City

Note: See **2 – 9** for an explanation of LD.

This jar has also been found in the Florence Medical Battery.



←**72.3** is smaller than **72.1** and **72.2**. Its dimensions are 4.125" square base with a 1.75" round and centered neck and mouth. It is aqua with a formed lip. It is embossed:

Base: (arc) F.G. OTTO & Sons / Jersey City

The jar is believed to have been used in the MYSTIC, a smaller and earlier version of the Florence.



← 72.4 is an unembossed Grenet type battery jar .
The electrode mount on tap is embossed **F.G.**
OTTO & SONS / PATENTED / NEW YORK.



77.5↑ is a picture of the Florence with either **72.1** or **72.2**. Note the Patent date of **August 18, 1883**, and the **WHITALL TATUM & CO.** embossing. Courtesy of **Debbi Graham**.

73 Partrick & Carter

Partrick and Carter was a manufacturer of electrical supplies for the telegraph, telephone, electric lights and general electrical business.

James Partrick was a long time telegrapher, starting as a messenger boy with the Philadelphia, Reading and Pottsville Telegraph Co. about 1850. He advanced in the business and at the start of the Civil War was a manager working in the south. Because of his Union sentiments he moved north and was an operator for the U.S. Military Telegraph. In 1867 he started the Electrical Supply Business and was soon joined by Franklin Carter and Charle & Edward Wilkins, about whom I could find no information. Partrick, however, was the key to the business. With his vast experience he was sought after as a consultant in the telegraph industry.

In 1869 and 1870 he was with the firm of C.T. and J.N. Chester as superintendent for the building of the New York City Fire Alarm Telegraph. These are the same "Chesters" known for their threadless insulators. Through the years, James Partrick was associated with other greats of the telegraph industry: L.G. Tillotson, J.H. Bunnell. There was a Chester, Partrick & Co. and a Partick, Bunnell & Co.



←**31.1** is a quart sized battery jar with a ground lip, and dimensions of 4" square x 6" tall. It is embossed **PARTRICK & CARTER . GENERAL AGENTS . PHILADELPHIA, PA.** If you look closely you can see that the spout is built into one of the corners, by extending it outward.
Courtesy of Tommy Bolack

74 - PATENTED

These jars are merely embossed with a patent date of May 22, 1882. As it is embossed, I decided to give it its own chapter, like the way we acknowledge “Patent” insulators.

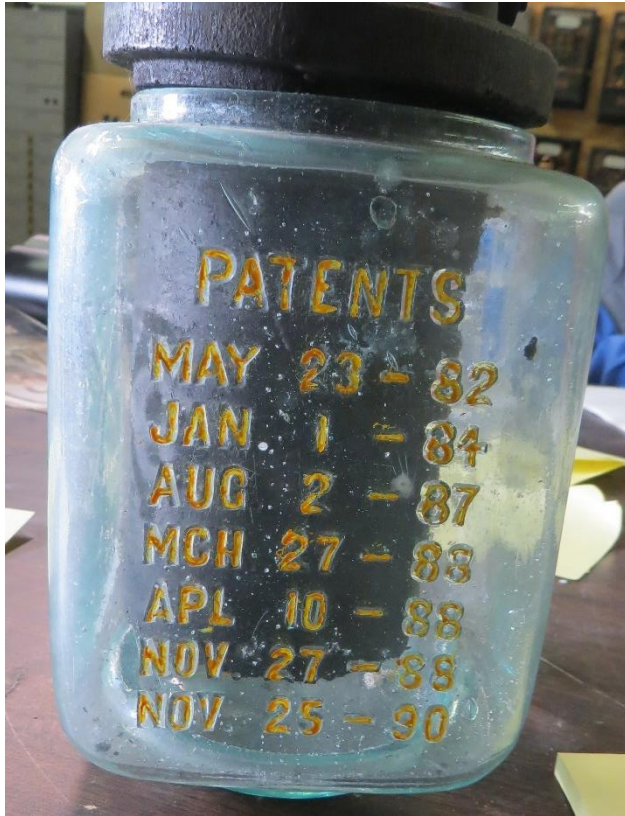


←**74.1** is 4.5” square with a 3.375” diameter. It is approximately 6.5” tall, with a ground lip. In addition to the patent date there are graduations on the front **3 / 2 / 1** **PATENTED / MAY 22, 1882**, and an “A” on the back. Courtesy of **Debbi Graham**.



← **74.2** is another patented battery jar. It is aqua, with a ground lip and a pour spout. It is 4” square x 6.25” tall with a 3.675” mouth. Courtesy of **Debbi Graham**.

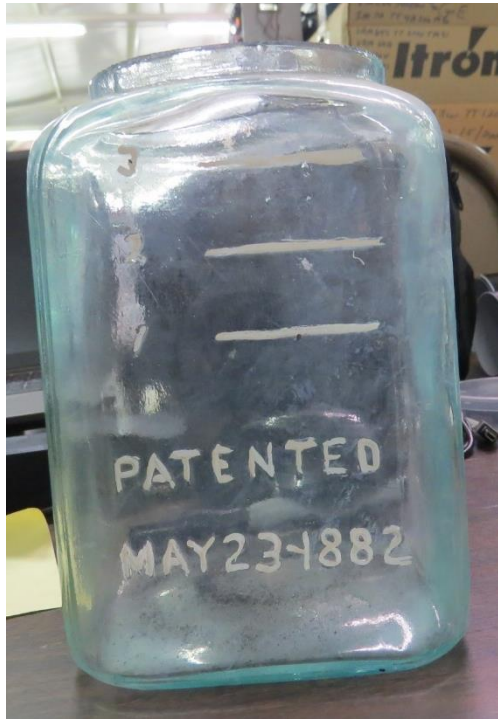
The embossing is **PATENTED / MAY 22, 1882 / B**. The rear side **2** lines denoting liquid levels, labeled **2 / 1**.



74.3 is in this section because of the Patent numbers. May 23 - 82, JAN 1- 84, Aug 2 - 87, MCH 27 - 88, APL 10 - 88, NOV 27 - 89, NOV 25 - 90. There is indecipherable embossing on the lid (74.4) and no other embossing on the jar. The jar is slightly shorter than 72.132 at 4.5" diameter x 6.5" tall. Courtesy of Tommy Bolack



←72.4



←**74.5** is similar to 72.1. It is slightly taller, with dimensions of 4.5" square x 7.75" tall. **Courtesy of Tommy Bolack**

74.6 is a variation of **74.1**. It has dimensions of 4.5" x 6.5" tall. The base, as seen in **74.7**, has a diagonal slot to fit some kind of rack.



74.6↑



← **74.7**

75 - Pettingell Andrews, Boston, MASS

There is very little on Pettingell Andrews as a company, other than that they sold electric supplies and lighting equipment in Boston Mass in the last half of the 19th and into the 20th century (1888-1927.) Pettingell and Andrews were both prominent families in The Boston area, having emigrated from England in the early 1800's. They are known for a line of insulators, of the CD 134 type, which were manufactured for them by a still unknown company. Their jars were also manufactured for them by an unknown company. The battery jars were likely used as a source of power for the early electric lighting that they sold. Throughout their existence they were primarily a supplier of all different kinds of General Electric Products.

When General Electric acquired The Thomas Houston Co. in 1892, the T.H.E. CO. glass insulators were manufactured under contract by Brookfield and Hemingray. It is likely, that, for a while after the acquisition, General Electric Glass Insulators were produced by Brookfield and Hemingray. Brookfield manufactured battery jars, so it is likely they manufactured for T.H.E and G.E.

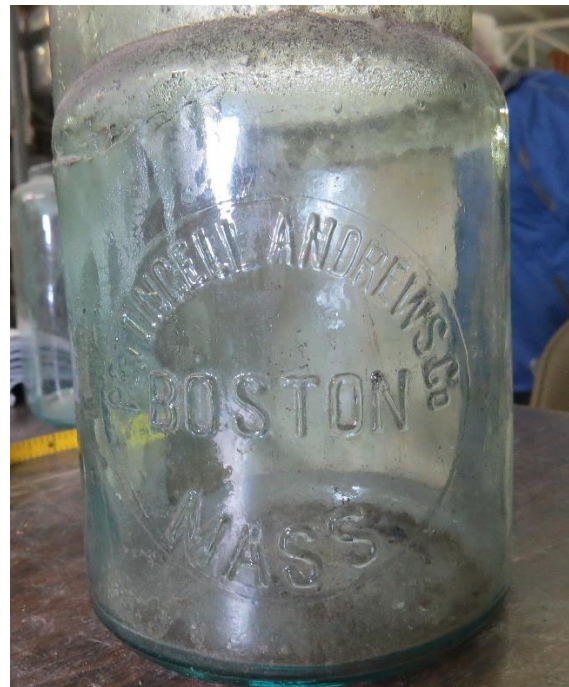
References: 125



←75.1 is aqua with a ground lip and pour spout. The dimensions are 4.75" diameter x 6.125" tall with a 3.75" diameter mouth. It is embossed inside of a circular slug plate: (arc) **PETTINGELL ANDREWS Co. / BOSTON / MASS.** Courtesy of **Debbi Graham.**



75.2↑



75.3↑

75.2 and 75.3 show opposite sides of the same jar. **The paper label says “CARBON BATTERY / PETTRNGELL ANDREWS CO. / BOSTON, MASS.”** The other side of the jar is embossed in a circular slug plate: (arc) **PETTRNGELL ANDREWS Co. / BOSTON / (arc) MASS.** **The dimensions of the jar are 4.5” diameter x 6.25” tall.** Note the discrepancy in “CO”. The paper label says CO. while the jar itself is embossed Co. Companies are usually careful about the spelling of their names. **Courtesy of Tommy Bolack**

76 - PHILCO Batteries

What would eventually become PHILCO, started in 1892 as the Helios Electric Co. After a very slow start, it was re-organized in 1906 to the PHILADELPHIA STORAGE BATTERY CO. In 1915 they introduced their new trademark "PHILCO". In the 1920s they focused on supplying batteries for the emerging market of battery powered radios. They developed the Socket Power "A", "B" and "AB" battery eliminators, which were arrays of rectifier cells. Later, Philco developed the first automobile radio. The 1960s and 70s saw the Philco brand changing hands from Ford to GTE – Sylvania to Philips, which still retains the rights.

References: 126



76.2↑

76.1↑ is an unmarked, double cell, radio battery jar in uranium glass. It is approximately 4" x 7" x 7" tall.

The lid, (**76.2**), shows **PHILCO** on the arm connecting the electrodes. Note the two cells are connected in parallel. **Courtesy of Debbie Graham.**



←**76.3** is a similar 2-cell, Philco radio battery in uranium glass. It, too, is embossed PHILCO on the connecting arm. It is slightly smaller with dimensions of 2.75" x 7" x 5.75" tall. **Courtesy of Tommy Bolack.**

The jar pictured below, **76.4**, is a battery for an early Radio. It is embossed **PHILCOTRON B / PART K-483** on the front two lines near the top. The upper and lower liquid levels. It is 1.5" square x 6" tall. *Note:* This is seen in the advertisement on page 188. Courtesy of Walt Baumgardt. I have pictured the electrodes, **76.5**, separately. Courtesy of **Walt Baumgardt**.



← **76.4**



←**76.5**



76.6↑

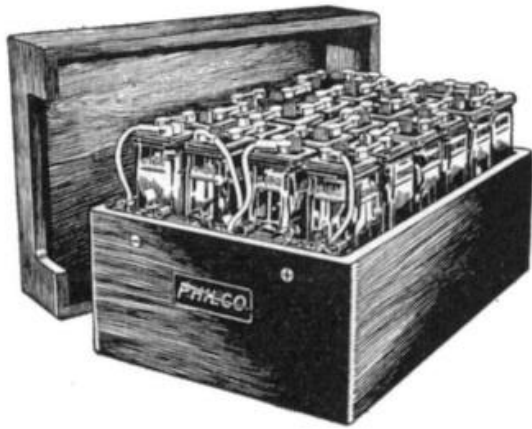


76.7↑



76.8↑

76.6 and **76.7** are similar to the K- 483. They show the Philcotron B, Part K 457. It, too, is 1.5" square but only 5" tall. **76.8**↑ shows two Philcotron B, Part K 457s, complete with electrodes. Both were used in Rectifier cells such as seen in **76.9**.



← **76.9** The rectifier Cells were sold as battery eliminators, which enabled one to power their radio from their home electricity through a wall socket.



←**76.10** is a larger single cell battery jar. It is clear with a formed lip. Its dimensions are approximately 3" x 10" x 14" tall. It is embossed **Water Line / PHILCO** on all 4 sides. The bottom is embossed **G-617**, likely made by Gayner.



←**76.11** and **76.12** show a Philco Battery jar embossed **G-11** on the base. The top dimensions are 7" x 3.25" x 10" tall. Other embossing is: **Upper and Lower water lines on 4 sides, and PHILCO on the Front and Rear.** This too, is likely a Gayner jar.

76.12↓





←**76.13** is a Philco battery jar with the brand name **KOHLER** embossed on the front. Full embossing is **Water Level / KOHLER / Philco / Made In U.S.A.** Dimensions are approximately 4" x 7" x 12" tall.



←**76.17** is a embossed **WATER LINE / PHILCO / MADE IN U.S.A.** on the front and back. Its dimensions are 6" x 7.5" x 10.5" tall.



76.14↑



76.15↑



74.14 through 76.16 show a porcelain battery jar by Philco. It is embossed within a laurel wreath: PHILCO / FLOTE' / in / VITRABLOC. It also has a serial number of 389 8703 and a Patent date of FEB 13 1946. It is 7" square at the base x approximately 14" tall. With the tapered sides the top is approximately 9 – 10" square.

← 76.16



76.18↑ is a Philco jar, manufactured by Corning with a Gould Lid. The jar is embossed **PHILCO / U.S.A.** on opposing sides. The dimensions are 2.5" x 6.75" x 9" tall; 9.5" with the lad. It is fair to assume the lid is not original. **Courtesy of Tommy Bolack**



76.19↑ is embossed **WATER LEVEL / PHILCO** on four sides, with **Made in U.S.A.** on one side. The dimensions are 6" x 9" x 14" tall.



←**76.20** is Gayner jar, embossed **G-2** on the bottom, with dimensions of 6" x 8" x 10.5". It is also embossed **WATER LINE / PHILCO** on opposite sides.



←**76.20** is embossed **PHILCO / Made in U.S.A.**, on front and back. Dimensions 6" x 7.5" x 10" tall.



←**76.21** is embossed **PHILCO**. Its dimensions are 5.5" x 7.5" x 10: tall

77 – Porous Cup Battery Co.

The battery jars read **POROUS CUP BATTERY** Co., but I could find no evidence of such a company. This really doesn't surprise me, as the porous cup is actually an improved battery technology, which was used by many companies.

The first porous cup technology was patented by J.A. Thiebaut, where both the negative electrode and a porous pot was placed in a zinc cup. This allows for the use of two different electrolytes. The porous cup allows the electrons to move toward the cathode or anode, while preventing the electrolytes from mixing. The original Daniel cell, one of the earliest batteries, used a porous cup filled with sulfuric acid and a zinc electrode. This is placed in a copper container filled with a copper sulfate solution. The resultant chemical reactions create positive copper ions and negative sulfate ions which migrate toward the cathode and anode, respectively. If we connect the anode and cathode with a copper we create an electrical circuit. A porous cup allows both reactions to take place with the same battery jar.

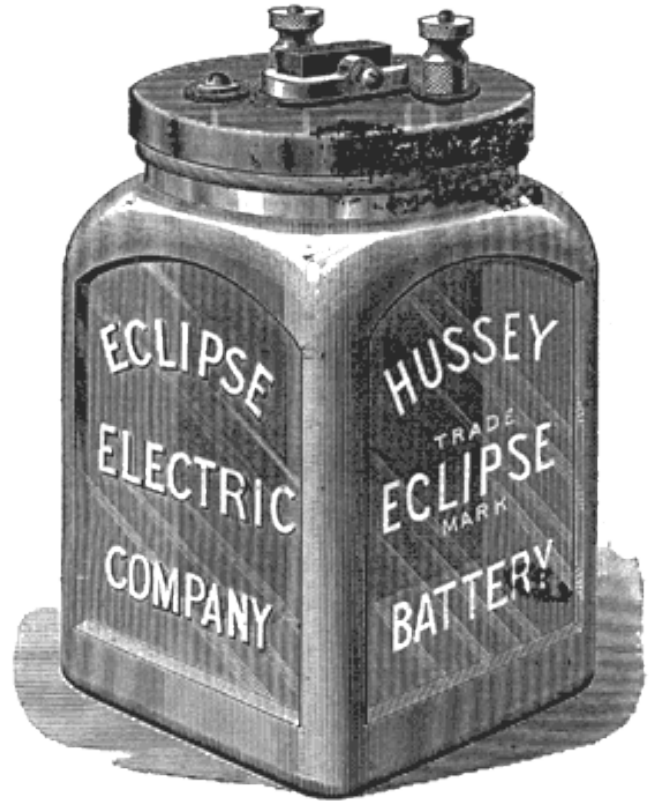
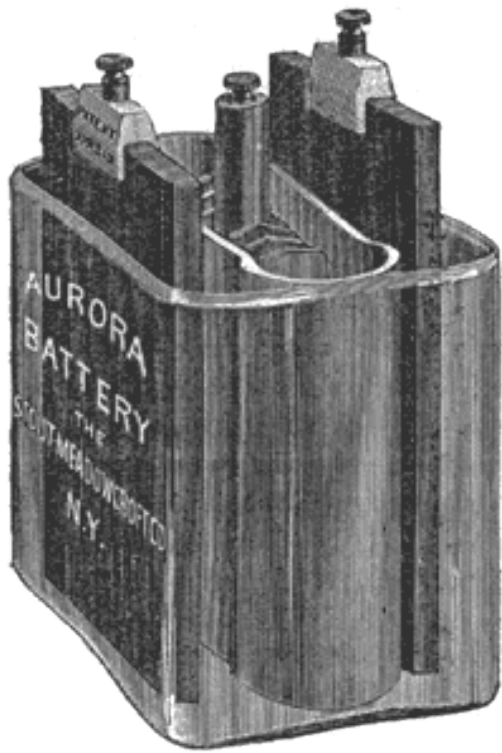
Many companies used the technology and offered a porous cup battery. The companies known to have offered porous cup batteries are: LeClanche (AXO trademark), Aurora Battery, Law battery, Hussy battery, Gonda batteries and Edison batteries. All the porous cup batteries I've found are the quart size.

P.C. Burns is on the list of patents, which would indicate that any or all of his companies likely used the porous cup technology. This would add The LeClanche Carbon Co., the Findlay Bottle Co., Peru Electrical Manufacturing Co. and The LeClanche Carbon & Electrical Co.

In addition, there were many patents issued for porous cell batteries. A quick search showed 29 patents issued between 1885 and 1918 related to porous cells. A list is provided in Appendix for those that are interested.

As an interesting aside, there were three patents issued to L.P.J. Kamerdyk, who describes himself as “a subject of the King of Belgium, residing in the city of New York, borough of Manhattan, in the county and State of New York.

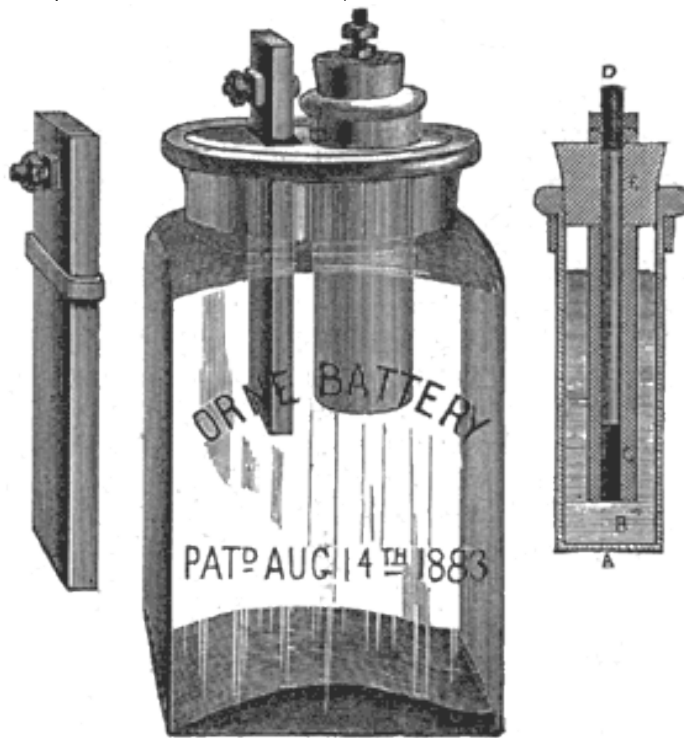
I show some pictures of porous cup batteries that I found in the literature that I have never seen. These include: **49.1** The Aurora Battery from the Stout Meadowcroft Electric Co., **49.2** The Hussy Eclipse Battery from the Eclipse Electric Co. and **49.3** The Orne battery Pat'd August 14, 1883. I could find no relevant information on the Eclipse Electric Co. I did find a catalog on the Stout Meadowcroft Co. offering a variety of electrical supplies and several batteries. The section on batteries is found in Appendix H.



77.1↑

77.3↓

77.2↑





←77.4 is a straight sided cylindrical battery jar, 4.5" diameter x 5.5" tall. It is embossed (arc) **THE IMPROVED / PATENTED POROUS CUP BATTERY CO. / NEW YORK / PAT'D. OCT 26, 1886 / Trade Mark / C.J.H.** (highlighted by 4 stars). Note the absence of any Water Line. **Courtesy of Tommy Bolack.**

78 PRISM

Most of what I could find on the benefits of the Prism Battery is found in the attached article from the Electrical Review of May 10, 1884. **78.1 and 78.2)**

To summarize it briefly the Disque LeClanche battery was intended for open circuit rather than closed circuit work.

- Open circuit work means requiring the closing of the circuit only for short periods of time such as for telephones, call bells, etc.
- Closed circuit work is where the circuit is closed continuously.

The Prism cell, in the patent of 1880 improved upon that concept, while the patent of 1884 added a feature making it possible to hermetically seal the battery. This makes the battery perfectly suited for transportation without danger of spilling. Copies of both patents are included in the appendices.

New form of Prism Battery

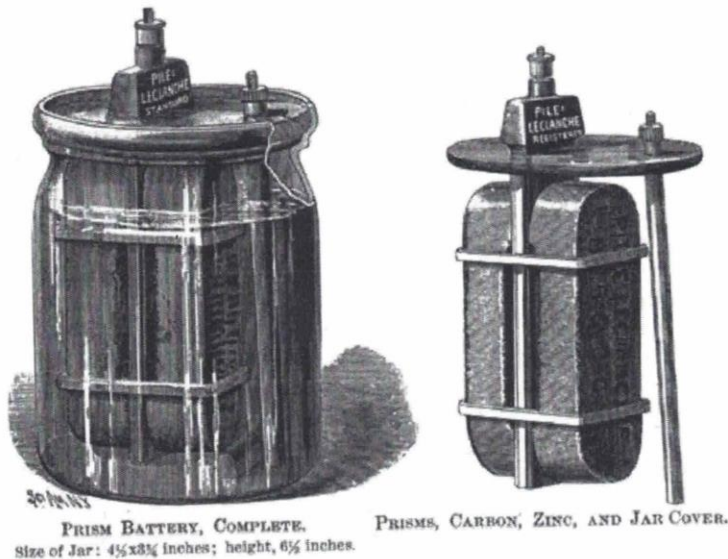
[Trade Journal]

Electrical Review

New York, NY, United States, Saturday, May 10, 1884
vol. 4, no. 10, p. 3, col. 2-4

A New Form of Prism Battery.

The introduction of the telephone brought a demand for an efficient working battery for open circuit work. To a very great extent the demand in question was met at once by a form of battery designed and patented by the Leclanche Battery Company of New York. Almost all telephone companies are familiar with the style first made, many thousands of which are doing good service to-day. The management of the Leclanche Company have recently made some improvements, and are now introducing a new form of jar and cover for the well-known prism battery, an illustration of which we give herewith. The cover rests upon a shoulder inside of the jar, which is oval in shape, the rim of the jar above the cover being concave in shape. The cover, when in place, closes the jar sufficiently tight for ordinary purposes; but, if desired, it may be hermetically sealed by pouring on the cover melted wax, which will spread over the cover, run into the concavity of the rim, and be held firmly in place, thereby effectually sealing the jar. Any kind of wax may be used for the purpose, but paraffine is preferable on account of the ease with which it can be removed. The cell can be unsealed with an ordinary pocket knife whenever necessary to renew or clean it. The latter process, however, will scarcely be necessary, as the paraffine prevents the salts from climbing up and fouling the cover. A cell thus sealed can be transported on boats, cars, and other vehicles without danger of slopping over the liquid. The adoption of the new jar and cover is a manifest improvement, and will undoubtedly add to the reputation of this famous battery. The jar and cover have both been patented.

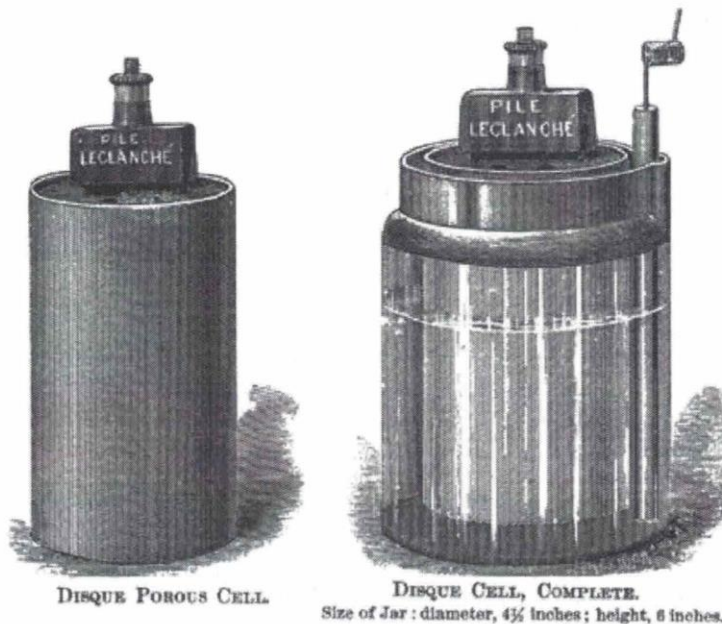


PRISM BATTERY, COMPLETE.
Size of Jar: $4\frac{1}{2} \times 3\frac{3}{4}$ inches; height, $6\frac{1}{2}$ inches.

PRISMS, CARBON, ZINC, AND JAR COVER.

Our readers in the telephone field are for the most part familiar with the Leclanche prism battery, yet a short description of the principal features of it will be of interest to many. The prism battery possesses the unquestionable advantage of dispensing with attention during long periods of service, provided that it be used only for those purposes for which it is suited and for which it was intended. It is an open

circuit battery, and is not intended for closed circuit work. By open circuit work is meant that requiring the closing of the circuit temporarily and for short periods only, such as service on telephones, call bells, annunciators, burglar alarms, etc. etc. No internal action takes place in the Leclanche battery unless the circuit is closed, so that when not actually at work there is no consumption of materials, and the battery will last indefinitely. In the legitimate use of the battery, the length of the periods during which the circuit may remain closed, without injury, varies with the amount of resistance in the circuit. The less the resistance, the greater will be the tax on the battery, and the shorter the time required to exhaust the elements; the greater the resistance, the less will be the tax on the battery, and the longer will be its term of service. With a high resistance it may be used for purposes requiring the closing of the circuit for a half hour or more at a time. By closed circuit work is meant that in which the battery is kept continuously in action It is not intended for such work. The idea that whenever the battery fails to work properly sal ammoniac should be added, is an erroneous one. A saturated solution (that is, just as much as the water will take up and dissolve and no more) is the proper quantity to be used; any amount over that will not increase the efficiency of the battery, but will rather be detrimental.



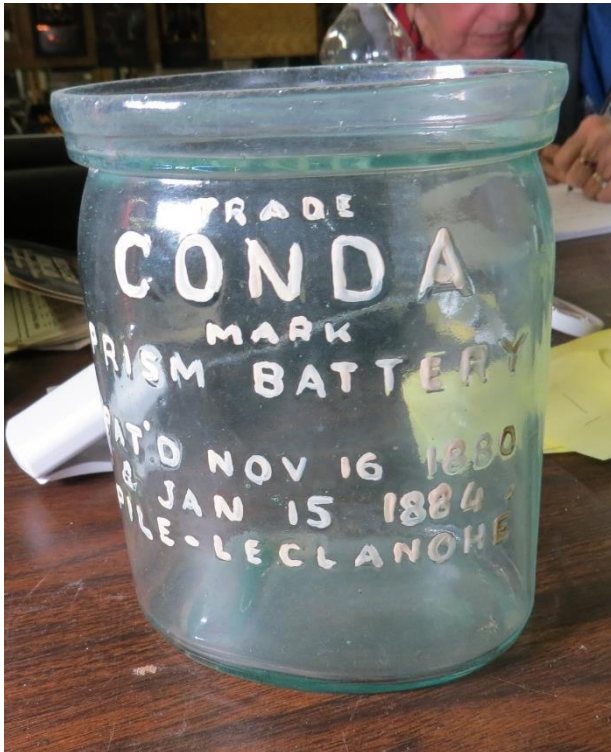
This company also manufacture the well-known disque cell, so long used by the telephone people. The above cuts represent the Leclanche disque cell, which, until the introduction of the Leclanche prism cell, was one of the best open circuit batteries made, and the one moat generally in use both in this country and in Europe. It is still used to some extent, and, as made by the Leclanche Battery Company of the best materials and with care and skill, is an efficient and useful battery.

No internal action takes place in the Leclanche batteries unless the circuit is closed, so that when not actually at work there is no consumption of materials.

The success of the immense business built up by this company is entirely due to the able management of Messrs. Hilborne and Cornelius Roosevelt and Mr. Horatio J. Brewer. The improvements in their batteries have kept pace with the improvements in other apparatus used in the telephone field.



←**78.3** is a LECLANCHE jar, embossed : **PRISM BATTERY / PAT. NOV. 16, 1880 / PAT. JAN. 15, 1884 / PILE LECLANCHE**. The jar is oval with dimensions of 3" x 4.5" x 6" tall. This PRISM technology(1884) enabled the jar to be hermetically sealed. **Courtesy of Tommy Bolack.**



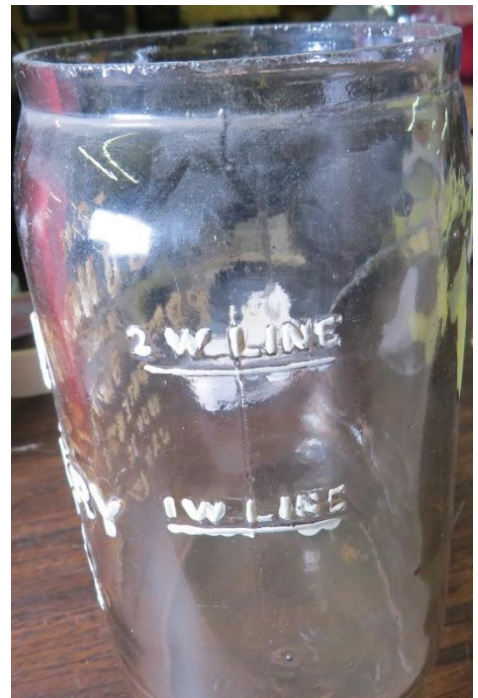
←**78.4** is the same jar as **62.3** with slightly different embossing: **TRADE / GONDA / MARK / PRISM BATTERY / PAT'D. NOV. 16, 1880 / JAN. 15, 1884**. **Courtesy of Tommy Bolack**

78.5 is another Prism battery. Its dimensions are 3.5" x 4.5" x 6.5" tall. **78.6** shows the water line markings on the side of the jar. Notice the difference in design between 78.3 and 78.4 and 78.5. 78.5 is the 1880 patent while the other two are the 1884 patent. **Courtesy of Tommy Bolack**



←78.5

78.6→



79 - RAILWAY STORAGE BATTERY CAR CO.

Railway Storage Battery Car Company was the name adopted for the former Federal Storage Battery Car Company, about 1913. Its purpose was to support the development of battery-operated rail cars. Some authorities maintain that Edison started the company as a means of selling his storage batteries. Although he may have been involved in the establishment of the company, The Railway Storage Battery Car Company was never Edison's company. A study of Edison's papers show that he was intimately involved with the company in technical matters, and management and promotion from before 1912 to as late as 1921.

An annual report of the Railway Storage Battery Car Company shows the company was incorporated to manufacture storage battery cars; and has a contract authorizing the use of the Edison Storage Battery.

Records show a streetcar powered by Edison Storage Batteries began a cross-town run in New York City in 1910. By 1914 the Long Island Railroad had four battery powered cars running.

References: 131

NOVEMBER 22, 1912 RAILWAY AGE GAZETTE 13

Beach Cars with the Edison Battery



On the Long Island R. R.
The First Battery Car on a Steam Road in the United States

This single-track car was installed on the Long Island Railroad on April 1, 1911. To October 1, 1912, it had covered more than 38,000 miles. It makes a schedule speed of 24 miles per hour and because of good tracks and infrequent stops the power consumption is unusually low.

The battery input is 490 watt hours per car mile—battery output, 377 watt hours per car mile and 57.1 watt hours per ton mile.

This branch line formerly operated with a locomotive and combination car. The Beach car makes 72 miles per day, or four trips more than the steam equipment. It has given no trouble—has remained in service with little attention and saves the company about \$21.00 per day over the cost of former equipment—a saving equivalent to more than \$11,000 in 18 months.

If you are operating steam equipment on branch line or local service and desire to increase the earnings—look to Beach cars.

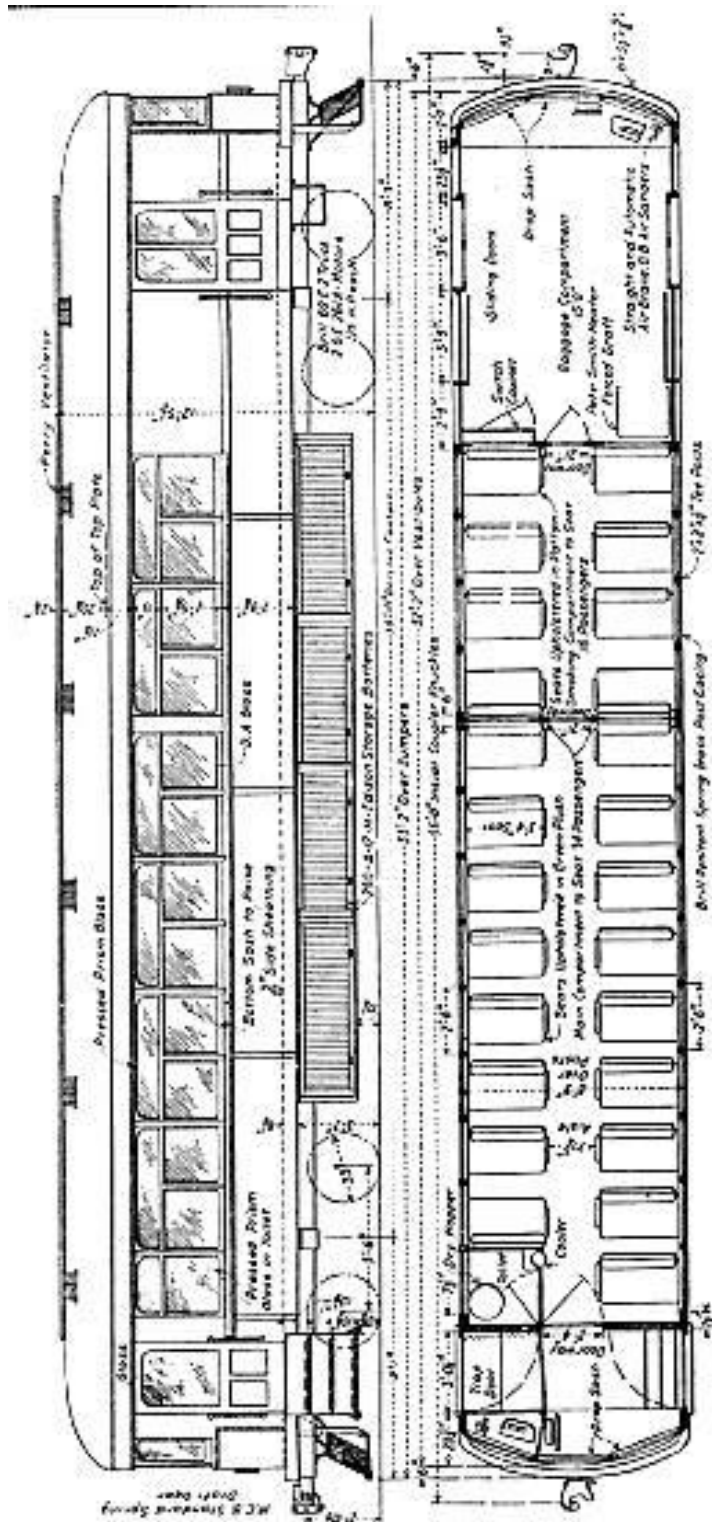
Anyway get the records of Beach cars on various roads for comparison with your present costs—we'll gladly mail them on request.

Railway Storage Battery Car Co.
Distributing Agents
30 Broad St. - - - - - New York City
FEDERAL STORAGE BATTERY CAR CO., Manufacturers, Silver Lake, N. J.

79.1↑



79.2↑



←79.3 shows the large battery compartment under the car.

80 Samson Electric Co, Canton MASS

The Samson Electric Co. was the successor to the Electrical Goods Manufacturing Co. (E.G.M. Co), which was the successor to The Electrical Gas Lighting Co. (E.G.L. Co.).

E.G.L. was formed in 1883 in Boston, MA. In 1906 they changed their name to E.G.M., at the same address. In 1911, the company moved to Canton, MA; a part of the greater Boston area, about 15 miles south-west of downtown Boston. In 1917 they changed their name again, to the SAMSON ELECTRIC Co.



80.1↑



80.2↑

80.1, is a squared aqua jar with a ground lip. The dimensions are 4.75" square x 6.5" tall with a 3.75" diameter mouth. The jar is embossed on 3 sides:

Side 1: The SAMSON/ BATTERY / No 2

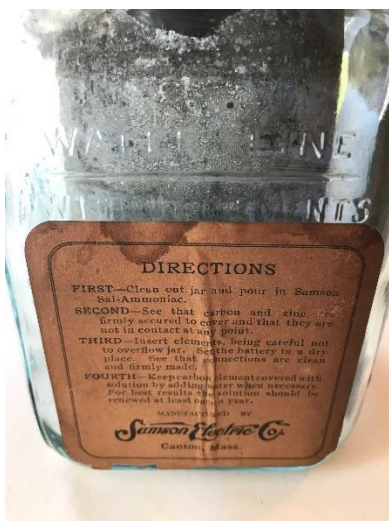
Side 2: SAMSON ELECT Co / CANTON / MASS

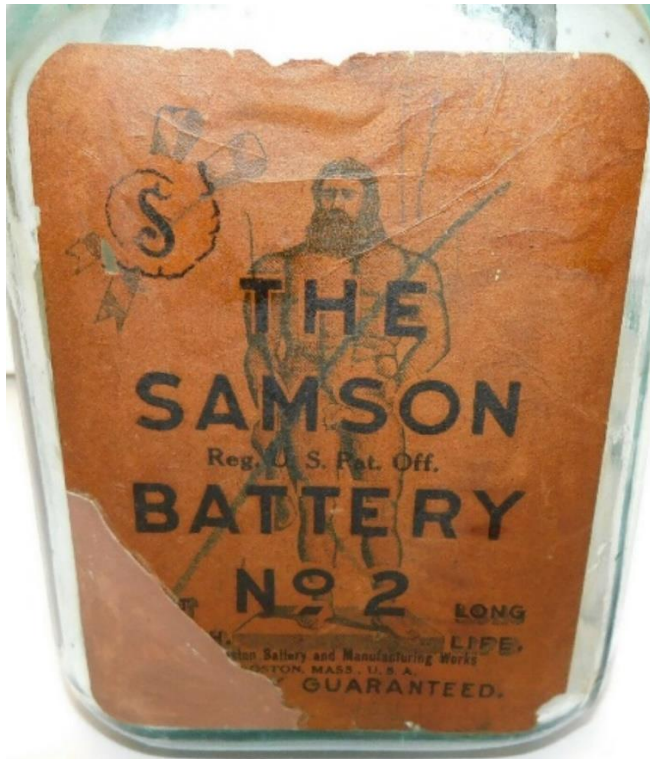
Side 3" Water Line without elements

The lid is embossed: (arc) **SAMSON / Samson Electric Co / Canton Mass / BATTERY**

80.2 and 80.3 show the lid and reverse of the jar. Courtesy of **Debbi Graham**.

←80.3





80.4↑

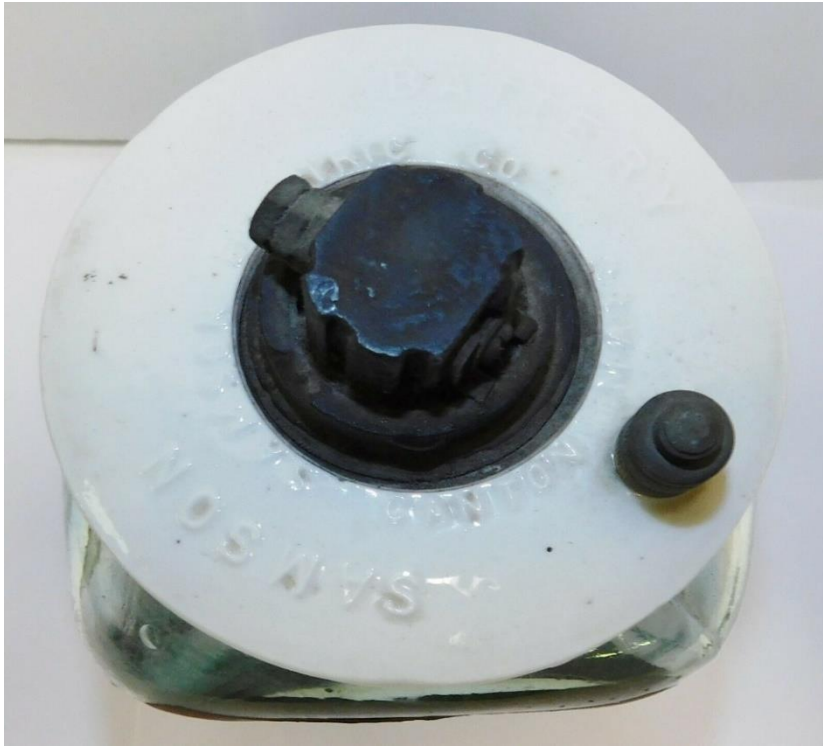
80.6↓



80.5↑

80.7↓





← 80.8

Pictures 80.4 through 80.9 show another SAMSON No. 2 battery. All four sides of the jar are shown. **Side 1: paper label with SAMSON no. 2 / Burn-Boston Battery and Manufacturing Works. Side 2: SAMSON / ELECTRIC Co. / CANTON / MASS. Side 3: THE / SAMSON / BATTERY / No. 2. Side 4: Water Line / Without Elements / Paper Label with instructions. Also labelled BURN-BOSTON BATTERY & MANUFACTURING Co.**

The lid, 80.8, is the same as 80.2. Labelled:80 (arc) SAMSON / (arc)

SAMSON ELECTRIC CO. / (arc) CANTON, MASS / (arc) BATTERY, it is original to the jar.



←80.9

80.9 shows the electrodes. They are unusual in that the inner electrode seems to be tied up like a sausage. This jar is also 4.74" square with a 3.75" diameter mouth. It is 6.5" tall, with a ground lip.

We have no idea who manufactured the jar, but it was obviously manufactured for The Samson Electric Co and distributed by Burn-Boston Battery and Manufacturing Works.

I could find no information on Burn Boston Battery and Manufacturing CO.

81 - Self-Winding Clock Co

The Self-Winding Clock Co. (SWCC) was started in 1866 by Chester H Pond, who was also a principal in the Gamewell Fire Alarm-Telegraph Company. Pond was an instrument maker as well as a pioneer in the developing field of electricity. It was one of the first companies to power its clocks with an electric motor. The motor rewound the main spring every hour and lasted approximately one year. Most clocks required two batteries, which accounts for the large size of most electric clocks of this period. Two batteries allowed symmetry, with a battery on either side.

The company was situated in New York City, at the site of the current Pratt Institute. Charles Pratt, the founder of the institute, was also one of the original founders of the Self-Winding Clock Company. The SWCC was in business until the early 1960s.

References: 134-136

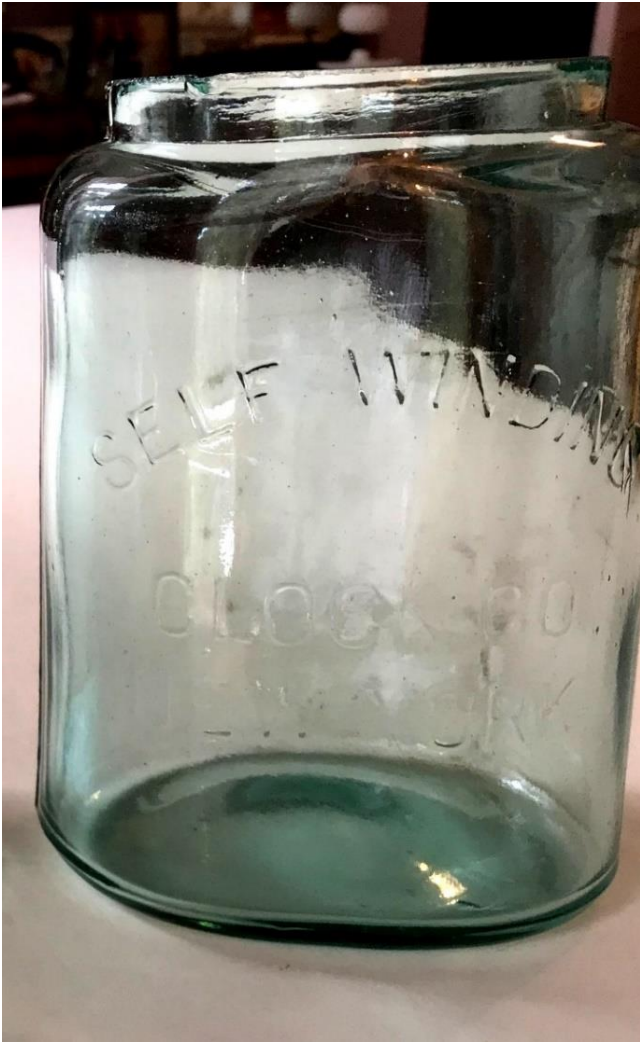
81.1↓



81.2 →



81.1 is 5" square with a 4" diameter mouth, with a pour spout and a ground lip. It is 6" tall. It is embossed on the front: **(arc) SELF WINDING / CLOCK / (arc) COMPANY / NEW YORK**. The lid, **81.2**, which seems may not be original to the jar, is a Carbon graphite composite and is 5" tall. The lid **81.3**, below, is embossed **J.E SHAW CO. PHILA, PA.** Courtesy of **Walt Baumgardt**.



81.3↑

←**81.4** is another variation of the Self-Winding Clock Co jar. The jar is aqua, with a ground lip. It is oval measuring 4.25" x 5.25" x 6.875" tall. The mouth is 3.675" diameter. **The front is embossed: (arc) SELF WINDING / CLOCK CO./ NEW YORK.** Courtesy of **Debbi Graham**.



←81.5

81.6↑

81.5 is a GONDA jar with a Self Winding Clock Co. lid, which appears to be original to the jar. The jar is embossed **TRADE / GONDA / MARK / The LECLANCHE / BATTERY / NEW YORK**. The lid (**81.6**) is embossed (arc) **SELF WINDING CLOCK CELL / (arc) HAYDEN No. 4. / PATENTED**.
Courtesy of Tommy Bolack

82 - J. Elliott Shaw & Co., Philadelphia

J. Elliott Shaw & Co. was an Electrical Supply Co. in Philadelphia in the late 1800's. There is not much to be found on the company. Surprisingly, there is more to be found on John Ware, a native Philadelphian who was running the J. Elliott Shaw Electric Co. in 1904 at the age of 16. J. Elliott Shaw died in 1905, at age 58, so he likely had stepped down prior to that. They supplied equipment for telephone, telegraph and also offered medical batteries (see Volume II).



82.1↑ is a square battery jar, embossed (arc)**SHAW CARBON BATTERY / J. ELLIOTT SHAW / & CO. / PHILA** The lid is unembossed. Dimensions are 4.5" square x 6.5" tall, with a 3.75" top. **Courtesy of Tommy Bolack**

82.2→ is the lid from 80.1. I could find no information on **V.B & CO.**





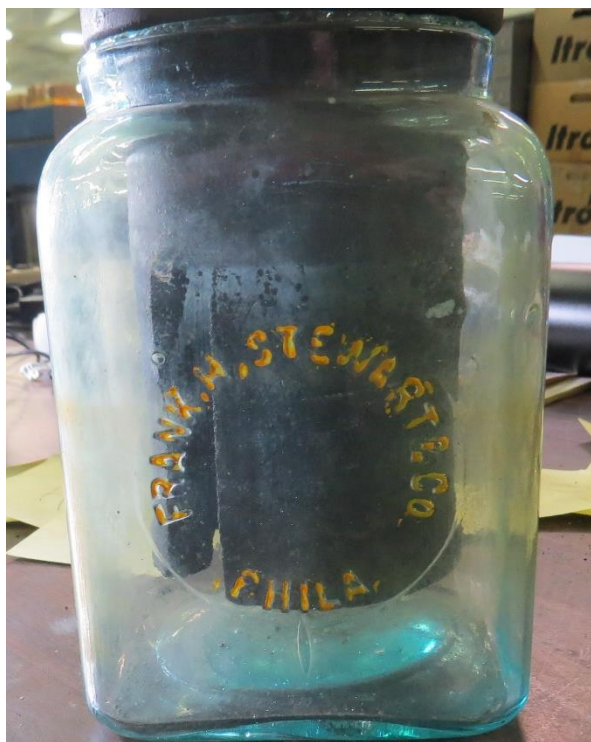
←82.3 is embossed (arc) **J. ELLIOTT SHAW / & CO. / PHILADELPHIA.** The dimensions are 4" square x 6" tall. **Courtesy of Tommy Bolack**



←82.4 is embossed **SHAW & GEARY / PHIL.P**
I could find no information on **Shaw & Geary.** I assume it is the same J.E Shaw The dimensions are 4" x 6.5" tall. **Courtesy of Tommy Bolack**

83 - STEWART, FRANK H., Electric Co. Philadelphia

Frank H. Stewart established his electrical supply business in 1894. In 1913 he purchased and renovated the old U.S. Mint in Philadelphia, as the new home of the Frank W. Stewart Electrical Supply Co.



He was a pioneer of the Electric industry in Philadelphia, and one of six pioneers of the industry who met and formed the Electric Club of Philadelphia. In 1919 he was the second President of the Club.

Upon moving into the new quarters he published a pamphlet "Our New Home and Old Times". Within the pages he reminisces about the early days of the electric industry. I have pages of his reminiscing in that appendix.

←**83.1** is a jar embossed around a circular slug plate **FRANK H STEWART & Co / PHIL. P.** It was found with a **Novelty Electric Co.** lid. See **67.3.** Courtesy of **Tommy Bolack**



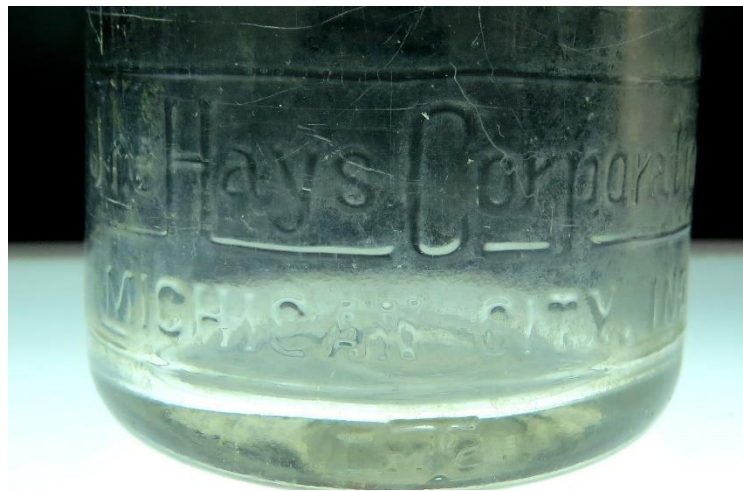
←**83.2** is a lid embossed (arc) **FRANK H. STEWART / (arc) PHILADELPHIA.** It was found with a **NOSMAS** jar.

84 - Thatcher Glass Manufacturing Co.

In 1884 Dr. Hervey Thatcher invented the common-sense milk bottle. As a result, Thatcher Glass Manufacturing Co. is best known for the milk bottles they manufactured. The company started in Potsdam, NY, and built their largest plant in Elmira, NY in 1912. At one point they manufactured 50% of all the milk bottles used in the United States. This bottle is identified as having been made by Thatcher Glass, by the “mTc” logo on the heel of the jar directly under the Hays Corporation embossing. This is a battery jar and not a milk bottle, as the Hays Corporation manufactured a series of specialty equipment for the oil, gas and electrical industries. Like other glass manufacturers, Thatcher embossed their customers names on the jars and bottles.



←84. 1



84.2↑

The battery jar shown in **82. 1** and **82.2**, was manufactured for The Hays Corporation of Michigan City, IN. The milk bottle shape is because Thatcher Glass is best known for manufacturing milk bottles. Courtesy of Walt Baumgardt.

I did not do a chapter on The Hays Corporation, as I could find nothing beyond what is on this page.

85 - Thaxter, Samuel & Son, Boston

Samuel Thaxter was born in Massachusetts in 1769 and lived until 1842. In 1796 he is listed in The Boston Directory as a mathematical instrument maker. In the 1823 edition the business is listed as Samuel Thaxter & Son (Joseph H. 1801 – 1835). Samuel Thaxter's grandson, Samuel Thaxter Cushing (1821 – 1882) took over the business. When Samuel Thaxter Cushing died, his widow, Abby C. Cushing took over management of the business. Nothing is known of the company after 1916. Over the years they manufactured nautical and optical instruments, charts, and nautical books; publishers of Eldridge's charts and coast pilots; agents for U.S. Coast Survey & Hydrographic Office charts & books; engineers' transits, levels, compasses, yacht and ship binnacles, patent logs and liquid compasses. They were located at 125 State St. in Boston.



I'm not sure why they would need batteries, but there must have been something in their product line requiring them.

←**85.1** is a round aqua jar; 4.5" diameter x 6.675" tall with a 3.875" diameter mouth. Embossing is inside a circular slug plate: (arc) **SAMUEL THAXTER & SON** / (arc) **BOSTON, MASS.** Courtesy of **Debbi Graham**.

86 - Thomson-Houston Electric Co.

In 1880 Elihu Thomson and Edwin Houston started the American Electric Co. Due to inexperience with running a company, the company struggled. In 1882 Charles Coffin of Shoe factory fame, and a customer of American Electric, purchased the American Electric Co. Coffin led the company, which had been renamed to the Thomson-Houston Electric Co., and organized its finances, marketing and sales operations. Edwin W. Rice, a former student of Thomson, was hired to organize the manufacturing department. Elihu Thomson ran the Model Room, which evolved into a Research Lab. Edwin Houston left all involvement with the company.

In seven years (circa 1890) Thomson-Houston had grown to the third largest competitor in the American electrical equipment market, with 4000 employees and \$10 million in annual sales.

The other companies struggling for supremacy in electrical systems were Edison Electric Co. and Westinghouse Electric Co. Edison was a proponent of a direct-current system, while Westinghouse and Thomson Houston favored the alternating current system. In 1890, Edison, realizing that AC was the better system, attempted to borrow money from J.P. Morgan to purchase Thomson-Houston to obtain their AC patents. Instead, in 1892, Morgan acquired both Thomson-Houston and Edison Electric Co. Charles Coffin was president, Thomson was consulting engineer, and Rice was the Technical Director. Edison served on the Board of Directors but had no managerial or executive role. Edison's Schenectady, NY facilities became the General Electric Co.'s headquarters.

Westinghouse and General Electric shared their patents which removed the competitive spirit and greatly helped to electrify America.

There are Insulators with T.H.E. Co. embossing, manufactured by Brookfield and/or Hemingray, there is no record of battery jars with T.H.E. Co. embossing. I included them because of the role they played in the electrification of America. In just under 10 years, rising from a struggling Electric Co. to a major player in the Electrical Industry.

87 - Tillotson, L.G.

Luther G. Tillotson was born in Ithaca, NY in 1834. In 1849, he moved west with his father, Daniel, who was superintendent of the Erie and Lake Michigan Telegraph Co. In 1850 he returned east, and worked for the New York and Erie Railroad, which ran across the southern tier of New York state. The New York and Erie Railroad was the first railroad to use the telegraph. In 1853 he was promoted superintendent of telegraph in charge of the eastern half of the route.

Seeing the future demand by railroads for telegraph and railroad supplies, in 1862, Luther started Tillotson & Co. In 1865 he founded the firm of L.G. Tillotson & Co. with General E.S. Greeley and W.H. Hold. He maintained his position with the Erie RR, until 1866, when he resigned to devote full time to the business.

In 1874, L.G. Tillotson & Co. was considered the largest independent manufacturer of telegraphic instruments in the U.S. Only the New York shop of Western Union, and Westinghouse in Chicago, were larger. In 1875 Jesse Bunnell (see Chapter 8) joined L.G. Tillotson & Co. He invented a new sounder, which significantly increased the clarity of the signal. The patent was granted and assigned to The Partrick and Bunnell Co. Partrick was already a partner with the firm of Partrick & Carter of Philadelphia. L.G. Tillotson and Partrick & Carter both claimed exclusive rights to the Bunnell patent. Bunnell stated publicly that L.G. Tillotson & Co. had the rights to his patent.

During this period L.G. Tillotson had three highly regarded telegraph inventors; J.H. Bunnell, Miles W. Goodyear and Henry Splitdorf. L.G. Tillotson invented and manufactured all types of telegraph and railroad equipment, including insulators. The insulators were made by other glass houses.

In 1878, Jesse Bunnell left L.G. Tillotson to form J.H. Bunnell.

When Tillotson passed away in 1885 his partner, General E.S. Greeley, took over the business, with plans to retain the Tillotson name. However, this soon changed, and the name was changed to E.S. Greeley & Co. E.S. Greeley & Co. became a victim of the depression of the 1890s and ended operations in 1897.

References: 141



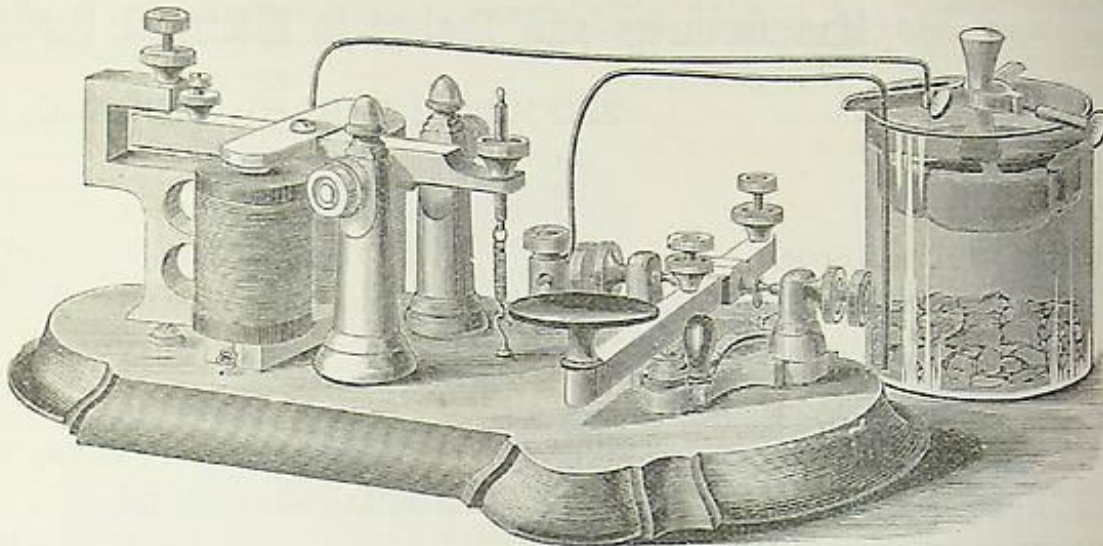
← **87.1** is Embossed (arc) **L.C. TILLOTSON / NEW YORK**. It is aqua with a ground lip and pour spout. The dimensions are: It is courtesy of **Debbi Graham**.



← **87.2**

Tillotson even offered a learner's instrument for battery jars (**55 - 2**), above. An enlarged picture is shown in **55 - 3**, below. Bunnell offered a learner's manual for beginning telegraphers. (see bibliography).

Bunnell's Learners' Instrument Perfected.



Complete and Perfect, full-sized Sounder and Key, with Book of Instruction.
Battery, Wire, and all necessary Materials.

[These instruments have been greatly improved in their working qualities and in the style in which they are finished. Those having the latest improvement in their construction are those manufactured *only* by Messrs. L. G. TILLOTSON & CO. JESSE H. BUNNELL.]

They are made in the best manner, and are just exactly the thing wanted for
**LEARNERS' USES, FOR TELEGRAPH SCHOOLS, or FOR
SHORT LINES, from a few feet to 12 miles long.**

PRICE, Complete, with Battery, Book of Instructions, Wire, and all necessary materials to put in operation, singly	\$8 50
or on a short line.....	6 50
Learners' Instrument, without Battery, &c.....	7 50
Ornamental Learners' Instrument. Rubber Covered Coils, &c.....	7 50

Same Instruments, wound with finer silk covered Wires, so as to operate satisfactorily lines up to twelve miles in length, \$1.00 in addition to above prices.

A COPY OF SMITH'S MANUAL,

new and enlarged edition (see advertisement in another column) sent with each complete outfit of BUNNELL'S PERFECT LEARNERS' INSTRUMENT.
These prices subject to our usual discount of 20 per cent. where money is sent in advance, either by Postal Order or Draft.

L. G. TILLOTSON & CO.

87.3 ↑

I'm unsure of the relationship between the various companies. Apparently Bunnell manufactured it and coupled it with a manual from Professor J.E. Smith. It was offered by L.G. Tillotson & Co. If you're interested, the complete manual can be found at: [Manual of telegraphy, designed for beginners \(archive.org\)](https://archive.org/details/manualoftelegrap00smit/page/22/mode/2up) <https://archive.org/details/manualoftelegraph00smit/page/22/mode/2up> <https://archives.org/details/manualoftelegraph00smit/page/22/mode/2up>. 1865

Another manual by prof. Smith can be found at <https://ia802901.us.archives.org/17/items/manualoftelegraph00yorkgoog/manualoftelegraph00yorkgoog.pdf>. It was published by L.G. Tillotson. 14th Edition.

A patent was granted to Emmor Bonsall of Davenport, IA for a Learners Telegraphic Instrument, # 336,284, Feb. 16, 1886.

88 U.S. L. Battery Co.

The National Battery Co was formed in 1898. The Electric Auto-Lite Co. was started in 1911. Approximately 1915 Electric Auto-lite took control Of National Battery Co. The U.S Light & Heating Company (U.S.L.) was formed in the early 1900s, with plants in Niagara Falls, Ontario and Niagara Falls, NY. At some point U.S.L. acquired all the stock of Electric Auto-Lite. U.S.L. is known for storage batteries, battery rests, etc. Battery Rests can be found in Chapter 8.



←**88.1** is a storage battery, embossed **U.S.L.** on the bottom. It is light green with base dimensions of 2.25" x 3.75" x 6.5" tall. **Courtesy of Tommy Bolack**

89 - Union Carbide and Carbon Co.

The Union Carbide and Carbon Company (U.C. & C.) was formed in 1917, as a merger of Union Carbide Co. (incorporated 1898), Linde Air Products Co. (incorporated 1907), National Carbon Co. (incorporated 1899) and Prest-O-Lite Co. (incorporated 1913). The new company was organized as holding company with each of its members acting autonomously and cooperating where their business converged. Cooperation between Prest-O-Lite and National Carbon enabled National Carbon to produce the first commercial dry cell battery, under the Eveready trademark, which would remain a U.C. & C. staple for the next seven decades.

As a holding company, the Union Carbide and Carbon Company would not have manufactured anything. Everything was manufactured by the individual members of the Holding Company. The UCC would be mentioned, as in the picture below “Division of U.C.& C. Company”.

References: 150-151



←**89.1** is a porcelain lid from the National Carbon Co. Embossed: (arc) **A.A.R. SIGNAL CELL / contains caustic / (arc) NATIONAL CARBON COMPANY / (arc) A Division of U.C. & C. Corporation, New York, N.Y. Made in U.S.A.**



89.2↑ is the un-embossed jar that accompanies the lid, **57 – 1**. With its convex barrel shape it appears to be of Corning manufacture, but with no embossing it is an educated guess.

90 - UNIVERSAL BATTERY CO. Chicago, IL

Very little is known about the Universal Battery Co. of Chicago. We know that they started by manufacturing batteries for early radios. They produced four different styles of radio batteries, each ranging in weight from 40 – 50 pounds. Each was comprised of three sealed glass jars. If you've ever wondered why the vintage console radios were so large in the nice Mahogany cases; it is because they had to be large enough, and strong enough to hold the batteries. Over time they went on to supply batteries for other purposes, including farm lighting plants.

90.1, left and **90.2** below, show a Universal Battery Jar. The jar has a formed lip, with dimensions of 7.25 x 6.75 x 10. The only embossing is on the base (**arc**) **UNIVERSAL** / (**arc**) **CHICAGO**

90.1↓



90.2↓





90.3↑



90.4↑

90.3 through 90.5, show another Universal Battery jar. It has the same dimensions as **90.1** and **90.2**. is jar is embossed **Water Line / UNIVERSAL** (inside a heart)

The lid, **90.5**, is embossed: **UNIVERSAL / CHICAGO / PAT. MARCH 28,1922**



← 90.5



← 90.6

90.7→



The Universal jar shown 90.6 through 90.8 is clear glass with dimensions of 6.5" x 7" x 13.75" tall. It is embossed **Water Line** on 4 sides and **UNIVERSAL** in a heart on two opposing sides. The base is embossed **UNIVERSAL / 140 / CHICAGO**.

90.8↓





←**90.9** is a Universal jar, embossed (in a heart) **UNIVERSAL / CHICAGO / MADE IN U.S.A.** Courtesy of Tommy Bolack

91 - Van Houten & Tenbroeck

I couldn't find much about this company other than that they supplied medical batteries and x-ray equipment. Some of their largest customers were the Sanitariums of the day. The medical batteries were for Physician's offices, as well as for home use. **89.1** is the lid for the Fitch jar, **44.1**. It is embossed: (arc) **FITCH PERFECT BATTERY** / (arc) **MANUFACTURED BY** / (arc) **VAN HOUTEN TENBROECK** / (arc) **NEW YORK**



91.1

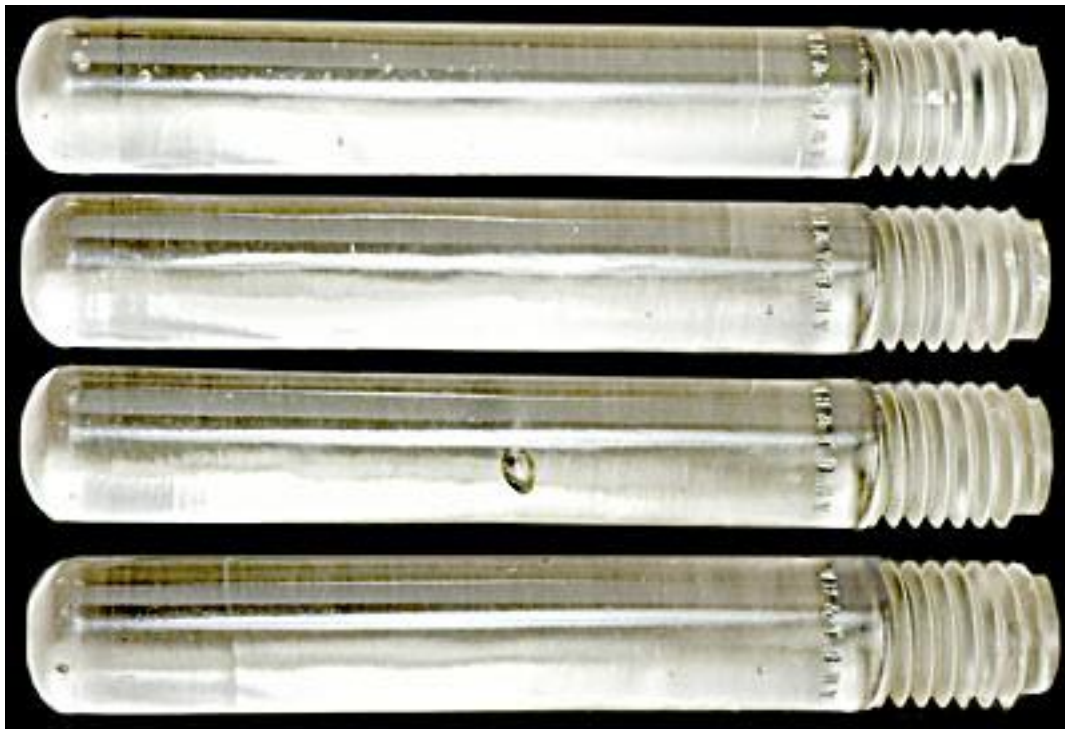
They also offered Static Machines for electro-therapy **91.2**. See Volume II for further discussion. Note the glass legs on the podium under the Static Machine to isolate the patient. The legs are highlighted in **91.3**

Van Houten & Ten Broeck were the proprietors of The Galvano Faradic Mfg. Co.



91.2↑

91.3↓

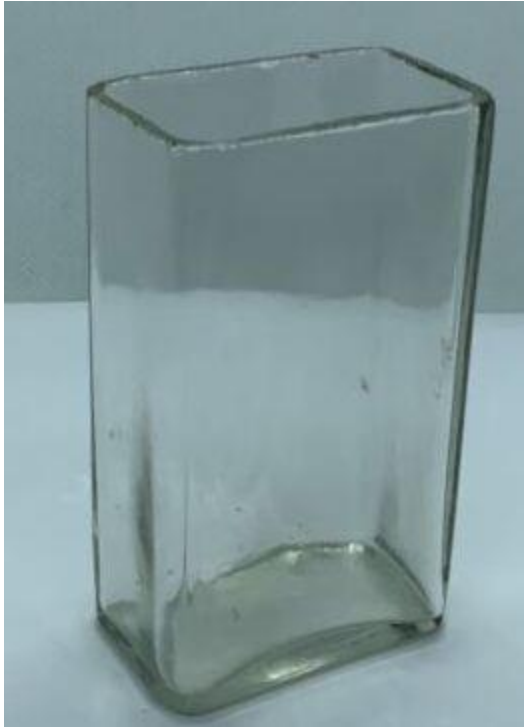


91.1 GALVANO FARADIC Mfg. Co.

I believe The Galvano Faradic Mfg. Co. was the manufacturing part of Van Houten and Ten Broeck. They were both incorporated on the same day, with VH & TB listed as proprietors.



91.1.1 is unmarked except for **GF M'F'G Co., Galvano Faradic Mfg. Co.** Its dimensions are 1.25 " x 2" x 3.5" tall. You will note that this jar appears to be identical to one seen in the Chapter on Waite & Bartlett. Chapter 92.



← **91.1.2**, although un-marked is believed to have been made by the Galvano Faradic MFG. Co. It is totally unembossed, with dimensions of 1.25" x 2" x 3.5" tall. Notice the dimensions are the same as 91.1.1

91.2 C.F. Birtman Co., Chicago

Although I could find little on C.F. Birtman, it appears they were similar to Van Houten & Ten Broeck, in that they supplied Statis Machines and X-Ray equipment.



← **91.2.1** shows a set of glass legs similar to those of Van Houten & Ten Broeck shown in 91.3. These are embossed C.F. Birtman.

92 - Viaduct Manufacturing Co ., Baltimore

The Viaduct Manufacturing Co. of Baltimore, MD is the successor to the firm of Davis & Watts (Chapter 32) which was founded circa 1870. Augustus G Davis continued as president of the Viaduct Mfg. Company. They manufactured a full line of electrical appliances: Telephones, Telegraph, Lighting, Fire Alarm Boxes, Messenger Boxes, Lightning Arrestors, Bells, etc.

References 174 - 178.

They had battery jars like **92.1** and **92.2** (below) with their name embossed to power some of their electrical Equipment.

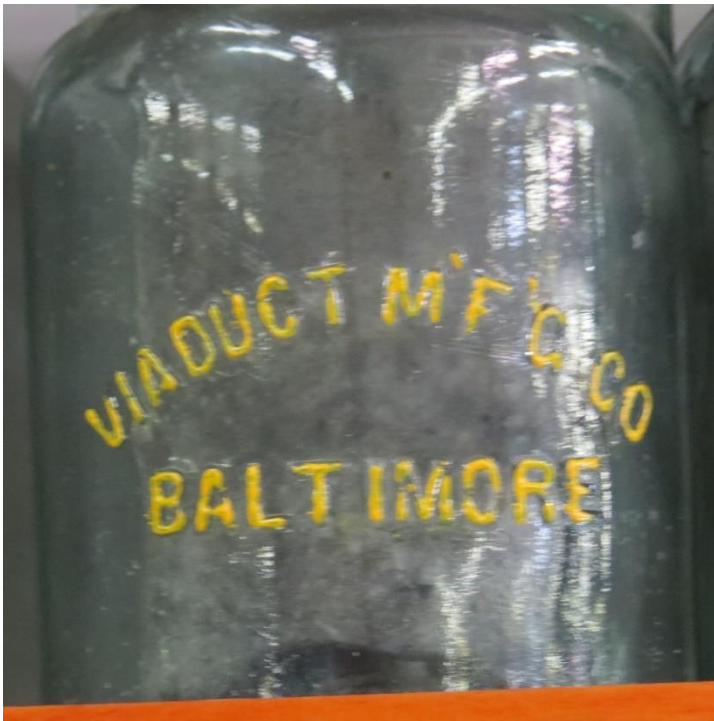


←92.1

92.2 is a light aqua and is embossed (arc) **VIADUCT MFG. CO. / BALTIMORE**. The dimensions are It has a ground lip and a squared spout rather than the usual V-shape. The dimensions are 4.5" diameter x 6" tall.



←**92.2**



←**92.3** is another Viaduct jar, 4.25" square x 6" tall.
Courtesy of Tommy Bolack

93 - Voltamp Electric Mfg. Co., Baltimore

Voltamp was an early American manufacturer of toy trains based in Baltimore, MD. It was founded by Manes A. Fuld, in the 18902. Voltamp is important in the evolution of toy trains. Their 1907 release was the first toy electric train to run on ordinary household alternating current. This was a significant advancement, as up to then toy trains had used battery power. As an out-growth of the Chloride of Silver Dry Cell Battery Co., also of Baltimore, Voltamp was formed to manufacture electric motors, toys, and novelties. They released their first model toy train in 1903 and it sold out immediately. They continued to manufacture toy trains and then branched out into batteries, including farm batteries, and then into medical batteries. They offered an entire line of medical batteries; even using Montgomery Ward as a distributor. Voltamp toy trains are very collectible, today, as they were known for their great attention to detail in the manufacture of the cars.

References; 156



←**93.1**, is the **Falcon Battery No. 1**, by Volamp, was one of their early entries into the field of medical batteries.

93.2, is **Voltamp Battery No. 6** a later version was available through the 1910s.

93.2↓





←93.3 is Voltamp Battery No. 11.

Note the increased sophistication of the medical batteries with the later models. Also, they all use dry cells as a power source.

93.4→ is a Voltamp Battery No. 12, sold through Montgomery Ward.



94 - Waite & Bartlett Co.

I could find very little on this company, other than they were a major supplier surgical supplies and equipment. They later manufactured and supplied of Medical Batteries to physicians. As such, it appears they purchased the batteries from the LeClanche Battery Co. and incorporated them into their units. Many of these are found in an illustrated catalog of 1896. (See Chapter 2) The medical batteries were largely arrays which powered wall mounted electro therapy devices in physicians. They also participated in the consumer market with smaller units. It is estimated that in the period from 1880 – 1920 there were 150 different companies supplying medical batteries. Most of these were small and left no real history.

Following is actual battery equipment ascribed to Waite & Bartlett

References: 157, 158



←**94.1** This small rectangular, aqua, battery jar is typical of the type Waite & Bartlett used in many of their batteries. It is 1.25 x 2 x 3.375" tall. The top edges are beveled. Front side embossing is: **(arc) WAITE & /BARTLETT / NY / MFG. Co. / PAT JULY 22 90.** It is not believed that Waite & Bartlett manufactured the jar; and at this time the actual manufacturer is unknown.

Courtesy of Walt Baumgardt.

Note: I have placed a copy of U.S. Patent 432,681, assigned to Henry Waite on July 22, 1890, in Chapter 74. It covers the use of chamfered top edges to form a more effective seal with a hydrostat to prevent spillage in portable medical devices.



94.2↑



94.3↑

94.2 and **94.3** are small specialty battery jars, similar to, but slightly larger than **92.1**. Both jars are 1.75" x 2" x 3.375" tall. 62 – 2 is embossed on the front: (arc) **WAITE & / BARTLETT / N.Y.** and is a very light SCA. 62 – 3 is clear and is embossed non the front: (arc) **WAITE & / BARTLETT / N.Y. / MFG. Co. / PAT. JULY 22 90**. Courtesy of Tommy Bolack

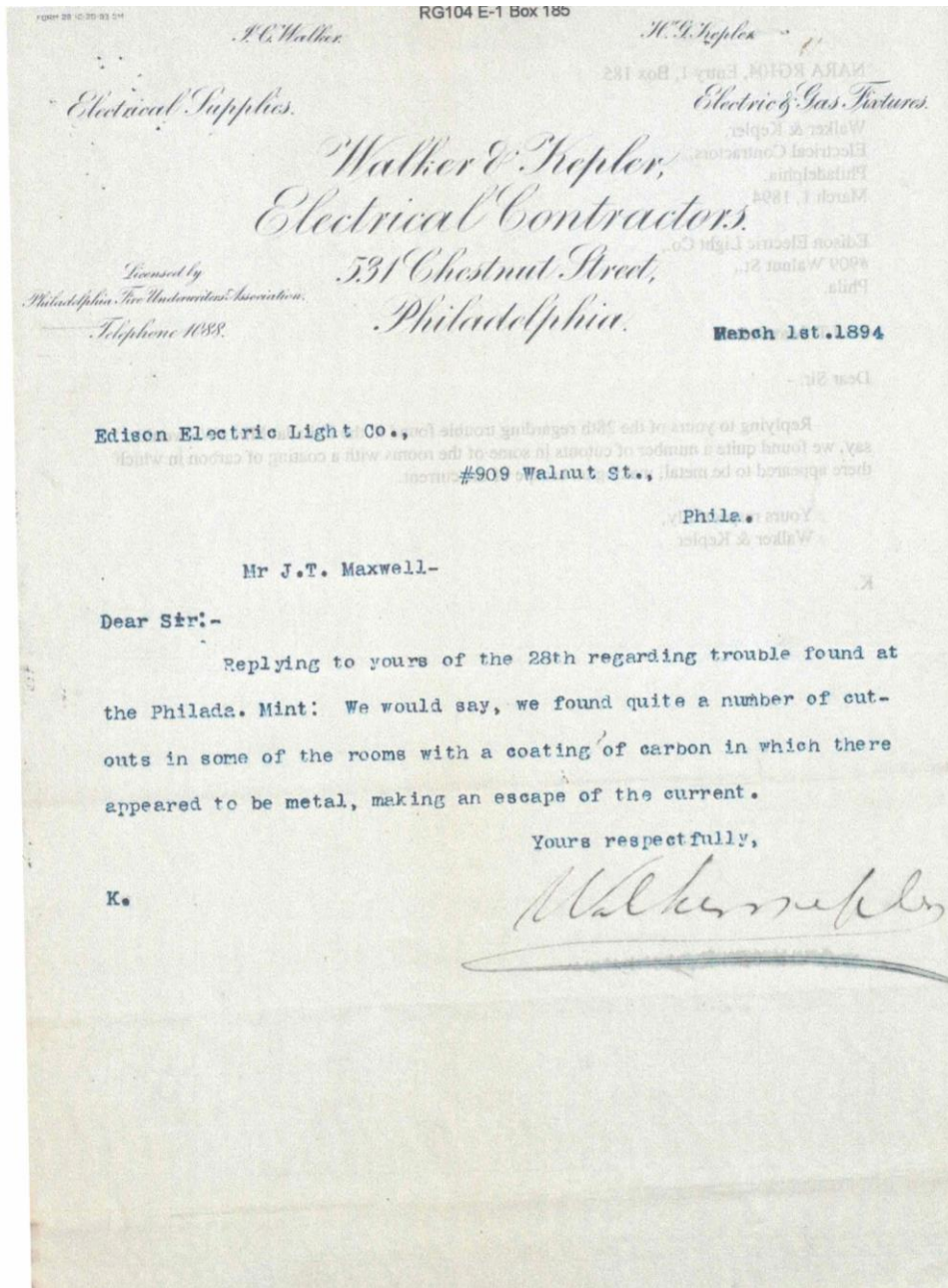


←**94.4** is very similar to ones we've attributed to Whitall Tatum, so it is likely that this is also manufactured by Whitall Tatum. It is embossed; (arc) **WAITE & BARTLETT / N.Y.** The base is 4" square x 4.75" tall with a 2.25" diameter mouth. It is clear glass with a ground lip and a zinc screw cap. It was likely used in a medical battery.

95 - WALKER & KEPLER

Walker & Kepler were Electrical Contractors ay 531 Chestnut St. in Philadelphia. There is not much written about them. There is a Walker & Kepler Electric Co. in Philadelphia in 1932, but that was too late to be what I was looking for. Then I found a copy of a letter from Walker and Kepler to the Edison Electric Light Co. dated 1894. This made much more sense. Unfortunately that is all I could find on the company, and I attach it here.

95.1↓





95.2↑

95.3↓



95.2 and **95.3** show a jar embossed Walker & Kepler. The jar is embossed in a circular slug plate (arc) **WALKER & KEPLER** / logo / (arc) **PHILADELPHIA**. The hard robber lid & carbon electrode is embossed (arc) **WALKER & KEPLER** / (arc) **531 CHESTNUT St.** / (arc) **PHILA. PA.** The jar has spout with a ground lip and dimensions of 4" diameter x 6" tall. The top diameter of the jar is 3.5".

Courtesy of Tommy Bolack



←**95.4** is another jar embossed Walker & Kepler. This embossing is different from **69 – 2**, as it lacks the logo. It is 4.75” diameter, rather than 4” diameter and is 6’ tall, with a ground lip and spout. It is embossed in a circular slug plate: (arc) **WALKER & KEPLER CO. / 531 CHESTNUT ST. / (arc) PHILA, PA.** The lid is identical to **69 – 3**.

Courtesy of Tommy Bolack

96 John Wannamaker

John Wannamaker was many things during his life, including Post- Master General of the U.S. He is best known, however, for giving us the department store. Everything under one roof, from food, appliances, clothing, electrical and hardware equipment, etc. He was the first to put price tags on merchandise, and to have a no questions return policy. He was the first to offer his employees paid vacation, health care, etc.



96.2↓

Batteries were apparently among his electrical supplies. Each jar is embossed on a circular slug plate: (arc) **IF JAR SHOULD BE BROKEN / PURCHASE ANOTHER / FROM (arc) JOHN WANNAMAKER.**
Courtesy of Tommy Bolack

96.1 and 96.2 are two jars bearing the Wannamaker name. Each jar is 4.25" diameter x 6" tall.

←96.1





96.3 is a jar in SCA, with a ground lip and pour spout. It is 4.5" diameter x 6" tall with a 3.75" mouth. Embossed inside a circular slug plate: (arc) **If Jar Should Be Broken / Purchase Another / From (arc) JOHN WANNAMAKER. Base: W.T. Co. / 4 / U.S.A.** Courtesy of Tommy Bolack

97 WATERBURY BATTERY CO

Waterbury Battery Co. was formed in the 1880's, in Waterbury, CT. to produce glass and porcelain battery jars. In the same period, The Gordon Battery Co., also in Waterbury, CT. produced glass and porcelain battery jars. Very little is known about the two companies other than what they produced. It seems very likely that there was a relationship between the companies, but there is nothing to indicate what that relationship was.



←**97.1** is an unmarked jar. The matching porcelain lid is embossed as follows: **WATERBURY PRIMARY (97.2)CELL / MANUFACTURED BY / THE WATERBURY BATTERY CO. / WATERBURY, CONN. / U.S.A.**

97.2↓





97.3↑

This round porcelain lid, without a jar is embossed: (arc) **WATERBURY PRIMARY CELL / WATERBURY BATTERY CO. / WATERBURY, CONN. / U.S.A.**



←97.4 is another lid from the Waterbury Battery Co. It is embossed (top) (arc) **PATENTED / (arc) Oct. 27, 1886 April; 13, 1897 / (arc) R.S.A. SIGNAL CELL. (Bottom) THE WATERBURY BATTERY CO. / WATERBURY, / CONN. / U.S.A.**

This battery was used as a power source for railway signaling.

98 - Western Electric Co.

Western Electric was incorporated as the Western Electric Manufacturing Co. in 1869 by Enos Barton & George Shank. They were acquired by the Bell Telephone Co. in 1881 as settlement of a law suit, but remained The Western Electric Engineering Co. In 1925, ITT purchased the Bell Telephone Manufacturing Co., and manufactured rotary system switching equipment under the Western Union brand. They continued to manufacture telephone systems and related equipment.

References: 159, 160



98.1↑



98.2↑

98.1, is 4.5" diameter x 6", with a ground lip and pour spout. Embossing; (inside circular slug plate) (arc) WESTERN ELECTRIC / NEW YORK. Courtesy of **Debbi Graham**.

98.2, is SCA with a ground lip and pour spout. It had a combination carbon-graphite lid and cylindrical electrode (not shown). Its dimensions are 4.5" diameter x 6.25" tall with a 3.785" diameter mouth. Embossing: WESTERN ELEC. CO. / NEW YORK / and / CHICAGO. Courtesy of **Debbi Graham**.



98.3↑



98.4→

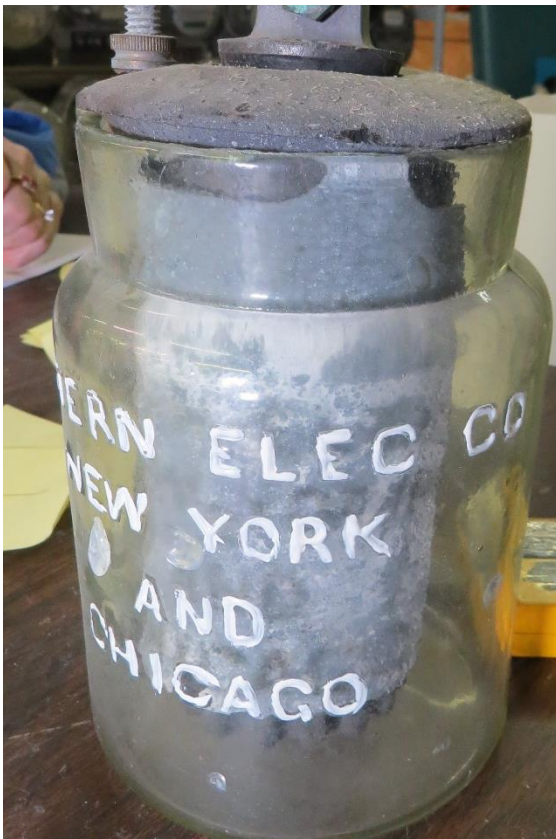
98.5↓



← 98.3 through 98.5 show a Western Electric battery jar with dimensions of 4" diameter x 6.5" tall. It has a ground lip and pour spout. The jar itself is unmarked except for **W.T & Co.** On the bottom. **WESTERN / ELECTRIC CO. / NEW YORK** is embossed on the lid of the carbon electrode. This indicates that at some point Whitall Tatum supplied battery jars for Western Electric.



←**98.6** is embossed in a circular slug plate (arc) **WESTERN ELECTRIC Co. / NEW YORK**. It is 4" diameter x 6" tall. Courtesy of Tommy Bolack.



←**98.7** is a Western Electric jar with essentially the same embossing in a different style. The embossing is straight: **WESTERN ELECTRIC Co. / NEW YORK / AND / CHICAGO**. It is 4.5" diameter x 6.75" tall. Courtesy of Tommy Bolack.



←**98.8** is the lid from **96.7**. It is a **SAMSON** lid which appears to be original to the jar.

Courtesy of Tommy Bolack



←**98.9**. Eureka brand was manufactured by Western Electric, This specialty jar is embossed (arc) **EUREKA / 6 / PAT'D DEC. 27TH / 1864**. The dimensions are 3.75" diameter x 7.25" with a ground lip.

Courtesy of Tommy Bolack

98.1 HYRAY Batteries

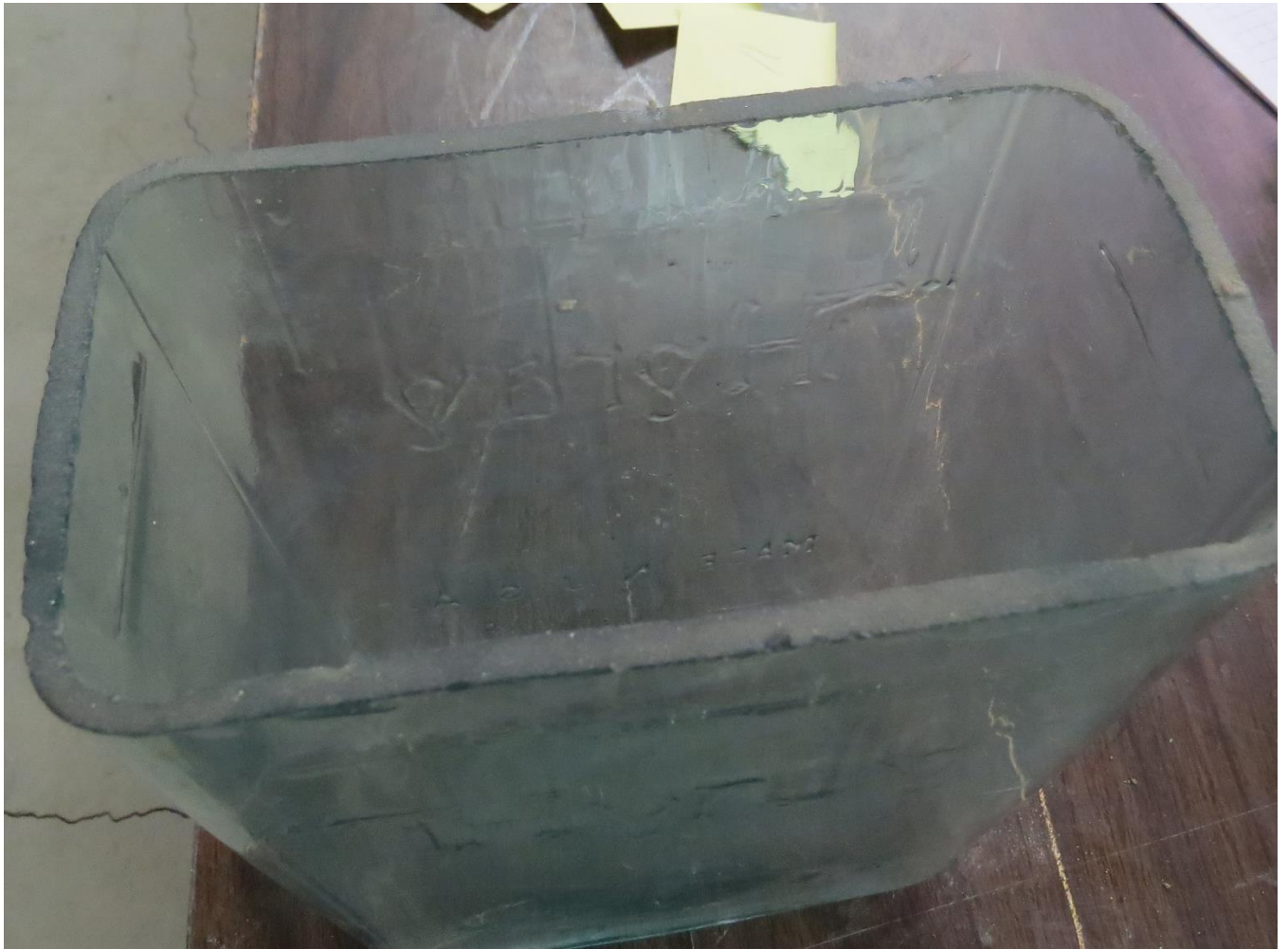
HYRAY batteries are a Western Electric battery designed for low voltage applications where a less expensive battery than the Chloride Accumulator is desired. They are available in both glass and rubber jars and are meant to be installed on wooden racks like the Farm batteries. The glass jars come as Type DDG and EEG. The DDG plates are 5.875" x 7.25" high, and the elements consist of 5, 7, 9, 11, 13, 05 15 plates. The overall height of Type DDG cells, trays and insulators is 17.25".

The EEG plates are 7.25" x 7.25" high and elements consist of 5, 7, 9, 11, 13, 15 or 17 plates. The overall height of Type EEG cells, trays and insulators is 19.75"

A booklet on the Hyray cells from 1913 is included as an appendix.



←**98.1.1** is embossed **HYRAY / MADE IN U.S.A.** on two opposing sides. The dimensions are 4" x 7" x 10" tall. **Courtesy of Tommy Bolack**



98.1.2↑ is a top view of **98.1.1** **Courtesy of Tommy Bolack**

99 - Westinghouse

Westinghouse Electric Corporation was founded in 1886 by George Westinghouse, inventor of the air brake and other devices, to construct and market alternating-current electrical systems. It overcame strong opposition from those fearful of alternating-current, branching out into all phases of electrical production and use.

The first, **99.1**, is embossed **WESTINGHOUSE**, logo (**B / W / C / O**) **B / W / C / O**, on all four sides of the jar. The **Water Line** mark is only on two opposing sides. It is approximately 7" x 11" x 17" tall.

The second jar, **99.2**, is embossed on only three sides: **WESTINGHOUSE / logo (B / W / C / O)**, with the **water line** embossed on only two opposing sides. It is approximately the same size as the first jar.

Both jars are large enough to have been part of Farm Lighting Systems.

Reference: 161-162



←99.1



99.2→

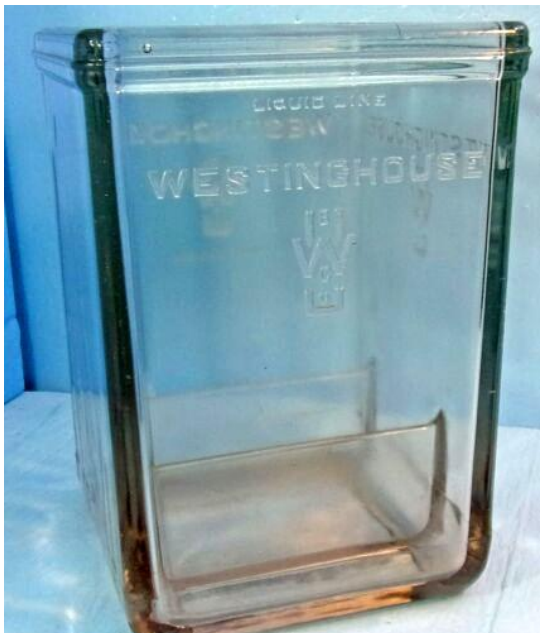


99.3↑

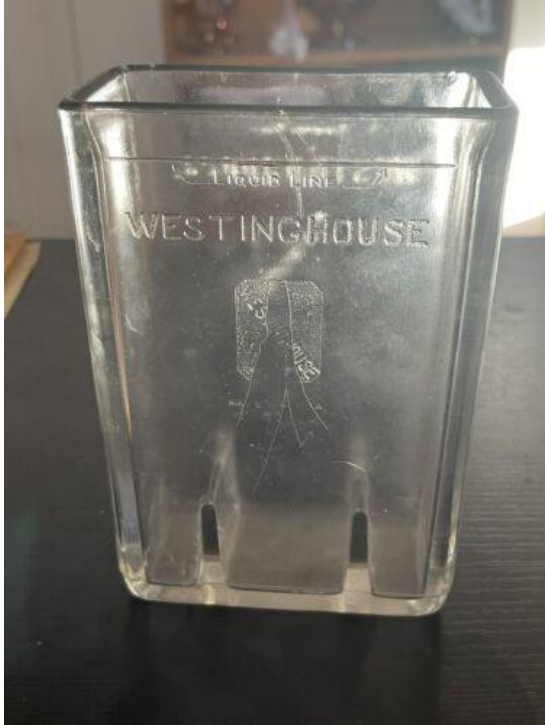


99.44↑

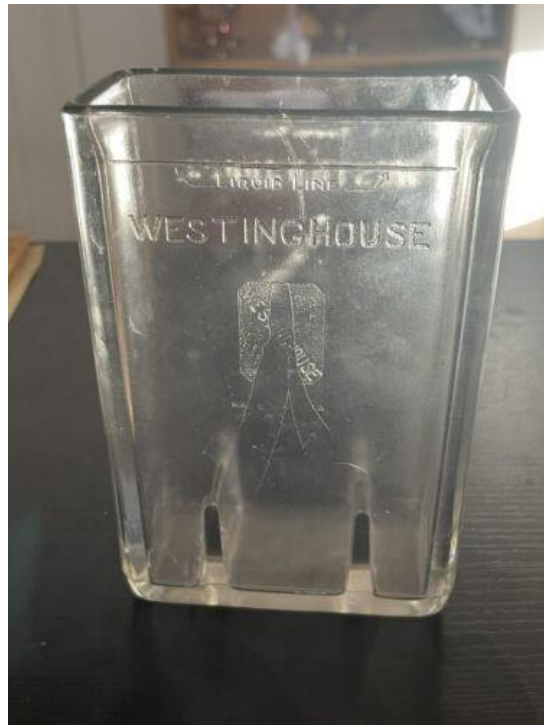
The jar, above, **97.3** and **97.4** is embossed **WESTINGHOUSE** on two sides, and **Water Line** on four sides. The dimensions are 4" x 2" x 6" tall.



←**99.5** is another Westinghouse Union battery jar. It is tapered square with a molded top. It is 11" tall. The bottom is 7" x 7", while the top is 8" x 8". It is embossed on three sides: **Liquid Line / WESTINGHOUSE / Westinghouse Union logo**. The middle side has **Made In U.S.A.** under the logo.



99.6↑



99.7↑

99.8↓



Photos 99.6 through 99.8 show a smaller Westinghouse battery jar. It is 6" tall by about 2" x 4" at the top. With the side taper it is about 1.25" x 3.25" at the bottom. It is embossed **LIQUID LINE** in all 4 sides. It is embossed front and rear, **WESTINGHOUSE / Westinghouse logo**.



←**99.9** is a Westinghouse battery jar with dimensions of 8.25" x 10" x 11" tall. It is embossed **WATER LINE / WESTINGHOUSE / logo** on four sides.



←**99.10** and **99.11** show a WESTINGHOUSE battery jar and lid. The jar itself is not embossed, but the lid (**65 - 11**) is embossed **WESTINGHOUSE / TYPE WC -13 / 160 A.H. INT. RATE**. The dimensions are 6.5" x 7.5" x 10.75". The lid measures 7.875" x 6.875".

65 - 11↓



←99.11



←99.12 is a large Westinghouse battery jar. **LIQUID LINE / WESTINGHOUSE / logo** is embossed on the two opposing short sides. A third side is merely embossed **WESTINGHOUSE / logo**. The dimensions are 7.5" x 8" x 11" tall. **Courtesy of Tommy Bolack.**



99.13↑ seems to be the only Westinghouse battery jar I've seen without the name WESTINGHOUSE. It merely has the Westinghouse Union Battery Co. logo on the front only. Its dimensions are: 7" square at the bottom, 8" tall at the top x 11" tall.

What we know as Whittall Tatum was formed in 1806. Originally known as the Phenix Glass Co., its first thirty years were unstable; changing ownership approximately 12 times during those years. Stability arrived when Edward Tatum joined the company in 1848.

That the operation specialized in glassware for druggists, chemists and perfumers probably reflects the fact several of the early owners were Philadelphia pharmacists. This was not true of the Whittalls and Tatums. It did, however, provide them with a business compatible with their religious beliefs. Both families were devout Quakers, who "did not believe in war, nor in litigation, nor in the manufacture or sale of intoxicating liquors." As a result, they refused to manufacture liquor bottles of any kind (although this was to change later).

References:

During the early years they produced window glass, carboys, and bottles. Later, they were a major insulator manufacturer. They also produced battery Jars. Company catalogs, as early as 1879 show a line of round battery jars ranging from 4 x 4" to 9 x 15" (shown below). A page from the Whittall Tatum catalog of 1880 is shown below (98.1).

WHITTALL, TATUM & CO. 1880 Catalog CHEMICAL WARE 43

<p>No. 2355. CHLORIDE CALCIUM JARS.</p> <table border="0"> <tr><td>12 x 2 inch</td><td>Each</td><td>\$1.75</td></tr> <tr><td>17 x 2½ inch</td><td></td><td>2.50</td></tr> <tr><td>21 x 3 inch</td><td></td><td>4.00</td></tr> </table> <p>No. 2360. PERCOLATORS.</p> <p>(Stoppered \$2.25 net, extra for each Percolator.)</p> <table border="0"> <tr><td>Graduated, see page 64.</td><td>Per Doz.</td><td>4.00</td></tr> <tr><td>½ Pint</td><td></td><td>6.00</td></tr> <tr><td>¼ Gallon</td><td></td><td>12.00</td></tr> <tr><td>½ Gallon</td><td></td><td>16.00</td></tr> <tr><td>¾ Gallon</td><td></td><td>22.00</td></tr> <tr><td>1 Gallon</td><td></td><td>28.00</td></tr> <tr><td>2 Gallon</td><td></td><td>54.00</td></tr> </table> <p>No. 2370. PRECIPITATING JARS.</p> <table border="0"> <tr><td>½ Pint</td><td>Per Doz.</td><td>3.00</td></tr> <tr><td>¼ Pint</td><td></td><td>3.75</td></tr> <tr><td>½ Pint</td><td></td><td>5.00</td></tr> <tr><td>¾ Pint</td><td></td><td>7.25</td></tr> <tr><td>¼ Gallon</td><td></td><td>12.50</td></tr> <tr><td>½ Gallon</td><td></td><td>17.00</td></tr> <tr><td>¾ Gallon</td><td></td><td>25.00</td></tr> <tr><td>1 Gallon</td><td></td><td>31.00</td></tr> <tr><td>2 Gallon</td><td></td><td>56.00</td></tr> </table> <p>No. 2380. EVAPORATING DISHES—GLASS.</p> <table border="0"> <tr><td>PLAIN.</td><td>Per Doz.</td><td></td></tr> <tr><td>2 inches diameter</td><td></td><td>2.50</td></tr> <tr><td>3 inches diameter</td><td></td><td>3.50</td></tr> <tr><td>4 inches diameter</td><td></td><td>4.00</td></tr> <tr><td>5 inches diameter</td><td></td><td>4.80</td></tr> <tr><td>6 inches diameter</td><td></td><td>5.30</td></tr> </table> <p>NESTES.</p> <table border="0"> <tr><td>Nest of 2, 3, 4 inch</td><td>Each Nest</td><td>.85</td></tr> <tr><td>Nest of 4, 5, 6 inch</td><td></td><td>1.20</td></tr> <tr><td>Nest of 2, 3, 4, 5, 6 inch</td><td></td><td>1.70</td></tr> </table> <p>No. 2390. WITH LIPS.</p> <table border="0"> <tr><td>2 inches diameter</td><td>Per Doz.</td><td>3.30</td></tr> <tr><td>3 inches diameter</td><td></td><td>4.10</td></tr> <tr><td>4 inches diameter</td><td></td><td>5.00</td></tr> <tr><td>5 inches diameter</td><td></td><td>6.00</td></tr> <tr><td>6 inches diameter</td><td></td><td>6.60</td></tr> </table> <p>NESTES.</p> <table border="0"> <tr><td>Nest of 2, 3, 4 inch</td><td>Each Nest</td><td>1.00</td></tr> <tr><td>Nest of 4, 5, 6 inch</td><td></td><td>1.50</td></tr> <tr><td>Nest of 2, 3, 4, 5, 6 inch</td><td></td><td>2.10</td></tr> </table>	12 x 2 inch	Each	\$1.75	17 x 2½ inch		2.50	21 x 3 inch		4.00	Graduated, see page 64.	Per Doz.	4.00	½ Pint		6.00	¼ Gallon		12.00	½ Gallon		16.00	¾ Gallon		22.00	1 Gallon		28.00	2 Gallon		54.00	½ Pint	Per Doz.	3.00	¼ Pint		3.75	½ Pint		5.00	¾ Pint		7.25	¼ Gallon		12.50	½ Gallon		17.00	¾ Gallon		25.00	1 Gallon		31.00	2 Gallon		56.00	PLAIN.	Per Doz.		2 inches diameter		2.50	3 inches diameter		3.50	4 inches diameter		4.00	5 inches diameter		4.80	6 inches diameter		5.30	Nest of 2, 3, 4 inch	Each Nest	.85	Nest of 4, 5, 6 inch		1.20	Nest of 2, 3, 4, 5, 6 inch		1.70	2 inches diameter	Per Doz.	3.30	3 inches diameter		4.10	4 inches diameter		5.00	5 inches diameter		6.00	6 inches diameter		6.60	Nest of 2, 3, 4 inch	Each Nest	1.00	Nest of 4, 5, 6 inch		1.50	Nest of 2, 3, 4, 5, 6 inch		2.10	<p>No. 2398. WATCH GLASSES.</p> <table border="0"> <tr><td>2 inch</td><td>Per Doz.</td><td>\$2.50</td></tr> <tr><td>3 inch</td><td></td><td>3.00</td></tr> <tr><td>4 inch</td><td></td><td>4.00</td></tr> <tr><td>5 inch</td><td></td><td>4.50</td></tr> <tr><td>6 inch</td><td></td><td>5.00</td></tr> </table> <p>Nestled at same price as single.</p> <p>No. 2400. BOTTLES WITH TUBULATURE NOT STOPPERED.</p> <table border="0"> <tr><td>½ Pint</td><td>Per Doz.</td><td>8.00</td></tr> <tr><td>¼ Pint</td><td></td><td>10.00</td></tr> <tr><td>½ Pint</td><td></td><td>12.00</td></tr> <tr><td>¾ Pint</td><td></td><td>14.00</td></tr> <tr><td>¼ Gallon</td><td></td><td>16.00</td></tr> <tr><td>½ Gallon</td><td></td><td>24.00</td></tr> <tr><td>¾ Gallon</td><td></td><td>32.00</td></tr> <tr><td>1 Gallon</td><td></td><td>40.00</td></tr> <tr><td>2 Gallon</td><td></td><td>60.00</td></tr> </table> <p>No. 2410. BOTTLES WITH TUBULATURE STOPPERED.</p> <table border="0"> <tr><td>½ Pint</td><td>Per Doz.</td><td>10.00</td></tr> <tr><td>¼ Pint</td><td></td><td>12.00</td></tr> <tr><td>½ Pint</td><td></td><td>14.00</td></tr> <tr><td>¾ Pint</td><td></td><td>16.00</td></tr> <tr><td>¼ Gallon</td><td></td><td>18.00</td></tr> <tr><td>½ Gallon</td><td></td><td>26.00</td></tr> <tr><td>¾ Gallon</td><td></td><td>34.00</td></tr> <tr><td>1 Gallon</td><td></td><td>42.00</td></tr> <tr><td>2 Gallon</td><td></td><td>62.00</td></tr> </table> <p>No. 2420. STOPPERED.</p> <table border="0"> <tr><td>½ Pint</td><td>Per Doz.</td><td>12.00</td></tr> <tr><td>¼ Pint</td><td></td><td>14.00</td></tr> <tr><td>½ Pint</td><td></td><td>16.00</td></tr> <tr><td>¾ Pint</td><td></td><td>18.00</td></tr> <tr><td>¼ Gallon</td><td></td><td>20.00</td></tr> <tr><td>½ Gallon</td><td></td><td>28.00</td></tr> <tr><td>¾ Gallon</td><td></td><td>36.00</td></tr> <tr><td>1 Gallon</td><td></td><td>44.00</td></tr> <tr><td>2 Gallon</td><td></td><td>64.00</td></tr> </table> <p>No. 2430. INVERTED SHOW BOTTLES STRAIGHT.</p> <table border="0"> <tr><td>½ Pint, 5 x 2 in.</td><td>Per Doz.</td><td>7.00</td></tr> <tr><td>Pint, 7½ x 2½ in.</td><td></td><td>8.00</td></tr> <tr><td>Quart, 9 x 3½ in.</td><td></td><td>9.00</td></tr> <tr><td>½ Gallon, 11 x 4½ in.</td><td></td><td>10.00</td></tr> <tr><td>Gallon, 14 x 5½ in.</td><td></td><td>11.00</td></tr> <tr><td>2 Gallon, 18 x 6½ in.</td><td></td><td>12.00</td></tr> <tr><td>3 Gallon, 19 x 8 in.</td><td></td><td>13.00</td></tr> <tr><td>½ Bushel, 27 x 10 in.</td><td></td><td>14.00</td></tr> <tr><td>32 x 12½ in.</td><td></td><td>15.00</td></tr> </table>	2 inch	Per Doz.	\$2.50	3 inch		3.00	4 inch		4.00	5 inch		4.50	6 inch		5.00	½ Pint	Per Doz.	8.00	¼ Pint		10.00	½ Pint		12.00	¾ Pint		14.00	¼ Gallon		16.00	½ Gallon		24.00	¾ Gallon		32.00	1 Gallon		40.00	2 Gallon		60.00	½ Pint	Per Doz.	10.00	¼ Pint		12.00	½ Pint		14.00	¾ Pint		16.00	¼ Gallon		18.00	½ Gallon		26.00	¾ Gallon		34.00	1 Gallon		42.00	2 Gallon		62.00	½ Pint	Per Doz.	12.00	¼ Pint		14.00	½ Pint		16.00	¾ Pint		18.00	¼ Gallon		20.00	½ Gallon		28.00	¾ Gallon		36.00	1 Gallon		44.00	2 Gallon		64.00	½ Pint, 5 x 2 in.	Per Doz.	7.00	Pint, 7½ x 2½ in.		8.00	Quart, 9 x 3½ in.		9.00	½ Gallon, 11 x 4½ in.		10.00	Gallon, 14 x 5½ in.		11.00	2 Gallon, 18 x 6½ in.		12.00	3 Gallon, 19 x 8 in.		13.00	½ Bushel, 27 x 10 in.		14.00	32 x 12½ in.		15.00	<p>No. 2440. INVERTED SHOW BOTTLES. PEAR SHAPE.</p> <table border="0"> <tr><td>½ Pint, 4½ x 2½ in.</td><td>Each</td><td>40</td></tr> <tr><td>¾ Pint, 5 x 4 in.</td><td></td><td>50</td></tr> <tr><td>¼ Gallon, 9 x 8 in.</td><td></td><td>75</td></tr> <tr><td>¾ Quart, 13 x 8 in.</td><td></td><td>1.20</td></tr> <tr><td>2 Gallon, 16½ x 8 in.</td><td></td><td>1.80</td></tr> <tr><td>3 Gallon, 19 x 9 in.</td><td></td><td>4.00</td></tr> <tr><td>4 Gallon, 22 x 10 in.</td><td></td><td>6.00</td></tr> <tr><td>½ Bushel, 26 x 13 in.</td><td></td><td>11.00</td></tr> <tr><td>34 x 16 in.</td><td></td><td>14.00</td></tr> </table> <p>No. 2450. DESICCATING JAR.</p> <p>WITH GROUND LID.</p> <p>4 inches diameter . . . 18.00</p> <p>No. 2460. SPECIMEN BOTTLES.</p> <table border="0"> <tr><td>STOPPERED.</td><td>Per Doz.</td><td></td></tr> <tr><td>1 oz.</td><td></td><td>2.70</td></tr> <tr><td>2 oz.</td><td></td><td>3.00</td></tr> <tr><td>4 oz.</td><td></td><td>4.00</td></tr> </table> <p>No. 2500. BELL GLASSES.</p> <p>Special Dimensions Made to Order.</p> <p>SHORT-KNOB.</p> <table border="0"> <tr><td>PLAIN.</td><td>Each.</td><td></td></tr> <tr><td>½ Pint</td><td></td><td>75</td></tr> <tr><td>¼ Quart</td><td></td><td>1.00</td></tr> <tr><td>½ Gallon</td><td></td><td>1.80</td></tr> <tr><td>¾ Gallon</td><td></td><td>2.80</td></tr> <tr><td>2 Gallon</td><td></td><td>3.90</td></tr> <tr><td>3 Gallon</td><td></td><td>5.00</td></tr> <tr><td>5 Gallon</td><td></td><td>10.00</td></tr> </table> <p>Bell Glasses, Flat or Tall, not ground for Covers, 10% less in price.</p> <p>No. 2510. TALL-KNOB.</p> <table border="0"> <tr><td>PLAIN.</td><td>Each.</td><td></td></tr> <tr><td>½ Pint</td><td></td><td>75</td></tr> <tr><td>¼ Quart</td><td></td><td>1.00</td></tr> <tr><td>½ Gallon</td><td></td><td>1.50</td></tr> <tr><td>¾ Gallon</td><td></td><td>2.00</td></tr> <tr><td>2 Gallon</td><td></td><td>3.00</td></tr> <tr><td>3 Gallon</td><td></td><td>5.00</td></tr> <tr><td>5 Gallon</td><td></td><td>10.00</td></tr> </table>	½ Pint, 4½ x 2½ in.	Each	40	¾ Pint, 5 x 4 in.		50	¼ Gallon, 9 x 8 in.		75	¾ Quart, 13 x 8 in.		1.20	2 Gallon, 16½ x 8 in.		1.80	3 Gallon, 19 x 9 in.		4.00	4 Gallon, 22 x 10 in.		6.00	½ Bushel, 26 x 13 in.		11.00	34 x 16 in.		14.00	STOPPERED.	Per Doz.		1 oz.		2.70	2 oz.		3.00	4 oz.		4.00	PLAIN.	Each.		½ Pint		75	¼ Quart		1.00	½ Gallon		1.80	¾ Gallon		2.80	2 Gallon		3.90	3 Gallon		5.00	5 Gallon		10.00	PLAIN.	Each.		½ Pint		75	¼ Quart		1.00	½ Gallon		1.50	¾ Gallon		2.00	2 Gallon		3.00	3 Gallon		5.00	5 Gallon		10.00	<p>No. 2520. OPEN TOP.</p> <table border="0"> <tr><td>PLAIN.</td><td>Each.</td><td></td></tr> <tr><td>½ Pint</td><td></td><td>1.10</td></tr> <tr><td>¼ Quart</td><td></td><td>1.60</td></tr> <tr><td>½ Gallon</td><td></td><td>2.20</td></tr> <tr><td>¾ Gallon</td><td></td><td>3.80</td></tr> <tr><td>2 Gallon</td><td></td><td>5.80</td></tr> <tr><td>3 Gallon</td><td></td><td>6.80</td></tr> <tr><td>5 Gallon</td><td></td><td>11.00</td></tr> </table> <p>No. 2530. NARROW MOUTH FOR CAPS.</p> <table border="0"> <tr><td>PLAIN.</td><td>Each.</td><td></td></tr> <tr><td>½ Pint</td><td></td><td>80</td></tr> <tr><td>¼ Quart</td><td></td><td>1.10</td></tr> <tr><td>½ Gallon</td><td></td><td>1.60</td></tr> <tr><td>¾ Gallon</td><td></td><td>2.20</td></tr> </table> <p>TUBULATED NEAR THE BOTTOM DOUBLE PRIZE.</p> <p>No. 2550. SHORT BELL GLASSES.</p> <p>NOV. GROUND.</p> <table border="0"> <tr><td>4 inch</td><td>Each</td><td>50</td></tr> <tr><td>6 inch</td><td></td><td>75</td></tr> <tr><td>8 inch</td><td></td><td>1.30</td></tr> <tr><td>10 inch</td><td></td><td>1.60</td></tr> <tr><td>12 inch</td><td></td><td>1.90</td></tr> </table> <p>No. 2580. GLASS BATTERY JARS.</p> <p>WITH GLASS LIDS.</p> <table border="0"> <tr><td>WIDE.</td><td>High.</td><td>Each.</td><td></td></tr> <tr><td>4 x 4 inches outside</td><td></td><td></td><td>30</td></tr> <tr><td>4 x 5 inches outside</td><td></td><td></td><td>45</td></tr> <tr><td>4 x 6 inches outside</td><td></td><td></td><td>54</td></tr> <tr><td>4 x 8 inches outside</td><td></td><td></td><td>75</td></tr> <tr><td>5 x 6 inches outside</td><td></td><td></td><td>90</td></tr> <tr><td>7 x 8 inches outside</td><td></td><td></td><td>1.20</td></tr> <tr><td>6 x 9 inches outside</td><td></td><td></td><td>1.30</td></tr> <tr><td>8 x 12 inches outside</td><td></td><td></td><td>1.80</td></tr> <tr><td>9 x 12½ inches outside</td><td></td><td></td><td>3.00</td></tr> <tr><td>9 x 15 inches outside</td><td></td><td></td><td>3.20</td></tr> </table> <p>No. 2590. GLASS BOXES.</p> <p>WITH GLASS LIDS.</p> <table border="0"> <tr><td>PLAIN.</td><td>Per Doz.</td><td></td></tr> <tr><td>½ oz.</td><td></td><td>1.40</td></tr> <tr><td>1 oz.</td><td></td><td>1.80</td></tr> <tr><td>2 oz.</td><td></td><td>1.80</td></tr> <tr><td>4 oz.</td><td></td><td>2.10</td></tr> <tr><td>8 oz.</td><td></td><td>2.60</td></tr> <tr><td>16 oz.</td><td></td><td>3.20</td></tr> </table> <p>See 4 oz. Ground Top Box, No. 634, Page 63.</p>	PLAIN.	Each.		½ Pint		1.10	¼ Quart		1.60	½ Gallon		2.20	¾ Gallon		3.80	2 Gallon		5.80	3 Gallon		6.80	5 Gallon		11.00	PLAIN.	Each.		½ Pint		80	¼ Quart		1.10	½ Gallon		1.60	¾ Gallon		2.20	4 inch	Each	50	6 inch		75	8 inch		1.30	10 inch		1.60	12 inch		1.90	WIDE.	High.	Each.		4 x 4 inches outside			30	4 x 5 inches outside			45	4 x 6 inches outside			54	4 x 8 inches outside			75	5 x 6 inches outside			90	7 x 8 inches outside			1.20	6 x 9 inches outside			1.30	8 x 12 inches outside			1.80	9 x 12½ inches outside			3.00	9 x 15 inches outside			3.20	PLAIN.	Per Doz.		½ oz.		1.40	1 oz.		1.80	2 oz.		1.80	4 oz.		2.10	8 oz.		2.60	16 oz.		3.20
12 x 2 inch	Each	\$1.75																																																																																																																																																																																																																																																																																																																																																																																																																																																						
17 x 2½ inch		2.50																																																																																																																																																																																																																																																																																																																																																																																																																																																						
21 x 3 inch		4.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
Graduated, see page 64.	Per Doz.	4.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
½ Pint		6.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
¼ Gallon		12.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
½ Gallon		16.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
¾ Gallon		22.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
1 Gallon		28.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
2 Gallon		54.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
½ Pint	Per Doz.	3.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
¼ Pint		3.75																																																																																																																																																																																																																																																																																																																																																																																																																																																						
½ Pint		5.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
¾ Pint		7.25																																																																																																																																																																																																																																																																																																																																																																																																																																																						
¼ Gallon		12.50																																																																																																																																																																																																																																																																																																																																																																																																																																																						
½ Gallon		17.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
¾ Gallon		25.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
1 Gallon		31.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
2 Gallon		56.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
PLAIN.	Per Doz.																																																																																																																																																																																																																																																																																																																																																																																																																																																							
2 inches diameter		2.50																																																																																																																																																																																																																																																																																																																																																																																																																																																						
3 inches diameter		3.50																																																																																																																																																																																																																																																																																																																																																																																																																																																						
4 inches diameter		4.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
5 inches diameter		4.80																																																																																																																																																																																																																																																																																																																																																																																																																																																						
6 inches diameter		5.30																																																																																																																																																																																																																																																																																																																																																																																																																																																						
Nest of 2, 3, 4 inch	Each Nest	.85																																																																																																																																																																																																																																																																																																																																																																																																																																																						
Nest of 4, 5, 6 inch		1.20																																																																																																																																																																																																																																																																																																																																																																																																																																																						
Nest of 2, 3, 4, 5, 6 inch		1.70																																																																																																																																																																																																																																																																																																																																																																																																																																																						
2 inches diameter	Per Doz.	3.30																																																																																																																																																																																																																																																																																																																																																																																																																																																						
3 inches diameter		4.10																																																																																																																																																																																																																																																																																																																																																																																																																																																						
4 inches diameter		5.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
5 inches diameter		6.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
6 inches diameter		6.60																																																																																																																																																																																																																																																																																																																																																																																																																																																						
Nest of 2, 3, 4 inch	Each Nest	1.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
Nest of 4, 5, 6 inch		1.50																																																																																																																																																																																																																																																																																																																																																																																																																																																						
Nest of 2, 3, 4, 5, 6 inch		2.10																																																																																																																																																																																																																																																																																																																																																																																																																																																						
2 inch	Per Doz.	\$2.50																																																																																																																																																																																																																																																																																																																																																																																																																																																						
3 inch		3.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
4 inch		4.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
5 inch		4.50																																																																																																																																																																																																																																																																																																																																																																																																																																																						
6 inch		5.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
½ Pint	Per Doz.	8.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
¼ Pint		10.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
½ Pint		12.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
¾ Pint		14.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
¼ Gallon		16.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
½ Gallon		24.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
¾ Gallon		32.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
1 Gallon		40.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
2 Gallon		60.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
½ Pint	Per Doz.	10.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
¼ Pint		12.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
½ Pint		14.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
¾ Pint		16.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
¼ Gallon		18.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
½ Gallon		26.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
¾ Gallon		34.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
1 Gallon		42.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
2 Gallon		62.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
½ Pint	Per Doz.	12.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
¼ Pint		14.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
½ Pint		16.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
¾ Pint		18.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
¼ Gallon		20.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
½ Gallon		28.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
¾ Gallon		36.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
1 Gallon		44.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
2 Gallon		64.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
½ Pint, 5 x 2 in.	Per Doz.	7.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
Pint, 7½ x 2½ in.		8.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
Quart, 9 x 3½ in.		9.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
½ Gallon, 11 x 4½ in.		10.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
Gallon, 14 x 5½ in.		11.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
2 Gallon, 18 x 6½ in.		12.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
3 Gallon, 19 x 8 in.		13.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
½ Bushel, 27 x 10 in.		14.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
32 x 12½ in.		15.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
½ Pint, 4½ x 2½ in.	Each	40																																																																																																																																																																																																																																																																																																																																																																																																																																																						
¾ Pint, 5 x 4 in.		50																																																																																																																																																																																																																																																																																																																																																																																																																																																						
¼ Gallon, 9 x 8 in.		75																																																																																																																																																																																																																																																																																																																																																																																																																																																						
¾ Quart, 13 x 8 in.		1.20																																																																																																																																																																																																																																																																																																																																																																																																																																																						
2 Gallon, 16½ x 8 in.		1.80																																																																																																																																																																																																																																																																																																																																																																																																																																																						
3 Gallon, 19 x 9 in.		4.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
4 Gallon, 22 x 10 in.		6.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
½ Bushel, 26 x 13 in.		11.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
34 x 16 in.		14.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
STOPPERED.	Per Doz.																																																																																																																																																																																																																																																																																																																																																																																																																																																							
1 oz.		2.70																																																																																																																																																																																																																																																																																																																																																																																																																																																						
2 oz.		3.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
4 oz.		4.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
PLAIN.	Each.																																																																																																																																																																																																																																																																																																																																																																																																																																																							
½ Pint		75																																																																																																																																																																																																																																																																																																																																																																																																																																																						
¼ Quart		1.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
½ Gallon		1.80																																																																																																																																																																																																																																																																																																																																																																																																																																																						
¾ Gallon		2.80																																																																																																																																																																																																																																																																																																																																																																																																																																																						
2 Gallon		3.90																																																																																																																																																																																																																																																																																																																																																																																																																																																						
3 Gallon		5.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
5 Gallon		10.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
PLAIN.	Each.																																																																																																																																																																																																																																																																																																																																																																																																																																																							
½ Pint		75																																																																																																																																																																																																																																																																																																																																																																																																																																																						
¼ Quart		1.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
½ Gallon		1.50																																																																																																																																																																																																																																																																																																																																																																																																																																																						
¾ Gallon		2.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
2 Gallon		3.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
3 Gallon		5.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
5 Gallon		10.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
PLAIN.	Each.																																																																																																																																																																																																																																																																																																																																																																																																																																																							
½ Pint		1.10																																																																																																																																																																																																																																																																																																																																																																																																																																																						
¼ Quart		1.60																																																																																																																																																																																																																																																																																																																																																																																																																																																						
½ Gallon		2.20																																																																																																																																																																																																																																																																																																																																																																																																																																																						
¾ Gallon		3.80																																																																																																																																																																																																																																																																																																																																																																																																																																																						
2 Gallon		5.80																																																																																																																																																																																																																																																																																																																																																																																																																																																						
3 Gallon		6.80																																																																																																																																																																																																																																																																																																																																																																																																																																																						
5 Gallon		11.00																																																																																																																																																																																																																																																																																																																																																																																																																																																						
PLAIN.	Each.																																																																																																																																																																																																																																																																																																																																																																																																																																																							
½ Pint		80																																																																																																																																																																																																																																																																																																																																																																																																																																																						
¼ Quart		1.10																																																																																																																																																																																																																																																																																																																																																																																																																																																						
½ Gallon		1.60																																																																																																																																																																																																																																																																																																																																																																																																																																																						
¾ Gallon		2.20																																																																																																																																																																																																																																																																																																																																																																																																																																																						
4 inch	Each	50																																																																																																																																																																																																																																																																																																																																																																																																																																																						
6 inch		75																																																																																																																																																																																																																																																																																																																																																																																																																																																						
8 inch		1.30																																																																																																																																																																																																																																																																																																																																																																																																																																																						
10 inch		1.60																																																																																																																																																																																																																																																																																																																																																																																																																																																						
12 inch		1.90																																																																																																																																																																																																																																																																																																																																																																																																																																																						
WIDE.	High.	Each.																																																																																																																																																																																																																																																																																																																																																																																																																																																						
4 x 4 inches outside			30																																																																																																																																																																																																																																																																																																																																																																																																																																																					
4 x 5 inches outside			45																																																																																																																																																																																																																																																																																																																																																																																																																																																					
4 x 6 inches outside			54																																																																																																																																																																																																																																																																																																																																																																																																																																																					
4 x 8 inches outside			75																																																																																																																																																																																																																																																																																																																																																																																																																																																					
5 x 6 inches outside			90																																																																																																																																																																																																																																																																																																																																																																																																																																																					
7 x 8 inches outside			1.20																																																																																																																																																																																																																																																																																																																																																																																																																																																					
6 x 9 inches outside			1.30																																																																																																																																																																																																																																																																																																																																																																																																																																																					
8 x 12 inches outside			1.80																																																																																																																																																																																																																																																																																																																																																																																																																																																					
9 x 12½ inches outside			3.00																																																																																																																																																																																																																																																																																																																																																																																																																																																					
9 x 15 inches outside			3.20																																																																																																																																																																																																																																																																																																																																																																																																																																																					
PLAIN.	Per Doz.																																																																																																																																																																																																																																																																																																																																																																																																																																																							
½ oz.		1.40																																																																																																																																																																																																																																																																																																																																																																																																																																																						
1 oz.		1.80																																																																																																																																																																																																																																																																																																																																																																																																																																																						
2 oz.		1.80																																																																																																																																																																																																																																																																																																																																																																																																																																																						
4 oz.		2.10																																																																																																																																																																																																																																																																																																																																																																																																																																																						
8 oz.		2.60																																																																																																																																																																																																																																																																																																																																																																																																																																																						
16 oz.		3.20																																																																																																																																																																																																																																																																																																																																																																																																																																																						

←100.1

It is believed they also produced specialty jars for F.G. OTTO & Sons for use in Electroshock Therapy Devices. The actual relationship between Whitall Tatum and F.G. Otto and Sons is not known. A full discussion is in Volume II.

For examples of their battery jars, see Whitall Tatum Catalogs from 1879 and 1880 at NIA.org. Other examples are shown below:



←**100.2** is not shown in their catalogs. A square, light aqua jar, 3” square x 4” high, with a 2” diameter top. It is embossed, on the front: (arc) **F.G. OTTO & SONS / Jersey City**. It is believed to have been used in an Electro Therapy device, (medical battery), very likely “The Mystic”. This is courtesy of **Don Briel**.

100.3→



100.3 is not shown in their catalog, either. It is 4” square x 5” high, with an off-set glass top, 2” square. It is light aqua and embossed, on the front, (arc) **F.G. OTTO & SONS / NEW YORK**. This one is known to have been used in an electro therapy device called “The Florence”. This jar is also courtesy of Don Briel.



←**100.4**, appears to be the same as **100.3**. It has been documented, however that **100.3** is embossed on the neck: **LD / PATENT / JULY 4 / 1874**. The body is embossed (arc) **F.G. OTT & Sons / NEW YORK**. The LD is for Luis Drescher, a physician in New York.

The jars shown in **100.2** through **100.6** are of the Grenet type.

100.5↓



100.6↓



Because of the shape it is believed that Whitall Tatum likely manufactured **100.5** and **100.6** as well. You recognize the Gamewell logo on **100.5**. I could find no information on H.S. in New York in **100.6**.



←**100.7** was made by Whitall Tatum Co. It is un-embossed **(arc) W.T & Co. / U.S.A.** It is a very light aqua in color and is 1.25” square x 3.5” tall. This jar does not show either of the Whitall Tatum Catalogs. This may indicate that Whitall Tatum, and perhaps other companies, manufactured specialty items for specific customers. Courtesy of **Debbi Graham**

If you look ahead to Willard Battery Co. you will notice a great deal of similarity between this bottle and the bottles in the 24-bottle array. The jars in the Willard are 1.25” square x 4.5” tall, thus the similarity. Based on this similarity, is it possible that Whitall Tatum made the small Willard battery Jars. We may never know. Courtesy of **Courtesy of Debbi Graham.**



←**100.8**, in spite of its appearance, is not a battery jar. As the embossing says it is a water cooler, manufactured by Whitall Tatum with the brand name Acme. It is described in their supplemental price list from 1894. “A glass jar, capacity, one quart, encased within a double walled can, so constructed as to be a non-conductor of heat. When the can is closed the temperature inside is kept almost unchanged for a considerable length of time. Owing to its non - conducting quality, the can is also well adapted for retaining the heat of broth, gruel or other food placed in the jar when hot.” The jar itself is light straw, with ground lip and pour spout. It is 3.75” diameter x 6” tall. Embossed on a slug plate on the front: **(arc) ACME / (arc) WATER COOLER** around the W/T logo. **The base is embossed W.T. & CO. U.S.A.**


Courtesy of **Debbi Graham.**



←**100.9** appears to be a variation of the complete **Water Cooler** as described in the Whitall Tatum price list of 1894. If you look closely, you can see the Whitall Tatum logo on the jar. The glass jar fit inside the red base and the darker portion fit over the whole thing. Notice the wire carrying handle on the jar. Courtesy of **Debbi Graham**.

←**100.10** is the page from the 1894 catalog showing the Acme Water Cooler made by Whitall Tatum. The one above may be an earlier version. Certainly, there are similarities. What is unique and special is that showing it in their 1894 catalog likely makes it the first version of a thermos. The Stanley Thermos wasn't invented for another 10 years or so.

ACME WATER COOLER.
(PATENT APPLIED FOR)
**FOR KEEPING WATER COLD,
 PRESERVING CRACKED ICE, ETC.**
 ESPECIALLY VALUABLE FOR SICK ROOM USE.
 DIMENSIONS $5\frac{1}{2} \times 7$ INCHES.



A glass jar, capacity one quart, is inclosed within a double walled can, so constructed as to be a non-conductor of heat. When the can is closed the temperature inside is kept almost unchanged for a considerable length of time. Ice placed in the jar will remain unmelted for many hours, and water may be kept perfectly cold all night.

Owing to its non-conducting quality the can is also well adapted for retaining the heat of broth, gruel, or other food placed in the jar when hot.

The can is lined with zinc, the outside is handsomely japanned, and it is furnished with a folding handle so that liquid may be readily poured out without removing the jar from the can.

For Sale,
 Price \$15 00

Although seldom seen, **Tommy Bolack** and **Walt Baumgardt** have these in their collections.

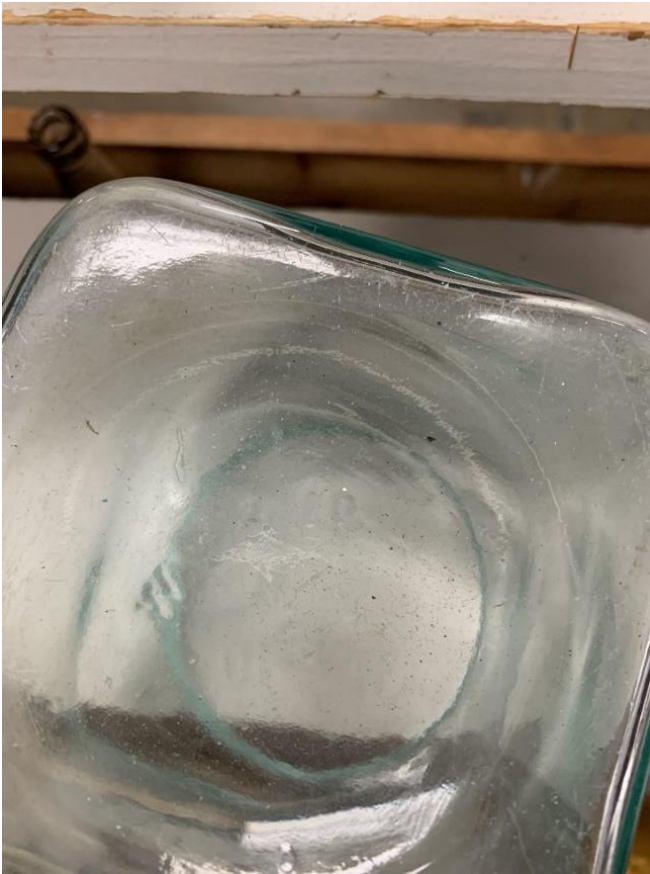


100.11↑ and **100.12** is a close-up of **100.8**. The bottom is embossed **W. T. CO. / B.** Courtesy of Tommy Bolack

←**100.12**



←**100.13 and 100.14** show a Whitall Tatum battery jar in light aqua. It is 3.75" square x 6" tall. tall with a spout. It has a ground lip. It is embossed **W.T. CO** on the base.



←**100.14**



←**100.15** is 6.75" diameter x 8.5" tall with a formed lip and no spout. The **W.T.CO. 8** is visible on the bottom. The porcelain lid (**100.16**) is embossed: (arc) RSA SIGNAL CELL / Manufactured By / (arc) WATERBURY BATTERY CO. - WATERBURY, CONN. U.S.A. Courtesy of W. Baumgardt



←**100.16**



←**100.17**, a J. Franklin Miller jar is also a Whitall Tatum product as seen on the **W.T CO.** on the base. **98.18**. The exact embossing is (arc) **THIS JAR SOLD SEPARATELY / J. FRANKLIN MILLER / (arc) 1626 CHESTNUT ST. PHILA.** Courtesy of Tommy Bolack

All I could determine is that there were several Miller Electric locations in Philadelphia.



←**100.18**



←**100.19** and **100.20** is another Whitall Tatum battery jar. It is 4.25" square with a 3.75" diameter top and a ground lip. There is a circular slug plate on the front. On the base is WT & Co. / 1/ U.S.A.



←**100.20**

The Grenet type jar in **100.21** through **100.23** is placed in Whitall Tatum because, in spite of the absence of any embossing, it has the unmistakable design of other Whitall Tatum jars we've seen.



The base of the jar is 4" square. The center neck is centered on the base, rather being off-set, as we've seen in other jars, Like **100.3**, it is 5" tall with a 2" square neck. With the electrodes it is 6.5" tall. The shaped pins on either side held the battery secure in a portable device such as the "Florence".

←**100.21**

100.22↓



←**100.23**



←**100.24 and 100.25** is an early piece from Whitall Tatum, with an open pontil in the bottom. It is embossed around the lid: **WHITALL TATUM & CO. / PAT. JUNE 11TH 1895 - PHILADELPHIA - NEW YORK.** The way the top fits over the jar, I suspect it is an apothecary jar rather than a battery jar. The dimensions are 9.5" diameter x 8.5" tall. The bottom is an 8.5" diameter. **Courtesy of Tommy Bolack.**

100.25↓





100.26 is a jar in SCA, with a ground lip and pour spout. It is 4.5" diameter x 6" tall with a 3.75" mouth. Embossed inside a circular slug plate: (arc) **If Jar Should Be Broken / Purchase Another / From (arc) JOHN WANNAMAKER. Base: W.T. Co. / 4 / U.S.A.** Courtesy of Tommy Bolack

101 Whitney Glass Works, Glassboro, NJ

Although the glass plant had a much older history, Thomas and Samuel Whitney began to operate the Harmony Glass Works as the Whitney Brothers in 1839. In 1885, the firm became the Whitney Glass Works, but the Owens Bottle Mfg. Co. purchased the factories (two by then) in 1918, closing one and absorbing the other into the Owens family of plants. The Whitney's produced a large variety of fruit jars and bottles of many types. Aside from the wide range of fruit jar names, Whitney apparently did not mark most of their products, although the firm managed to use a large variety of logos on the ones, they did mark. Fruit jars they are known to have made, include, Trademark 5, Jersey, Telephone, WB monogram, Leader, Whitney Mason and Whitney. In 1885 Whitney received its largest single order, for 7.5 million Warner's Safe Cure bottles. In 1888 they received an order for 15,000 battery jars from the Law Battery Co. It is not known if they produced battery jars for other companies, but it is likely they did.

See Chapter 57 for information about Law Battery Co.

102 - WILLARD Storage Battery CO., Cleveland, OH.

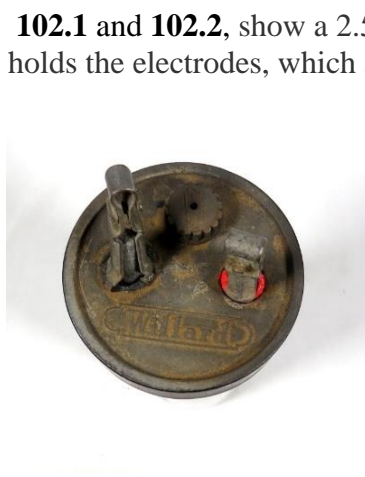
The **Willard Storage Battery Co.**, an early leader in the development and manufacture of automobile batteries, was founded by Theodore A. Willard as the Willard Electric & Battery Co. at 33 Sheriff (E. 4th) St. in 1896, relocating to 49 Wood (E. 3rd) St. the following year. Willard reorganized the company as the Willard Storage Battery Co. in 1902. The company produced batteries for use by dentists and physicians, in Edison phonographs, and for lighting railroad cars, and made its first battery for automobile ignition in 1908. Beginning in 1910 Willard produced batteries and electric lighting accessories and sold them directly to individual automobile owners, unable to convince the manufacturers of their viability until 1912. Business then grew quickly; the company built a 15-acre plant at 274 E. 131 St. in 1915 and had contracts to supply batteries to 85% of the automobile factories in the U.S. by 1918.

The company grew with the automobile industry and after several years of experimental broadcasting, Willard bought station WEAR from Goodyear Tire and Rubber Co. and combined it with its own operation to create WTAM, a 1,500-watt, clear-channel radio station in Cleveland in 1923 (see [WTAM](#)). In Nov. 1930 Willard had more than 2,500 employees, additional plants in Toronto and Los Angeles, and distributors in 89 countries. The company produced batteries for submarines during World War II and was a pioneer in the development of small, hand-sized batteries. In 1952 employment had fallen to 1,500 and the firm was purchased by the Electric Storage Battery Co. of Philadelphia. In Aug. 1959 Electric Storage Battery announced it would close its Cleveland manufacturing operations, and by 1961 the E. 131 St. plant was vacant.

References: 168



102.1↑



102.2↑

102.1 and **102.2**, show a 2.5" x 7" round glass battery jar with a screw top that holds the electrodes, which are 2" x 5". There is no embossing on the jar and the name **WILLARD** appears only on the lid. This was a radio battery. Courtesy of **Walt Baumgardt**.



102.3↑

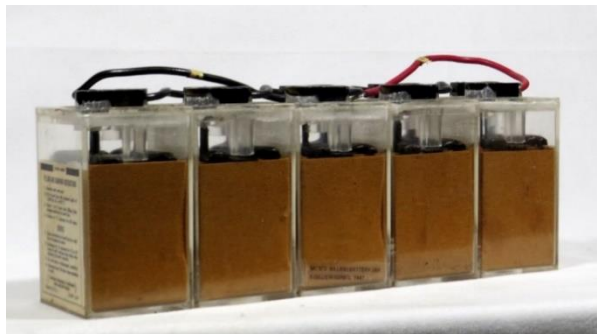


102.4↑

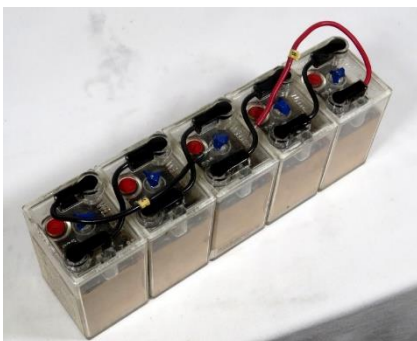


← 102.5

102.3 through 102.5 show a Willard Radio battery, Model B, Battery Jar that was used to power radios in the early 19TH century. It is 1.5" diameter x 6.5" tall. It was used as part of an array, wired in series. A typical array to power radios is shown in 100.5.



←102.6 is a 5-cell array manufactured by WILLARD. Each cell is 2 x 2.5 x 3.5" high. 5 of these individual cells are connected in parallel to produce a higher voltage. They are unmarked except for the top, which is embossed, WILLARD. The labels on the ends of the array are filling, charging, and servicing instructions.



← 102.7 is a top view of 102.6 showing the connection of the cells, (parallel). It looks like it was never used. Courtesy of Walt Baumgardt.←

Building upon the array concept we have two 24-cell arrays, also manufactured by WILLARD, below. Courtesy of **Walt Baumgardt**.



←**102.8**

Each cylindrical, glass cell is 1.25” diameter x 4.5” tall. They are arranged in a 4 x 6 cell array, connected in parallel to increase the voltage to approximately 48 volts. The jars are unmarked except for a number on the bottom. “**WILLARD**” is embossed on the connecting rods between the cells. The electrodes are 1” x 3”. The box is embossed the same as 68 – 6 except for WTAM on one end. This was like an array used in

conjunction with the WTAM radio station,

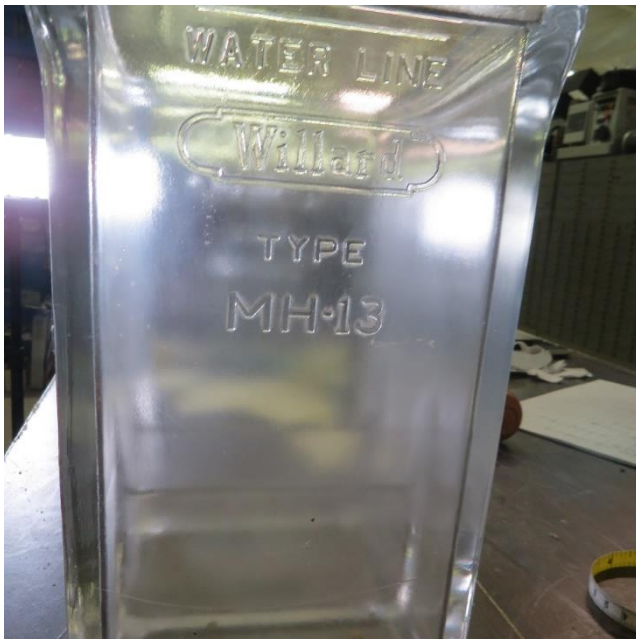


←**102.9** is a similar array with 1.5” square x 4.5” tall bottles. This box is embossed: (Front) **THREAD RUBBER / WILLARD / Large W) INSULATION, (Left Side) WILLARD / 1126 (Right Side) WILLARD / 1126 (Rear) PART NO. 2776 / CHARGE at 1/10 AMP. Courtesy of Walt Baumgardt.**



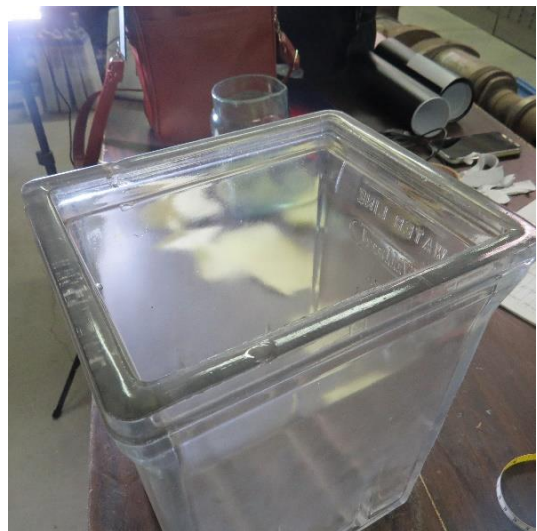
←**102.10** is a WILLARD radio battery. it has 12 cells in an array. Each cell is 1.5" x 5" tall. The box is labeled (Arc) **THREAD RUBBER / WILLARD / (arc) INSULATION**. Another side is labeled Part No 2833. **Courtesy of Tommy Bolack.**

Just when you think Willard may have only used small battery jars and arrays, we find this large WILLARD battery jar, **102.11** and **102.12**. It is 7" x 8.25" x 10.5" tall. It is thick walled, with the walls measuring 1/2" thick. On opposing sides, it is embossed: **WATER LINE**. One of those sides is further embossed **WILLARD / TYPE / MH - 13**. Note the flared top. **Courtesy of Tommy Bolack.**



←**102.11**

102.12↓





102.13 is a Willard Battery jar , embossed WATER LINE / WILLARD TYPE / MFH 15. The dimensions are 7.5" x 8" x 10". Note the tapered sides.



←**102.13** is a unique Willard battery jar. It is clear glass with dimensions of 1.375" square x 5" tall. It is unembossed except for **HIGH** near the top, indicating the maximum level for electrolyte. It was likely used in arrays, similar to **102.8**.



←**102.14** is a Willard battery jar in light straw. It is a multicell offering 3 distinct cells in a single unit. The dimensions are 4" x 8" x 8" tall. It is embossed on front and back: **High and Low liquid levels / WILLARD (in an oval)**. The base has embossing, but I can't make it all out. What I can see, is: ??? / WILLARD ?? / PATENTED / CLEVELAND, OH.



←**102.15** is similar to **102.14**. It is uranium glass rather than straw. It is embossed on front and back: **High and Low liquid levels / WILLARD (in an oval)**. The base is unembossed. Its dimensions are 4" x 8.75" x 7.75" tall. Courtesy of Tommy Bolack



102.16↑ appears to be a specialty battery jar with dimensions of 2.5” square bottom x 8.5” tall. The sides a tapered making the top 3.25”square. It is embossed **HIGH and LOW Liquid Levels / (arc) THREAD- RUBBER / WILLARD / (arc) INSULATION**. Courtesy of Tommy Bolack

Thread Rubber Insulation refers to the fact that thread rubber is placed between the electrodes to keep them apart.



←**102.17**



←102.17

102.17 and 102.18 show the front and back of Willard 2-volt battery packs, No. ER-6-2B. They were lead acid radio batteries and were used into the 1950s. The dimensions were 1.5" x 2.5" x 4" Tall.

104 - Submarine Batteries

The first U.S. submarine was the USS Holland, commissioned in 1900. She had both an internal combustion engine (specifically, a 4-stroke Otto gasoline engine of 45 bhp (34 kW) for running on the surface and for charging batteries, and an Electro Dynamic electric motor of 50 shp (37 kW) for submerged operation, with one shaft.[https://en.wikipedia.org/wiki/USS_Holland_\(SS-1\) - cite_note-Conways1-8](https://en.wikipedia.org/wiki/USS_Holland_(SS-1) - cite_note-Conways1-8) A 66-cell Exidehttps://en.wikipedia.org/wiki/Electric_battery array powered the electric motor when submerged.[https://en.wikipedia.org/wiki/USS_Holland_\(SS-1\) - cite_note-FriedmanSubs1-specs-5](https://en.wikipedia.org/wiki/USS_Holland_(SS-1) - cite_note-FriedmanSubs1-specs-5) This allowed speeds of 6 knots (11 km/h; 6.9 mph) surfaced and 5.5 knots (10.2 km/h; 6.3 mph) submerged.

By the time WWII came, submarine batteries had advanced considerably. Each battery was about 54 inches high, 15 inches deep, and 21 inches wide, and weighed about 1,650 pounds. Each battery was composed of 126 lead-acid cells. Each cell in a submarine battery produced from 1.06 volts when fully discharged, to 2.75 volts at the optimum output. The cells could be connected in series to give a usable output of from about 210 to 350 volts, and in parallel for a power output of as much as 15,000 amps.

The primary manufacturers of the batteries were the Exide Corporation (now Exide Technologies) and the Gould Storage Battery Company (absorbed by JX Nippon Mining in 1988).

Pictured below, **104.1** and **104.2** is a typical submarine battery from WWII. They were constructed of a modified hard rubber, impervious to the acid, and shock resistant to avoid breakage.

References: 148, 149



←**104.1**



104.2 →

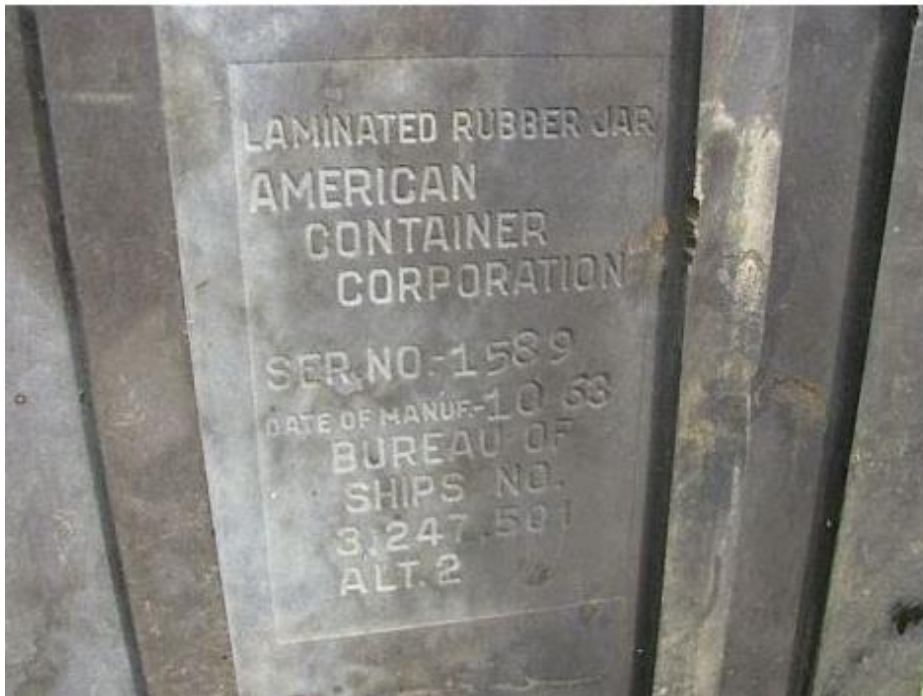


104.3↑

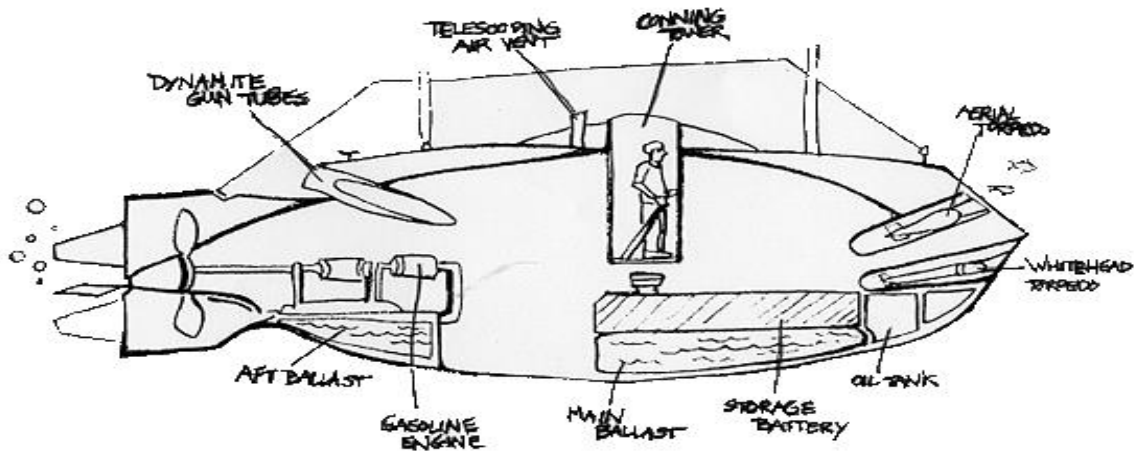


104.4↑

104.5↓



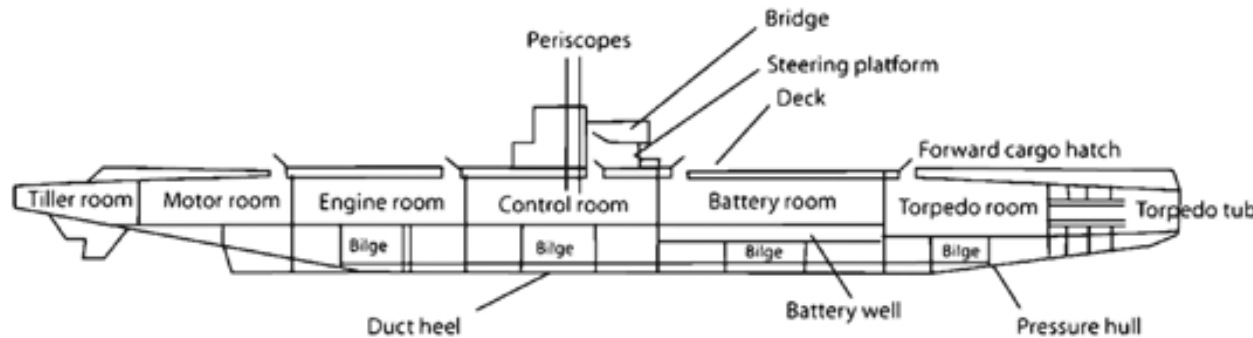
104.3 through 104.5 show the rubberized outer shell of the submarine battery described on the previous page. It is embossed: LAMINATED RUBBER JAR / AMERICAN / CONTAINER / CORPORATION / SER. NO: 1589 /Manuf: 10-63 / BUREAU OF / SHIPS NO. / 31247.501 / ALT. 2



104.3↑

USS Holland

←106.146 is an unembossed jar with a corner spout and dimensions of 3.75" square x 6" tall. Courtesy of Tommy Bolack



Schematic diagram of the S-Five.

104.4↑

WORLD WAR II type Submarine

Pictured, above, and 104.3 and is a schematics of the USS Holland, an early submarine. 104.4 shows a Typical WWII era submarine (the S-Five) showing the battery compartments.

105 - Batteries from Fruit Jars

For the layman and/or the DIYers at the time; conversion kits were available for converting fruit jars to battery jars. WE have two examples of these conversions, Gelfand's and Atlas.

I could find very little on Gelfands. It appears that they were a food products co, among many other things. They offered mayonnaise and other such products in Crocks, manufactured by the Western Stoneware Co. of Monmouth, IL, with Weir closures.

There is at least one Gelfand's fruit jar listed (# 1052) in the Fruit Jar Red Book. It is marked GELFAND's HA on the base. Some records show a GELFAND'S / BALTIMORE embossing.

The other is an Atlas fruit jar. Atlas Mason Jars were manufactured by the Atlas-Hazel Glass Company of Wheeling, WV, from 1902 – 1964.

Both conversions are simply screw fruit jar lids fitted with a single set of electrodes to make a single cell (battery). They were obviously used on small electrical appliances, requiring very little voltage.

References: 92, 132

105.1→





←105.2

105.3→

Gelfand's conversion is pictured above **105.1** through **103.3** Note the more refined electrode attachments, compared to the Atlas conversion

pictured below. **Courtesy of Walt Baumgardt**



105.4↑



105.5↑

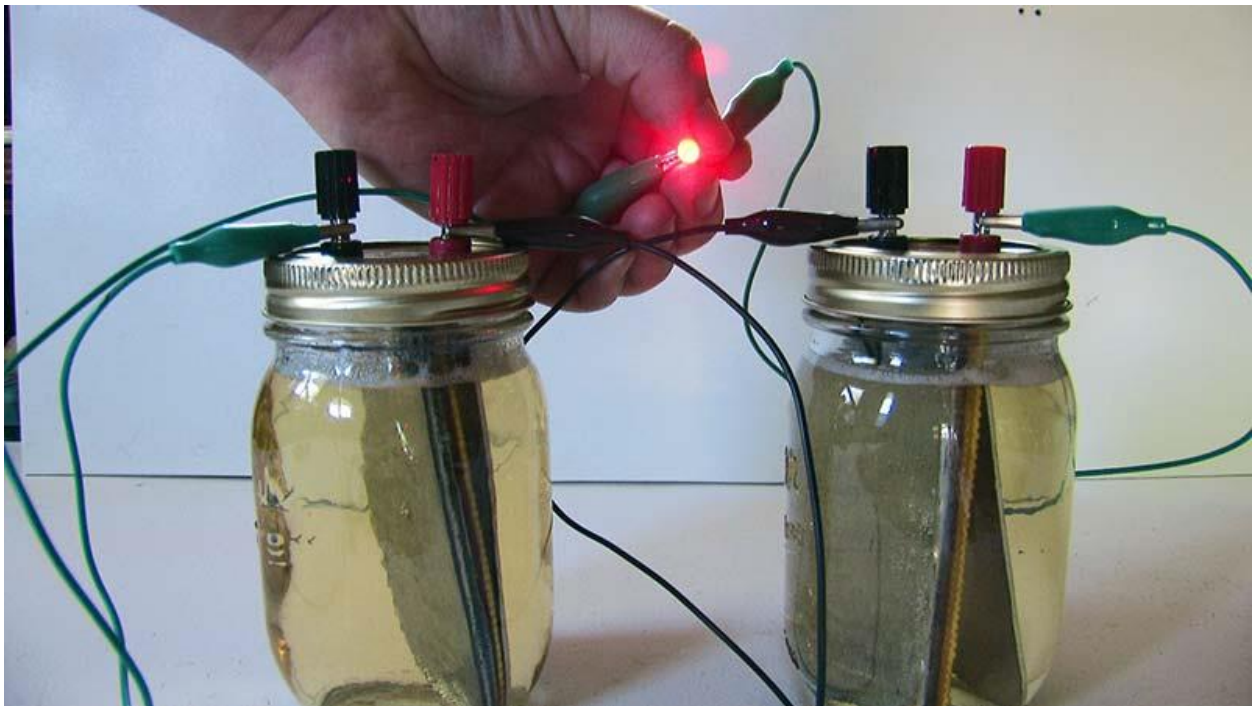
The large wing nuts on the Atlas, **105.4** and **105.5**, look like a DIY project. **Courtesy of Walt Baumgardt.**



←**105.6** is a clear, wide mouth Ball jar fitted with electrodes

105.7 (below) shows two fruit jars connected to power a light.

105.7↓



106 - Battery Jars, etc. of Unknown Manufacturers

There were so many manufacturers of Battery jars around the turn of the century (1880-1920) that many were un-embossed. We may never know who manufactured many of them, but they were manufactured and used, thus, deserving mentioning.

This chapter is devoted to battery jars that are either un-embossed; or, if embossed, there is little or nothing to report on the company.

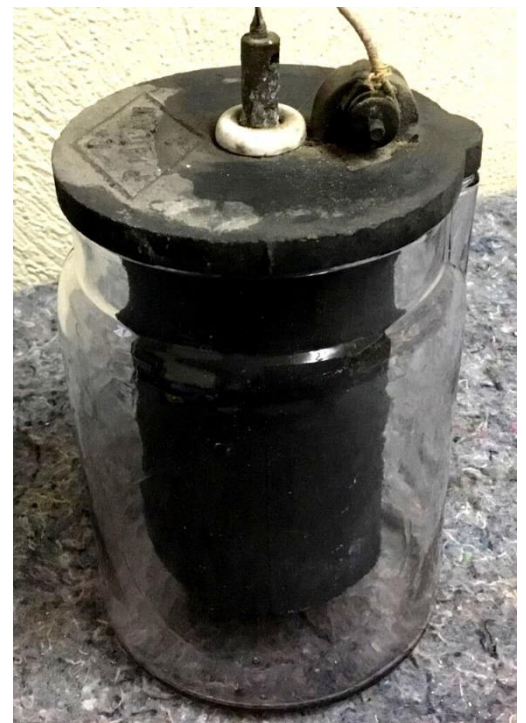


106.1 is merely embossed **THE / (arc) CRESCENT / BATTERY**. It is a clear, squared, jar with a ground lip. It is 4.75" square x 6.675" tall, with a 4.375" diameter mouth. Courtesy of **Debbi Graham**.

There was no information to be found. There are several Crescent Electric Companies, but none that would have been in existence in the early 1900s.

106.2→

106.2, is in a very light SCA, with a ground lip and pour spout. Dimensions: 4.375" diameter x 5.5" tall, with a 3.875" diameter mouth. It is embossed **PC&W PHILA** on the lid, which appears to be original.





←106.3



←106.4

106.5→

106.3 through 106.5 show an unmarked aqua jar with a carbon graphite electrode. The jar is 4.4" diameter x 6.5" tall, with a ground lip and pour spout. The lid and electrode do not appear original to the jar. The lid is embossed (arc) **APEX / E.T.W.** Courtesy of **Walt Baumgardt**.

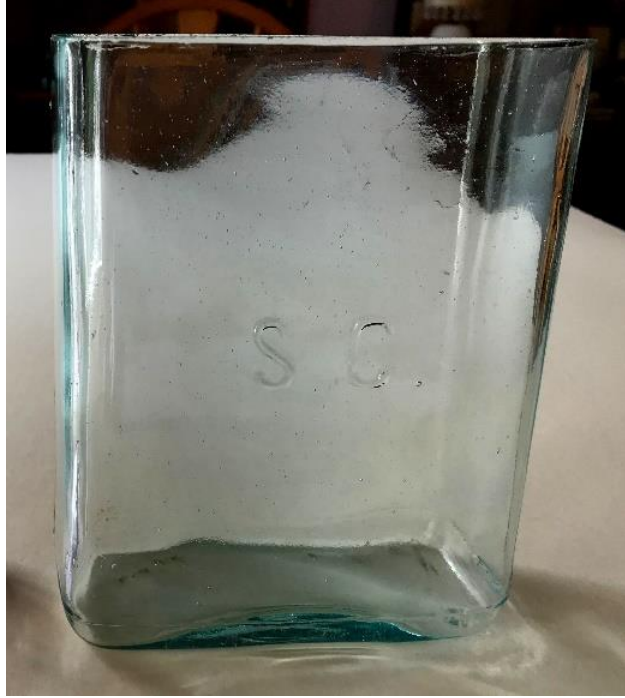
There are several Apex Electric Companies, but none that would match the period.

106.6 is a round jar with a ground lip a pour spout. It is embossed **BURNLEY / (arc) MIAMISBURG / ELECTRIC CO. / Miamisburg, OH.** The color is SCA. Dimensions are 3.375" diameter x 6.25" tall

106.7 is a rectangular jar, simply labeled **SC**, with a ground lip. Dimensions are 5 " x 2.675" x 6.25" tall. The color is light aqua.



106.6↑



106.7↑



106.8↑



106.9↑

106.8, is an un-embossed battery jar. It is aqua with a ground lip and pour spout with a circular slug plate with a small raised circle in the center. Its dimensions are 4.75" diameter x 6.5" tall with 3.75" diameter mouth. Courtesy of **Debbi Graham**.

106.9, is an un-embossed battery jar. It is aqua with a ground lip and pour spout with a circular slug plate. Its dimensions are 4.75" diameter x 6.5" tall with 3.75" diameter mouth. Courtesy of **Debbi Graham**.



106.10↑



106.11↑

106.10, is a battery jar for a microphone, apparently. It is aqua with a ground lip and pour spout. It is 4.5" diameter x 6" tall, with 3.675" diameter mouth. It is embossed: **MICROPHONE CELL / NEW YORK / PATENTED**. Courtesy of **Debbi Graham**.

106.11, is an un-embossed aqua jar, with a ground lip and pour spout. It is 4.5" diameter x 6.25" tall, with a 3.75" diameter mouth. There is a circular slug plate on the front with what appears to be a diamond in the center. Courtesy of **Debbi Graham**.



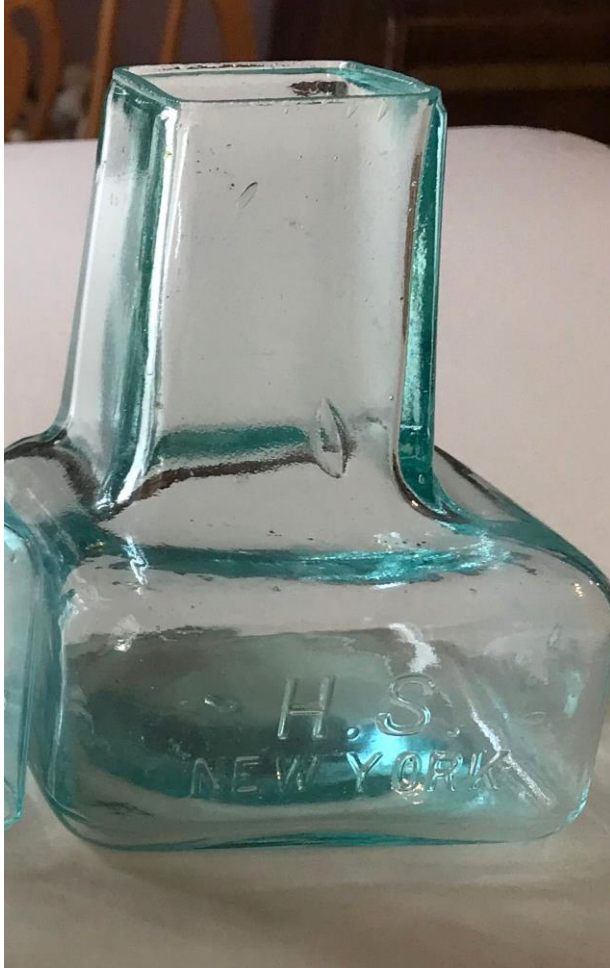
106.12↑

106.12, is a light green jar, identical to **102.10**. Courtesy of **Debbi Graham**.



106.13↑

106.13, is a square amber jar with a ground lip. It is 1.675" square x 4.5" tall. There is a recessed groove around the jar approximately 1.5" from the top. It is embossed: (arc) **BATTERY / Made By / NATIONAL / COMMERCIAL Co. / CINCINNATI, OHIO**
Courtesy of **Debbi Graham**.



106.14↑



106.15↑

106.14, is a small specialty battery jar, likely manufactured by Whitall Tatum. It is like the jars shown under F.G. Otto & Sons in Chapter 36. It is aqua with a ground lip and offset, square neck. The base is 5.25" square, and the neck is 1.75" square and off-set. The front is embossed **H.S. / NEW YORK**. It was very likely used in a medical battery. **Courtesy of Debbi Graham.**

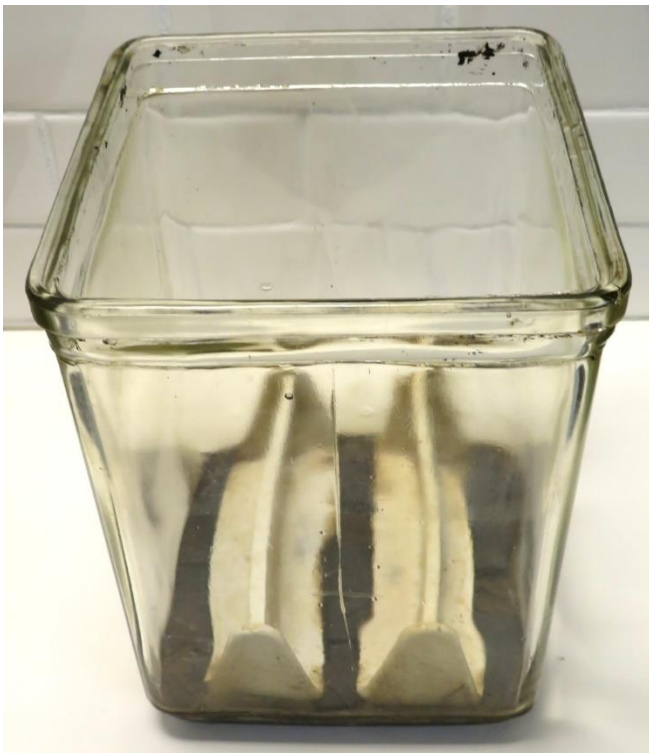
106.15, is like the jars seen in Chapter 36, F.G. OTTO & Sons. Likely made by Whitall Tatum, it is smaller than the ones we've seen before. It has a square base with a small square neck, with a ground lip. The base is 3" square while the neck is 1.75" square. It was likely used in medical batteries. **Courtesy of Debbi Graham.**



←**106.16** shows a squared aqua jar with a paper label formed lip along with the combination lid and electrode. The jar is un-embossed except for a BL 1 near the base. Its dimensions are 4.75" square by 7" tall, with a 4.375" diameter mouth. The label reads: **SEROCO / Seroco Carbon Battery / Directions / for use on open circuit service.** The lid is un-embossed. Courtesy of **Debbi Graham.**

106.17↓ is a straw-colored jar and is about the largest one I've seen. It is rectangular in shape with rounded corners and a formed top. Its dimensions are 8.675" x 13" x 17" tall. NOTE: The electrode rests in the bottom.

Courtesy of **Walt Baumgardt.**



106.18 → is a rectangular (almost square) jar in an aqua color. It has a ground lip, and the dimensions are 6.675" x 7.5" x 10". The number 6 appears on two sides. The bottom has 110 - 6. Courtesy of **Walt Baumgardt**.



106.19 is unmarked, except for a BK 2 near the base. It is aqua, with a ground lip and pour spout. It is 4.5" diameter x 6.75" tall, with a 3.75" diameter mouth, Courtesy of **Debbi Graham**.



←**106.20** is embossed **Water Line** on 4 sides, with **MADE IN U.S.A.** on one side. Its dimensions are 3.75" x 4" x 6" tall. It has a formed lip, and tin lid. The electrode rests in the base are 1.74" tall. Courtesy of **Walt Baumgardt**.



←**106.22** is a light Aqua jar with Ground lip and pour spout. It is 4.375" diameter x 5.875" tall. There is no lid and no embossing. Courtesy of **Walt Baumgardt**.

←**106.23** is a clear, 4.5” square jar is 4.5” with a 3.75” diameter round top, x 6.25” tall, with a formed lip. The jar has no embossing. The lid, **104.24**, is of hard rubber with 3.25” x 4.5” cylindrical electrodes fused to it. The lid is embossed in a circle

**ELECTRICAL ENGINEERING
COMPANY / MINNEAPOLIS,**

MINN. Not much is known about the Electrical Engineering Co. It is unknown if they manufactured the jar. Courtesy of **Walt Baumgardt**.



106.24

106.25 and **106.26** show a round aqua jar 4.5” diameter x 6.25” tall. The front has what appears to be a diamond inside of a large circle. A “3” is on the base. The lid is hard rubber with fused cylindrical electrodes, 3” diameter x 4.75” tall. There is an “S” embossed on the lid, below, which is not original to the jar. Courtesy of **Walt Baumgardt**.



106.25↑



106.26



←**106.27** is identified merely as KXC 13, on the bottom. Its dimensions are 6" x 7" x 10" tall. It is aqua and has **WATER LINE** on four sides.

106.28 → is totally unmarked, with dimensions of 6" x 10" x 7" tall. Note the formed, decorative lip.



←**106.29** is a totally un-embossed jar with a circular slug plate on the front. It is almost straight sided, 4" diameter x 7" tall with a 3.75" diameter mouth. It has a ground lip.

106.31 and **106.32**, below, is a light green aqua jar, with the same dimensions as **106.30**. It is embossed **ACID LEVEL / TYPE J1/9**. It is unknown why jars with different numbers would have the same dimensions.

These jars were reportedly used on the railroad system in the 1930s.

104.31↓



104.32↓





106.42↑

106.43↓



106.44↑



106.42 through **106.44** is an unembossed green aqua battery jar with a ground lip and spout. It is 4.25" diameter x 6.5" tall. The hard rubber lid is embossed (arc) **ANCHOR ELECTRIC CO. / BOSTON, MASS.**

I could find no informatio about the Anchor Electric CO.



106.45↑ is an unembossed battery jar, except for **WATER LINE** which is embossed at the top on all 4 sides. Its dimensions are 8.25" x 10.25" x 14.5" tall.



104.47↑

106.46↓

106.48→



106.46 through **106.48** show an un-embossed battery jar. Its only marking is **558 B 1303** on the base. The dimensions are 7.75" square x 10.5" tall with a formed lip. Courtesy of **Wayne Dudzinski**.

This jar has a unique feature. The plate rests are not an integral part of the jar. Instead the rests are separate, and, adhered to the bottom with tar.

This is surprising, as I would imagine the tar would have a negative effect on the electrolyte.



←**106.49** is an aqua jar with a ground lip and pour spout. It is 4.675: diameter x 6.25" tall with a 3.875: diameter mouth. It is embossed inside a circular slug plate: (arc) **SAMUEL THAXTER & SON** / (arc) **BOSTON, MASS.** Courtesy of **Debbi Graham.**

—



←**106.50**

I could find no information on the **Empire City Electric Co.** An illustrated catalog of the Empire City Electric Co sold on eBay in 2021. The jars **106.50** and **106.51** are all we have of this company Courtesy of **Walt Baumgardt and Debbi Graham.**

106.51→

They are round with a pour spout and ground lip. Dimensions are 4.25" diameter top x 6.875" tall. The embossing is (arc) **THE EMPIRE CITY / ELECTRIC COMPANY / (arc) NEW YORK**, inside a circular plate usually used for a paper label.



106.52 and **106.53** show a rectangular battery jar embossed **THE H & VW CO / BATTERIES / & / DYNAMOS**. Its dimensions are 6" x 9.5" X 8.5" tall. It is aqua with a ground lip.

106.52↓



106.53↓



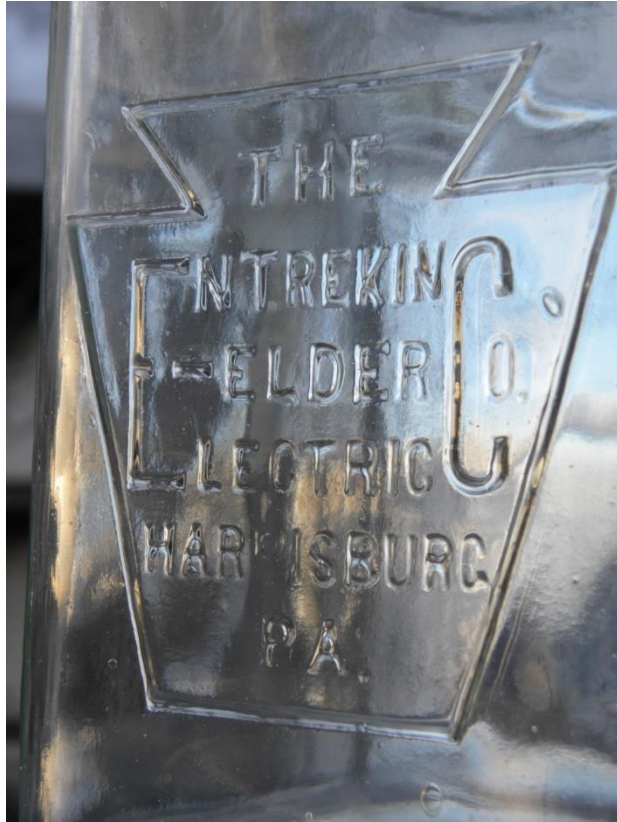
The battery jar shown in **106.54** and **106.55** is at the courtesy of **Jim Fleishman**. It is clear glass with no embossing, except for the numbers 33762 on the bottom. Its dimensions are 7.75" x 10" x 13" tall. It has a formed lip.

← **106.54**



106.55↓





106.56↑



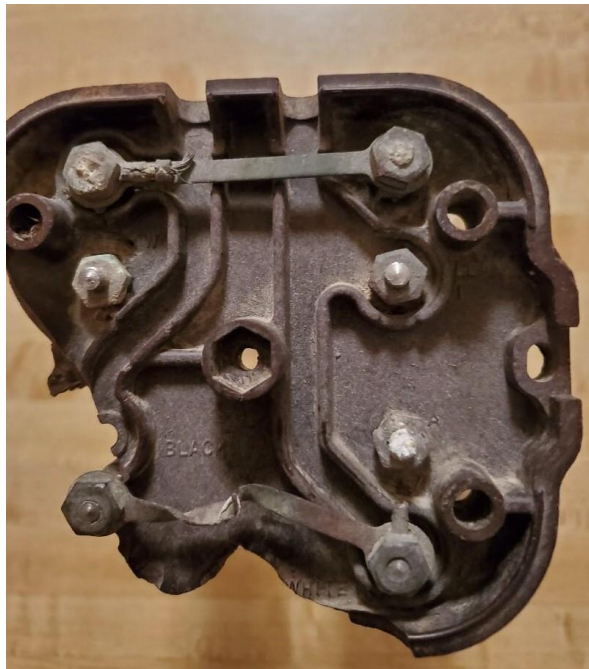
106.57↑

The jar pictured in **106.56** and **106.57** is the courtesy of **Dave Fertig**. It is clear glass with a ground lip. The jar is square with a round mouth. Dimensions are 4.75" square x 7" tall. The mouth is 4.375" diameter. The embossing is inside a keystone: **THE / [ENTREKIN / ELDER / ELECTRIC.] Co. / HARRISBURG / PA.**

There are currently several Entrekins and Elders in Harrisburg, but no Entrekin Elder Electric Co.



106.58↑



106.59↑



104.58 through **104.60** show four battery jars joined together into a multi cell unit by the use of a module. The module is constructed of molded Bakelite, which would date it to the period 1925 - 1935. It is reported to have been used on a tractor. This is perfectly logical, considering what we know about the electrification of America at the time. At this time there is nothing to identify the manufacturer, although the jars bear a remarkable resemblance to a similar Willard jar.

One corner of the module has broken off. I can't tell from the pictures how it was wired. Series connections would have increased the voltage approximately 8.4 volts. Parallel connections would have quadrupled the ampere output.

←**106.60**

106.64↓



106.64 through **106.70** show an unembossed battery jar held in a decorative brass base with a vine motif. The jar itself is 7.375" x 5.25" x 2.75", with a ground lip. The brass holder is obviously made to go with the jar. There is difficult to read embossing on the rear of the brass holder. Looks like it could be "**ARCHITECTURAL ??**". Very like a decorative piece for a well to do family that just didn't want a plain battery jar sitting around. Like a single purpose jar such as door bell or something similar.



106.65↑



106.66↑

106.67↓



106.68↓





←**106.69** is unmarked except for **WATER Line** on the two ends and **G 15** on the bottom. The dimensions are 6" x 7.5" x 10" tall. The hand crafted wooden lid is not original to the jar.

The battery jar shown below (**106.70**) is embossed as follows: The dimensions are 4.25" diameter x 7" tall. It has a ground lip and no spout.

Front:

THE IMPROVED / PATENTED / POUROUS CUP BATTERY / PAT'D OCT 26 1886 / TRADE MARK / CJH (surrounded by 4, 5-point stars)



←**106.70**



106.71↑ 106.73



106.72↑



106.71 through 104.73 appear to be the same jar with the exception of rear Embossing: **1st Water Line / 2nd Water Line.**

It also has a lid that is embossed: **P. & C. CO. / PHILADELPHIA / PAT OCT 6 1885**



← **106.74**

The jar pictured in **106.74** and **106.75** is the only one I've seen like it. It is Green, 4.675" in diameter and 5.375" tall with a screw top. It is embossed as follows:

1. Line all around the jar at the top with the words;"FILL ONLY TO THIS LEVEL".
 2. About a third of the way from the top, another line all around the jar, with the words; "**DO NOT ALLOW LIQUID LEVEL / TO FALL BELOW THIS LINE**".
- Courtesy of Bob Berry.



106.75



106.76↑



106.77↑

106.78



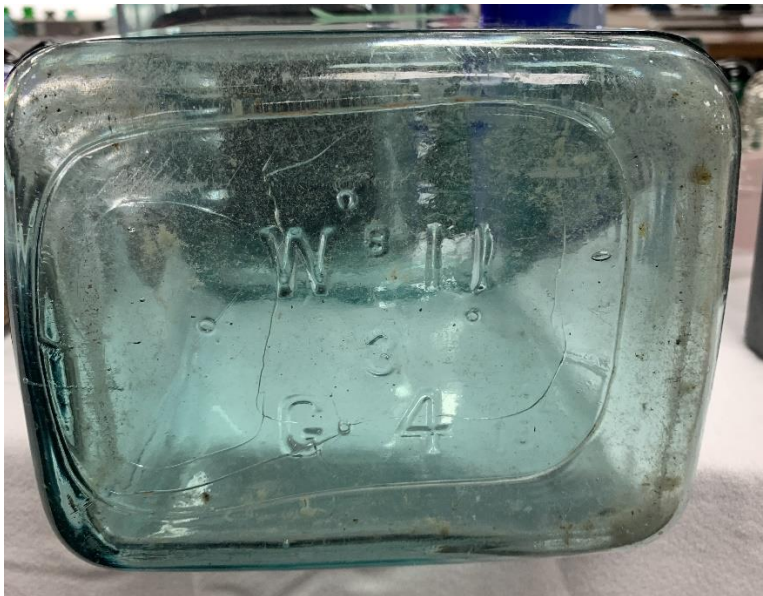
The battery jar pictured on this page is totally unmarked, except for the W 7 on the bottom. It is aqua with dimensions of 4" x 7" x 11.5". It seems too narrow for a typical farm battery.



←106.80

The battery jar shown in **104.80** and **104.81** is courtesy of Russ & Marge Frank. It is aqua with dimensions of 5.5" x 7" x 11.5" tall with a wooden lid. There is no embossing on the sides, not even Water Line. The only embossing is on the bottom and reads: **B / W 11 / 3 / G 4**. I do not recognize this as being related to a familiar embossing, although the G could be Gayner. **Courtesy of Tommy Bolack**

106.81 ↓





106.82↑



106.83↑



106.84↑

This battery jar shown in **104.82** through **104.84** is simply embossed **CT – 2** on the bottom. “Water Line” / Made In U.S.A. is embossed on opposite sides. There are no other embosings on the jar. At this point the manufacturer is unknown.



←**106.85** is a jar embossed (arc) **PROVIDENCE ELECTRIC / PROVIDENCE / RI / (arc) SUPPLY CO.** It is light aqua, with approximate dimensions of 4.5” diameter x 6.5” tall tith a 3.75” diameter mouth. It has a pour spout and a ground lip. There are several Prvidence Electric Supply Co. around the country, but I could find none in Providence, RI.

106.86 through **106.90** (below) show an unembossed Battery jar with electrodes. The Lid is embossed (arc) **BEACON**. There are several Beacon Electric Companies around the country, but none seemed to fit the battery jar era. The jar I 4.25" diameter with straight sides. It is approximately 7" tall with a pour spout and a ground lip.



←106.86↑ 106.87
↓106.88





← 106.89



106.90 →



106.91↑



106.92↑



←106.93

The jar pictured in **106.91** through **106.93** is unembossed. It has ground lip and pour spout. There is a circular slug plate for a label. The jar is 6.375" tall x 4.25" diameter. The lid is merely embossed E.C.W. For now that mark is unknown.



I could find nothing about the Joyce Bros., therefore they are in the Chapter of unknowns. We know from the full page (next page) ad from Radio Retailing Magazine of March 1926 that they offered a line of radio batteries and accessories



Like Philco, most of the items from Joyce Bros. are in the category of Battery Eliminators, allowing radios to be powered directly from a wall outlet.

The items listed are:

Left- from left:

- Charger for "B" batteries.
- 4 Volt battery for UV 199 tubes (12,000 MA).
- Wonder Cell, replaces Dry Cell, 2 V, 12,000 MA.
- 6 Volt charger for UV 201A

Right- from top:

- Wonder Cell filter circuit, works with any standard rectifier.
- Trickle charger for Joyce Bros. Wonder Cells.
- "A" Battery eliminator.
- Power Unit for UV 201A and UV 199

(Note) UV 199 radio tubes and UV 201A radio batteries were introduced in 1922.

←**106.94** is a Joyce Bros. Wonder Cell. Its dimensions are 1.5" diameter x 6" tall. It is embossed as follows: (arc) **WONDER CELL / (arc) JOYCE BROS / BOSTON, MASS. / CAP. 19000 MA / Volts 2 / CHARGING RATE / ???**

hers

Live sellers right now!

*These exclusive features
mean new big sales—*

Radio storage batteries with these new and exclusive features are bound to attract a lot of favorable attention and stimulate battery sales immediately.

The dealers who display them now will benefit first and most, of course.

These storage batteries have been tested and endorsed by many of the leading technical experts. Due to their construction they cannot short-circuit, shed material nor buckle. They are unconditionally guaranteed for one year.

This battery is 4 volts, 12.960 MA. for UV 199 tubes. Lists at \$4.00.



The Wonder Cell. This battery replaces the dry cell. Is 2 volts, 12.800 MA. Lists at \$1.50.



This battery is 6 volts for UV 201A for one and two tube sets. Can also be used for larger sets if a trickle charger is used. List at \$4.50.



This charger recharges all type "B" Batteries. Lists at \$2.00.

**Introductory offer to dealers—
50% discount**

Buy your sample order from us. Buy your stock order from your jobber.

The Joyce Bros. Wonder Cell has been patented in America and Europe.

*Distributors, Jobbers, Dealers
Write for details.*

Factory Representatives of Joyce Bros. Products:

Wm. H. Kreeb, 2505 Union Central Bldg., Cincinnati, Ohio. Leonard C. Kohn-Noah Co., 917 Phoenix Bldg., Minneapolis, Minn. Leonard Kohn Co., 625 Security Bldg., Omaha, Neb. Strimpe & Gillette, 169 Jackson Street, Seattle, Wash. Strimpe & Gillette, Corbett Bldg., Portland, Oregon. Stephen Brown, Ft. Smith, Arkansas, Park Co., 128 No. Wells St., Chicago, Ill. William Reed Sales Co., 308 E. 17th St., Kansas City, Missouri. L. C. Kohn-Noah Co., 801 Somerset Building, Winnipeg, Canada. I. D. Livingston, 1529 Hutchinson St., Montreal, Canada.

New Joyce Products!

**Wonder Cell Filter
Circuit**

Can be used in conjunction with Bakelite, Tungar, and Rectigon Chargers from 2 1/2 amp. to 5 amps. exactly.

Designed for use with any of the standard rectifiers and smooths out the rectifier current and therefore allows the operation of radio tubes direct from lighting circuit without any humming noises. Approximate dimensions 6 1/2 x 7 1/4 high. Solves the problem of electric radio. List \$19.00.



Trickle Charger

Full Wave Trickle Chargers for charging Joyce Bros. Wonder Cells or other low capacity storage batteries. Can be hooked up to the electric light socket while set is in operation. List \$10.00

**Joyce Bros. A
Eliminator**

Noiseless, Humless, Simple—attach to electric light socket and forget about it. Runs Radio Sets 4 to 12 tubes. Inexpensive to operate. It is the last word in Radio Electric Sets. Made to fit all type sets. List \$40.00.



**Joyce Bros.
Power Unit
Type U V 301 A
& U V 199**

Hooks up to light socket and electrifies your set. Simple, Noiseless and neat. No fuss. No recharging. Simply turn switch. List \$19.50.

JOYCE BROS.

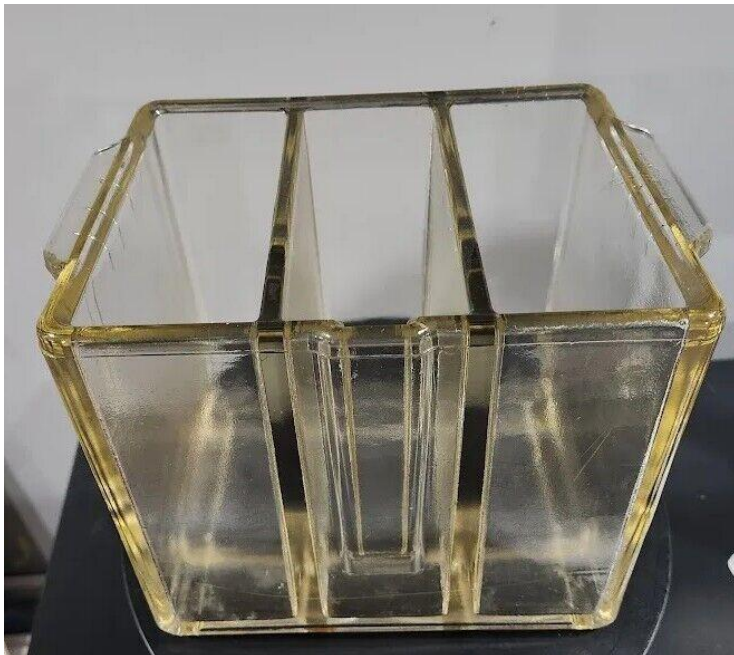
71 Chestnut St., Boston, Mass., U. S. A.



←106.95 is unmarked with the exception of **WATER LINE** on all four sides. The dimensions are 6.5" x 7.5" x 10.5" tall.

106.96 is a pair of unmarked battery jars. The dimensions are 3" x 4" x 6" tall.





←**106.97** is another triple cell battery jar. It is unmarked with dimensions of 9" x 7" x 8" tall. Each cell measures 2.5" x 6.25".



←**106.98** is an unmarked battery jar with combined lid and electrode. It has a ground lip with pour spout. Dimensions are 4.5" diameter x 8" tall.



106.99 is unmarked except for **WATER LINE**. The dimensions are 7.25" x 7.5" x 14.5" tall.



←**106.100** is unmarked. It has a ground lip and spout, with a circular slug plate in front for a paper label. It has a green tint, a diameter of 3.5" across the top (4.5" across the bottom) and a height of 6.5".



←**106.101** is unmarked, except for **WATER LINE** on four sides. It is large, with dimensions of 8.25" x 10" x 14.75".



←**106.102** does not have a manufacturer's mark. It is embossed **WATER LINE** on all 4 sides and **MADE IN U.S.A.** on 2 sides. The dimensions are 7" x 8" x 10".



←**106.103** is a totally un-embossed battery jar.
Its dimensions are 2" x 6" x 9" tall.



106.104 is unembossed with dimensions of 4.5" diameter x 8" tall.



←**106.105** is an unembossed battery jar in a light straw color with a formed lip. The dimensions are 9.5" x 12" x 13" tall. **Courtesy of Tommy Bolack.**



←**106.106** is another unembossed battery jar. It has a ground lip, with dimensions of 8.5" x 12.75" x 17" tall. **Courtesy of Tommy Bolack.**



←**106.108** shows two unembossed battery jars. They are small, with dimensions of only 3.5” diameter x 5” tall. **Courtesy of Tommy Bolack.**



←**106.109** is a small thin battery jar with dimensions of 2.5” x 6.5” x 8” tall. It is embossed **WATER LINE / MADE IN U.S.A.** on opposing sides. There is faint embossing on the bottom, appearing to be either a “G” or a “6”. As I can’t be certain, it is in the Unknown section. **Courtesy of Tommy Bolack.**



←**106.110** is a totally unmarked jar, in a light lavender color. The bottom diameter is 5.25", while the top diameter is 3.75 ". It is 12" tall with a 1" neck. **Courtesy of Tommy Bolack.**

106.111→

106.111 is another unmarked jar with a formed lip. Dimensions are 3" x 7.75" x 10" tall **Courtesy of Tommy**

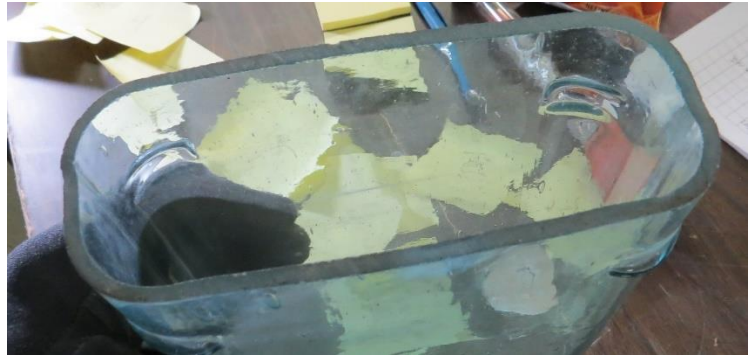


Bolack

106.114 ↓



106.115 ↓



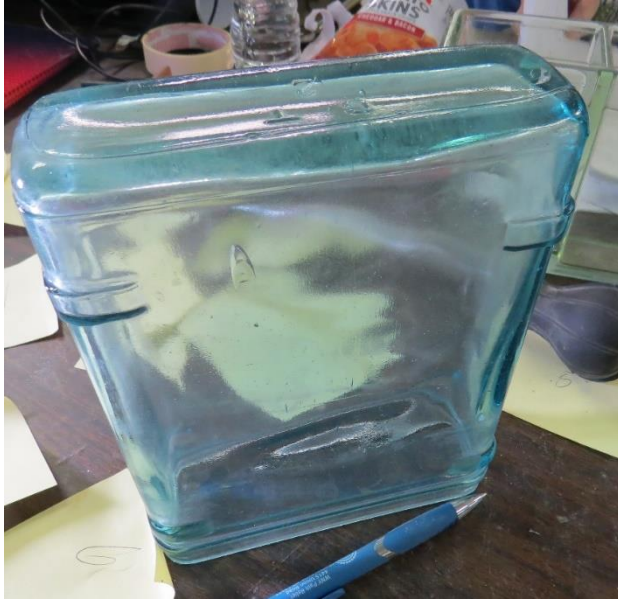
104.114 and **106.115** show a totally unembossed battery jar with a ground lip. The dimensions are 2.5" x 6" x 12" **Courtesy of Tommy Bolack**

106.116 is straw colored jar with no markings, It has a formed top with dimensiona of 4.75" x 8" x 10" tall. **Courtesy of Tommy Bolack**

106.116→



←**106.117** is an a jar and lid,with carbon electrode, neitherof which is embossed. It is 4" square x 6.5" tall, with the lid. Note how te one corner is extended forming a spout. **Courtesy of Tommy Bolack.**



←**106.118** is unembossed except for **C T** on the bottom, The dimensions are 2.25" x 6.5" x 7.75" tall. **Courtesy of Tommy Bolack**



←**106.119** and **106.120**↑ show an unembossed jar in light lavender with an **EDISON** lid. The jar is 6.75" diameter x 8.25" tall; 8.5" with the lid. **Courtesy of Tommy Bolack**



←**106.121** shows 2 unembossed battery jars with what appears to be a shared electrode. Each jar is 2" x 3.75" x 7" tall. **Courtesy of Tommy Bolack**



←**106.122** is embossed **MADE IN U.S.A.** on one side. It has a ground lip and dimensions of 2.25" x 6.25" x 12" tall. **Courtesy of Tommy Bolack**



106.123↑



106.124↑

106.123 and **106.124** show the same battery jar in two different colors. It is a 2-cell automotive battery with dimensions of 3" x 7.25" x 6.5" tall. The jars are totally unembossed. **Courtesy of Tommy Bolack**



←**106.125** and **106.126** show a Schafers Patent jar with an EDISON lid. The 7.5" square jar x 7.5" tall is a larger quart size battery jar with a ground lip. The exact embossing is **SCHAEFER'S / PATENT** on the front. The white porcelain lid is from EDISON. The exact embossing is (arc) **EDISON PRIMARY BATTEERY / TRADE (script) Thomas A. Edison / MARK / TYPE BB / PAT. JUNE 17, 1890 / OTHER PATENTS PENDING / MANFD, by / (arc) EDISON MFG. CO. ORANGE, N.J. U.S.A.** I could find no references to a Schaefer's Patent or any patents assigned to a Schaefer. Until we can find informatuin on the jasn it will remain in Unknowns.



←**106.126**



106.127 is Franklin battery jar. It is in UNKNOWN as I could find no information on it, I did find a Franklin Electric Co that was founded in 1944 in Bluffton, IN, near Ft. Wayne. I doubt very much if that is the right company. The jar is embossed: **THE FRANKLIN / ELECTRIC WAREHOUSE / PHILADELPHIA**. The dimensions are 4.5" diameter x 7" tall, with spout and ground lip. The top opening is 4" diameter. The lid has an "S" on it. I have seen the "S" on other carbon lids, but have no idea what it stands for. **Courtesy of Tommy Bolack.**

]



← **106.128** and **106.129**↑ is an embossed battery jar, but I could find nothing on it. The jar is embossed **TELEPHONE / BATTERY**, vertically on the jar. The lid is embossed **BEACON**. The dimensions are 4" square x 6" tall. Note the extended corner spout. **Courtesy of Tommy Bolack**



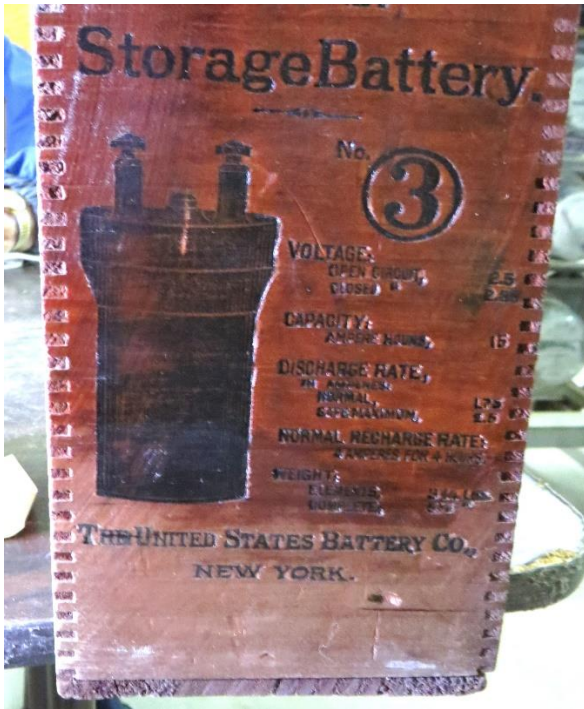
←**106.130** is an oval battery jar, embossed **DAWSON / ELEC. / SERVICE**. There are/were several Dawson Electric Companies around the country but all much later in time. The dimensions are 3.75" x 5.25" x 5.5" tall. **Courtesy of Tommy Bolack**



←**106.131** has no embossing on either the jar or inner lid. It is 4.5" diameter x 6.5" tall, with a top diameter of 3.5". It has a ground lip and spout. **Courtesy of Tommy Bolack**



←**106.132** is battery Jar, embossed (arc)
ELECTRICAL / (arc) SUPPLY Co. t is 4.5"
diameter x 6" tall with a 3.75" diameter top. It
has a ground lip and spout. **Courtesy of Tommy
Bolack**



106.133↑



106.134↑



←106.135

106.133 through 106.135 show a storage battery from the United States Battery Co., New York. The jar is unembossed with dimensions of 3.5" diameter x 6.25" tall. The lid is embossed (arc) U.S. B. Co. / (arc) N.Y. It comes in its own wooden box which is embossed: **STORAGE BATTERY / 3 / Voltage Open Circuit 2.5, Closed Circuit 2.35 / Capacity Ampere Hours 15 / Discharge Rate / in ampoeres / Normal 1.75 / Safe Maximum 2.5 / Normal Recharge Rate / 4 Amperes for 4 hours / Weight / Elements 3.75 lbs. / Coimplete 9.75 lbs. / THE UNITED STATES BATTERY CO. / NEW YORK.** Courtesy of Tommy Bolack.



←**106.136** is ground lip battery jar with a spout. It is 4.25" in diameter x 6.5" tall. It is embossed **FINCH / & / HAHN**. I could find no information on any Finch and Hahn. The lid is unembossed. **Courtesy of Tommy Bolack**



106.137↑ is totally unmarked with dimensions of 4" x 12" x 6" tall.



6

104.138↑ is totally unmarked, with dimensions of 4" x 18" x 8" tall.



←**106.139** is totally unmarked, with dimensions of 7" x 10" x 6.5" tall.



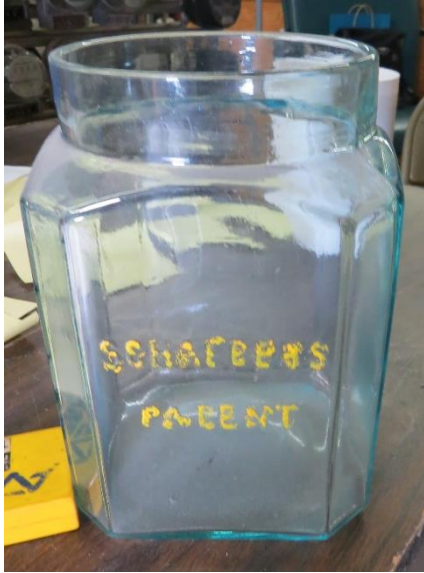
←**106.140** is embossed **CT 2** on the bottom. Dimensions are 2" x 4" x 6"



←**106.141** shows 2 identical jars with dimensions of 3" x 4" x 6" tall.



106.142 is embossed on the bottom, **W 11 / G 4**. The dimensions are 5.5" x 7" x 13" tall. It was likely a Farm / Home battery



←**106.143** Schaffers/Patent jar is 5" square x 7.25" tall.



←**106.144** is unembossed with dimensions of 2" x 6" x 9" tall.



106.145 is an unembossed jar and lids dimensions of 3.75" 4" tall. **Courtesy of Tommy Bolack**



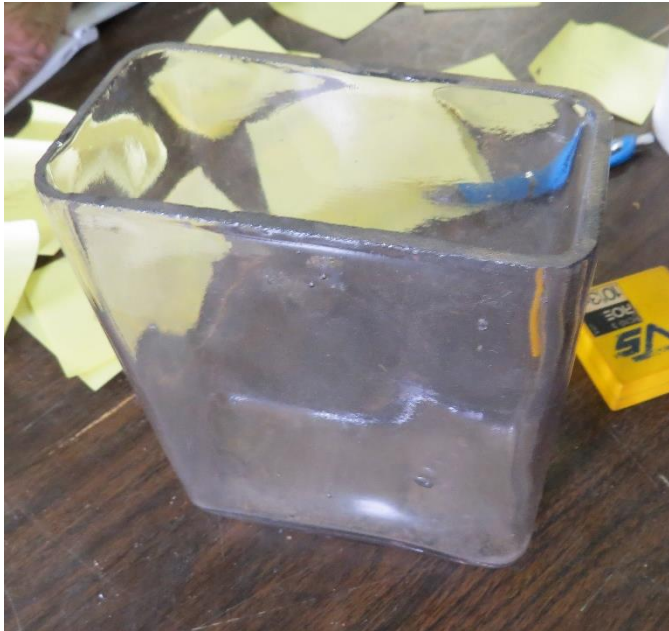
←**106.146** is an unembossed jar with a corner spout and dimensions of 3.75" square x 6" tall. **Courtesy of Tommy Bolack**

read



←**106.147** is a jar with a faded paper label that can't be read. Dimensions are 2.5" diameter x 5" tall. **Courtesy of Tommy Bolack**

106.148 ↓ is merely embossed MADE IN U.S.A. It is 2.25" x 3.75" x 6.75" tall **Courtesy of Tommy Bolack**



106.149 → is unmarked with dimensions of 2.5" x 4.75" x 6.25"





←**106.150** is an unembossed double cell with base dimensions of 1.75" x 2.375" x 5.75" tall
Courtesy of Tommy Bolack

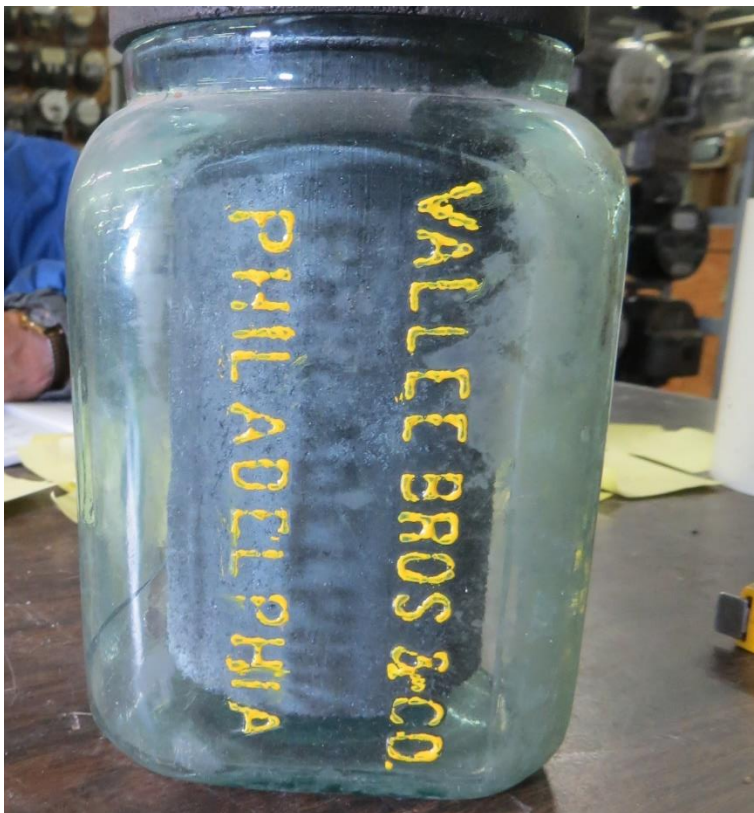


←**106.151** is an unmarked oval jar with dimensions of 3.75" x 5.25" x 5.5" tall. Courtesy of Tommy Bolack

176



←**106.152** is an embossed with base dimensions of 2.5" x 3.5" x 6.5" tall.
Courtesy of Tommy Bolack



←**106.153** is embossed **VALLEE BROS & Co. / PHILADELPHIA.** Dimensions are 4.25" square x 6.25" tall. I could find nothing about the Vallee Electric Co other than they concentrated on Telegraph and Telephone and related equipment. **Courtesy of Tommy Bolack**



←**106.154** is marked (arc) **ELECTRICAL / (arc) SUPPLY CO.** with dimensions of 4.375 x 575" tall. The lid, 140 and electrode, 106.155, is embossed **V.B.E. Co / PHILA PA.** Courtesy of Tommy Bolack



←**106.155**

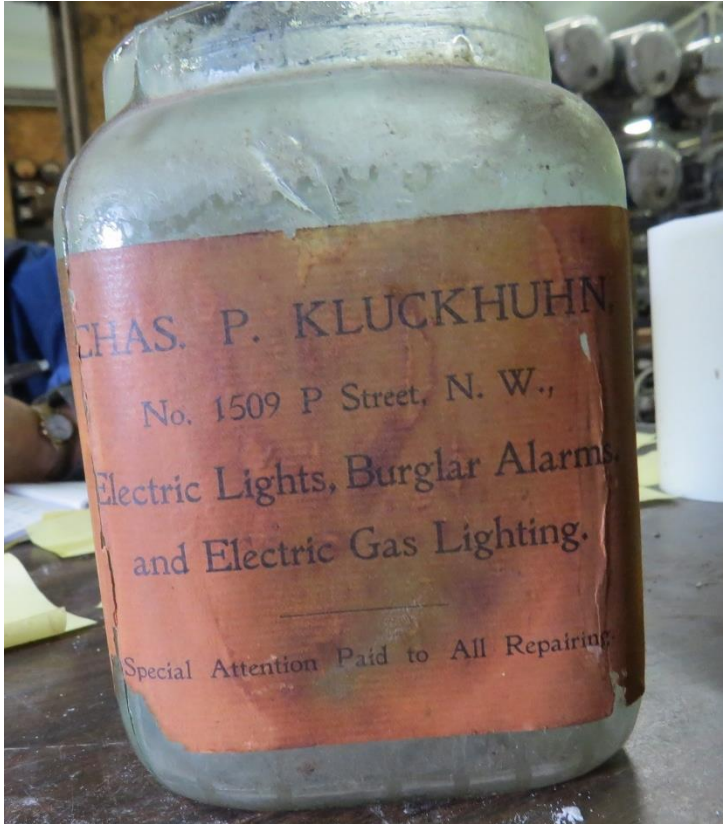


←**106.156** is embossed **P.F. & BRO. / NEW YORK**, with dimensions of 4.25" 6.25"
Courtesy of Tommy Bolack



←**106.157** is embossed **STANDARD TEL. & ELECT Co. / MADISON, WIS.** I could find nothing It was found with a Novelty Electric CO. jar. See **67.4** Courtesy of Tommy Bolack

192



←**106.158** Is embossed **Charles P. Kluckhuhn**. From the paper label we gather they were a full-service electrical co. It is 4.25" tall x 6" tall, with a ground lip. Courtesy of **Tommy Bolack**



←**106.159** is unembossed with dimensions of 2.25" x 3.75" x 5.25" tall. Courtesy of **Tommy Bolack**



←**106.160**

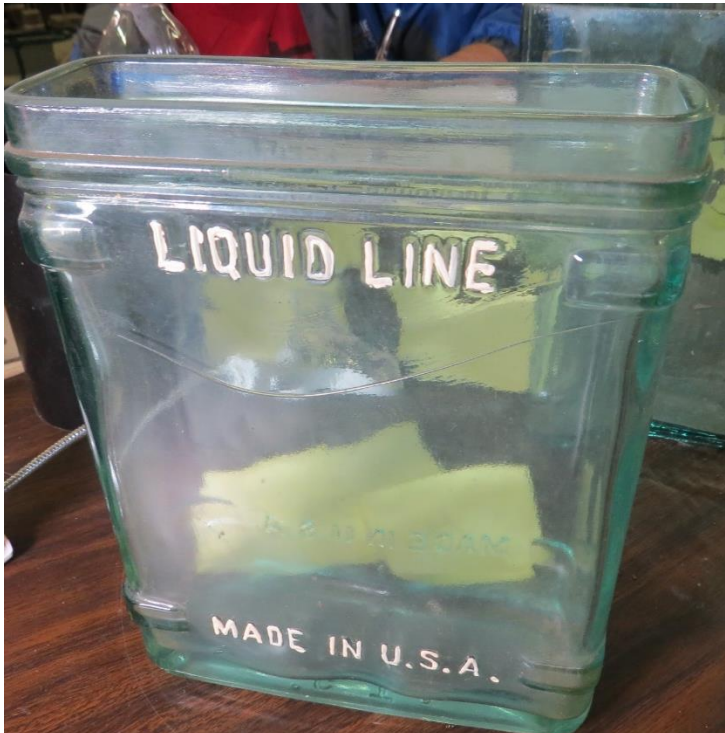
106.161→



106.160 and **106.161** are both unembossed jars. 140.159 is 4.25" square x 6" tall. 140.160 is 4" diameter x 5" tall. **Courtesy of Tommy Bolack**



←**106.163** is unembossed except for **CT** on the bottom. Dimensions are 2" x 6.25" x 8" tall. Courtesy of Tommy Bolack



←**106.164** is embossed **WATER LINE** / **MADE IN U.S.A.**. Dimensions are 2.25" x 6.25" x 8" tall.

Courtesy of Tommy Bolack

216



←**106.165** is merely embossed **Water Line**
It is a very light SCA with dimensions of
3.75"square x 6.5" tall. It has a ground lip.
Courtesy of Tommy Bolack



←**106.166** is an unembossed light SCA jar
with ground lip and spout. Dimensions are
3.25"square x 6" tall

Courtesy of Tommy Bolack



←**106.167** is a light green unembossed jar with dimensions of 4.25" x 6" tall. It has a ground lip and no spout. **Courtesy of Tommy Bolack**



←**106.168** is a light SCA jar with ground lip and spout. Dimensions are 4" square x 6.5" tall. **Courtesy of Tommy Bolack**



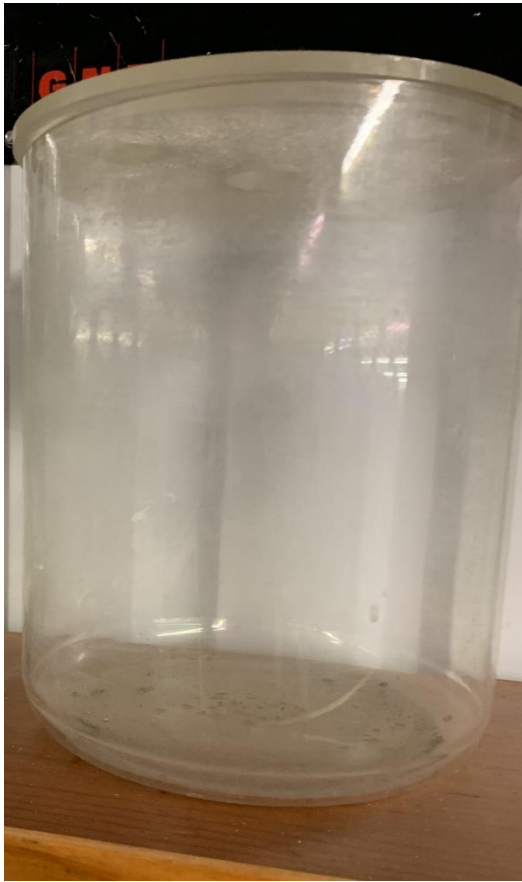
←**106.169** is an SCA jar with formed lip and dimensions of 3.575" x 6" x 7" tall. Note the long sides are drawn in. **Courtesy of Tommy Bolack**



←**106.170** is light green with a ground lip, no spout and dimensions of 4.375" square x 5.75" tall. **Courtesy of Tommy Bolack**



←**106.171** is unembossed with a formed lip, and dimensions of 6" x 8.5" x 13.25" tall. Courtesy of Tommy Bolack



←**106.172** is a clear jar with dimensions of 8.5" diameter x 10.5" tall. Courtesy of Tommy Bolack



←**106.173** is clear with a sight glass on the side, and dimensions of 6.5" square x 8" tall. **28383** is embossed on the bottom. **Courtesy of Tommy Bolack**



←**106.174** is embossed **LJ 11-13** on the bottom. Its dimensions are 6" x 7" x 11.75" tall. **Courtesy of Tommy Bolack**



←**106.175** is embossed (arc) **IF THIS JAR SHOULD BE BROKEN,/ GET IT AT EVANS / PHILADELPHIA.**
Dimensions are 4.25" diameter x 6" tall.
Courtesy of Tommy Bolack



←**106.176** is embossed **FINCH / & / HAHN,**
with dimensions of 4.25" diameter x 6.5" tall.
Courtesy of Tommy Bolack



106.177 is unmarked except for **WATER LINE** on all four sides. It has formed lip, with dimensions of 7" x 7.5" x 13" tall. It was obviously a Farm/Home battery.



106.178 is unembossed, with a ground lip and dimensions of 5" x 8" x 10" tall.



106.179 and 106.180 show a two cell unit of unknown manufacture. The dimensions are 7.25" x 2.75" x 6.675" tall. The bottom is embossed 54 UX. **Courtesy of Wayne Duzynski.**

←**106.179**

106.180↓





106.181 and 106.182 show a single unembossed battery jar with a rarely seen feature. Arrows pointing to the exact position of the Water level. In yhis case it appears to be right at the shouldeer of the jar. **Courtesy of Wayne Duzynski.**

←**106.181**

106.182↓





←106.183

106.183 and 106.184 show an un-identified battery jar lid. Its only embossing is MADE IN U.S.A. and an incuse number. The four large holes in the lid are a bit unusual. It is 7" in diameter.

106.184↓





←**106.185** unmarked with dimensions of 7.5" x 9" x 12" tall. Notice the tall plate rests. They are about a third of the height of the jar.

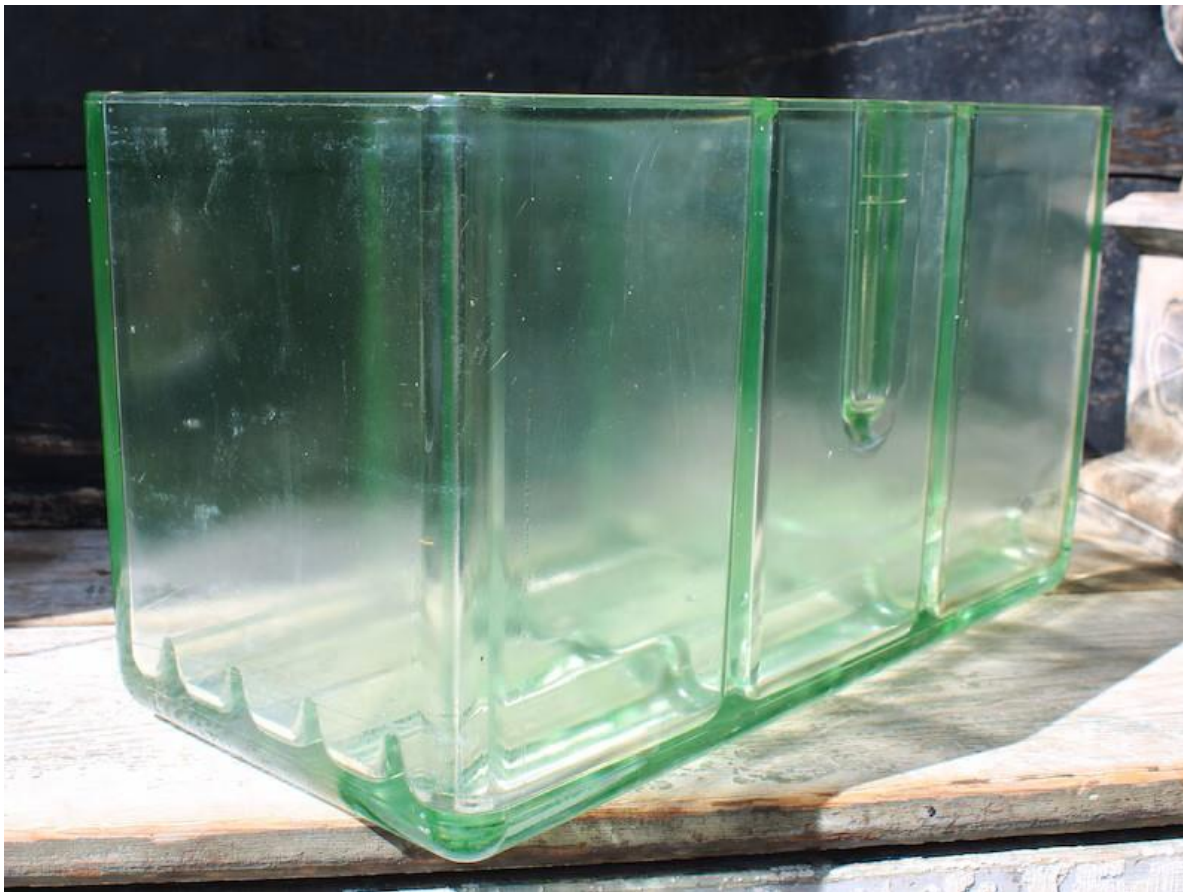


←**106.186** is a quart size battery jar with a ground lip and spout. The dimensions are 4.5" diameter x 7" tall. The top has a diameter of 3.5". It is embossed: P & S / NEW YORK, inside a triangle. I could no information or reference to the embossing.

106A Uranium (Vaseline) Glass

Uranium glass, commonly called Vaseline Glass, was popular in the early 20TH century. Although they are used interchangeably, purists insist that they are not the same. Research shows that they are both made by the addition of Uranium Oxide, to the glass before melting. True Uranium glass fluoresces bright green under ultraviolet light and contains approximately 2% of Uranium Oxide. Lesser amounts of Uranium Oxide, generally in the range of 0.1 - 0.3%, may tend to fluoresce in a yellow green color which is Vaseline glass. Other minerals in the glass will also affect the color. True Uranium glass will glow green or shades of green. It is not used any more as Uranium is needed in the defense industry.

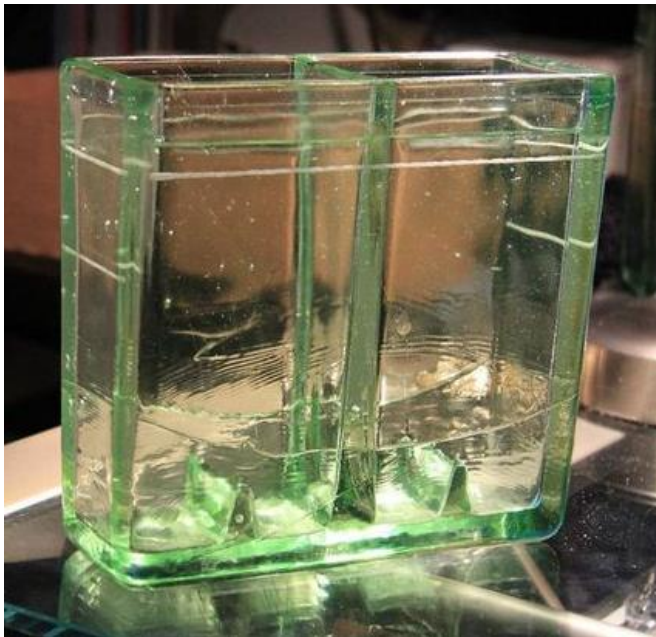
Uranium glass was found in many battery jars and related items. Chapters 9 and 10 show that it was used for Electric Vehicles batteries and for battery (sand) trays.



106.187↑ in unembossed in uranium glass. The dimensions are 7" x 14" x 7" tall, with a formed lip.



106.61↑ is a Uranium glass battery jar. It is totally un-embossed, with dimensions of 4.5" x 10.5" x 6" tall. It is three units in one; sort of a 3 battery array in a single battery jar. This is the courtesy of **Cabaret Antiques**, Wakefield, RI.



← **106.62** is a 2-cell battery jar in vaseline glass. Its dimensions are approximately 2" x 8" x 8" tall. It is totally unembossed. **Courtesy of Tommy Bolack**



←106.63 is a single cell vaseline battery jar. Except for a liquid level line it is unembossed. Dimensions are approximate 4" square x 9" tall. A little unique is the attached carry handle, which we haven't seen before.



← 106.21 is in Uranium (Vaseline) glass, measuring 6.75 x 8.75 x 7.75". There are internal dividers molded in, essentially dividing the jar into three separate jars, each measuring 3.25 x 6 x 7.75" tall. Its electrode supports are 0.75" tall. Courtesy of **Walt Baumgardt**.



← **106.30** is embossed on 2 sides (opposing): **ACID LEVEL** / **TYPE J1/8**. The dimensions are 8.5" x 10.5" x 13" tall. It appears to be a light olive green, or perhaps Uranium (vaseline) glass.

← **106.107** is another unembossed battery jar except for **B-1000** on the bottom. This one is unusual in that it has a flared top. The bottom dimensions are 6.25" x 9.75". The top dimensions are 8" x 11.5". It stands 14.25" tall. It may be uranium glass. **Courtesy of Tommy Bolack.**

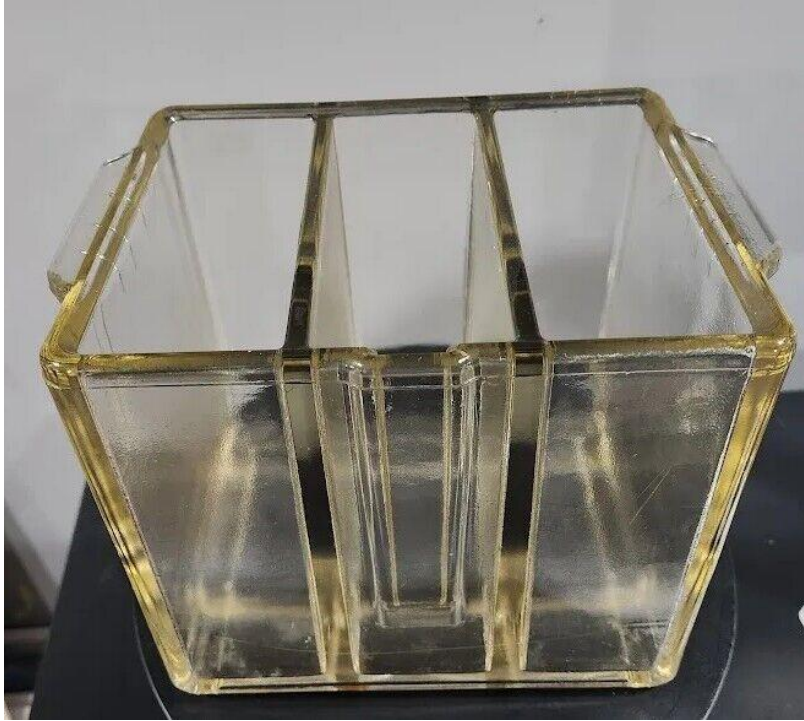




106.113↑

←**106.112** is also unembossed except for **B-1002** on the bottom as seen in **106.119**. This one is in uranium glass. The dimensions are: Base – 8.5” x 9.5” The top flares out to 11” x 11.25”. The height is 14”. **Courtesy of Tommy Bolack**

The following pictures are copied from Chapter 10 showing Uranium glass used in Electric Vehicle batteries.



10.3 is another three cell jar in uranium glass. Its dimensions are 9" x 7" x 8" tall. Each cell is 6.25 x 2.675" x 8" tall. It would have provided 6 volts.



←**10.4** This Willard uranium glass jar has dimensiona of 8.75" x 4" x 7.75" tall. Each cell is 2.5" x 3.25" x .,75" tall. It also would have provided 6 volts. **Courtesy of Tommy Bolack**





←**10.1** is a three cell jar in Uranium glass. Its dimensions are 4.5 x 10.5 x 6" tall. It would have provided 6 volts, wired in series.

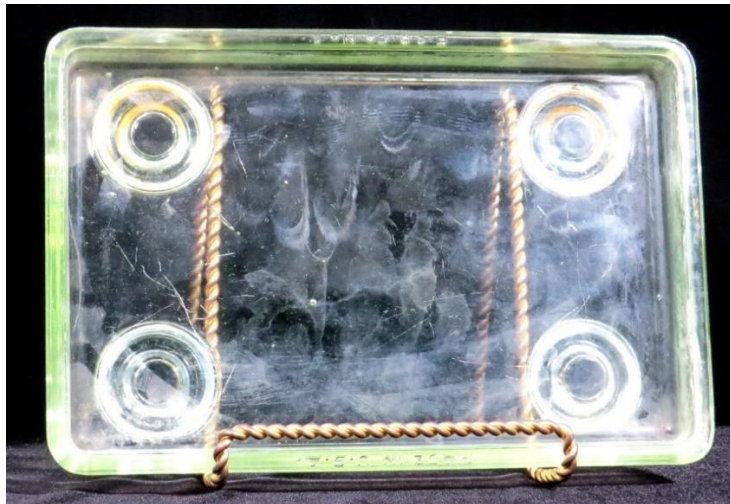


←**10.2** is a five- cell jar in Uranium glass. It is embossed EXIDE with dimensions of 4.4" x 15 " x 8" tall. It would have provided 15 volts, wired in series, approximately half of what was needed.



←**10.6** This two cell PHILCO jar is also in uranium glass. With dimensions of 7" x 2.75" x 5.75" tall, (each cell 3" x 2" x .25" tall), it could have been a jar for an electric vehicle. I suspect, however that it is actually a radio battery. **Courtesy of Tommy Bolack.**

The following pictures are copied from Chapter 9 showing Uranium glass use in battery (sand) rests.



←**9.1** is embossed **E.S.B. Co. No. 5 // Made IN U.S.A.** Note the BK Ns. Its dimensions are 6.75" x 10". It is Uranium Glass. **Courtesy of Baumgardt.**



←9.2 and 9.3 show an E.S.B. Co. No. 5, With Normal Ns.

Courtesy of Tommy Bolack.



←9.4 is embossed E.S.B. Co. No. 7-5 // Made IN U.S.A. Note the BKN. Its dimensions are 10.25" x 13.5". It is Vaseline glass Courtesy of Walt Baumgardt.



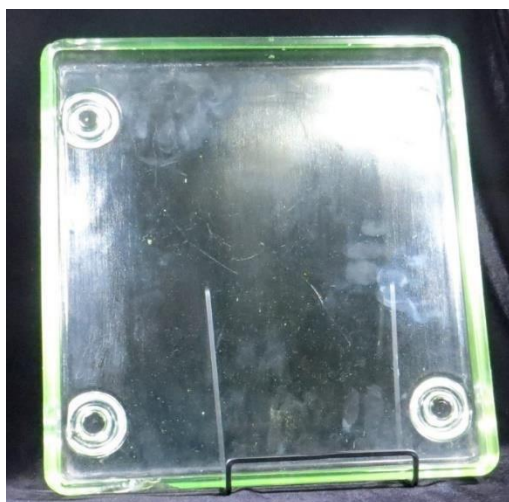
←9.5 is embossed E.S.B. Co. No. 7 // MADE IN U.S.A. Its dimensions are 10.25 x 12.125. It is Uranium glass. Note the Normal Ns. Courtesy of Tommy Bolack



← **9.6** is embossed **E.S.B. Co. No. 7-1 // MADE IN U.S.A.** Its dimensions are 10.5" X 13.5". It is Uranium glass, also. Note the Normal Ns rather than BK Ns. **Courtesy of Tommy Bolack.**



← **9.7** is embossed **E.S.B. Co. No. 6 // Made IN U.S.A.** Its dimensions are 9.25" x 10". Note the BK Ns. It is Uranium Glass. **Courtesy of Walt Baumgardt.**



← **9.10** is embossed **E.S.B. Co. No. 9 // Made in U.S.A.** Note the BK Ns. Its dimensions are 12.5" x 13.5." **Courtesy of Walt Baumgardt.**

107 - Battery Jars from Outside the U.S.

This is another surprise category, although it probably should have been expected, seeing as how most of the civilized world was awakening to electricity at this time. In any event, as more battery jars and batteries from outside the U.S. were discovered, it made sense to create a chapter for them.

The Society of the Accumulateur 'Fulmen' (Fulmen Battery Co.) was founded in France in 1891 by Albert Brault. In the following years he opened plants across France. In 1894 the first automotive carriage, created by Louis Kreiger, used a Fulmen battery. In 1898, Fulmen batteries powered the Narval submarine. The history of the Fulmen Battery Co is summarized as follows:

- 1891: Founded by Albert Brault.
- 1924: Campaignie Generale Electrique purchases Fulmen.
- 1925: Fulmen expands into Belgium. Forms the Belgian Society of Fulmen Accumulator.
- 1974: The merge between Fulmen France and CGE becomes CEAC.
- 1982: Merging of the commercial networks between Fulmen/Tudor/Dinin.
- 1989: Repurchase of the rights of use of the Fulmen brand in Belgium by the CEAC. (A European investment firm investing in, and purchasing, firms with cutting edge technology)
- 1993: Exide Technologies of the U.S. purchases CEAC.



←**107.1** shows a Fulmen battery jar.



107.2↑ is another Fulmen battery jar in a very light aqua. Its dimensions are approximately 3” x 4” x 4” tall. Camera angle makes most of the embossing unreadable.



←**107.3** is a square aqua jar, with a pour spout and a ground lip. It is 4” square x 7.25” tall with a 3.675” mouth. Courtesy of **Debbi Graham**.

The embossing is: **(Front) PILE / 3 / PRUD HOMME/ B^{TE}-S.G.D.G. / PARIS (Rear) SETH W. FULLER / 63 / DEVONSHIRE ST / BOSTON**

It is believed the jar was manufactured in France for the Seth W. Fuller Co. of Boston.



←**107.4** also appears to be from France. **It** is a squared, light SCA jar with a ground lip. It is 4.375" square with a 3/875" diameter mouth x 6.25" tall. The embossing is: **BAZAR / D ELECTRIQUE / 34B HENRIM / PARIS.** Courtesy of **Debbi Graham.**

107.5↓



107.5, on the previous page, shows a 10 cell French battery jar. Overall dimensions are 1.875" x 8.5" x 3.5" tall. Each cell measures 0.675" x 1.675" x 3.25" tall. Numbers on the bottom are 61-362 2.

Courtesy of Wayne Duzynski.

The following jar (**107.5** through **107.6**) is small with an **EXIDE** name and **DTG** designation. The front embossing (**105.5** is: ?? / **LEVEL** / **EXIDE** / **DTG** / ?? / **WHEN FULLY** / **CHARGED**. Another side (**105.6**) is embossed: ?? / **LEVEL** / ?? / ?? / ?? / **MAINTAIN** / **LEVEL WITH** / **DISTILLED** / **WATER**. The bottom (**105.7**) is embossed: **MADE IN** / **383C** / **ENGLAND**. It dimensions are roughly 3" square x 5.5" tall

107.5↓



107.6↓





**The base (107.7) is embossed
MADE IN / 383C /
ENGLAND**

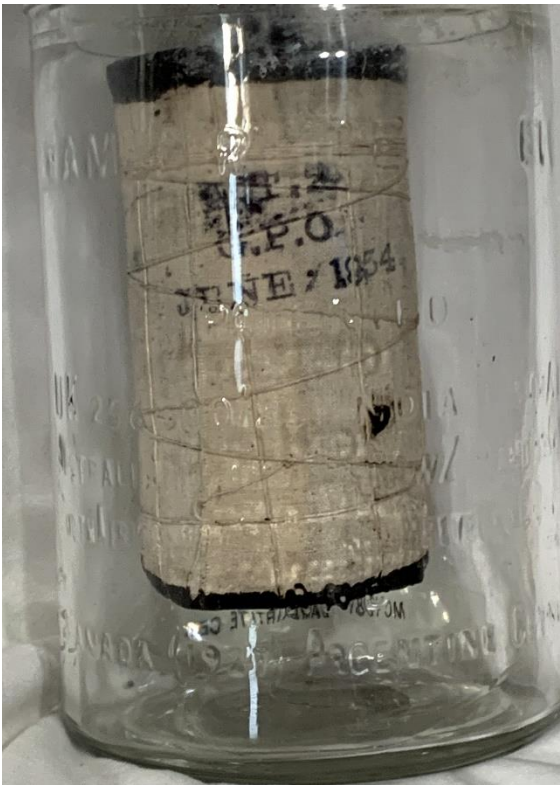
This next battery is also from England. It is embossed with patent dates from different countries.



←**107.8** is embossed on the lid: (arc) BAMBAIRTITE / (arc) CELL. In addition the front of the jar is faintly embossed with patent dates for different countries. Although the dates are too faint, the countries listed are: UK, India, Australia, New Zealand, South Africa, France (Brevete SCDC A type of patent that no longer exists in France), Canada, Argentine, Germany. The jar is clear glass with dimensions of 4.75" diameter x 7.25" tall. The patent claims a lid of sufficient strength, coated in rubber, to form a seal with the top of the jar to prevent evaporation of the electrolyte. Essentially it is a sealed battery. I have attached a copy of the U.S. patent (2,022,998) in Chapter 74. It was apparently manufactured by the Bambairtite Battery Co. in England. I could find no other information on the battery or the company.



← 107.9 is another Bambairtite battery jar. It is clear with a ground lip. Most of the embossing cannot be read because of the angle. It is approximately 4" diameter x 12" tall.



107.10 is another Bambaite Cell with the same dimensions as 105.8. You can see how difficult is to read the embossing The lid, 107.11) is embossed **BAMBAITITE / CELL.** 107.12 shows the whole piece. .



←107.11

107.12→



These two jars are also from England. They have the Inda Rubber Co. name on them as well as Silvertown.

The India Rubber, Gutta Percha and Telegraph Works Company was formed by a merger of Stephen Silver's Indiarubber Works and Telegraph Cable Company Ltd and the Charles Hancock's West Ham Gutta Percha. Silvertown, named after Stephen W. Silver, is in the Newham district of East London, England. From 1867 until about 1900 the company was active in manufacturing and laying submarine cable. In financial difficulties in 1933 the British Goodrich Rubber Company, a subsidiary of the B.F. Goodrich Co. acquired controlling interest. In 1934 it became the British Tyre and Rubber Co. It finally went out of business in the 1960s. It is not believed that the India Rubber Co. manufactured the battery jars, but that they were manufactured for them. They were like used to power a telegraph system.

107.13 is a greenish aqua jar with a ground lip and pour spout. It is 4" square x 6.25" tall with a 3.375" mouth. It is embossed **PILE LECLANCHE / INDIA RUBBER CO / SILVERTOWN / 2**. The embossing is inside of a rectangular panel. 105.14 has no panel with a slightly different shape than 105.1. The embossing is the same. 105.14, unlike 105.13 has a formed lip. Courtesy of **Debbi Graham**.



107.13↑



107.14↑



107.15↑ shows two battery jars embossed **MADE IN BRITAIN**. The one on the left is approximately 2” x 4” x 10” tall. The one on the right is approximately 4” square x 10” tall.

Courtesy of Tommy Bolack

The two jars bellow are also English, embossed **Pile ? LECLANCHE / INDIA RUBBER / SILVERTOWN / 2**.



107.16



107.17



107.18↑ is simply marked **Acid Level / CLYDE** on two sides. It is approximately 6" x 8" x 12" tall, in a sort of green aqua. I immediately thought of Clyde Glass Works in Clyde, NY, but it turns out this jar is from Australia. I could find no evidence that CLYDE Glass Works in NY ever made battery jars. I did, however, discover that there were several CLYDE Glass Works around the country, other than in NY.



←**107.19** is a battery jar from Estonia. It is marked **AVATA** and is a light brown (bronze) color. The dimensions are 3" x 4.5" x 7" tall.

I could find little information about the company, other than they are still in business in Estonia, making drones and drone batteries.



←**107.20** is a glass battery jar from India. It is embossed **ACID LEVEL** on all four sides, with opposite sides embossed **GLOBE / (INDIA)**.

The dimensions are 3.75" square x 8" tall. Based on its similarity to other British battery jars and the history between England and India, I suspect this jar was manufactured in Britain.

IND GLOBE is currently a major battery manufacturer in India.



←**107.21** appears the major oil companies also supplied battery water. **107.21** is a Shell Oil Co. plastic bottle. It is embossed **SHELL / WATER for / BATTERIES & / STEAM IRONS**. It is from the U.K. The plastic used likely dates it to 1955 – 1965.



107.22→ is a clear, square, jar with a ground lip and pour spout. It is

4.25" square with a 3.675" diameter mouth x 6.375" tall. It is embossed: (arc) **THE SOUTHERN GROSS / REGISTERED TRADE MARK / MADE IN GERMANY** Courtesy of Debbi Graham.



←107.23

Courtesy of Tommy Bolack

The jar shown in 107.23 -107.25 is another battery jar from England. It is the same dimensions as 107.120, further reinforcing the likelihood of 107.120 being manufactured in England. It, too, has dimensions of 3.75" square x 8" tall. It is embossed ACID LEVEL on all four sides, EXIDE on opposing sides and MADE IN BRITAIN on the bottom.



←107.24



107.25↑

Medical Batteries were also manufactured outside the U.S.

One such battery is shown in **107.26** and **107.27**. The name plate says: **manufactured in England by / Garrett Osborne Co. Ltd / London**. It appears to be a Violet Ray (Ultra Violet) machine. It appears this machine was a later model, as it looks like it had a power cord that plugged into a household electrical system.



←107.26



107 - 127↑

107.27 through **107.28** show A Gaiffe Pocket Medical Battery from France. It is featured in the 1875 Montgomery Ward Catalog on page 42. It also used Bi-Sulfate of Mercury as an electrolyte. 107.27 is the closed case. 107.28 is the open case showing the two battery cells. 107.29 shows the name plate identifying it as French.



107.29↑

107.30↓





107.31↑

107.32 through 107.33 show medical batteries from Charles Chardin. Also French.



107.32↑

107.33↓





107.34↑



←107.35and 107.36 are Charles Chardin battery jars in white porcelain, The top dimensions are 3.3" x 3.125" x 8.125" tall. It is embossed in ink: Charles Chardin / Ingenieur Electricien, /

Constructeur /

Paris.



107.36 →

108 - Manufacturers Catalogs

Sales Catalogs of the following companies; all known to have manufactured and/or supplied battery jars and associated equipment have been placed in the members only portion of the NIA website.

- Cunberland Glass Mfg. Co., Bridgeton, NJ, 1911
- Whittall Tatum Co., New York & Philadelphia, 1879,
- Whittall Tatum Co., New York & Philadelphia, 1880
- Whittall Tatum Co., New York & Philadelphia,
Supplemental Price List 1894
- Northern Electric Co., Montreal, 1920
- Novelty Electric Co., Philadelphia, 1899
- Waite & Bartlett, New York, NY, 1895 - 1896
- J. Andrae Westinghouse Electric Co., Milwaukee, 1915
- F.G. Otto & Sons , New York, NY, 1875
- F.G. Otto & Sons , New York, NY,
Surgical & Orthopedic Instruments 1875
- Electric Storage Battery Co (ESB) 1917
- Chloride of Silver Dry Cell Faradic Batteries. Circa 1900.
- Catalogue of Screw Glass Insulators, Battery Jars, Electric Light Globes, etc.by Hemingray Glass CO. 1903
- Catalogue of Edison-Lalande Batteries, Battery Motors, Measuring Instruments, Medical Apparatus, etc., 1910
- Partrick and Carter, 1888
- Illinois Glass Works, 1906
- Frank H. Stewart, (E.G.L.)
- Electric Storage Battery Co.
- J.C. Vetter, (LeClanche)
- Novelty Electric Co.
- Edison LaLande Batteries #1
- Edison LaLande Batteries #2
- Peru Electric Manufacturing Co., 1898

It is suggested that you visit the site to see what these manufacturers offered, to get a better idea of the scope of wet cell batteries.

109 - Associated Equipment

In addition to the battery jars, lids and electrodes, there were other items needed to set up and maintain batteries. I have used the term “associated equipment” to describe these items.

Below, **109.1**, is a picture of what Irons calls battery plate spacers, which he describes as a failed attempt to insulate the positive and negative plates from each other in a cell. Others, including the McDougalds, describe them as protective covers for the wires between batteries, to protect them from the corrosive materials dripping from batteries above, such as in a farm battery set up. They have been found in various shades of aqua, blue, and green. Courtesy: **Walt Baumgardt**

109.1↓





109.2↑ You have seen this before in the ESB chapter. It is an automatic water fill unit to maintain the liquid level in the batteries. It is a quart size; 5.5" diameter x 3.5" high. The neck is 1.75" diameter x 1.5" high. Aqua in color it is embossed: **(F-Readable UD) PILOT CELL AUTOMATIC / WATER FILLER / STYLE A - ONE QUART / To Refill - Invert bottle and / Unscrew Goose Neck at Sleeve / THE ELECTRIC STORAGE BATTERY CO.** This is the courtesy of **W. Baumgardt**, who acquired it from **Phil Mayhew**.



109.3↑

The picture of associated equipment, above, is the courtesy of **Debbi Graham**. The hydrometer, laying across the bottom was used to check the specific gravity of the electrolyte solutions, critical to a properly functioning battery. The other three items were various instruments for checking the condition of the cells. In each case the contacts on the instruments were placed across the cell (Battery) electrodes to check whether the battery was charged or spent, how many volts were left, etc. All instruments necessary to maintaining a properly working battery.



←**109.4** is not about the jar, but rather about the electrode rests in the bottom of the jar. Usually, we find the rests to be an integral part of the jar. In this case the rests are a separate entity and adhered to the bottom of the jar with a tar like substance. This demonstrates that the electrode rests were manufactured and could be added to an existing jar at any time. The exact term for this is the Battery Bridge Rest.



109.5↑ shows various electrodes, leads etc. to accompany a medical battery. As the embossing is in French it is assumed they came from France.



109.6↑



109.6 and **109.7** show an ESB Charge Control Unit, with the jar manufactured by Corning. For more information, see Chapter 18.

The embossing is (arc) T.M. REG. / PYREX / (arc) U.S. PAT. OFF.

←109.7



109.8↑



109.9↑

109.10↓



Decorative brass battery jar holders were available to disguise the battery jar for the well – to – do. They appear to have been custom made to fit specific jars. **109.8** through **109.10** show such a holder. **See 73 – 74** through **73 – 78** for more details.



109.11 is a cage and carry handle for battery jars. In this case it appears to be made specifically for this particular jar.

109.1 - Battery Water and Acid

It is natural that chemically pure water and sulfuric acid would be critical to the maintenance of a battery. The water had to be pure so as not to add unknown contaminants to the battery, which could damage it. With only a single item I included it with Associated items; but as I found more listings, I decided to give them their own chapter.



←109.12

I could find no information on the Campbell Bros. in Jamaica, NY. **(109.12)**. Obviously, they were a beverage company, among other things. There is a Campbell Construction Co. in Jamaica, NY. It could be part of the same company and even the same family.



109.13↑



109.14↑

109.13 and 109.14 show a Sulfuric Acid bottle from The Electric Auto Lite Co. of Toledo, OH. It was formed in the early 1900s to produce spark plugs, for which they are best known. Obviously, they supplied other battery products, as well, including Sulfuric Acid.

Auto Lite began in 1911, with the merger of two small companies producing buggy lamps. By the 1930s it was a major supplier of automotive parts. Its real history, however, began in 1935 with the introduction of the Auto Lite spark plug.



109.15↑



109.16↑



←**109.17.** The **Charles E. Hires Co**, of Philadelphia, famous for Hires Root Beer, also produced bottled water, including chemically pure Hydro Purok for use in batteries as seen in **109.15** through **109.17**.

Charles E. Hines was vacationing in New Jersey in 1875 when he was served a drink compounded from Sassafras root and herbs. Being a pharmacist, he experimented with Sassafras root and other ingredients. In 1876 he introduced Hires Root Beer. At first, he sold packages of the dried roots, bark and herbs and people made their own. It became so popular that in 1890 The Charles E. Hires Company was formed.

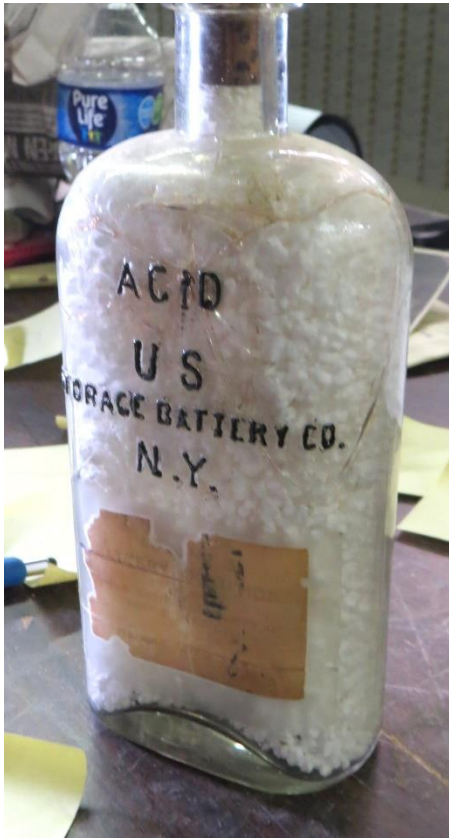


109.18



109.19

109.18 and **109.19** are distilled water bottles for battery jars. **109.18** is from SHASTA, while **109.19** is a half gallon bottle from Zenith. **Courtesy of Tommy Bolack**



←**109.20** is an acid bottle from the **U.S Storage Battery Co. N.Y.**
Courtesy of Tommy Bolack. I could find no information on the
company **Courtesy of Tommy Bolack**

110 - Battery Patents

This is a list of battery patents included for your reference. It includes the first battery jar battery patent I could find. It was granted to Thomas Edison in 1873, for a telegraph battery. Oddly, it was for a porous cell (# 142,999). I also included a patent for an electric pen that led to the tattooing pen.

Patent 393,814 is the Burn's MICROPHONE cell.

476,792 is the Gayner patent for a mold for battery jars. As battery jars existed long before 1892, it is possible there were patents before this. However, the Gayner patent appears to be for the larger Farm/Home batteries, so this may be the first patent. The quart size jars could have been made under other patents, such as for jars, bottles, etc.

142,999	T.A. Edison	Galvanic Battery	Sept. 23, 1873
196,747	T.A. Edison	Stencil Pen	Nov. 6, 1877
351,602	C.J. Hirlmann	Electric Battery	Oct. 26, 1886
393,814	P.C. Burns	Galvanic Battery	Dec. 4, 1886
403,955	C.B. Noble	Porous Cup Battery	May 28, 1889
439,279	T.A. Edison	Voltaic Battery	June 17, 1890
439,516	C.A. Hussey	Porous Cup Battery	Oct. 28, 1890
470,417	Andrews & Ball	Insulator for Trolley	Mar. 6, 1892
476,792	J. Gayner	Mold for Battery Jar	July 12, 1892
514,845	P.C. Burns	Electric Battery Cell	Feb. 13, 1894
580,523	R.W. Gordon	Galvanic Battery	May 28, 1889

If you're interested in a complete list of Thomas Edison's U.S. patents (there are 1094 of them) I refer you to: https://en.wikipedia.org/wiki/List_of_Edison_Patents.

T. A. EDISON.
Galvanic Batteries.

No. 142,999.

Patented September 23, 1873.

Fig. 1.

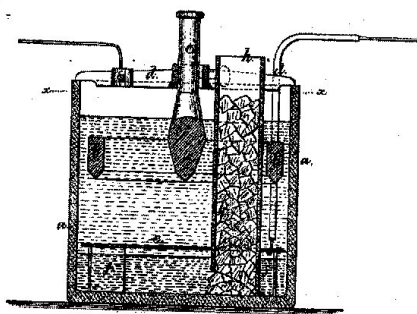
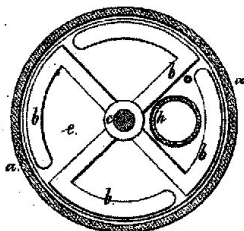


Fig. 2.



Witness,

Samuel Smith
Charles Terrell

Inventor

Thomas A. Edison
Lemuel W. Terrell atty.

UNITED STATES PATENT OFFICE.

PETER C. BURNS, OF PERU, INDIANA.

ELECTRIC-BATTERY CELL.

SPECIFICATION forming part of Letters Patent No. 514,845, dated February 13, 1894.

Application filed June 12, 1893. Serial No. 477,395. (No model.)

To all whom it may concern:

Be it known that I, PETER C. BURNS, a citizen of the United States, residing at Peru, in the county of Miami and State of Indiana, have invented certain new and useful Improvements in Electric-Battery Cells; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to electric batteries, and, more especially, to the batteries of the zinc carbon type.

One of the objects of my invention is to provide simple means for keeping the carbon electrode off the bottom of the jar, such means being designed to take the place of the troublesome rubber bands which are now employed for the purpose mentioned.

A second object of my invention is to provide means whereby the carbon and the zinc may be readily insulated from each other within the cell, without resort to the rubber bands now very generally employed for securing the insulation.

Another detail of my invention concerns itself with furnishing a substitute for the ordinary zinc binding-post, such substitute being formed by cutting out a piece of the zinc electrode itself, and attaching it to the electrode, and forming the binding-post from the cut away portion, or else in slitting the zinc electrode, and then turning up the strip thus formed, and making a binding-post out of it.

My invention will be fully understood by referring to the accompanying drawings, in which—

Figure 1, is a vertical section of a battery jar or cell, embodying my invention. Fig. 2, is a plan of the same; and Fig. 3, is a cross section along the line 3—3, in Fig. 1, looking upward.

Referring to the drawings by letter, A, is a battery jar, within which are contained the zinc electrode, B, and the carbon electrode, C. At the top of the jar is shown a plate, D, of porcelain, which is adapted to rest upon a ledge, E, formed within the mouth of the jar. The plate, D, practically forms a cover for the jar, and through it project the binding-posts for the two elements of the cell. The carbon element passes up through the middle

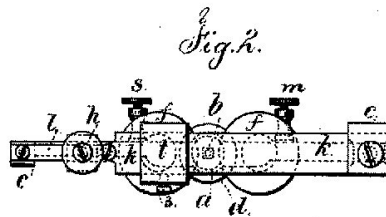
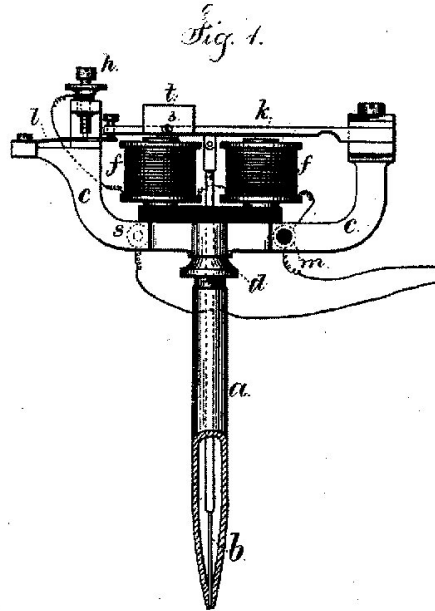
of the plate D, and has a binding-post, F, upon its top. It is also provided with lugs, c, c, which project over the edge of the central opening in the plate, D, but are just able to pass up through grooves, d, d, made at opposite sides of the said central opening. The practice is to pull the carbon up through the central opening, first bringing the lugs, c, c, into alignment with the grooves, d, d, and then give the carbon electrode a partial turn or rotation, leaving the said electrode supported by the lugs, c, c, resting on the plate, D. In this way, the bottom of the carbon is held off the floor of the jar, as will be readily understood. This feature of my invention may be applied to carbons either smooth or corrugated, and either plain or provided with some depolarizing substance.

I have illustrated in the drawings a corrugated carbon, and in Fig. 3, I have shown certain of the corrugations, one hundred and twenty degrees apart, as being made a little deeper and more rounding than the others, to receive plugs or pencils of insulating material G, such as soft rubber, which may be inserted either by pushing in from the end of the corrugations, or pressing in from the sides. The corrugations formed as described do not need to be one hundred and twenty degrees apart, nor to be limited in number to three. The number may be made as great or as small as may be found efficient for producing the result desired. Moreover, the specially formed corrugations may either extend along the entire length of the corrugated portion of the carbon, or there may be short portions, specially formed in the way described, either at the ends or the middle of the corrugated portion. A method which I like to use is that of having short deepened and rounded corrugations, one hundred and twenty degrees apart at one end of the corrugated portion of the carbon, and other deepened and rounded corrugations at the other end, the said specially formed corrugations being also one hundred and twenty degrees apart, but alternating with the corrugations first mentioned. In any case, the object of securing good insulation between the carbon and the zinc is the main object sought, and any arrangement which accomplishes this is sufficient for my purpose.

T. A. EDISON.
Stencil-Pen.

No. 196,747.

Patented Nov. 6, 1877.



Witnesses

Chas. Smith
Geo. T. Pinckney

Inventor

Thomas A. Edison.

per Lemuel W. Ferrill

att'y.

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF MENLO PARK, NEW JERSEY.

IMPROVEMENT IN STENCIL-PENS.

Specification forming part of Letters Patent No. 196,747, dated November 6, 1877; application filed April 23, 1877.

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, of Menlo Park, in the county of Middlesex and State of New Jersey, have invented an Improvement in Autographic Pens, of which the following is a specification:

My present invention relates to a pen actuated by electricity, and adapted to perforating paper that is to be used in printing in the manner set forth in Letters Patent No. 180,857, granted to me.

I reciprocate the perforating-needle with great rapidity by means of a reed or bar vibrating with great rapidity, and acting to open and close a circuit to an electro-magnet, that serves to maintain the vibration of the said reed or bar; and I employ an adjustable weight to vary the speed of vibration, similarly to a pendulum.

In the drawing, Figure 1 is a side view of the pen, reed, and magnet; and Fig. 2 is a plan of the same.

The tubular pen *a* and reciprocating needle *b* are similar to those in the aforesaid patent; and the tube *a* screws into the frame *c*, and it is clamped by the lock-nut *d* after the tube has been adjusted to the proper position relatively to the point of the needle.

Upon the frame *c* is an electro-magnet, *f*, the helix of which is connected at one end to the insulated adjusting-screw *h*, and at the other end to the insulated binding-screw *m*.

The reed *k* is secured at one end to the frame *c*, and the other end is free to act upon the spring *l*, and open and close the circuit between said spring *l* and the adjusting-screw *h*.

As the reed vibrates it opens and closes the

circuit through the magnet. When the reed is attracted the circuit is broken, and as it flies back the circuit is again closed through the binder *m*, helix *f*, screw *h*, spring *l*, and frame to the binding-screw *s*, the flexible battery-wires being connected to these binding-screws *h* and *s*, as in aforesaid patent.

By this construction the speed of vibration will depend on the tone of the reed, and that may be altered and the vibration lessened or increased by moving the weight *t* along upon the reed and then clamping it by the screw *3*.

When the weight is moved toward the point of attachment of the reed, the reed will be free to vibrate; but when moved toward the moving end of the reed the speed of motion will be lessened.

The upper end of the needle-rod is connected to this reed; hence motion of the reed is given to the rod and needle to actuate the same in perforating the paper.

The reed might be dispensed with, and a pivoted lever and spring be employed; but the speed and reliability are not as great as with the reed.

I claim as my invention—

The combination, with the electro-magnet and reed or lever vibrated by the same, of the perforating-needle, tubular pen, and circuit-breaker operated by the reed or lever, substantially as set forth.

Signed by me this 18th day of April, A. D. 1877.

THOS. A. EDISON.

Witnesses:

GEO. T. PINCKNEY,
CHAS. H. SMITH.

(No Model.)

P. C. BURNS.
GALVANIC BATTERY.

No. 393,814.

Patented Dec. 4, 1888.

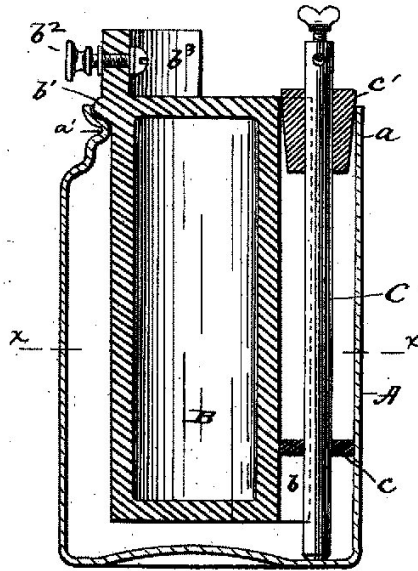


Fig. 1.



Fig. 3.

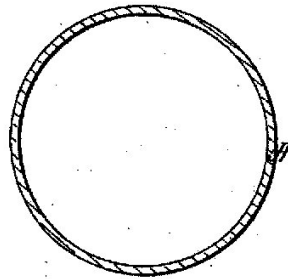


Fig. 4.

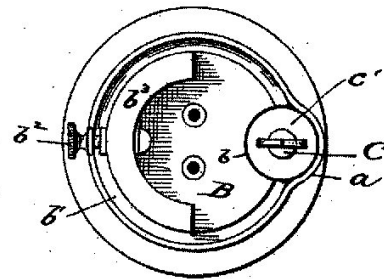


Fig. 5.

WITNESSES:

M. A. Rosenbaum
W. J. Blake

INVENTOR,

Peter C. Burns,

BY

R. J. Johnston,

ATTORNEY.

UNITED STATES PATENT OFFICE.

PETER C. BURNS, OF ST. LOUIS, MISSOURI.

GALVANIC BATTERY.

SPECIFICATION forming part of Letters Patent No. 393,814, dated December 4, 1888.

Application filed December 21, 1887. Serial No. 368,619. (No model.)

To all whom it may concern:

Be it known that I, PETER C. BURNS, a citizen of the United States, residing at St. Louis, in the State of Missouri, have invented certain new and useful Improvements in Galvanic Batteries, of which the following is a specification.

The invention relates to galvanic batteries, the primary objects being to provide a battery of low internal resistance, and one in which the greatest efficiency of the depolarizing agent is secured.

To this end the invention consists of a porous cup composed of carbon and filled with a depolarizing agent. The cup is formed with a flange extending a part way around its upper edge to support the cup and to close the mouth of the jar. The zinc is supported in the jar in such a manner as to prevent contact between it and the carbon cup.

The manner of supporting the zinc and other details will be fully described in the following specification and set forth in the claims.

In the drawings, Figure 1 represents a central vertical section of my improved cell; Fig. 2, a plan; Fig. 3, a side elevation of the zinc and its attachments; Fig. 4, a horizontal section of the inclosing-jar of the cell, taken on line $\alpha \alpha$.

Referring to the drawings by letter, A represents the outer inclosing-jar of the cell. On one side, and extending from top to bottom, is a bulge, α , for a purpose hereinafter set forth. The neck or upper edge of the jar is formed into a shoulder, α' , which extends entirely around the jar, except at the bulge.

B is a porous cup, constructed of carbon, which forms the negative element of the battery. This cup takes the place of the ordinary porous cup, and to that extent does away with one part of the cell. The depolarizing agent, whatever it may be, is held freely in the cup. I have found that better results are obtained by placing this agent loosely in the cup than by combining or mixing it with the carbon. The cup is formed with a vertical groove, b , in its outer wall extending its full length, and when the cup is properly adjusted in the cell this groove is opposite the bulge in the outer jar, thus forming a cylindrical chamber. The size of the cup is such as to allow it to pass through the mouth of the jar, and its upper edge is surrounded by a flange,

b' , except where the groove is, which rests upon the shoulder α' of the jar, and thus effectually closes the mouth of the same. The binding-post b^2 of this element is secured in an upwardly-projecting flange, b^3 , formed opposite the groove b . The depolarizing substance, which may be any of the well-known depolarizers, is contained within the cup.

C represents the zinc or positive element of the battery. It is the ordinary pencil-zinc, having a binding-screw at the top for electrical connection. The zinc occupies the cylindrical chamber formed by the bulge in the jar and the groove in the cup. Before the zinc is inserted the lower end is encircled by a rubber collar or gasket, c , and its upper end by a wooden or cork plug, c' . The collar and plug fit tightly in the chamber and serve to prevent contact between the zinc and carbon. They also act as a key to prevent the cup from rotating in the jar and short-circuiting the battery. The plug c' is slightly conical, and when pushed down tightly holds all the parts securely in place and seals the jar.

It will be seen that this construction forms a compact battery-cell, and experiment has demonstrated that it is a very effectual and economical cell as well.

What I claim as my invention is—

1. The combination, with a porous cup provided with a groove, as b , of an outer jar provided with a bulge, as α , substantially as described.

2. The outer jar provided with bulge α and shoulder α' , and the porous cup constructed of carbon and provided with groove b and flange b' , in combination with the zinc-carrying collar c and plug c' , as set forth.

3. The porous cup constructed of carbon, provided with an upward-projecting flange, b^3 , carrying binding-post, substantially as described.

4. The combination, with outer jar provided with bulge, of porous cup provided with groove and zinc-carrying insulating plug and collar, as described.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

PETER C. BURNS.

Witnesses:
JOHN RING,
P. L. ROSE.

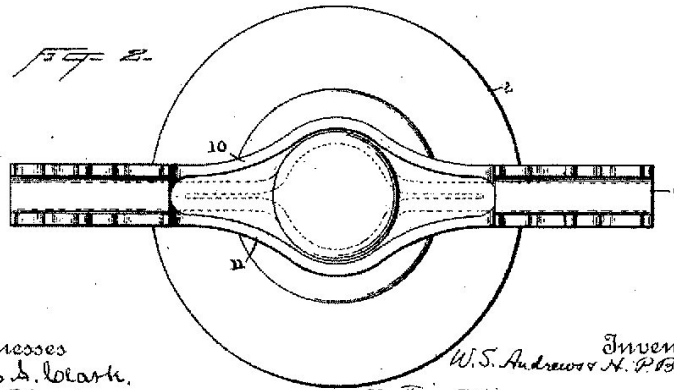
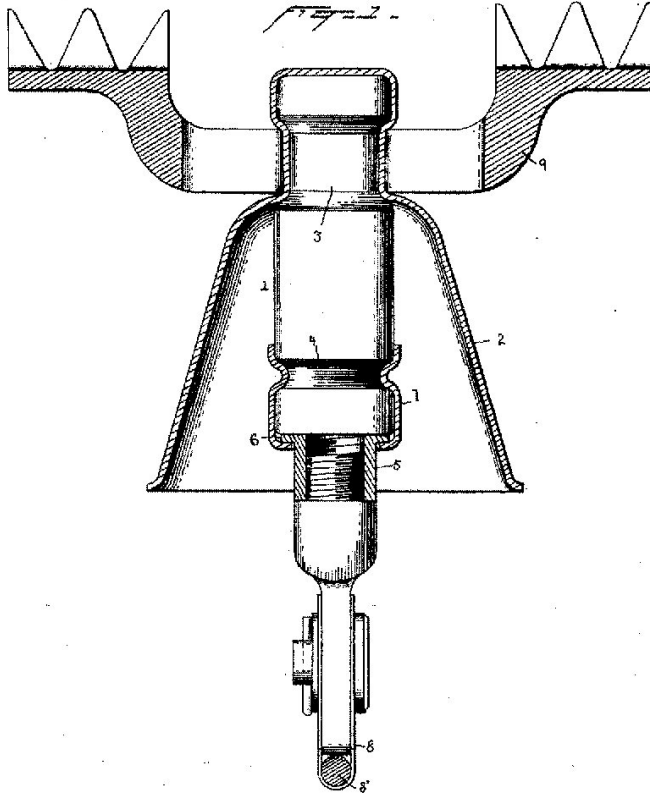
(No Model.)

2 Sheets—Sheet 1.

W. S. ANDREWS & H. P. BALL.
INSULATOR FOR TROLLEY WIRES.

No. 470,417.

Patented Mar. 8, 1892.



Witnesses
J. A. Clark.
H. F. Clark

Inventors:
W. S. Andrews & H. P. Ball.
By Their Attorneys
Syert & Seely

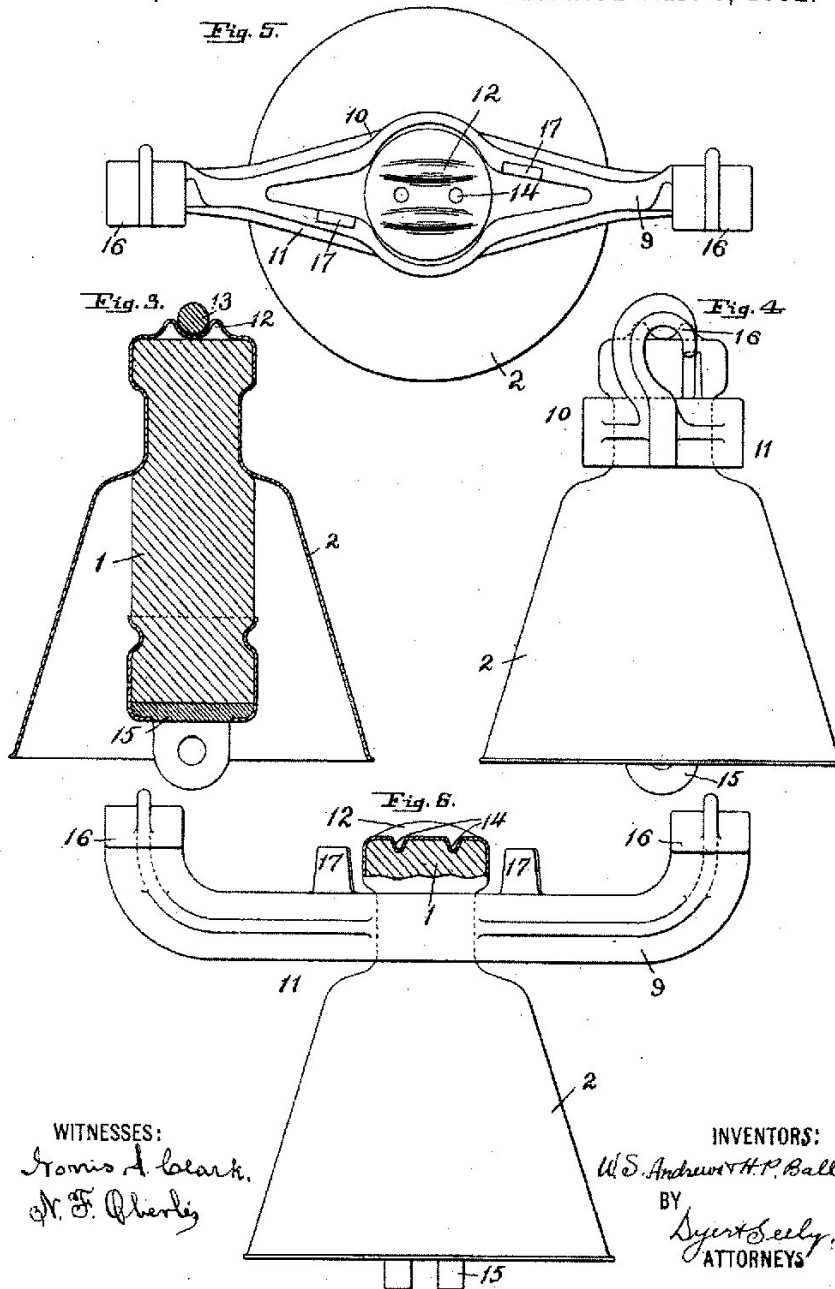
(No Model.)

2 Sheets—Sheet 2.

W. S. ANDREWS & H. P. BALL.
INSULATOR FOR TROLLEY WIRES.

No. 470,417.

Patented Mar. 8, 1892.



WITNESSES:
James A. Clark.
M. F. Oberly

INVENTORS:
W. S. Andrews & H. P. Ball
BY
Sydney Seely,
ATTORNEYS

UNITED STATES PATENT OFFICE.

WILLIAM S. ANDREWS, OF NEW YORK, AND HENRY PRICE BALL, OF
BROOKLYN, ASSIGNORS TO THE EDISON GENERAL ELECTRIC COM-
PANY, OF NEW YORK, N. Y.

INSULATOR FOR TROLLEY-WIRES.

SPECIFICATION forming part of Letters Patent No. 470,417, dated March 8, 1892.

Application filed October 1, 1891. Serial No. 407,399. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM S. ANDREWS, residing at New York city, county and State of New York, and HENRY PRICE BALL, residing at Brooklyn, in the county of Kings and State of New York, both citizens of the United States, have invented a certain new and useful Improvement in Insulators for Trolley-Wires, of which the following is a specification.

The present invention relates to devices for suspending wires, and especially wires designed for trolley-wires in electric-railway systems, the main object of the invention being to provide a strong and simple device for this purpose.

In the accompanying drawings, illustrating the invention, Figure 1 is a side view, partly in section, of the device. Fig. 2 is a plan view of the supporting-arm, showing the method of securing it to the insulator. Fig. 3 is a central section of an insulator embodying additional features of improvement. Fig. 4 is a side view of the same. Fig. 5 is a plan view; and Fig. 6 is a side view at right angles to Fig. 4, the upper end of the body being in section.

The insulator consists of a main body 1, of insulating material, preferably a block of wood, and a metal bell or cap 2, which surrounds the insulating-body. Said body is provided near one end with a circumferential groove or depression 3, and the metal of the bell is spun into this groove, so that it securely holds the bell and body together and entirely covers the upper end of the insulating-body, there being no opening through the bell to the body of the insulator at this end, although certain features of the invention may be used without having a bell formed to entirely cover and inclose the insulating-body. Near the opposite end of the insulating-body is a groove 4, and at the end of the body is a screw-threaded sleeve 5, which may be provided with a flange 6. 7 is a metal sleeve, which is placed over this end of the block or body 1 and which is spun into the groove 4 and around the sleeve 5 to hold it in place. The exposed part of the wood within the bell is preferably painted with a water-proof composition, such as ordinary paint or bituminous paint. It will be understood that any suitable clamp or trolley-

wire hanger 8 may be secured to the insulator by means of this screw-threaded sleeve and that this clamp supports the trolley-wire 8'.

9 is an arm, which supports the insulator from a suitable span-wire running across the street from one post to another or extending between other supports. This arm is divided near the center into two branches 10 11. When the insulator is being made, after the bell has been spun onto the insulating-body, as described, this arm is placed over the head at the upper end of the bell and the two branches 10 11 are bent inward to bring them close together around the neck formed by the groove 3, as indicated in dotted lines in Fig. 2. This secures the supporting-arm to the body of the insulator without separate fastening devices and is a very quick and ready means for accomplishing that object.

In the insulator shown on Sheet 2 the parts are modified to some extent. The bell is formed at the upper end of the insulator-body with a cross-groove 12, in which the span-wire 13 rests. The metal of the bell is forced into the body of the insulator by suitable punches at two or more points, as at 14, for the purpose of holding the body in position while spinning the bell on. Instead of the threaded sleeve 5 of Fig. 1, we may use the device 15, to which any suitable trolley-wire hanger may be pivoted. The arm 9 is provided at each end with a hook 16, adapted to fit over the span-wire. Since the span-wire cannot pass in a straight line over the insulator, but is bent upward slightly to rest in the groove 12, the insulator will not slip along the span-wire. The two branches of the arm 9 have lugs 17, which may be bent over when the branches are forced together around the neck of the insulator, as before explained, to lock them against spreading apart.

It will be evident that the form of the body of the insulator, as well as the form of the bell and the means for securing the trolley-wire to the insulator, may be otherwise varied somewhat without departing from our invention.

What we claim is—

1. The combination of the insulating-body consisting of a block of wood having a groove

or depression at one end, a metal bell into which the body is placed, the metal of the bell being formed into said groove or depression, whereby the body and bell are secured together, and means at the other end of the insulating-body for supporting a wire, substantially as described.

2. The combination of the insulating-body having a groove or depression at one end, a metal bell into which the body is placed, the metal of the bell being formed into said groove or depression, whereby the body and bell are secured together, a flanged trolley-wire-hanger support at the opposite end of the body, and a sleeve over said flange and secured to the body, substantially as described.

3. The combination of the insulating-body having a groove or depression at one end, a metal bell into which the body is placed, the metal of the bell being formed into said groove or depression, whereby the body and bell are secured together, and a hanger-support comprising a screw-threaded sleeve secured to the body at the opposite end by means of a sleeve spun or otherwise formed around the screw-threaded sleeve and entering a groove or depression in said insulating-body, substantially as described.

4. The combination of the insulating-body having a groove or depression at one end, a metal bell into which the body is placed, the

metal of the bell being formed into said groove or depression, whereby the body and bell are secured together, and a supporting-arm secured to the bell where it enters said groove, substantially as described.

5. The combination of the insulating-body having a groove or depression at one end, a metal bell into which the body is placed, the metal of the body and bell being formed into said groove or depression, whereby the body and bell are secured together, and a supporting-arm having two branches which clamp the bell where it enters the groove, substantially as described.

6. The combination of an insulator-body of wood, a spun-metal cover therefor, said cover being formed with a groove across one end of the insulator, and a supporting-arm, substantially as described.

7. The combination, with the body of an insulator, of a hanger-support at one end thereof and a sleeve formed over the same and secured to the body of the insulator, substantially as described.

This specification signed and witnessed this 16th day of September, 1891.

W. S. ANDREWS.
HENRY PRICE BALL.

Witnesses:
HENRY E. JOËL,
ALDRED N. WARREN.

(No Model.)

P. C. BURNS.
ELECTRIC BATTERY CELL.

No. 614,845.

Patented Feb. 13, 1894.

Fig. 1.

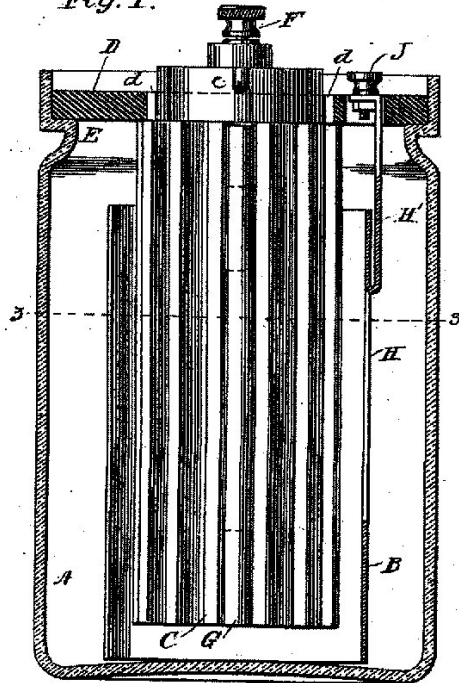


Fig. 2.

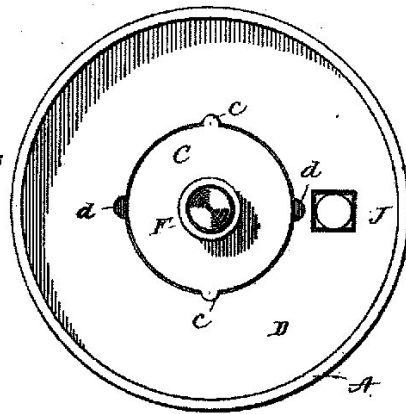
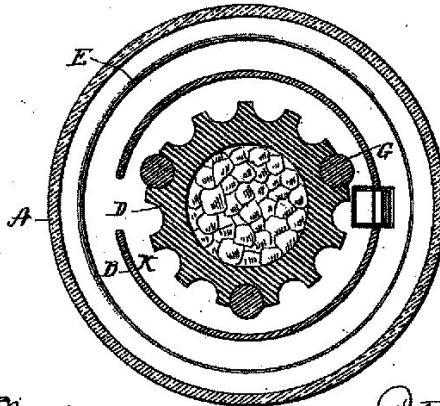


Fig. 3.



WITNESSES:

Frank S. Ober
C. L. Betcher

INVENTOR,

Peter C. Burns,

BY

W. H. Stockbridge
his ATTORNEY.

At H, in Fig. 1, is an opening in the zinc, B, where a strip of the zinc has been cut and turned up, the turned-up portion being shown at H'. At the top, the said turned-up portion, H', is bent, so as to form a horizontal seat for a binding-screw, J. The portion, H', being thin, I reinforce it by placing an angular nut under the bent-over portion at the top, letting the said nut, or one of its sides, rest against the vertical part of the strip, H', and then screwing in the binding-screw, J, while the nut is in its place. In this way, a simple binding device is formed on the zinc element, a strip of the said element itself being the principal portion of the said binding device. The cutting away of a small strip of the zinc does not affect injuriously the action of the battery cell, the portion so taken being inconsiderable. Instead of turning the cut strip upward, and so forming the binding-post, I may cut the strip entirely off and rivet it, or otherwise secure it, to the top of the zinc element, the construction in other respects being the same as that already detailed.

It will be seen that I have shown in Fig. 3, a hollow carbon, filled with a depolarizer K, such as coke, ground carbon, or manganese. It is, of course, a matter of indifference, so far as my present invention is concerned, whether the carbon is hollow or solid. It is, in fact, also indifferent whether the carbon is corrugated around its entire surface, the only essential being that there should be certain indentations or depressions (whether properly called corrugations or not) in which the plugs or pencils of insulating material may be inserted.

It will be understood that the grooves or depressions in the carbon element need not be in the form of corrugations; they may be simply holes adapted to be filled with plugs or pencils which will project beyond the outer surface of the carbon element.

45 What I claim is—

1. In an electric battery cell, a carbon element having grooves or depressions in which are plugs or pencils of insulating material projecting beyond the surface of the said carbon element, as and for the purpose set forth. 50

2. In an electric battery cell, a carbon element, and a zinc element surrounding the same, the said carbon element being provided with grooves or depressions in which are plugs or pencils of insulating material projecting beyond the surface of the said carbon element, as and for the purpose set forth. 55

3. In an electric battery cell, a zinc element, and a carbon element within the same, the said carbon element being corrugated longitudinally and having certain corrugations, or parts thereof, formed deep and rounding, the said deepened and rounded corrugations having in them plugs or pencils of insulating material, as and for the purpose set forth. 65

4. In an electric battery cell, a carbon element provided with grooves or depressions, and soft rubber plugs in the said grooves or depressions, the said plugs projecting beyond the surface of the carbon element, as and for the purpose set forth. 70

5. In an electric battery cell, a zinc element having a strip cut away, the said strip being attached to the said zinc element, and being bent over at the top and re-inforced by an angular nut, the said bent-over and re-inforced portion being traversed by a binding-screw, the said binding-screw being supported solely, by the said bent-over portion and the re-inforcing nut, as and for the purpose set forth. 80

In testimony whereof I have signed my name, in the presence of two witnesses, this 6th day of June, A. D. 1893.

PETER C. BURNS.

Witnesses:

HARRY C. MCKINLEY,
BEN. J. TURPIN.

(No Model.)

C. J. HIRLIMANN.
ELECTRIC BATTERY.

No. 351,602.

Patented Oct. 26, 1886.

FIG. I.

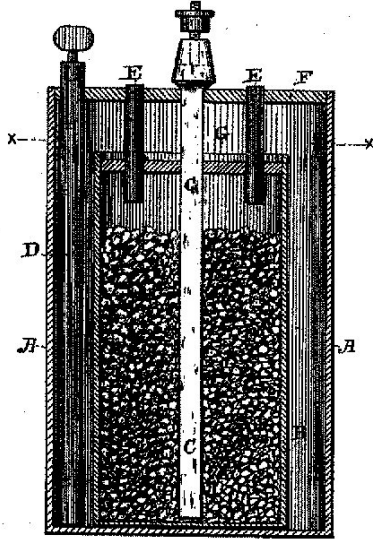


FIG. II.

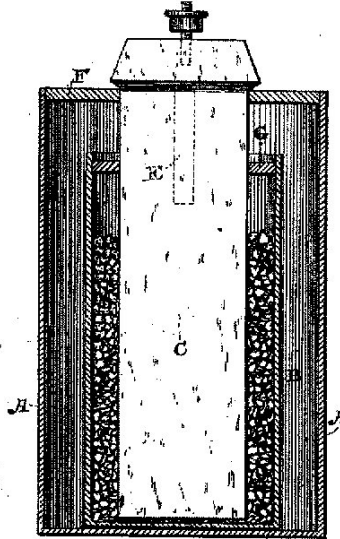


FIG. III.

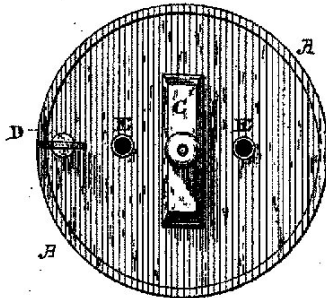
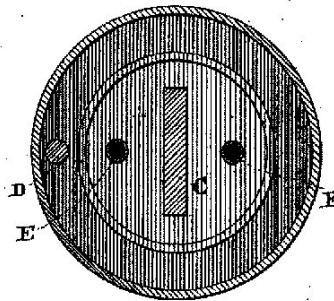


FIG. IV.



Attest:
Geo. T. Smallwood.
F. Astor P. Riss

Inventor:
Charles J. Hirlimann
By Knight Bros.
attys

UNITED STATES PATENT OFFICE.

CHARLES J. HIRLIMANN, OF NEW YORK, N. Y.

ELECTRIC BATTERY.

SPECIFICATION forming part of Letters Patent No. 351,602, dated October 26, 1886.

Application filed April 7, 1886. Serial No. 198,081. (No model.)

To all whom it may concern:

Be it known that I, CHARLES J. HIRLIMANN, a citizen of the United States, residing at New York, in the State of New York, have invented a new and useful Improvement in Electric Batteries, of which the following is a specification.

My invention relates particularly to those non-acid batteries in which the porous cup, and sometimes the outer jar, are tightly sealed to prevent the spreading of the salt and keep the poles electrically isolated. With such jars, when peroxide of manganese is used in the porous cup, it is necessary that air should be admitted to the latter in some manner.

In order that my invention may be fully understood, I will proceed to describe it with reference to the accompanying drawings, and point out specifically in the claims the novel features.

In said drawings, Figures I and II are vertical sectional views of a battery-jar embodying my invention, the sections being taken in planes at right angles to each other. Fig. III is a plan view of the jar or element; and Fig. IV is a section on the line X X, Fig. I.

A may represent an ordinary cylindrical jar containing the battery-fluid. B is the porous cup; C, the carbon plate placed therein, and D the zinc pole placed in the jar A.

The jar A is covered by a lid, F, which provides bearing for the zinc pole D and the upper ends of two tubes, E E, of brass or other proper material, which project down through the lid or sealing, G, of the porous cup. The inner lid, G, is sealed with wax in such manner that the only access of air to the porous cup is through the tubes E E.

By an arrangement such as above described all the beneficial effects resulting from a tight covering of both the porous cup and the outer jar are secured, and at the same time air is freely admitted to the interior of the porous cup.

I am aware that it is not new to provide openings in the sealing of the porous cup. Such device is shown in the ordinary Leclanché battery. As before made, however,

such openings have been found to be imperfect, by reason of the fact that when in use they are liable to become clogged or completely closed by the heat or simply by the action of the atmosphere. My brass tubes, projecting through the sealing of the porous cup and sufficiently above and below the same, insure the maintenance of connection between the outside air and the porous cup.

It will be readily seen that the continuance of the tubes beyond the covers of the jar and porous cup prevents the likelihood of the closing of the tubes by the creeping of the salt thereon.

It is important that brass or similar refractory tubes should be employed, because, by reason of their superior gravity, they do not rise out of the melted cement when the latter is used as a sealing for the porous cup, and there is no danger of their breakage by the hot cement.

Having thus described my invention, the following is what I claim as new therein and desire to secure by Letters Patent:

1. In an electric battery, the combination of an outer jar containing the battery-fluid, a porous cup, and negative and positive poles extending into said cup and jar, a sealed lid on the porous cup, and refractory tubes projecting through said lid some distance into the porous cup at their lower ends and above the fluid in the outer jar at their upper ends, substantially as set forth.

2. In an electric battery, the combination of an outer jar and a porous cup therein, both jar and cup having covers, substantially as described, electrodes placed in said jar and cup, and refractory tubes extending through the covers of both jar and cup and projecting some distance into the latter, substantially as set forth.

In testimony whereof I have hereunto set my hand this 1st day of April, 1886.

CHARLES J. HIRLIMANN.

In presence of—
R. T. VAN BOSKERCK,
CHARLES G. COE.

(No Model.)

R. W. GORDON.
GALVANIC BATTERY.

No. 580,523.

Patented Apr. 13, 1897.

Fig. 1.

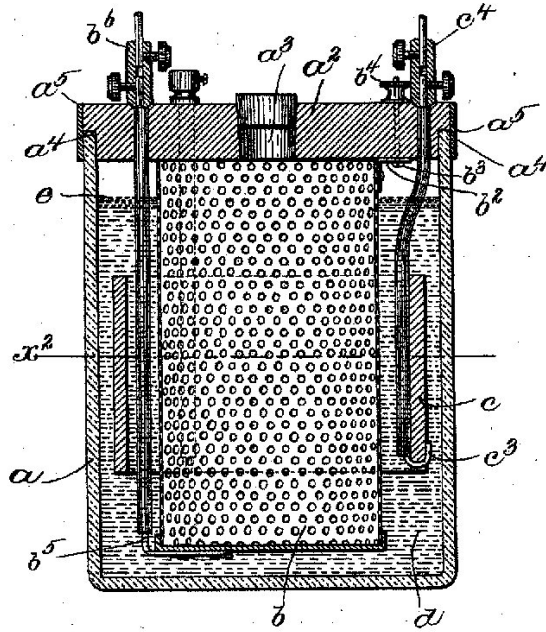
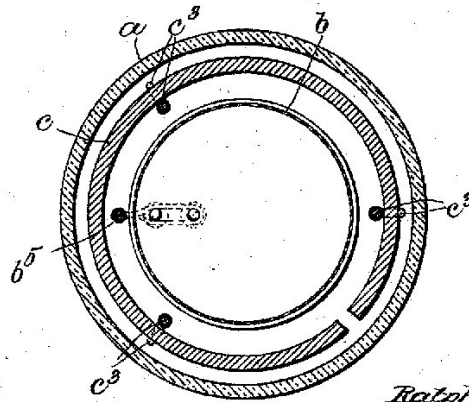


Fig. 2.



Witnesses
Jas. J. Maloney,
Henry P. Ford.

Inventor,
Ralph W. Gordon,
by J. P. Swann
Att'y.

UNITED STATES PATENT OFFICE.

RALPH W. GORDON, OF BOSTON, MASSACHUSETTS, ASSIGNOR TO THE GORDON-BURNHAM BATTERY COMPANY, OF PORTLAND, MAINE, AND NEW YORK, N. Y.

GALVANIC BATTERY.

SPECIFICATION forming part of Letters Patent No. 580,523, dated April 13, 1897.

Application filed October 1, 1894. Serial No. 524,823. (No model.)

To all whom it may concern:

Be it known that I, RALPH W. GORDON, of Boston, county of Suffolk, State of Massachusetts, have invented an Improvement in Galvanic Batteries, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

The present invention relates to a primary or galvanic battery; and it consists, mainly, in a novel and improved construction of such a battery in which a solution of caustic soda is used for the exciting fluid and black oxid of copper as the depolarizing agent.

The object of the invention is to provide a battery in which a more perfect consumption of the several elements is possible than in batteries of this class heretofore constructed, the arrangement being such that the depolarizing agent is to the fullest extent exposed to the action of the exciting fluid, while the positive element may be consumed to the fullest extent without destroying the action of the battery.

Figure 1 is a vertical section of a cell embodying the present invention, and Fig 2 is a horizontal section of the same on the line x^2 of Fig. 1.

The exciting fluid d is contained in a receptacle a , preferably a glass jar, the said jar being provided with a cover a^2 , fitting tightly thereon, from which are suspended a positive element c and a negative element b , the latter consisting of a cylindrical receptacle having perforated walls and being adapted to contain the depolarizing agent, which consists of black oxid of copper in granulated form.

In order to obviate the necessity of removing the cover a^2 when the cell is to be recharged, the said cover is provided with a central opening a^3 , provided with a suitable stopper, and the cover itself is rendered practically air-tight by means of a band a^4 of resilient material, such as rubber, extending around the outer edge of the said cover and the walls of the jar, as shown, the cover being preferably shouldered at a^4 . The positive electrode c consists of an annular plate or cylinder of zinc suspended from the cover a^2 by means of hooked rods c^1 , adapted to en-

gage therewith. One at least of the said rods is provided with a binding-socket c^2 , to which may be secured the positive conductor of the circuit, as shown. The negative element b , which, as has been described, forms a receptacle for the depolarizing agent, may be secured to the cover in any suitable way, preferably, as shown, by brackets b^3 , through each of which extends a screw b^4 , which screw also passes through the cover and is secured to the outside thereof by means of a thumb-screw b^5 , thus rendering the said negative element readily detachable from the cover. The conductor b^6 is connected to the lower part of the said receptacle b and extends upward through the cover a , being secured in a binding-post b^7 , to which may be connected the negative wire of the external circuit. In order to prevent short-circuiting, the suspending rods c^1 and the conductor b , which extend upward between the positive and negative elements, are covered with insulating material, thus effectually preventing any possible electrical contact of the two elements within the jar.

It being essential for the best operation of the cell in which the aforesaid elements are utilized that the air should be carefully excluded therefrom, it is preferable after the cell is charged to pour in a thin layer of oil e , which forms an effectual seal.

I do not intend herein to claim, broadly, the combination of a negative element having perforated walls and adapted to contain a depolarizing agent with a positive element, both suspended in a jar and surrounded by an exciting fluid, since I am aware that such construction is not novel and has been disclosed in prior patents.

I claim—

In a battery-cell containing an exciting fluid, the combination with a cover for the cell, of a negative element secured to and dependent from said cover and consisting of a cylindrical receptacle having perforated walls, a depolarizing agent contained in said receptacle, a positive element consisting of an annular plate or cylinder of zinc surrounding said negative element, insulated suspending rods or wires for said positive element secured at their upper ends to the cover and

extending downward therefrom between the
said elements and provided with supporting
portions at their lower ends for said positive
element, and an insulated conductor con-
5 nected at its lower end with said negative
element and extending upward between said
negative element and the positive element
and through the cover of the jar, said con-
ductor being provided with a binding-post
10 for one terminal of the circuit, and one of

said suspending rods being provided with a
binding-post for the other terminal of the cir-
cuit, substantially as described.

In testimony whereof I have signed my
name to this specification in the presence of 15
two subscribing witnesses.

RALPH W. GORDON.

Witnesses:

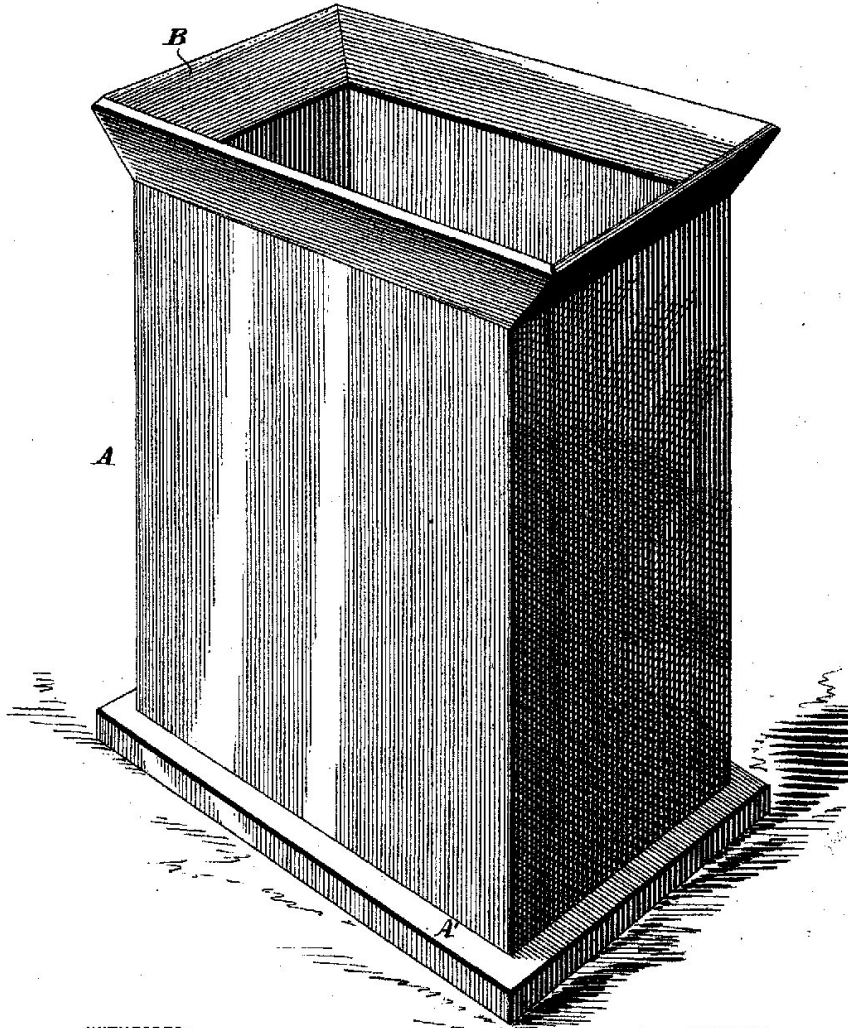
M. E. HILL,
JAS. J. MALONEY.

(No Model.)

J. GAYNER
MOLD FOR GLASS BATTERY JARS.

No. 478,792.

Patented July 12, 1892.



WITNESSES:

P. J. Chagle,
W. C. Wiedersheim,

INVENTOR

John Gayner
BY *John W. Wiedersheim,*
ATTORNEY.

UNITED STATES PATENT OFFICE.

JOHN GAYNER, OF SALEM, NEW JERSEY.

MOLD FOR GLASS BATTERY-JARS.

SPECIFICATION forming part of Letters Patent No. 478,792, dated July 12, 1892.

Application filed November 9, 1891. Serial No. 411,248. (No model.)

To all whom it may concern:

Be it known that I, JOHN GAYNER, a citizen of the United States, residing at Salem, in the county of Salem and State of New Jersey, have invented a new and useful Improvement in Molds for Glass Battery-Jars, which improvement is fully set forth in the following specification and accompanying drawing.

My invention consists in providing a mold for glass battery-jars, formed of a hollow block and provided with a funnel at the top thereof, whereby overflowing of the bulbs of glass from which the jars are made is prevented and the bulbs may be formed so large as to free the molds, thus producing uniform work, as will be hereinafter set forth.

The figure represents a perspective view of a mold embodying my invention.

Referring to the drawing, A designates a mold for the purpose stated, formed of a hollow block having a base portion A' extending beyond each of the vertical main portions of the sides thereof. The top portion of each of the sides is outwardly inclined, forming a flaring or widened mouth or funnel B, the sides of which are plane.

In blowing glass battery-jars the difficulty heretofore has been in getting the glass evenly distributed, because it is required to blow the bulb of glass the width of the narrowest di-

ameter of the mold. Consequently the corners of the jars are thinner than the sides thereof. Should a larger bulb be used, it would overflow at the top of the mold and part of the same be lost, the main portion, however, being insufficient to accomplish perfect work; but by the use of the funnel B, I may use a larger bulb than heretofore, the same being equal to the inner diameter of said funnel, so that the bulb impacts upon the sides of the same, and fully enters the mold, so that there is sufficient metal to be distributed equally around the mold, thus producing uniformity of work.

Having thus described my invention, what I claim to be new, and desire to secure by Letters Patent, is—

A mold for glass battery-jars, consisting of a hollow block with a base portion extending beyond the vertical main portion of the sides of the body thereof and a flaring mouth having plane sides at the top of the body portion, said parts being combined substantially as described.

JOHN GAYNER.

Witnesses:

N. H. HAZELTON,
I. O. ACTON.

(No Model.)

C. A. HUSSEY.
POROUS CUP FOR GALVANIC BATTERIES.

No. 439,516.

Patented Oct. 28, 1890.

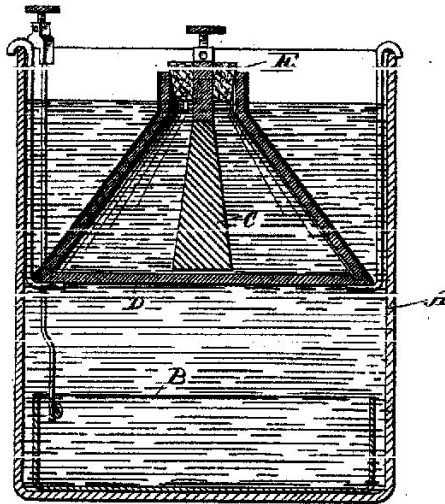


Fig. 1.

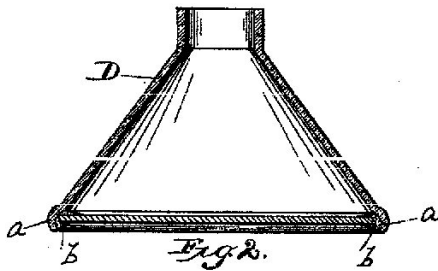


Fig. 2.

Witnesses:
Arthur H. ...
Thomas Durant.

Inventor:
Charles A. Hussey,
by Church & Church
His Atty's.

UNITED STATES PATENT OFFICE.

CHARLES A. HUSSEY, OF NEW YORK, N. Y., ASSIGNOR TO THE CROSBY ELECTRIC COMPANY, OF SAME PLACE.

POROUS CUP FOR GALVANIC BATTERIES.

SPECIFICATION forming part of Letters Patent No. 439,516, dated October 28, 1890.

Application filed August 29, 1890. Serial No. 868,432. (No model.)

To all whom it may concern:

Be it known that I, CHARLES A. HUSSEY, of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Galvanic Batteries; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification, and to the letters of reference marked thereon.

This invention relates more particularly to improvements in that class of primary batteries known as "bluestone" or "gravity" batteries; and it consists in the novel and improved form, construction, and arrangement of the porous cup or receptacle as employed in said batteries, all as hereinafter fully described, and pointed out in the claims.

In the drawings, Figure 1 is a longitudinal vertical section through the battery. Fig. 2 is a longitudinal vertical section showing one mode of applying a separate bottom or lower section of porous material to the body or upper section of non-porous material.

Similar letters of reference in the several figures indicate the same parts.

The letter A designates the jar or receptacle of any usual or approved form and construction; B, the positive or copper electrode immersed within the exciting-solution; C, the negative or zinc electrode, and D the porous cup partially immersed in the before-mentioned exciting-solution and containing the negative element C.

With the exception of the cup D the battery is of the usual well-known type of gravity-battery, and does not require more detailed description, as its construction and mode of operation will be at once recognized by any one skilled in the art.

The cup or receptacle D is formed or provided with impervious or non-porous side walls and a porous lower section or bottom, and its upper end or mouth is contracted to form a relatively small opening for the insertion of the negative electrode, said opening being occupied by a stopper E, inserted therein, and provided with a passage for the neck

of the electrode C or a conductor leading to said electrode.

By forming the cup with impervious sides or walls and a contracted mouth the evaporation or escape of the fluid from within the cup can readily and conveniently be prevented by the insertion of the stopper E within the contracted mouth of the cup, said stopper also serving to support and sustain the zinc or other negative electrode in position, if necessary.

The cup may be formed in one piece of clay, and the side walls glazed to render them impervious to the fluids; or the cup may be constructed in two or more sections, the side walls being formed of any suitable impervious material—such as rubber, glass, &c.—or provided with an impervious coating, while the bottom or lower section is made of porous material, and the two sections are united by an impervious joint. A cup of this kind is illustrated in Fig. 2, wherein the body portion of the cup is shown as provided with a ring-seat *a* to receive the disk or bottom of pervious material, the latter being retained in position and the joint closed to prevent the passage of fluids therethrough by the application of a suitable cementing material—such as plaster-of-paris—as shown at *b*. By thus forming the cup in sections the lower portion, that through which the fluid is caused to pass, can be reversed or changed when necessary or desirable without involving the loss or destruction of the entire cup. Moreover, the requisite degree or quality of porosity can be secured at less expense and trouble when the section is made in disk form rather than as a component part of the cup, for in the latter case any imperfections occurring in either the pervious or impervious portions of the cup involve the rejection and consequent loss of both.

Having thus described my invention, what I claim as new is—

1. As a new article of manufacture, the hereinbefore-described improved porous cup for batteries, provided with impervious sides or body portion, a contracted neck or orifice, and a pervious bottom.

2. The combination, in a battery such as described and with the receptacle or jar and the electrodes, of a porous cup having impervious side walls and a pervious bottom, the walls being contracted at the top to form an orifice smaller than the body of the cup, with a stopper fitted to said orifice, as and for the purpose specified.

3. The combination, in an electric battery such as described, and with the receptacle containing the exciting-solution, and an electrode, of the porous cup partially immersed in said solution and containing the opposite electrode, said cup being formed with a contracted upper end or mouth, impervious sides, and a pervious bottom, with a stopper closing the mouth of the cup and provided with an

opening for the neck of the electrode, substantially as and for the purpose specified.

4. As a new article of manufacture, a porous cup for electric batteries, composed of an impervious body and a pervious bottom, the two sections being united to form a receptacle for the electrode.

5. As a new article of manufacture, a sectional cup for electric batteries, the same comprising an impervious body provided with a seat and a porous bottom fitted to said seat and held in position by an impervious cement applied to the joint, substantially as described.

CHARLES A. HUSSEY.

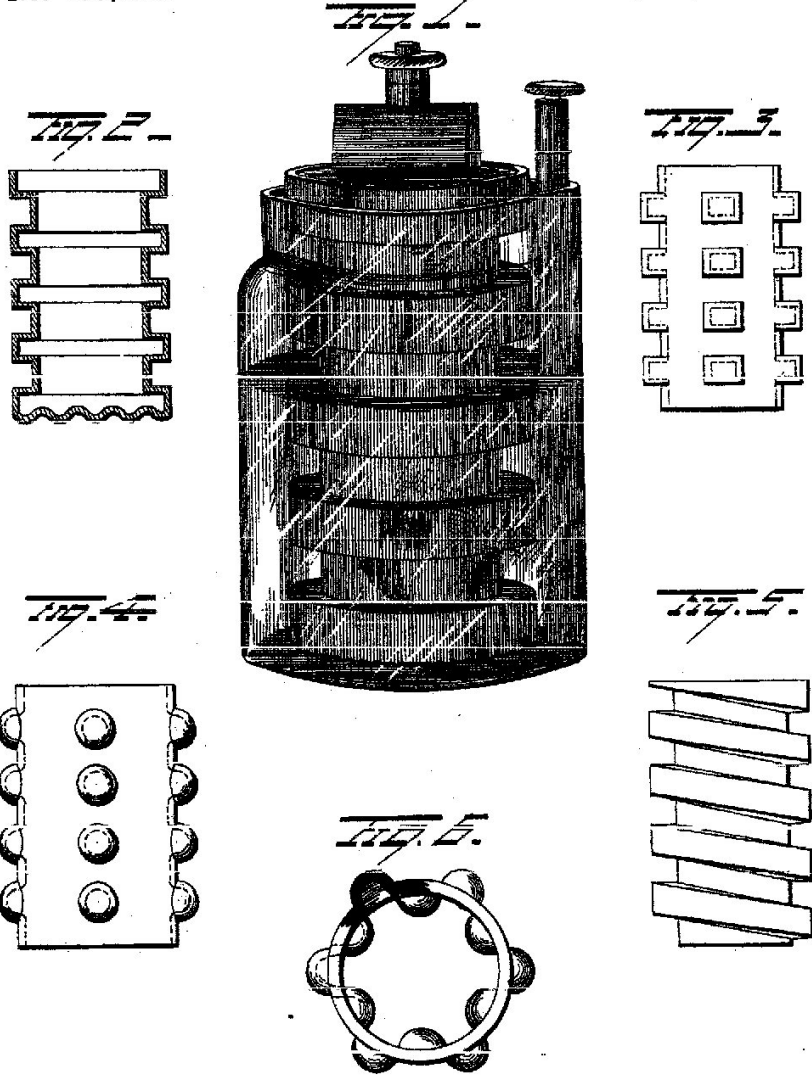
Witnesses:
 SUMNER C. CHANDLER,
 W. J. ANDERSON.

(No Model.)

C. B. NOBLE.
POROUS CUP FOR BATTERIES.

No. 403,955.

Patented May 28, 1889.



Witnesses,
Albert Popkin,
R. S. Ferguson

Inventor
C. B. Noble
By his Attorney
H. A. Dugan

UNITED STATES PATENT OFFICE.

CLARENCE B. NOBLE, OF CLEVELAND, OHIO.

POROUS CUP FOR BATTERIES.

SPECIFICATION forming part of Letters Patent No. 403,955, dated May 28, 1889.

Application filed October 11, 1888. Serial No. 287,810. (No model.)

To all whom it may concern:

Be it known that I, CLARENCE B. NOBLE, of Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Porous Cups for Batteries; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to galvanic batteries, and more particularly to an improvement in porous cups used with some forms of such batteries.

In galvanic batteries a glass or earthen jar is employed to contain the several elements, which latter are separated by means of a jar or cup of porous material, usually clay, and unglazed.

In one form of such battery, known as the "Grove cell," a cylinder of zinc is placed in a dilute solution of sulphuric acid and has a conducting-wire attached thereto. Within this zinc cylinder a porous cup is immersed in the sulphuric-acid solution, said porous cup containing nitric acid. A plate of platinum is immersed in the nitric acid contained in the porous cup and provided with a conducting-wire. When the porous cup is immersed into the acid solution, it will become soaked with said solution, and thus an electric current will be permitted to pass through the cup, and with such cups as at present made, in regular cylindrical form, a considerable resistance is offered to the passage of the electric current. As is well known, when a porous diaphragm is interposed between two liquids, the process of osmose is established. This is the case with the use of the porous cup in the form of battery just mentioned, and in fact in all forms of galvanic batteries employing a porous cup to separate the liquids.

In the Grove cell a chemical action takes place between the zinc and sulphuric-acid solution and produces sulphate of zinc, while the union of the platinum and nitric acid produces a heavy brown gas—peroxide of nitrogen. The solution in the porous cup and that in the glass jar surrounding such cup being now separated by a porous shell, the process of endosmose and exosmose is

established and the solutions will pass through said shell in reverse directions.

It is essential, in order to decrease the internal resistance of the battery and thereby increase the amount of electricity generated by said battery, that as little resistance as possible be afforded to the passage of the electric current through the porous cup. In batteries where but a single liquid is employed the action is very similar. For example, take the battery known as the "Leclanché cell," in which the solution is a solution of sal-ammoniac or chloride of ammonia, into which is immersed a rod or plate of zinc. Also immersed in this solution is a porous cup containing a plate of carbon surrounded by peroxide of manganese, one conducting-wire being attached to the carbon and the other to the zinc. When the parts are thus assembled, the process of endosmose is established, the ammonia solution finding its way through the porous walls of the cup to the manganese contained therein. When this solution reaches the manganese, a chemical action takes place, and the resultant mixture will find its way into the ammonia solution by the process of exosmose.

In some forms of batteries the porous cup is entirely indispensable—such, for example, as the Grove cell, which employs two liquids. It is well known that the employment of such cups in the battery produces an internal resistance, thereby limiting to a certain degree the output of the current from the battery. It is therefore desirable, in order to decrease the internal resistance and increase the output of the electric current, to so construct the porous cup that it shall present as large a surface as possible to the solutions in the battery; and it is also understood that the porous cup when plunged into the battery solution becomes a conductor simply on account of the solution wetting it all through, and consequently the more surface the porous cup presents inside and outside to the solutions in the battery the easier and more readily will the electric current pass through the porous cup, because it is the solutions of the battery which conduct the electric current through said cup.

It is the object of this invention to provide

a porous cup having its walls present a large amount of surface to the solutions in the battery, and thereby enlarge the path of the electric current through the porous cup, thus decreasing the internal resistance and increasing the output of the electric current.

A further object is to produce a porous cup having an irregular surface which shall be cheap to manufacture and effective in the performance of its function.

With these objects in view my invention consists, essentially, in a porous cup for batteries having its walls so formed as to produce a considerable extent of surface to the battery solutions or elements, as hereinafter set forth, and pointed out in the claims.

In the accompanying drawings, Figure 1 is a view of a Leclanché cell having a porous cup embodying my invention. Fig. 2 is a vertical sectional view of the cup shown in Fig. 1. Figs. 3, 4, 5, and 6 are views illustrating modifications.

In Fig. 1, A indicates a glass jar of the form usually adopted for a Leclanché cell, and B a solution of sal-ammoniac. A porous cup, C, is placed in the jar and immersed in the ammonia solution, and is filled with peroxide of manganese, D, which surrounds the carbon plate F, preferably in small lumps. The carbon plate produces one electrode of the battery, and has a conducting-wire, a, attached thereto, while the other electrode of the battery is formed by a zinc rod or plate, E, immersed in the ammonia solution and furnished with a conducting-wire, b. The form of porous cup shown in this cell is made having irregularities running around or at right angles to the vertical axis of the cup, both internally and externally, and of generally cylindrical form, so that an immense surface of the cup is presented to the ammonia solution, and also to the peroxide of manganese contained in the cup; and it is evident that if the amount of surface contact be increased the conductivity of the cup will also be extended; and, further, as the conductivity of the cup is extended by such increase of surface of the cup, and as the cup depends on the solution or solutions of the battery for its conductivity, it is clear that the path for the passage of the electric current through the cup will be increased in size, consequently decreasing the resistance of the cup and rendering the output of the battery greater.

The cup is made of clay or other suitable material, and, as shown in Fig. 2, the irregularities extend around or at right angles to the vertical axis of the cup, thus producing a series of hollow flanges or ribs, g. The bottom surface of the cup will also preferably be grooved, corrugated, or otherwise made irregular. By this construction the interior as well as the exterior of the cup is made irregu-

lar and presents a considerable extent of surface to the elements of the battery. The irregularities running around the vertical axis of the cup can be quickly, easily, and cheaply produced by formers pressed against the surfaces of the cup, thus obviating the necessity of employing molds in the manufacture of my improved cup.

The outer surface of a cylindrical cup may be furnished with a series of hollow squared projections, h, as shown in Fig. 3, or in some cases the solid projections h may be made to project from the outside, inside, or both sides or surfaces of the cup. Hollow rounded projections i may be produced upon both faces of the cup, as shown in Figs. 4 and 5. The flanges or ribs may extend around the vertical axis of the cup in the form of a spiral, as shown in Fig. 6, if desired.

Having fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A porous cup having an irregular surface internally, externally, and on its bottom, substantially as set forth.

2. In a battery, the combination, with a jar, of a porous cup having irregularities projecting at right angles to the vertical axis of the cup and adapted to separate the battery elements and produce a medium for the process of osmose, substantially as set forth.

3. The combination, with a galvanic battery, of a porous cup having a non-regular surface on both its sides and bottom, within and without, substantially as set forth.

4. The combination, with a battery, of a porous cup having sides and bottom of the same thickness throughout, the said sides and bottom being of irregular shape for presenting an enlarged area of surface to the elements within and without the porous cup, substantially as set forth.

5. The combination, with a galvanic battery, of a porous cup with walls having irregularities running around the vertical axis of the cup, substantially as set forth.

6. The combination, with a galvanic battery, of a porous cup having its sides formed irregularly around the vertical axis of the cup, substantially as set forth.

7. The combination, with a galvanic battery, of a porous cup having sides of equal thickness throughout, the said sides being shaped irregularly and running around or at right angles to the vertical axis of the cup, inside and outside, substantially as set forth.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

CLARENCE B. NOBLE.

Witnesses:

ELLEN H. B. NOBLE,
JANE W. HUTCHINSON.

P. J. KAMPERDYK.
POROUS CUP ELECTRODE.

APPLICATION FILED NOV. 9, 1907. RENEWED MAY 20, 1910.

982,729.

Patented Jan. 24, 1911.

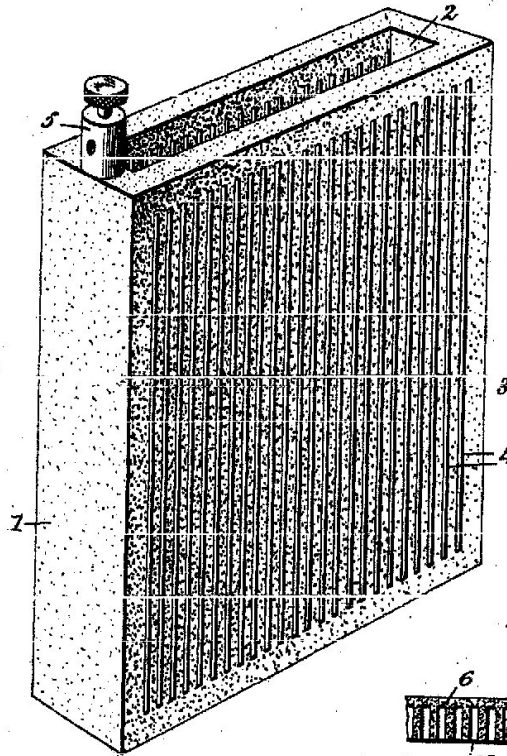


FIG. 1.

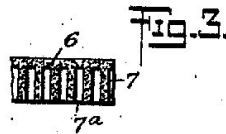
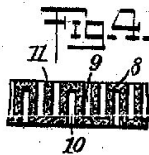


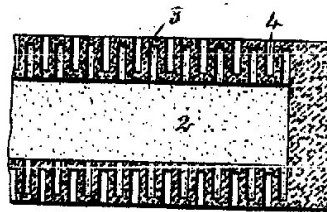
FIG. 3.



10
WITNESSES

G. R. Thomas
J. D. [Signature]

FIG. 2.



INVENTOR
Pierre J. Kamperdyk
BY [Signature]
ATTORNEYS

UNITED STATES PATENT OFFICE.

PIERRE J. KAMPERDYK, OF NEW YORK, N. Y.

POROUS CUP ELECTRODE.

982,729.

Specification of Letters Patent.

Patented Jan. 24, 1911.

Application filed November 9, 1907, Serial No. 401,430. Renewed May 20, 1910. Serial No. 562,408.

To all whom it may concern:

Be it known that I, PIERRE J. KAMPERDYK, a subject of the King of Belgium, and a resident of the city of New York, borough of Manhattan, in the county and State of New York, have invented a new and Improved Porous-Cup Electrode, of which the following is a full, clear, and exact description.

This invention relates to primary batteries or cells, and especially to that type of cells which employ two fluids separated by a porous wall or cup.

The object of the invention is to produce a porous wall or cup which will offer a low resistance, and which will present a greatly increased area to the exciting fluid.

Porous cups or partition walls of two-fluid cells have been employed, composed of carbon. This material is highly porous and answers the requirements in this particular. It is, however, a bad conductor and is therefore of little value where the porous cup or partition wall is used as an electrode of the cell. A cup or partition wall of graphite, to be used in a two-fluid cell, would seem to be impracticable, as graphite is substantially non-porous. I have discovered that, though a graphite wall is substantially non-porous for ordinary purposes, and consequently non-permeable when of ordinary form, it is possible to construct such a wall of graphite as will be sufficiently permeable for the use suggested. This, of course, is possible because the graphite is actually slightly porous. By giving the wall a special form, producing a very thin separating partition between the fluids and greatly increasing the superficial area, I am enabled to produce a permeable wall or cup out of a substantially non-porous material. As graphite is about three times as conductive as carbon, the cup or wall will act with great efficiency as an electrode.

The invention consists in employing a substance of high conductivity which, on account of its density and low porosity, has not heretofore been used as a composition for porous cup electrodes, and I give the wall such a form as will render it practically permeable to the electrolyte.

Reference is to be had to the accompanying drawings forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures.

Figure 1 is a perspective of a porous cup electrode constructed according to my invention; Fig. 2 is a horizontal section taken through a portion of the cup shown in Fig. 1; Fig. 3 is a section through the wall of a cup of a slightly modified form, and Fig. 4 is a view similar to Fig. 3, and showing another modified form.

Referring more particularly to the parts, 1 represents the body of the cup, which is rectangular in form, as shown, presenting a chamber 2. The side walls 3 of the cup are preferably of the form illustrated; that is, they are provided on each face with deep grooves 4 which extend vertically, as indicated, in parallel arrangement. The cuts or grooves on the outside of the wall are arranged intermediate those on the inner side, so that the effect of a rectilinear corrugation is produced, as indicated in Fig. 2. In this way a relatively thin wall is formed between the cuts or grooves and at the ends of the cuts. It will be evident, also, that the superficial area of the side walls of the cup is greatly increased.

Porous carbon cups are worthless as electrodes, because porous carbon is a bad conductor and does not resist attacks of acids. My cup is formed of graphite, which is preferably molded to the required form; if desired, the grooves may be formed in molding the cup but they may, on the other hand, be cut in the wall by tools, such as milling cutters. The cup may also be of built-up form; that is, its side walls may be formed of plates having strips on the edges thereof, except at the upper edges. These plates are then connected together at the strips to form a cup. The cup may also be formed of carbon and afterward graphitized by any of the well known processes. The porous cup is used in a cell or battery as a positive electrode, the depolarizing fluid being placed on the exterior of the cup and the exciting fluid on the interior. At a suitable point the cup is provided with a binding post 5 for the attachment of a conductor.

Instead of using the sinuous form of wall shown in Fig. 2, I may adopt the form of wall shown in Fig. 3, which is simpler but does not give so great a surface or porosity. In this form, the side wall 6 is provided on its outer side with a plurality of outwardly-projecting rectangular ribs or fins 7, which are disposed a slight distance apart to form

grooves 7^a which extend vertically in parallel arrangement. In this form the superficial area of the cup is greatly increased, while the area of the portion of the wall which conducts the depolarizing fluid is not increased.

In Fig. 4 I show a form of the wall which may be considered as a combination of the two forms shown in Figs 2 and 3. In this case I provide a sinuous wall 8 presenting grooves 9 on the inner side arranged in pairs disposed close together, and between these pairs of grooves single grooves 10 are formed on the outer side of the wall. In this way the superficial area of the wall is greatly increased, and a portion of the conducting part of the porous wall is also increased. In this connection attention is called to the fins 11 which are formed on the inner side of the wall between the grooves 9, and by the combination of the forms shown in Figs. 1 and 3 I obtain the form shown in Fig. 4, in which the extent of porosity is intermediate in amount.

An electrode composed of graphite as described, is sufficiently porous to perform the functions of the porous cup in a voltaic cell, and at the same time it is a relatively good conductor, being far superior in this respect to a carbon electrode.

The invention may be practiced by employing a single wall separating the two fluids and having the form in cross section, illustrated.

While graphite is relatively not greatly

porous, I make it efficient as a porous cup by forming the separating wall as described; and it will be observed that by adopting the form suggested I greatly increase the area of the cup and at the same time reduce the thickness of the wall without weakening the same. Both these features are factors in increasing the efficiency of the cup.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:

1. A separating wall constituting an electrode for two-fluid cells, composed of a substantially non-porous, highly conductive material having a wall so thin as to render said wall permeable to the electrolyte, said wall having reinforcing extensions laterally disposed.

2. A separating wall constituting an electrode for two-fluid cells, composed of a dense, substantially non-porous, highly conductive material, said wall having a form presenting a plurality of small areas, the aggregate whereof is sufficient to render said wall substantially permeable to the electrolyte.

3. An imperforate separating wall for voltaic cells, composed solely of graphite.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

PIERRE J. KAMPERDYK.

Witnesses:

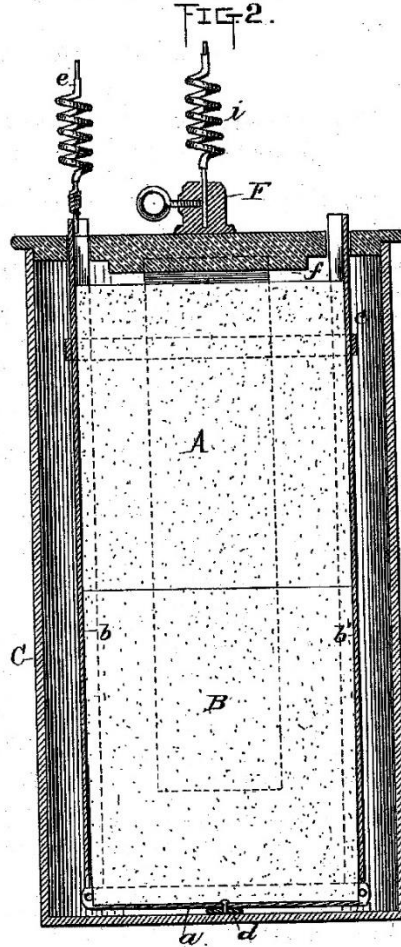
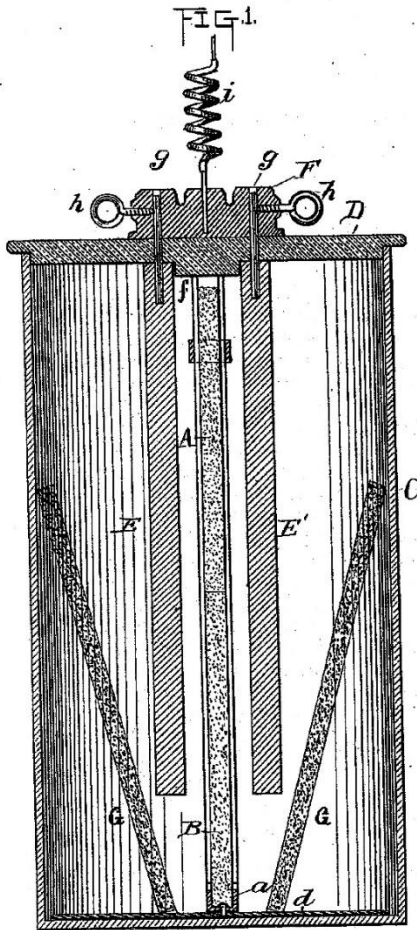
F. D. AMMEN,
EVERARD B. MARSHALL.

(No Model.)

T. A. EDISON.
VOLTAIC BATTERY.

No. 430,279.

Patented June 17, 1890.



Witnesses
E. C. ...
W. P. ...

Inventor
Thomas A. Edison
By his Attorneys
J. S. ...

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

VOLTAIC BATTERY.

SPECIFICATION forming part of Letters Patent No. 430,279, dated June 17, 1890.

Application filed July 2, 1889. Serial No. 316,325. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented a new and useful Improvement in Voltaic Batteries, (Case No. 837,) of which the following is a specification.

The object of my invention is to simplify and make compact the construction of that class of voltaic batteries employing oxide of copper as the depolarizing agent at the negative electrode of the battery.

In carrying out my invention I mold the copper oxide into plates by mixing the copper oxide with a slight amount of alkali water—say soda—and then hardening the plates by exposing them to a red heat until the mass is well locked together. The plates of copper oxide thus formed are clamped between copper plates, which form a frame supporting the edges of the oxide plates and holding them together.

The construction of the negative electrode of the battery is the principal feature of the invention; but the invention also consists in other matters of detail, which will presently appear.

In the accompanying drawings, forming a part hereof, Figure 1 is a vertical section of a cell of the battery, and Fig. 2 is a vertical section at right angles to Fig. 1.

A and B are two plates formed by mixing the copper oxide with a slight amount of alkali water, then molding the same, and then exposing the same to a red heat until the mass is locked together. These plates are held by a channeled metal frame, of copper, composed of a bottom piece *a* and two side pieces *b b'*, pivoted to the bottom piece. The pieces *a b b'* are channeled, so as to make a frame for supporting the oxide plates A B. To secure the oxide plates in this frame the side pieces *b b'* are swung open, the oxide plates slipped down between them, the lower one resting on the piece *a*, and the side pieces *b b'* are then swung together on the oxide plates and are secured by a copper band *c*, which is slipped over the side pieces *b b'*. A cross-bar *d* is secured centrally to the bottom piece

a of the frame, so as to insure the central position of the negative electrode in the glass jar C. The top of the glass jar is closed by a cover D, made, preferably, of porcelain and having openings through which the upper ends of the side pieces *b b'* project. A connecting-wire *e* is secured to one of the projecting ends of the side pieces. The cover D is molded with a central rib *f* extending transversely part way across it. Two zinc plates E E' are supported from the under side of the cover D on opposite sides of the rib *f*. Metal pins *g* from the zinc plates pass upwardly through the cover D and enter a metal block F, in which they are secured by set-screws *h*. A wire *i* for making circuit-connections may be secured to the block F. The rib *f* maintains the zinc plates E E' a definite distance apart, and between the two zinc plates is located the negative electrode formed of the copper oxide plates A B and the sustaining-frame. This construction produces an exceedingly simple and compact form of the battery and one which can be conveniently renewed, since the copper oxide plates can be readily replaced. I preferably employ two copper oxide plates instead of one, for convenience in molding, and so that the upper plate can be reversed in renewing the plates, so as to immerse that part of the plate which before was above the liquid. A single plate, however, can be employed.

The solution employed is preferably a twenty-five-per-cent. solution of caustic soda; but other caustic alkali—such as caustic potash—may be employed. To obtain this I employ sticks G, Fig. 1, of caustic soda, which are formed by melting the soda and running it into molds. The glass is filled with water and the soda sticks put in. These being made of the material fused into a solid mass, they dissolve slowly, and the glass jar is saved from injury. If the caustic soda were put into the glass jar in the form of powder, the heat produced by its rapid dissolution would be liable to crack the jar.

What I claim as my invention is—

1. A voltaic battery having a negative electrode composed of a plate or plates of molded and solidified oxide of copper removably held

in a supporting-frame which embraces the edges of the oxide plate or plates, substantially as set forth.

2. A voltaic battery having a negative electrode composed of one or more plates of copper oxide molded and solidified, and a channeled sustaining-frame composed of parts pivoted together and capable of being opened to permit of the replacement of the oxide plate, substantially as set forth.

3. In a voltaic battery, the combination, with the oxide electrode and sustaining-frame, of the centering cross-piece *d*, substantially as set forth.

4. In a voltaic battery, the combination, with the jar, of the cover having a central rib on its under side, the zinc plates attached to the cover on opposite sides of the rib, and the

central copper oxide electrode between said plates, substantially as set forth.

5. The combination, in a voltaic battery, of an electrode and a supporting-frame therefor having a hinged part, whereby the electrode may be easily inserted and withdrawn, substantially as set forth.

6. The combination, in a voltaic battery, of an electrode, a supporting-frame therefor having a hinged part, and a clamp for retaining the frame in the closed position around the electrode, substantially as set forth.

This specification signed and witnessed this 15th day of June, 1889.

THOS. A. EDISON.

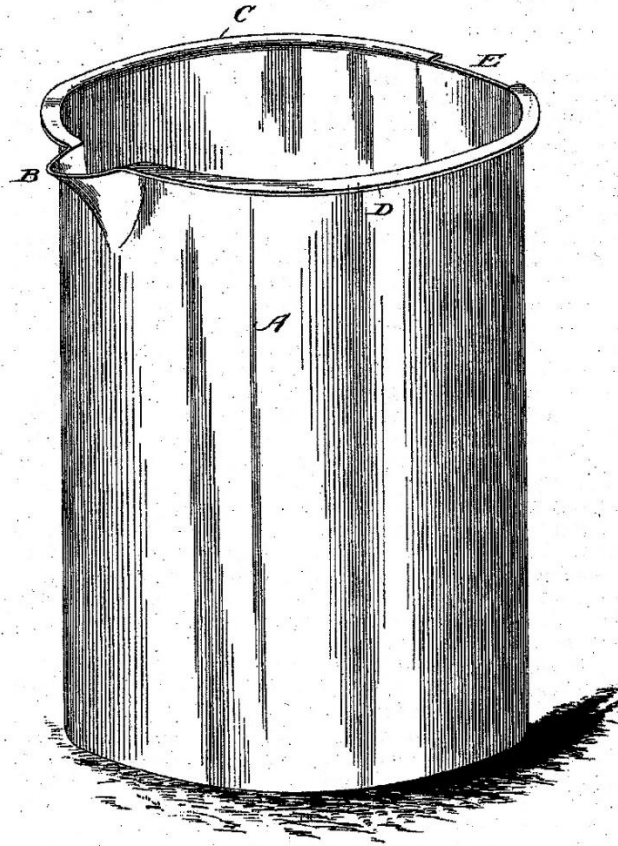
Witnesses:
WILLIAM PELZER,
RICHD. N. DYER.

(No Model.)

A. L. WERNER.
TELEGRAPH BATTERY JAR.

No. 575,449.

Patented Jan. 19, 1897.



WITNESSES:

Calvin L. Bradford
H. A. Hall

INVENTOR,

Andrew L. Werner,
BY *John Hedduburn*

ATTORNEY.

UNITED STATES PATENT OFFICE.

ANDREW L. WERNER, OF DELANO, PENNSYLVANIA.

TELEGRAPH-BATTERY JAR.

SPECIFICATION forming part of Letters Patent No. 575,449, dated January 19, 1897.

Application filed June 29, 1896. Serial No. 597,273. (No model.)

To all whom it may concern:

Be it known that I, ANDREW L. WERNER, a citizen of the United States, residing at Delano, in the county of Schuylkill and State of Pennsylvania, have invented certain new and useful Improvements in Telegraph-Battery Jars; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to telegraph-battery jars.

The common form of gravity-battery jar used for telegraphic and other purposes where a closed electric circuit is used is simply cylindrical in shape, being devoid of a handle or spout of any kind. In the use of the gravity-battery there is formed what is known to the art as "creeping salts," this being a white flaky substance which creeps up and over the upper edge of the jar, but does not cling there to tenaciously. The upper portion of the battery-jar is generally coated with paraffin to prevent these salts from creeping upward, but this does not always prove satisfactory. When the jars are handled, the salts before described slip off easily, and unless the operator is very careful the jar will slip through his hands and fall to the floor. A further disadvantage lies in the fact that inasmuch as the jar has no spout it is difficult to properly pour off the fluid when necessary.

The object of the present invention is to overcome these difficulties, and this is accomplished by the provision of a battery-jar which is provided with a spout and with portions which can be grasped, so that the jar can be lifted from place to place without danger of dropping it.

The accompanying drawing illustrates my improved battery-jar in perspective.

A designates a cylindrical glass battery-jar

which can be constructed of a size found most desirable to suit the requirements to which the battery is to be subjected. This jar is provided with an integral spout B, so that the fluid can be poured off readily without danger of it coming in contact with the hands of the person.

The upper edge of the jar is provided with integral flanges C and D, which extend from the spout almost entirely around the jar, but leave the edge of the jar devoid of a flange at the point E. This blank space is provided so that the hook of the "crow-foot" zinc commonly employed in a battery can be made to straddle the jar at this point.

The flanges are of sufficient width to allow of a firm grasp by the fingers, so that the jar can be handled without danger of its slipping and falling to the floor on account of the creeping salts which are generally found at these points on gravity-battery jars.

Immaterial changes might be resorted to without materially affecting the invention, and it is to be understood, therefore, that I consider that I am entitled to all such variations as come within the spirit and scope of my invention.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

A battery-jar provided with an integral spout and having its rim formed into outwardly-projecting hand-grasp flanges which extend almost completely around the jar but leave a blank portion.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

ANDREW L. WERNER.

Witnesses:

OLIVER W. REIGEL,
WILLIAM A. FAUST.

(No Model.)

P. C. BURNS.
GALVANIC BATTERY.

No. 393,814.

Patented Dec. 4, 1888.

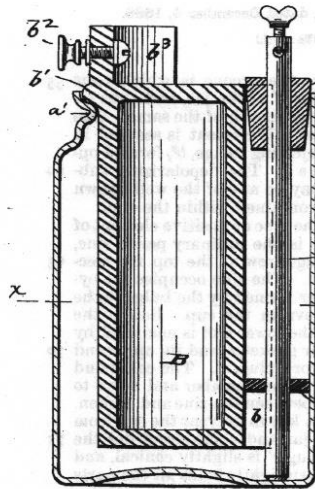


Fig. 1.

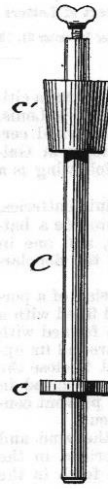


Fig. 3.



Fig. 4.

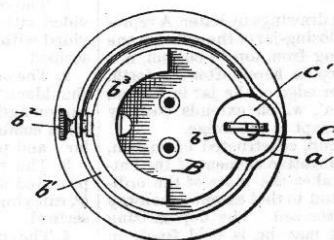


Fig. 5.

WITNESSES:

M. A. Rosenbaum
Wm. J. Blake

INVENTOR,

Peter C. Burns.

BY

W. J. Johnston

ATTORNEY.

UNITED STATES PATENT OFFICE.

PETER C. BURNS, OF ST. LOUIS, MISSOURI.

GALVANIC BATTERY.

SPECIFICATION forming part of Letters Patent No. 393,814, dated December 4, 1888.

Application filed December 21, 1887. Serial No. 258,619. (No model.)

To all whom it may concern:

Be it known that I, PETER C. BURNS, a citizen of the United States, residing at St. Louis, in the State of Missouri, have invented certain new and useful Improvements in Galvanic Batteries, of which the following is a specification.

The invention relates to galvanic batteries, the primary objects being to provide a battery of low internal resistance, and one in which the greatest efficiency of the depolarizing agent is secured.

To this end the invention consists of a porous cup composed of carbon and filled with a depolarizing agent. The cup is formed with a flange extending a part way around its upper edge to support the cup and to close the mouth of the jar. The zinc is supported in the jar in such a manner as to prevent contact between it and the carbon cup.

The manner of supporting the zinc and other details will be fully described in the following specification and set forth in the claims.

In the drawings, Figure 1 represents a central vertical section of my improved cell; Fig. 2, a plan; Fig. 3, a side elevation of the zinc and its attachments; Fig. 4, a horizontal section of the inclosing-jar of the cell, taken on line $x x$.

Referring to the drawings by letter, A represents the outer inclosing-jar of the cell. On one side, and extending from top to bottom, is a bulge, a , for a purpose hereinafter set forth. The neck or upper edge of the jar is formed into a shoulder, a' , which extends entirely around the jar, except at the bulge.

B is a porous cup, constructed of carbon, which forms the negative element of the battery. This cup takes the place of the ordinary porous cup, and to that extent does away with one part of the cell. The depolarizing agent, whatever it may be, is held freely in the cup. I have found that better results are obtained by placing this agent loosely in the cup than by combining or mixing it with the carbon. The cup is formed with a vertical groove, b , in its outer wall extending its full length, and when the cup is properly adjusted in the cell this groove is opposite the bulge in the outer jar, thus forming a cylindrical chamber. The size of the cup is such as to allow it to pass through the mouth of the jar, and its upper edge is surrounded by a flange,

b' , except where the groove is, which rests upon the shoulder a' of the jar, and thus effectually closes the mouth of the same. The binding-post b^2 of this element is secured in an upwardly-projecting flange, b^3 , formed opposite the groove b . The depolarizing substance, which may be any of the well-known depolarizers, is contained within the cup.

C represents the zinc or positive element of the battery. It is the ordinary pencil-zinc, having a binding-screw at the top for electrical connection. The zinc occupies the cylindrical chamber formed by the bulge in the jar and the groove in the cup. Before the zinc is inserted the lower end is encircled by a rubber collar or gasket, c , and its upper end by a wooden or cork plug, c' . The collar and plug fit tightly in the chamber and serve to prevent contact between the zinc and carbon. They also act as a key to prevent the cup from rotating in the jar and short-circuiting the battery. The plug c' is slightly conical, and when pushed down tightly holds all the parts securely in place and seals the jar.

It will be seen that this construction forms a compact battery-cell, and experiment has demonstrated that it is a very effectual and economical cell as well.

What I claim as my invention is—

1. The combination, with a porous cup provided with a groove, as b , of an outer jar provided with a bulge, as a , substantially as described.
2. The outer jar provided with bulge a and shoulder a' , and the porous cup constructed of carbon and provided with groove b and flange b' , in combination with the zinc-carrying collar c and plug c' , as set forth.
3. The porous cup constructed of carbon, provided with an upward-projecting flange, b^3 , carrying binding-post, substantially as described.
4. The combination, with outer jar provided with bulge, of porous cup provided with groove and zinc-carrying insulating plug and collar, as described.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

PETER C. BURNS.

Witnesses:

JOHN RING,
P. L. ROSE.

(No Model.)

P. C. BURNS.
ELECTRIC BATTERY CELL.

No. 514,845.

Patented Feb. 13, 1894.

Fig. 1.

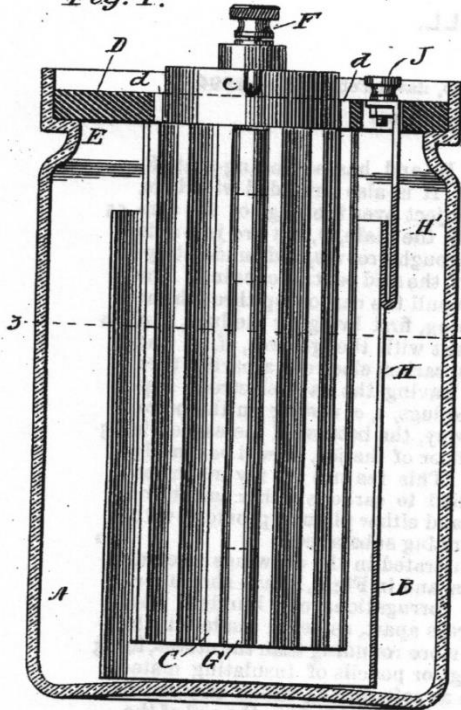


Fig. 2.

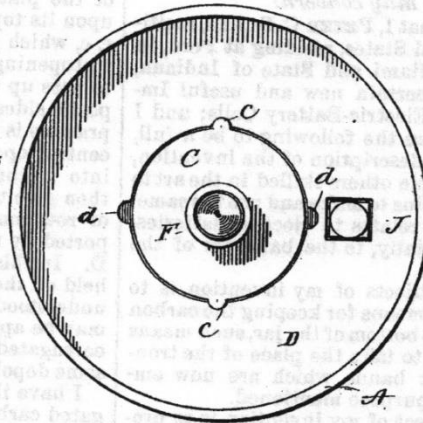
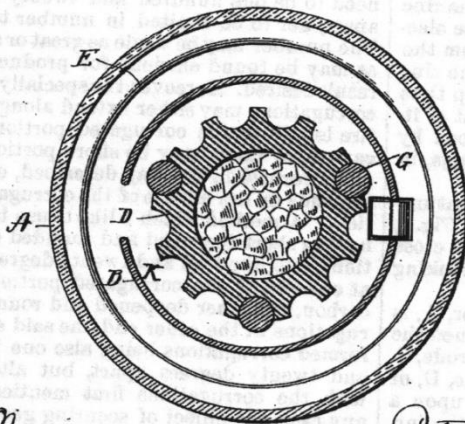


Fig. 3.



WITNESSES:

Frank S. Ober
C. L. Becker

INVENTOR,

Peter C. Burns,

BY

C. H. Stockbridge
his ATTORNEY.

THE NATIONAL LITHOGRAPHING COMPANY,
WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

PETER C. BURNS, OF PERU, INDIANA.

ELECTRIC-BATTERY CELL.

SPECIFICATION forming part of Letters Patent No. 514,845, dated February 13, 1894.

Application filed June 12, 1893. Serial No. 477,395. (No model.)

To all whom it may concern:

Be it known that I, PETER C. BURNS, a citizen of the United States, residing at Peru, in the county of Miami and State of Indiana, have invented certain new and useful Improvements in Electric-Battery Cells; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to electric batteries, and, more especially, to the batteries of the zinc carbon type.

One of the objects of my invention is to provide simple means for keeping the carbon electrode off the bottom of the jar, such means being designed to take the place of the troublesome rubber bands which are now employed for the purpose mentioned.

A second object of my invention is to provide means whereby the carbon and the zinc may be readily insulated from each other within the cell, without resort to the rubber bands now very generally employed for securing the insulation.

Another detail of my invention concerns itself with furnishing a substitute for the ordinary zinc binding-post, such substitute being formed by cutting out a piece of the zinc electrode itself, and attaching it to the electrode, and forming the binding-post from the cut away portion, or else in slitting the zinc electrode, and then turning up the strip thus formed, and making a binding-post out of it. My invention will be fully understood by referring to the accompanying drawings, in which—

Figure 1, is a vertical section of a battery jar or cell, embodying my invention. Fig. 2, is a plan of the same; and Fig. 3, is a cross section along the line 3—3, in Fig. 1, looking upward.

Referring to the drawings by letter, A, is a battery jar, within which are contained the zinc electrode, B, and the carbon electrode, C. At the top of the jar is shown a plate, D, of porcelain, which is adapted to rest upon a ledge, E, formed within the mouth of the jar. The plate, D, practically forms a cover for the jar, and through it project the binding-posts for the two elements of the cell. The carbon element passes up through the middle

of the plate D, and has a binding-post, F, upon its top. It is also provided with lugs, c, c, which project over the edge of the central opening in the plate, D, but are just able to pass up through grooves, d, d, made at opposite sides of the said central opening. The practice is to pull the carbon up through the central opening, first bringing the lugs, c, c, into alignment with the grooves, d, d, and then give the carbon electrode a partial turn or rotation, leaving the said electrode supported by the lugs, c, c, resting on the plate, D. In this way, the bottom of the carbon is held off the floor of the jar, as will be readily understood. This feature of my invention may be applied to carbons either smooth or corrugated, and either plain or provided with some depolarizing substance.

I have illustrated in the drawings a corrugated carbon, and in Fig. 3, I have shown certain of the corrugations, one hundred and twenty degrees apart, as being made a little deeper and more rounding than the others, to receive plugs or pencils of insulating material G, such as soft rubber, which may be inserted either by pushing in from the end of the corrugations, or pressing in from the sides. The corrugations formed as described do not need to be one hundred and twenty degrees apart, nor to be limited in number to three. The number may be made as great or as small as may be found efficient for producing the result desired. Moreover, the specially formed corrugations may either extend along the entire length of the corrugated portion of the carbon, or there may be short portions, specially formed in the way described, either at the ends or the middle of the corrugated portion. A method which I like to use is that of having short deepened and rounded corrugations, one hundred and twenty degrees apart at one end of the corrugated portion of the carbon, and other deepened and rounded corrugations at the other end, the said specially formed corrugations being also one hundred and twenty degrees apart, but alternating with the corrugations first mentioned. In any case, the object of securing good insulation between the carbon and the zinc is the main object sought, and any arrangement which accomplishes this is sufficient for my purpose.

At H, in Fig. 1, is an opening in the zinc, B, where a strip of the zinc has been cut and turned up, the turned-up portion being shown at H'. At the top, the said turned-up portion, H', is bent, so as to form a horizontal seat for a binding-screw, J. The portion, H', being thin, I reinforce it by placing an angular nut under the bent-over portion at the top, letting the said nut, or one of its sides, rest against the vertical part of the strip, H', and then screwing in the binding-screw, J, while the nut is in its place. In this way, a simple binding device is formed on the zinc element, a strip of the said element itself being the principal portion of the said binding device. The cutting away of a small strip of the zinc does not affect injuriously the action of the battery cell, the portion so taken being inconsiderable. Instead of turning the cut strip upward, and so forming the binding-post, I may cut the strip entirely off and rivet it, or otherwise secure it, to the top of the zinc element, the construction in other respects being the same as that already detailed.

It will be seen that I have shown in Fig. 3, a hollow carbon, filled with a depolarizer K, such as coke, ground carbon, or manganese. It is, of course, a matter of indifference, so far as my present invention is concerned, whether the carbon is hollow or solid. It is, in fact, also indifferent whether the carbon is corrugated around its entire surface, the only essential being that there should be certain indentations or depressions (whether properly called corrugations or not) in which the plugs or pencils of insulating material may be inserted.

It will be understood that the grooves or depressions in the carbon element need not be in the form of corrugations; they may be simply holes adapted to be filled with plugs or pencils which will project beyond the outer surface of the carbon element.

What I claim is—

1. In an electric battery cell, a carbon element having grooves or depressions in which are plugs or pencils of insulating material projecting beyond the surface of the said carbon element, as and for the purpose set forth. 50

2. In an electric battery cell, a carbon element, and a zinc element surrounding the same, the said carbon element being provided with grooves or depressions in which are plugs or pencils of insulating material projecting beyond the surface of the said carbon element, as and for the purpose set forth. 55

3. In an electric battery cell, a zinc element, and a carbon element within the same, the said carbon element being corrugated longitudinally and having certain corrugations, or parts thereof, formed deep and rounding, the said deepened and rounded corrugations having in them plugs or pencils of insulating material, as and for the purpose set forth. 65

4. In an electric battery cell, a carbon element provided with grooves or depressions, and soft rubber plugs in the said grooves or depressions, the said plugs projecting beyond the surface of the carbon element, as and for the purpose set forth. 70

5. In an electric battery cell, a zinc element having a strip cut away, the said strip being attached to the said zinc element, and being bent over at the top and re-inforced by an angular nut, the said bent-over and re-inforced portion being traversed by a binding-screw, the said binding-screw being supported solely, by the said bent-over portion and the re-inforcing nut, as and for the purpose set forth. 80

In testimony whereof I have signed my name, in the presence of two witnesses, this 6th day of June, A. D. 1893.

PETER C. BURNS.

Witnesses:

HARRY C. MCKINLEY,
BEN. J. TURPIN.

112 - Vintage Advertisements

This chapter is devoted to battery ads from the late 1800's to the early 1900's. Some are self-explanatory, while others require a caption.

For example, the ad, left, is from a Sears Roebuck catalog circa 1900



Q



THE LAW BATTERY



SIZE OVER ALL, 7 1/2 x 4 1/2 INCHES.
PATENTED.
THE BEST OPEN CIRCUIT BATTERY
 in every respect, without any question.
SUPPLANTING ALL OTHERS!
 With its introduction, Battery Trouble and Battery Expense became things of the past. As a **TELEPHONE BATTERY**, the LAW unquestionably exceeds all others. Now almost universally used by the Telephone Exchanges of the whole country.
 The materials used in its construction are the very best. No acids. No salts. Great responsive power. Nothing to move except the zinc and an atmosphere of hydrogen, oxygen or pure air. Fits the standard size battery box.
 Send for Circular and Schedule of Prices, Single Cells, \$1.25.
 Manufactured and for sale by the **LAW TELEGRAPH COMPANY**
 140 Fulton Street, New York.
 WILHELM A. CHILDS, Manager.
 FRANK BEAN, Engineer.

The LAW Battery

responds dependably at all times and under all conditions. It is the kind of battery that functions when you want it to and does not lay down on you when you need it most. It will stand long and hard usage in Radio or Auto service.

Response



\$13.50 up
William Law Co.
 COR. ABORN and SADIN STS.
 Established 1913



The New Medical Battery.

The Earth-Magneto. **THE BEST OF ALL ELECTRICAL DISCOVERIES!**
INDORSED BY PHYSICIANS, ELECTRICIANS AND SCIENTISTS.



The Earth-Magneto combines the most essential forms of electricity known in Electro-Therapeutics, viz.:

THE STATIC-MAGNETIC-GALVANIC.
 Can be used by the most nervous or sensitive man, woman, or child.
IT GIVES NO SHOCK OR SENSATION.

The Earth-Magneto will permanently cure all forms of Nervous Diseases, Gout, Dyspepsia, Constipation, Rheumatism, Neuralgia, Sciatica, Insomnia or Sleeplessness, Melancholia, Paralysis, Lumbago, Pains in the Back or Limbs, and Kidney, Bladder or Liver Complaints, Headaches, Nervousness, Female Complaints, Wasting Diseases, etc., etc.

The Earth-Magneto Medical Battery Co.,
 19 Union Square, West, New York.



Supplies For Battery Radios



CRUSADER RADIO BATTERIES

Crusader Radio Batteries are suitable for all battery operated sets. Crusader Batteries will render long and dependable service being designed especially for radio operation.

- NO. N-6-AR11** Crusader Battery 6 volt 80 amp. hours.....**\$11.75**
NO. N-6-AR13 Crusader Battery 6 volt 100 amp. hours.....**\$13.20**



PHILCO GLASS BATTERIES

Philco glass case "A" batteries are designed for Philco Socket Power units and for trickle charger use. They are well made, spray proof, have a large solution space, and thick rugged plates.

- NO. U. D. 44** Philco Battery (4 volts for small sets).....**\$ 7.50**
NO. U. D. 86 Philco Battery (6 volts for sets of six tubes or less).....**12.50**
NO. U. D. 96 Philco Battery (6 volts for sets of six tubes or more).....**13.90**



PHILCOTRON REPLACEMENT CELLS



NO. K-463 "AA" Philcotron...**\$4.00**



NO. K-458 "A" Philcotron...**\$3.00**



NO. K-457 "B" Philcotron...**\$1.00**

HAFNER HYDROMETERS

Hafner Hydrometers come in two styles, the regular and the drip-proof. Both are of the best quality.

- NO. 75** Hafner Hydrometer, regular.....**\$.75**
NO. 150 Hafner Hydrometer, "Drip-Pruf".....**1.00**



"Everything for the Radio Dealer"

Note: No. K-463 is the Philcotron battery seen in Chapter 41.



THE MYSTIC.
A PORTABLE FARADIC BATTERY.
GENUINE ELECTRICITY.
NO HUMBUG!

Full directions accompany each battery. Can be carried about without spilling battery fluid.
Size of Machine, in fine wood box, $4\frac{1}{2} \times 4\frac{1}{2} \times 5\frac{1}{2}$ high.
All metal parts nickel-plated.
Will be delivered free to any part of the U. S. for \$3.50, by

F. G. OTTO & SONS,
345 Fourth Avenue, New York.
SURGICAL INSTRUMENTS, ELASTIC STOCKINGS, &c., &c.

TRY THEM.

Pat. Aug. 11, 1888. F. G. Otto & Sons, Sole Agents.

“Hey, Dad!
THE CAR WON’T START”



**WHEN IT'S AN
Exide
YOU START**

BATTERY WAGON? Better have a standard type in a battery. Decided to get one of them and message. Look for the recent Exide. They will give you top-notch service. And don't forget, if you need a new battery, Exide has the same margin of profit that gives their owners value in return of the one standard set by the Society of Automobile Engineers. Prices below in Advance.

THE EASTERN STORAGE BATTERY COMPANY, Philadelphia
The World's Largest Manufacturer of Storage Batteries of Every Type
East Avenue at Locust, Philadelphia

WHEN IT'S AN EXIDE YOU START

The Standard Magazine



After this—a Philco!



LONGEST LIFE IN HISTORY

PHILCO DIAMOND GRID BATTERIES

PHILCO BATTERIES

S.O.S.
TRADE MARK REGISTERED

FARM LIGHT BATTERIES

**NEW AND GREATER
S. O. S.
FARM LIGHT BATTERIES
YOU WANT A RELIABLE QUALITY PRODUCT!**

Our new S. O. S. "P" type Farm Light Batteries include new white PORCELAIN COVERS—PLATES SUSPENDED FROM THE COVER—LARGE ACID SPACE—NO CHANCE FOR SHORT CIRCUITS FROM ACCUMULATIONS IN THE BOTTOM OF JAR.

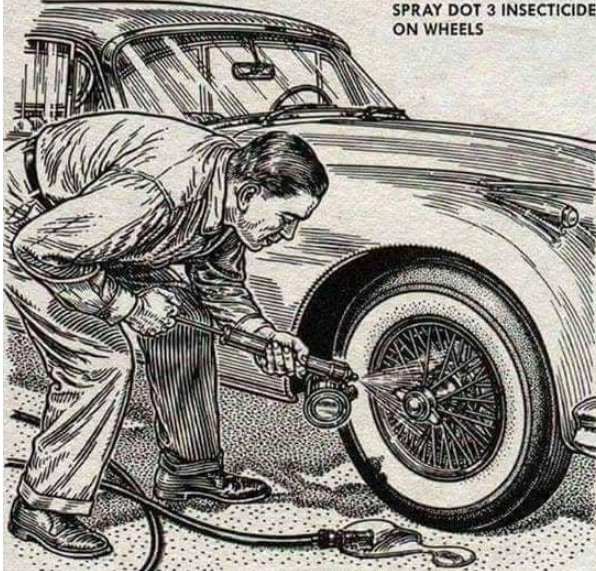
S. O. S. Batteries proven best by years of service!
New Distributors' Contract on Auto, Radio and Farm Lighting Batteries ready!

— WRITE TODAY —
S. O. S. are the
ONE QUALITY batteries
BEST — BAR NONE!

Victor Storage Battery Co.
Rock Island, Illinois
ESTABLISHED 1914

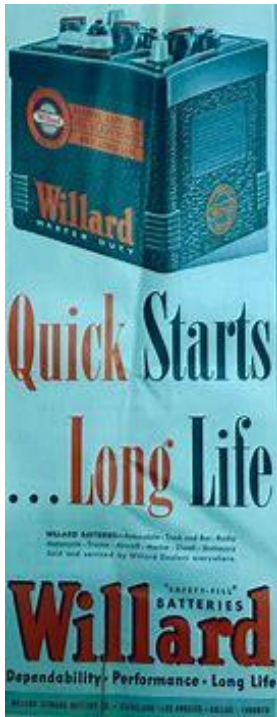



SPRAY DOT 3 INSECTICIDE
ON WHEELS



RINSE WITH HOSE

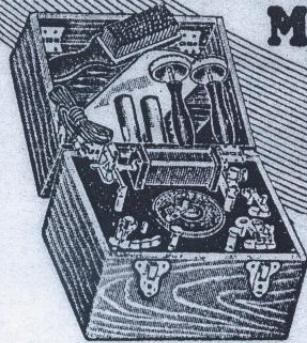
Wheels can be thrown out of balance by a buildup of wheel ants. Protect your car's smooth ride with weekly applications of automotive grade insecticide.



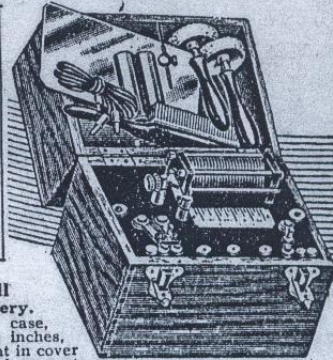
The Wheel Ants insecticide ranks right up there with paying to have your tires de-stoned. The consumer constantly has to be aware of scams.



MEDICAL BATTERIES

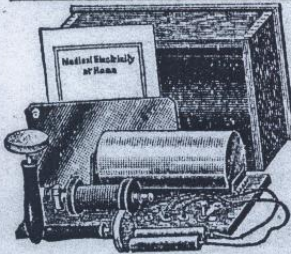


Medical Batteries are in extensive use for the relief of certain diseases and disorders. Their advocates are enthusiastic over the possibilities for relief resulting from the proper use of these machines. We advise consultation with a physician before placing an order, so that the purchaser may be sure to order the particular machine best suited to the purpose for which it is to be used. We guarantee these appliances to be high grade in every respect.




Triple Cell Medical Battery.
Polished oak case, about 9 3/4 x 7 1/4 x 8 1/4 inches. Three dry cells. Faradic coil, 1 1/4 inches in diameter. Circular carbon rheostat regulates current. Four-point switch permits one cell, two cells or three cells to be used at a time. Wheel rheotome for interrupted current, adjustable for slow or rapid interruptions. Metal parts all nickel plated. One pair conducting cords with tips, pair insulating wooden handles, pair nickel plated metal handles, pair sponge electrodes, one nickel plated foot plate, hair brush and an instruction pamphlet included. Otherwise same as 6L9105. Shipping wt., 20 lbs.
6L9110 1/4—Complete with accessories and three dry cells.

Double Cell Medical Battery.
Polished oak case, about 8 3/4 x 6 1/4 x 8 inches, with compartment in cover for accessories and compartment in base for two dry cells. Faradic coil, 1 1/4 inches in diameter, with locknut, spring vibrator and adjustable ball attachment for slow vibration. Intensity of current regulated by withdrawing shield. Three-point switch. Pole changer for changing the polarity or direction of the current. Metal parts all nickel plated. One pair conducting cords with tips, pair insulating wooden handles, pair nickel plated metal handles, pair sponge electrodes, nickel plated foot plate, hair brush and instruction pamphlet included. Shipping wt., 13 lbs.
6L9105—Complete with accessories and two dry cells. **\$9.15**
For extra batteries see 6L8635 on page 813.



\$13.55

Single Cell Medical Battery.
Polished oak case, about 10 x 6 1/4 x 5 inches, opening top and bottom. Lower compartment for dry cell and battery mechanism, upper compartment for accessories. Faradic coil, 1 1/4 inch in diameter, with locking device and spring vibrator. Intensity of current regulated from mild to strong by withdrawing shield from core of coil. Metal parts nickel plated. One pair conducting cords with tips, one pair insulating wooden handles, pair nickel plated metal handles, pair sponge electrodes, nickel plated foot plate and an instruction pamphlet included. Shipping weight, 7 1/4 pounds.
6L9100—Complete with accessories and one dry cell. **\$5.80**



Universal Batteries
FOR
AUTOMOBILE
Ignition and Lighting
GIVE SATISFACTION

Agents wanted in every state
MANUFACTURED BY
Universal Electric Storage Battery Co.
301-9 North Paulina Street — — — CHICAGO, ILL.

UNIVERSAL BATTERIES

The heart of every good starting and lighting system

UNIVERSAL BATTERIES are built to meet: to give long life and maximum efficiency

Chicago, Georgia, Cleveland, Service Station and Street Motor, write for special literature.

Universal Battery Co.
301-9 North Paulina St.
Chicago, Ill.

Universal Battery Co.
Chicago

Portable Electro-Medical Batteries.

These magnetic instruments are of undoubted value as the instruments through whose agency physicians effected almost miraculous cures. Our most learned doctors and physicians acknowledge their efficiency in even the worst cases of paralysis, rheumatism, neuralgia, and in fact, all nervous diseases. These machines may be used by all invalids with perfect safety. When doctors fail to effect a cure with drugs and medicines, and electricity is resorted to in the last stage of disease, even then, under such immense disadvantages, electricity often cures.

24175 Gaiffe's Battery, three currents, with silk covered conducting cords, two insulated handles, one metallic brush, one olive shaped exciter, one spherical exciter and one vial of bisulphate of mercury. In polished mahogany case, 7 1/2 x 4 1/2 x 1 1/2 in. Complete, with full directions. Weight, 1 1/4 lbs. \$7.75

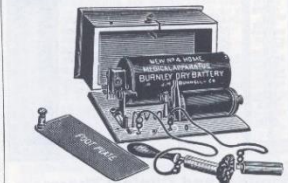
24176 Gaiffe's Battery, with same size coil as in preceding, producing two currents instead of three. Mounted in single cover mahogany case, 6 1/2 x 4 1/2 x 1 1/2 inches, containing two insulated handles and one vial bisulphate of mercury. Weight, 1 pound. Each.....\$6.25



24177 The Crown Family Battery. The merits of this battery will be easily appreciated as possessing neatness of design and simplicity of operating. A pleasant and uniform electric current, both mild and powerful. Three different and distinct currents are produced—the primary, secondary, and both combined in intensity. Mounted in polished cherry case with nickel handles. Size, 6 1/2 x 5 1/2 x 3 1/2 inches, with full directions for using. Highly recommended. Weight, 2 1/4 lbs. Price, complete.....\$3.50



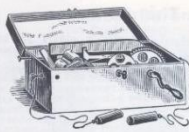
24178 Alpha Paradio Family Medical Battery, constructed upon improved scientific principles and designed for private or professional use. Full description of apparatus, directions for operating and directions for making solution furnished with each instrument. Weight, 3 1/4 lbs. Each.....\$5.00



24179 The New Home Electro-Medical Apparatus, with dry battery. This battery is the most convenient and reliable of any hundreds of forms ever introduced. It is reliable, because with its dry battery so much less care is necessary to avoid getting it out of order than is required with any other known form. The entire absence of acids, liquids or salts will be appreciated by any one who has ever had occasion to use a medical battery. The appliance furnished with the apparatus consists of foot-plate, sponge, cords and handles (electrodes). The electrode having a wooden handle is used as a sponge-holder when required. The size of the apparatus is 3 1/4 x 5 1/2 x 8 1/2 inches. Weight, 4 pounds. Price, complete.....\$7.00 Extra battery, per cell \$0.72 Extra Sponge Holder .50 Extra Handles, pair... .75 Extra Metallic Hair Brush, electrode..... 1.25 Extra Cords, 4 feet, per pair..... .50

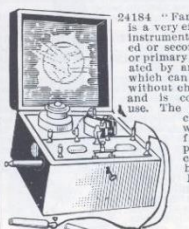


24180 The Genuine Smith & Shaw Portable Pocket Battery. Powerful current. The most practicable and thorough pocket battery made. Cells cannot spill contents. Price, with two cells (weight, 1 1/4 lb)... \$8.50 Price, with three cells (weight, 2 lbs)...\$10.00



Magnetic Electro Battery.

24182 Davis & Kidder's Genuine Magneto-Electric Machines. Price, each, \$7.25 Weight, 6 1/2 lbs.



24184 "Family" Battery. This is a very effective and portable instrument, produces the induced or secondary, and the direct or primary current, and is operated by an open battery which can be used for months without changing the solution and is constantly ready for use. The power may be increased by gradually withdrawing the tube from the helix. In polished black walnut case with cords and handles; weight, 4 lbs. Each.....\$10.00

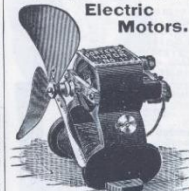
Medical Battery Parts.

- Order No. 24185 and be sure to specify what battery the parts are for. Each.
- Zincs for the Crown Family Battery..... \$0.20
 - Carbons for same..... .25
 - Glass Jars for same..... .25
 - Tops complete for same, zinc and carbon attached..... .65
 - Zincs for the Alpha Battery..... .25
 - Carbons for same..... .25
 - Glass Jars for same..... .25
 - Clamps for same..... .18
 - Postage on pair zincs..... 1.00
 - Platins for same..... .25
 - Clamps for same..... .50
 - Cords for same..... .25
 - Glass Jars for same..... .25
 - Metal Springs for Magnetic Battery..... .10
 - Cord belt for same..... .05
 - Bisulphate Mercury for use with batteries Nos. 24175, 24176 and 24180 per ounce..... .10
 - Price, per 1 lb. bottle..... .75
 - Price, per 1/2 lb. bottle..... 1.25
 - Bichromate Potassium for use with batteries, Nos. 24177 and 24178. Per lb..... .35

Medical Induction Coil, Without Battery.

24186 Induction Coil, mounted on neat wooden stand with pair of hand electrodes and sponge holder of best quality. Can be operated with any acid battery. Price, without battery..... \$3.50

24187 Same as above, complete with dry battery cell, ready for use. Weight, 3 1/2 pounds..... 4.00



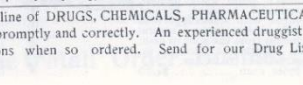
Electric Motors.

The Porter Electric Motor, a practical machine for a little money. An entirely novel principle underlies the construction both electrically and mechanically, insuring simplicity, low cost, reduced size, diminished weight, higher speed and wonderful economy in power required to operate them.

24190 The No. 1 Motor, although a very small one in size, is highly efficient. With one

cell of acid battery it will operate a small dental lathe, a fan, a revolving window stand, an egg beater, a music-box, etc. It is no toy. Its electrical efficiency is about 1/2 horse power, or from 35 to 40 watts on a continuous run. No better motor can be furnished to meet the wishes of young students engaged in the study of experimental physics. Its efficiency will surprise the user. Weight, 1 1/4 pounds. Price, each.....\$2.00

24191 The No. 2 Motor, same construction as above, but larger size, weighing 3 pounds and capacity of 1/4 horse power. Price..... 4.75



WE CARRY IN STOCK a full line of DRUGS, CHEMICALS, PHARMACEUTICAL PREPARATIONS, Etc., Etc., and can fill orders promptly and correctly. An experienced druggist is in charge, and he will compound prescriptions when so ordered. Send for our Drug List. Mailed free.

18.00
35.00
24218.

Gas Engine Manufacturers



find distinct advantages in Universal Storage Batteries in sealed glass jars because they are shipped from the factory fully charged and ready to go into immediate service. They are specially adapted for use in connection with farm lighting plants, for which there is now a large demand. The addition of our lighting plant to your present list would increase the sale of your engine through your dealers.

Reliable service and long life assured. Our Prices will please you. Write us today and let us show you the new field of demand for your gas engine.

Representatives in all parts of the country. Write today for catalog and price.

Universal Battery Co.
2448 South La Salle Street, Chicago

We Set the Standard

The Gordon Cell

THE GORDON CELL BATTERY COMPANY
19 South La Salle Street, Chicago

100,000 Car Owners Last Year Replaced Their Original Batteries With the Vesta

EVERY car owner who installed a Vesta Battery in the car last year did so because he was convinced that the Vesta was a better battery than the one he had.

And here is what he, that most Vesta Battery of all the hundreds of thousands he saw last year brought in would have said when he replaced the one he had with a Vesta.

It is this performance constantly gaining strength, that has caused the Vesta to show an increased business year after year, even in 1931, when the demand for Vesta Batteries was greater than in 1930, because even last.

The fact that the Vesta Battery "costs less per month of service" is due to its exclusive and patented construction features, namely, Vesta Insulators and Insulating Mass which prevent the various sorts of short-circuiting that would speed deterioration in storage batteries.

Backed up by the quality of the Vesta Battery are 1,300 Vesta service stations distributed over the United States, operating under the National Vesta Club, and representing splendid service and repairs on all makes of batteries.

VESTA BATTERY CORPORATION
CHICAGO



VESTA
STORAGE BATTERY
Costs Less Per Month of Service



Quick Starts
... **Long Life**

WILLARD BATTERIES—Automotive, Truck and Bus, Radio, Marine, Marine, Aircraft, Marine, Diesel, Battery, and all other types, available by Willard Electric everywhere.

WILLARD BATTERIES
Dependability • Performance • Long Life

Every Detail of Construction of the

EDISON ALKALINE STORAGE BATTERY

is an argument in favor of its universal adoption in

Wireless Installations

Steel Container—Unbreakable.
Potash Electrolyte—Preserves metal and produces no obnoxious or injurious fumes.
Steel Grids and Pockets—Unaffected by extreme vibration. **Reliable even after a collision.**
Connectors—Copper wire in lugs over tapered poles. **Perfect electrical connection** without "lead burning."

The Edison Storage Battery may, **without harm**, be short circuited, charged in the reverse direction, left standing idle indefinitely either charged or discharged, charged at rates several times normal and at any time regardless of the state of charge.

The Edison Storage Battery is guaranteed to be capable of developing **100 per cent** capacity at the end of **four years**.

EDISON STORAGE BATTERY CO.
213 Lakeside Avenue Orange, N. J.

Gordon Battery



For IGNITION.

Guaranteed Long Life and Efficiency Insures Economy and Reliability.

ASK FOR CATALOGUE.

GORDON BATTERY CO.,

429-445 East 144th St., NEW YORK, N. Y.

C.A.V. ACKNOWLEDGED

The **World's Best Battery** for **CARS & RADIO**

SERVICED THROUGHOUT THE COUNTRY

Another Amazing Battery Development...

THE "DOUGHNUT" BATTERY...
The all around battery with a hole

1. The Doughnut Battery is made of...
2. It is made of...
3. It is made of...
4. It is made of...
5. It is made of...
6. It is made of...

THE BATTERY MANUFACTURING COMPANY, 100 N. 10th Street, PHOENIX, ARIZONA

YOU CAN HAVE ELECTRIC COMFORTS IN EVERY ROOM OF YOUR HOME

The question is not, can you afford to have Electric Lighting?—but, can you afford not to have it?

Can you afford to work by torch, or three days of labor, changing when the need arises, for dark passages and changes of adjustment?

Can you afford to run for miles from all lamps and other electrical lighting fixtures?

Can you afford to be woken and the girls to work that electricity will not change from being?

Edison Electric Light may be had in any home, no matter how far from electric light company lines, if you have a plant equipped with the

EDISON STORAGE BATTERY FOR HOME LIGHTING

You can specify and secure the Edison Storage Battery with any reliable home lighting plant, including the kind that starts and stops automatically—or you can buy the complete plant from us.

Why It Pays to Specify "EDISON"

A battery lighting plant is desirable for its convenience and safety, and for its economy and reliability. The Edison Storage Battery has been proved by the most exact tests to be the most reliable and economical of all. It is the only battery that will give you the most light for the least money, and it will give you the most light for the least money, and it will give you the most light for the least money.

Mr. Clinton's Work Experience

Mr. Clinton's work experience is a record of success in the use of the Edison Storage Battery. He has used it for years in his home, and he has used it in his business, and he has used it in his work.

CUT THIS OUT AND MAIL TODAY

Edison Storage Battery Co., Orange, N. J.
 1000 S. Michigan Ave., Chicago
 Edison Storage Battery Co., Orange, N. J.
 Edison Storage Battery Co., Orange, N. J.

EDISON STORAGE BATTERY CO.
 Factory and Main Office, ORANGE, N. J.
 Hamilton Branch

DR. SCOTT'S ELECTRIC FLESH BRUSH.



IT CURES
Rheumatism, Sciatica, Gout, Nervous Debility,
Lumbago, Neuralgia, Toothache, Malarial
Lameness, all Pains and Aches resulting from
Colds, Impure Blood, and Impaired Circulation.
It acts quickly in Stomach, Liver, and Kidney
Troubles, and is a valuable assistant in their
Treatment. It quickly Removes those "Back
Aches" peculiar to LADIES.

WILLIAM C. NEFF,
 MANUFACTURER OF
ELECTRO-MAGNETIC MACHINES,
PHILADELPHIA.

These Machines are used by our best physicians in their practice, and by many families without the aid of a physician. They can be managed by following the directions accompanying the machine, being self-acting in their operation.

By Royal Letters Patent.

THE GREAT HEALTH RESTORER.

DR. LOWDER'S

PATENT MAGNETO-ELECTRIC BATTERY MEDICAL

STOP TAKING MEDICINE, AND TRY

Patent's Own Remedy - Electricity!




PRICE FIVE SHILLINGS EACH.

Most complaints effectively cured by Dr. Lowder's Battery.

Rugged as a...



Powerful as a... Long lived as a...



DELCO
BATTERIES
A QUALITY PRODUCT
BY DELCO-REMY



DELCO BATTERY

POWER

THE EDWARD P. ALLIS COMPANY,
MILWAUKEE, WIS.

Manufacturers of



Blowing Engines, Hoisting Engines, Pumping Engines,
Air Compressors, Special Engines for Cutting Light-
ing, Street Railways and Hoisting Mills, Ore Crushers,
Crushing Rolls, Stamp Mills, Concentrators, General
Mining, Milling and Smelting Machinery.

RETAINS PATENT ELECTRICAL MACHINES,
REPAIRS MARINE ENGINES.

FRICK COMPANY
ESTABLISHED 1854

Eclipse Corliss Engines,
SIMPLE, CONDENSING AND COMPOUND.



High Speed Automatic Engines,
and Ice Making and Refrigerating Machinery.

FRICK COMPANY, ENGINEERS,
Wagonersburg, Franklin Co., Pa., U. S. A.

THE DICKSON MANUFACTURING CO.,
Scranton, Pa., Wilkesbarre, Pa.

Cable Machinery and all kinds of
STATIONARY ENGINES,
Including the Dickson Corliss, Van Hook Triple and
Quadruple Expansion, Blast Furnace Hoisting
and Pumping Engines.

Also Boilers of all Descriptions.
GENERAL OFFICE, SCRANTON, PA.

NOYE AUTOMATIC ENGINES, GEARED BOILER FEED PUMP.



0 to 500 H. P.

Simple, Compact,
Reliable, Perfect,
Inexpensive Economy.

Also
General
Boiler
Feed
Pumps
and
all
kinds
of
Machinery
and
Boilers.

THE JOHN T. NOYE MFG. CO.,
BUFFALO, N. Y.

THE ELECTRIC STORAGE BATTERY CO.

ELECTRIC VEHICLE SERVICE



Where all well equipped, the real question that indicates the choice of an Electric Storage Battery, is not that made in SERVICE. And service from the "Edison" is inseparable associated with the battery.

After such the completion of the electric vehicle industry, we have been concentrating our efforts on supplying a battery service to exactly perfect in feature, efficiency and in permanent use position.

Actually, we have developed the "EAGLE" GROUP of vehicles, batteries, composed of the "Treadle-Edis", "Edis-Edis", the "Wagon-Edis", and the "Truck-Edis" batteries, each of which is made to meet vehicle use.

As requirements of commercial and pleasure electric vehicles.

These batteries give more miles with less expense, and less attention than any other battery made. Their economy of service is also greater. They are especially recommended for delivery, oil engine and motor cars, and also for other starting heavy loads.

And to back of it all stands the experience, the history and success of the oldest and largest battery manufacturer.

Electric Cars, Trucks, and "Edison" Trolleys, and light, heavy and all other applications. "EAGLE" series is really superior groups and reliable vehicles.

THE ELECTRIC STORAGE BATTERY CO.
PHILADELPHIA 1912

1834
1884
1894
1904
1912

Use the "EAGLE" Battery for Gas Car Starting, Electric Lighting, or Ignition.

READ WHAT THE LADIES SAY:

The attention of Ladies is directed to the following VERY SATISFACTORY CASES, which are worthy of the investigation by all who suffer from those DISINGULARITIES peculiar to the Sex:—

J. HAWKEY, 16, Matilda-street, Barnsbury, London, N., April 21, 1883:—"I have received great benefit since wearing ELECTROPATHIC BELT. Wearing it has improved my health very much. I fail to express in words the satisfaction it gives me. I have not felt so well for years as I have since wearing your Belt. I have been under the care of a physician for six months, suffering from all the irregularities incidental to debility and bad circulation, and I am now despairing of ever feeling well again, when I was recommended your ELECTROPATHIC BELT. I cannot say enough in favour of it, but I shall be glad to communicate with any lady who would like further particulars of my case."

INTERNAL WEAKNESS.

L. HUDSON, Twyford, Derby, writes, March 20, 1883:—"Seven months ago I purchased one of your ELECTROPATHIC BELTS. I need not describe the benefits to me here, but refer you to my letter of June 17, 1882, No. 3144. I have worn the Belt every day since that time, and it has been an unalloyed comfort to me. I would not have been able to do my work without it, and cannot say enough in favour of your Belt. I regret is they are not better known. I shall be glad to write to any lady who may wish to hear more of the benefits respecting my case, and shall certainly send you my name and address to your appliances to my friends."

IMPORTANT TO INVALIDS.

Consulting Electrician and Member of the Electrical Association, who has the application of Electricity to the Cure of Disease as a specialty, attends daily (consultation personally or by letter) at the PRIVATE CONSULTATION - ROOMS, 52, OXFORD STREET, LONDON, W. A very experienced Lady is also in attendance.

Persons at a distance should apply for a Private Advice Form, which will be sent free.



READ WHAT

Dr. ANDREW WILKS observes that the Belt has been frequently used by a few genuine electrical practitioners with safety and satisfaction at 52, Oxford-street, London. As a Director of the Commission against Quackery it is highly commendable that the development of electrical medicine has been so successfully projected.

entering
Comp
the M
of per
of cap
factur
to be
do no
will t
its m
applic

Please
next

A Hundred-and-thirty-two Page Treatise, copiously illustrated, entitled "ELECTROPATHY; or, HARNESSE'S GUIDE TO HEALTH," post-free.

YOU CAN HAVE ELECTRIC COMFORTS IN EVERY ROOM OF YOUR HOME

The question is not, can you afford to have Electric Lighting?—Just, can you afford not to have it?

Can you afford to work by candle, or three days of false daylight, when the sun sets, and to have matches and candles for electricity?

Can you afford to see the mice hole all holes and other shadow lighting removed?

Can you afford to be another and the globe to work that electricity will light does have being?

Edison Electric Light may be had in any home, no matter how far from electric light company lines, if you have a plant equipped with the

EDISON STORAGE BATTERY FOR HOME LIGHTING

You can specify and secure the Edison Storage Battery with any reliable home lighting plant, including the kind that starts and stops automatically—or you can buy the complete plant from us.

Who It Pays to Specify "EDISON"

A home lighting plant or battery plant, including the Edison Storage Battery, is a permanent investment and a profitable one. Don't take chances. Remember that the Edison Storage Battery has been proved by actual tests to have a longer life than any other battery. It will give you the maximum value of all your lighting plants and will give you the most efficient and economical lighting plant you can have. It will give you the most efficient and economical lighting plant you can have.

Mr. Edison's Book Explains

Get the full story on the Edison Storage Battery and its advantages. It is a book that will give you the full story on the Edison Storage Battery and its advantages. It is a book that will give you the full story on the Edison Storage Battery and its advantages.

CUT THIS OUT AND MAIL TODAY

Edison Storage Battery Co., Orange, N. J.
 2123 S. Michigan Ave., Chicago, Ill.
 40 West 17th Street, New York, N. Y.
 Edison Storage Battery Supply Co., Portland, Me.
 1000 Broadway, New York, N. Y.

EDISON STORAGE BATTERY CO.
 Factory and Main Office, ORANGE, N. J.
 American Franchise

R. V. WAGNER & CO., CHICAGO. 87

FRICITION SPARK TREATMENT.

This cut represents the most convenient way of applying the spark. The patient is seated upon an insulated platform and attached to the positive pole. The sliding electrodes are then separated. The operator uses a ball or roller electrode which is attached to a flexible cord or chain. If a small amount of current is desired, the flexible cord is held by an insulated hook a great distance from the floor or other ground so that all current which passes from the patient to the ball and into the cord must pass through a thick layer of air to reach the ground, the air acting as a rheostat. As it is desired to increase the strength of the spark the cord may be lowered, nearer and nearer the floor, until the full tolerance of the patient is reached. This treatment is principally used for its counter-irritant effect and for the stimulation of the skin and superficial blood vessels, especially valuable in the treatment of eczema and sensory paresthesia.

LIGHTER MOMENTS with fresh Eveready Batteries

"You also know the word is to include a better 'I can see the light'."

Eveready Batteries are the only ones that give you the most efficient and economical lighting plant you can have. They are the only ones that give you the most efficient and economical lighting plant you can have.

EVEREADY

"A Live Kneel in Smoker"

1. A group of people in a room, possibly a classroom or office.

2. A person sitting at a desk, looking at a book.

3. A person standing in a room, possibly a factory or workshop.

The Century Magazine for March 21, 1916

"Exide" service is yours to command

THE original assembly, non-flaming, made high capacity, great engine cranking ability and long life of "EXIDE" Automobile Starting and Lighting Batteries are so distinctive a national guarantee of satisfactory performance on your automobile.

In addition "Exide" service to all parts of the country is especially made by your nearest Exide Service Station, to give you advice and help thus increasing the possibility of trouble arising from almost any Exide battery.

And remember all that "Exide" offers. Here as "Exide" equipped you with the best of modern engine cars, the "Exide" Service Station. For the expert, honest and fair advice in the car. For the expert in getting the most out of your "Exide" battery. For the long life and good service that is built into a battery when you cannot get them you under any obligation.

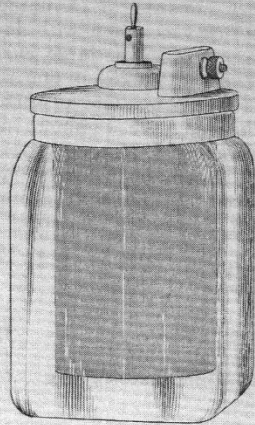
Get of Service Stations together with a set of what we call "Exide" book "A Live Kneel in Smoker" with an engine.

THE ELECTRIC STORAGE BATTERY CO.
 The office and largest manufacturing plant of Exide Batteries is in the country.
 4000 W. 17th Street, Chicago, Ill.

See Your Dealer, Chicago, Washington, Denver, San Francisco, Los Angeles, New York, Philadelphia, St. Louis, St. Paul, Minneapolis, Kansas City, Omaha, Dallas, Houston, Portland, Seattle, San Diego, San Francisco, San Jose, Santa Ana, Santa Monica, Stockton, Sunnyvale, Vallejo, Visalia, Yuba City.

New Peru No. 1 Square Laclede Battery.

Carbon Corrugated on Inside and Slotted.



A perfectly made battery for open circuit work, guaranteed as strong and long-lived as any Sal Ammoniac Battery.

The solution for the square form consists of four ounces of Sal Ammoniac dissolved in one and a half pints of water.

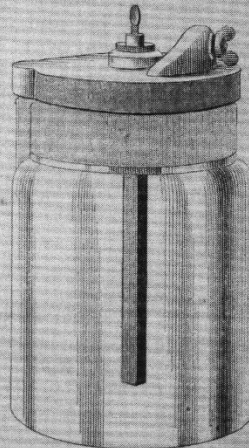
"Abide"--Complete Cell, with Sal Ammoniac.....	\$.35
"Attrite"--Carbon Cylinder.....	.20
"Angur"--Glass Jar.....	.10
"Abaft"--Zinc Rod.....	.05
"Abbot"--Porcelain Insulator.....	.02
"Abash"--Sal Ammoniac.....	.07

New Peru No. 3 Round Laclede Battery.

Made to Fit a Leclanche Jar.

We use in all of our Batteries Carbon made of finest grade of Coke, best quality of Rolled Zincs, Imported Sal Ammoniac.

"Able"--Complete Cell, with Sal Ammoniac.....	\$.35
"Vigor"--Carbon Cylinder.....	.20
"Virile"--Glass Jar.....	.10
"Abaft"--Zinc Rod.....	.05
"Abbot"--Porcelain Insulator.....	.02
"Abash"--Sal Ammoniac.....	.07



DISCOUNTS TO THE TRADE.

In ordering goods please use Trade Word. See page 8. Send for net price list.

New No. 4 Square Laclede Battery.



The Most Popular Form of
Battery Made by Us.
Strong, Long-Lived, Efficient.

BINDING POST WILL NOT RUST OR CORRODE.

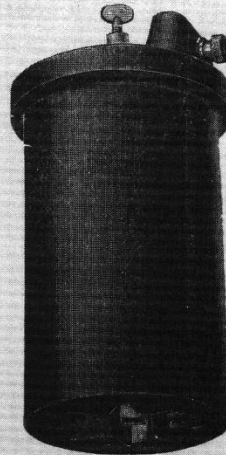
"Acute"--Complete Cell, with Sal	
Ammoniac.....	\$.35
"Value"--Carbon Cylinder.....	.20
"Augur"--Glass Jar.....	.10
"Abaft"--Zinc Rod.....	.05
"Abbot"--Porcelain Insulator.....	.02
"Abash"--Sal Ammoniac.....	.07

New No. 6 Laclede Battery.

Carbon Corrugated Inside.
Compact, Neat, Strong.

Binding Post will Not Rust or Corrode.

The No. 6 Laclede Battery consists of a corrugated cylinder of carbon with opening in top through which the zinc hangs supported by a porcelain insulator. The carbon forms a perfect lid for the battery and prevents evaporation or the climbing of salts.



"Admire"--Complete Cell, with Sal	
Ammoniac.....	\$.35
"Vandyke"--Carbon Cylinder.....	.20
"Augur"--Glass Jar.....	.10
"Abaft"--Zinc Rod.....	.05
"Abbot"--Porcelain Insulator.....	.02
"Abash"--Sal Ammoniac.....	.07

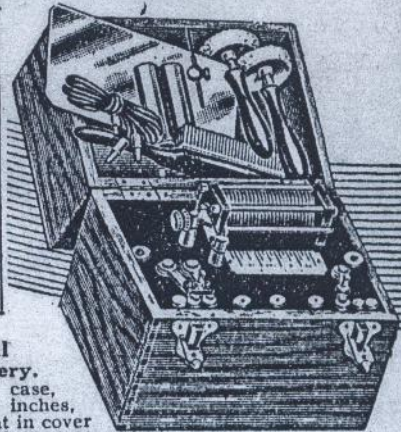
DISCOUNTS TO THE TRADE.

In ordering goods please use Trade Word. See page 8. Send for net price list.

MEDICAL BATTERIES



Medical Batteries are in extensive use for the relief of certain diseases and disorders. Their advocates are enthusiastic over the possibilities for relief resulting from the proper use of these machines. We advise consultation with a physician before placing an order, so that the purchaser may be sure to order the particular machine best suited to the purpose for which it is to be used. We guarantee these appliances to be high grade in every respect.



Triple Cell Medical Battery.

Polished oak case, about $9\frac{3}{4} \times 7\frac{1}{4} \times 8\frac{1}{4}$ inches. Three dry cells. Faradic coil, $1\frac{1}{4}$ inches in diameter. Circular carbon rheostat regulates current. Four-point switch permits one cell, two cells or three cells to be used at a time. Wheel rheotome for interrupted current, adjustable for slow or rapid interruptions. Metal parts all nickel plated. One pair conducting cords with tips, pair insulating wooden handles, pair nickel plated metal handles, pair sponge electrodes, one nickel plated foot plate, hair brush and an instruction pamphlet included. Otherwise same as 6L9105. Shipping wt., 20 lbs.

6L9110 $\frac{1}{4}$ —Complete with accessories and three dry cells.

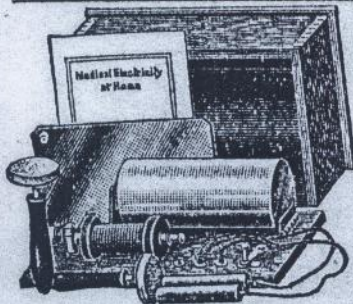
\$13.55

Double Cell Medical Battery.

Polished oak case, about $8\frac{3}{4} \times 6\frac{1}{4} \times 8$ inches, with compartment in cover for accessories and compartment in base for two dry cells. Faradic coil, $1\frac{1}{4}$ inches in diameter, with locknut, spring vibrator and adjustable ball attachment for slow vibration. Intensity of current regulated by withdrawing shield. Three-point switch. Pole changer for changing the polarity or direction of the current. Metal parts all nickel plated. One pair conducting cords with tips, pair insulating wooden handles, pair nickel plated metal handles, pair sponge electrodes, nickel plated foot plate, hair brush and instruction pamphlet included. Shipping wt., 13 lbs.

6L9105—Complete with accessories and two dry cells. **\$9.15**²¹

For extra batteries see 6L8635 on page 813.



Single Cell Medical Battery.

Polished oak case, about $10 \times 6\frac{1}{4} \times 5$ inches, opening top and bottom. Lower compartment for dry cell and battery mechanism, upper compartment for accessories. Faradic coil, $1\frac{1}{16}$ inch in diameter, with locking device and spring vibrator. Intensity of current regulated from mild to strong by withdrawing shield from core of coil. Metal parts nickel plated. One pair conducting cords with tips, one pair insulating wooden handles, pair nickel plated metal handles, pair sponge electrodes, nickel plated foot plate and an instruction pamphlet included. Shipping weight, $7\frac{3}{4}$ pounds.

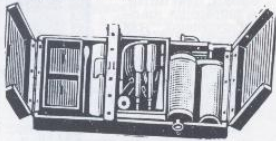
6L9100—Complete with accessories and one dry cell. **\$5.80**

Portable Electro-Medical Batteries.

These magnetic instruments are of undoubted value as the instruments through whose agency physicians effected almost miraculous cures. Our most learned doctors and physicians acknowledge their efficiency in even the worst cases of paralysis, rheumatism, neuralgia, and in fact, all nervous diseases. These machines may be used by all invalids with perfect safety. When doctors fail to effect a cure with drugs and medicines, and electricity is resorted to in the last stage of disease, even then, under such immense disadvantages, electricity often cures.

24175 Gaiffe's Battery, three currents, with silk covered conducting cords, two insulated handles, one metallic brush, one olive shaped exciter, one spherical exciter and one vial of bisulphate of mercury. In polished mahogany case, 7 1/4 x 4 x 1 1/4 in. Complete, with full directions. Weight, 1 1/4 lbs. \$7.75

24176 Gaiffe's Battery, with same size coil as in preceding, producing two currents instead of three. Mounted in single cover mahogany case, 6 1/2 x 4 x 1 1/4 inches, containing two insulated handles and one vial bisulphate of mercury. Weight, 1 pound. Each.....\$6.25



1.35
ow-
ng).
han
han
3.40
4.25
.50
5.00
.80
6.00

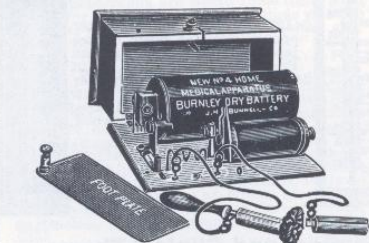
.60
6.25
.75
7.50
.85
8.50

DS.
ustic
ly of
self-
screw
tele-
line 1/2
atest,
work-
phone
ones,
feet
s and
y the
order
\$5.00
o. 18,
ound
\$0.31

118.00
35.00
24218.

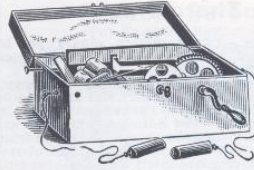
24177 The Crown Family Battery. The merits of this battery will be easily appreciated as possessing neatness of design and simplicity of operating. A pleasant and uniform electric current, both mild and powerful. Three different and distinct currents are produced—the primary, secondary and both combined in intensity. Mounted in polished cherry case with nickel handles. Size, 6 x 5 1/4 x 5 1/4 inches, with full directions for using. Highly recommended. Weight, 2 3/4 lbs. Price, complete.....\$3.50

24178 Alpha Paradic Family Medical Battery, constructed upon improved scientific principles and designed for private or professional use. Full description of apparatus, directions for operating and directions for making solution furnished with each instrument. Weight, 3 1/4 lbs. Each.....\$5.00



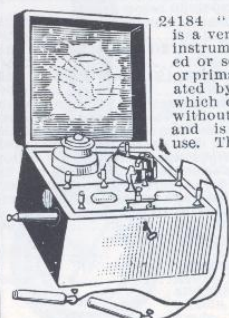
24179 The New Home Electro-Medical Apparatus, with dry battery. This battery is the most convenient and reliable of any hundreds of forms ever introduced. It is reliable, because with its dry battery so much less care is necessary to avoid getting it out of order than is required with any other known form. The entire absence of acids, liquors or salts will be appreciated by any one who has ever had occasion to use a medical battery. The appliance furnished with the apparatus consists of foot-plate, sponge, cords and handles (electrodes). The electrode having a wooden handle is used as a sponge-holder when required. The size of the apparatus is 3 1/4 x 5 x 8 1/4 inches. Weight, 4 pounds. Price, complete....\$7.00 Extra battery, per cell \$0.75 Extra Sponge Holder .50 Extra Handles, pair.. .75 Extra Metallic Hair Brush, electrode..... 1.25 Extra Cords, 4 feet, per pair..... .50

24180 The Genuine Smith & Shaw Portable Pocket Battery. Powerful current. The most practicable and thorough pocket battery made. Cells cannot spill contents. Price, with two cells (weight, 1 1/4 lb)...\$8.50 Price, with three cells (weight, 2 lbs....\$10.00



Magnetic Electro Battery.

24182 Davis & Kidder's Genuine Magneto-Electric Machines. Price, each, \$7.25 Weight, 6 3/4 lbs.



24184 "Family" Battery. This is a very effective and portable instrument, produces the induced or secondary, and the direct or primary current, and is operated by an open battery which can be used for months without changing the solution and is constantly ready for use. The power may be increased by gradually withdrawing the tube from the helix. In polished black walnut case with cords and handles; weight, 8 lbs. Each.....\$10.00

Medical Battery Parts.

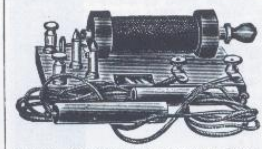
Order No. 24185 and be sure to specify what Battery the parts are for. Each.

Zincs for the Crown Family Battery.....	\$0.20
Carbons for same.....	.25
Glass Jars for same.....	.25
Tops complete for same, zinc and carbon attached.....	.65
Zincs for the Alpha Battery.....	.25
Carbons for same.....	.25
Glass Jars for same.....	.25
Zinc for Family Battery. Per pair.....	.50
Postage on pair zincs.....	.18
Platinas for same.....	1.00
Clamps for same.....	.25
Cords for same. Per pair.....	.50
Glass Jars for same.....	.25
Metal Springs for Magnetic Battery.....	.10
Cord belt for same.....	.05
Bisulphate Mercury for use with batteries Nos. 24175, 24176 and 24180 per ounce.....	.10
Price, per 1/2 lb. bottle.....	.75
Price, per 1 lb. bottle.....	1.25
Bichromate Potassium for use with batteries, Nos. 24177 and 24178. Per lb.....	.35

Medical Induction Coil, Without Battery.

24186 Induction Coil, mounted on neat wooden stand with pair of hand electrodes and sponge holder of best quality. Can be operated with any acid battery. Price, without battery.....\$3.50

24187 Same as above, complete with dry battery cell, ready for use. Weight, 3 1/2 pounds. 4.00

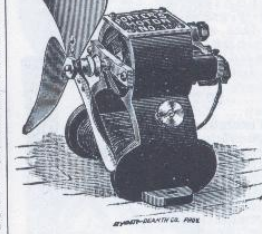


Electric Motors.

The Porter Electric Motor, a practical machine for a little money. An entirely novel principle underlies the construction both electrically and mechanically, insuring simplicity, low cost, reduced size, diminished weight, higher speed and wonderful economy in power required to operate them.


24190 The No. 1 Motor, although a very small one in size, is highly efficient. With one cell of acid battery it will operate a small dental lathe, a fan, a revolving window stand, an egg beater, a music-box, etc. It is no toy. Its electrical efficiency is about 2 1/2 horse power, or from 35 to 40 watts on a continuous run. No better motor can be furnished to meet the wishes of young students engaged in the study of experimental physics. Its efficiency will surprise the user. Weight, 1 3/4 pounds. Price, each.....\$2.90

24191 The No. 2 Motor, same construction as above, but larger size, weighing 3 pounds and capacity of 1/2 horse power. Price..... 4.75



WE CARRY IN STOCK a full line of DRUGS, CHEMICALS, PHARMACEUTICAL PREPARATIONS, Etc., Etc., and can fill orders promptly and correctly. An experienced druggist is in charge, and he will compound prescriptions when so ordered. Send for our Drug List. Mailed free.

Every Detail of Construction of the



EDISON ALKALINE STORAGE BATTERY

is an argument in favor of its universal adoption in

Wireless Installations

Steel Container—Unbreakable.
 Potash Electrolyte—Preserves metal and produces no obnoxious or injurious fumes.
 Steel Grids and Pockets—Unaffected by extreme vibration. **Reliable even after a collision.**
 Connectors—Copper wire in lugs over tapered poles. **Perfect electrical connection** without "lead burning."

The Edison Storage Battery may, **without harm**, be short circuited, charged in the reverse direction, left standing idle indefinitely either charged or discharged, charged at rates several times normal and at any time regardless of the state of charge.

The Edison Storage Battery is guaranteed to be capable of developing **100 per cent** capacity at the end of **four years**.

EDISON STORAGE BATTERY CO.
 213 Lakeside Avenue Orange, N. J.

Gordon Battery



For IGNITION.

Guaranteed Long Life and Efficiency Insures Economy and Reliability.

ASK FOR CATALOGUE.
GORDON BATTERY CO.,
 429-445 East 144th St., NEW YORK, N. Y.



We Set the Standard

The Gordon Cell

Gordon Primary Battery Company
 213 Lakeside Avenue
 Orange, N. J.

THE MYSTIC.
 A PORTABLE FARADIC BATTERY.
GENUINE ELECTRICITY.
NO HUMBUG!

Full directions accompany each battery. Can be carried about without spilling battery fluid.
 Size of Machine, in fine wood box, $4\frac{1}{2} \times 4\frac{1}{2} \times 5\frac{1}{2}$ high.
 All metal parts nickel-plated.
 Will be delivered free to any part of the U. S. for \$3.50, by

F. G. OTTO & SONS,
 345 Fourth Avenue, New York.
 SURGICAL INSTRUMENTS, ELASTIC STOCKINGS, &c., &c.

TRY THEM.



Pat. Aug. 11, 1885. F. G. Otto & Sons, Sole Agents.

DR. SCOTT'S ELECTRIC FLESH BRUSH.



IT CURES
Rheumatism, Sciatica, Gout, Nervous Debility,
Lumbago, Neuralgia, Toothache, Malarial
Lameness, all Pains and Aches resulting from
Colds, Impure Blood, and Impaired Circulation.
 It acts quickly in Stomach, Liver, and Kidney
 Troubles, and is a valuable assistant in their
 Treatment. It quickly Removes those "Back
 Aches" peculiar to **LADIES.**

THE NEW BATTERY OF 1922

"Hey, Dad! THE CAR WON'T START"



**WHEN IT'S AN
Exide
YOU START**

BATTERIES WISE? Have been checked before
 B is certainly decided to get one of these well
 designed Exide for the latest Exide battery. It
 will give you long trouble-free service. And don't forget,
 if you need a new battery, Exide has the extra
 margin of power that gives them winning quality in
 excess of the one standard set by the Society of
 Automotive Engineers. (Please Exide in Exide)

THE EXIDE STORAGE BATTERY COMPANY, Philadelphia
 The World's Largest Manufacturer of Storage Batteries for Auto Purposes
 Exide Division of Exide, Limited, Exide, Exide

WHEN IT'S AN EXIDE YOU START



Wainvade Slumberland —use your flashlight!

Is your children's bedroom, in the dark of night,
 not your flashlight? The shining glass in its soft,
 reflected rays... no flicking electric switch to
 make the sleeping man... Keep an Exide flashlight
 handy for night duty and emergencies. Keep
 several near those dark cellar stairs. And advise
 the automobile. "Give a flashlight of Exide!"

Wield your flashlight and keep them on the
 job with Exide, using Exide's Eveready Cells. And
 if you have a flashlight, use the famous Exide
 brand at once. But the superior Exide
 flashlight from electrical hardware and electric
 supply stores, sporting parts and general stores,
 jewelry and auto accessory shops.

Manufactured and marketed by
NATIONAL CARBON COMPANY, Inc.
 New York

EVEREADY FLASHLIGHTS & BATTERIES

—they are longer



THE BATTERY WITH 9 LIVES



prest-o-lite

MADE TO STAND THE STRAIN OF MODERN BATTERY DEMAND

The world's most reliable battery is the Prest-o-lite. You can depend on Prest-o-lite batteries because they are made with the finest materials and are built to last. They are the only batteries that are built to last. They are the only batteries that are built to last. They are the only batteries that are built to last.

WILLARD RADIO BATTERIES



WTAM

WILLARD BATTERIES

When the cold waves start...



You'll start with a DELCO

Exide starting voltage is self-winding or a particularly noticeable characteristic of all Delco batteries.

It is a characteristic that has been demonstrated in laboratory tests where batteries are subjected under the most adverse conditions. It has been proved to actually service the motor, all over temperature and any other.

While the starting of winter, Exide starting power is the one thing you really want - and need - in a battery.

Delco batteries are made from the best materials available and are built to last. They are used on virtually all types of cars, trucks, and equipment in every part of the world. You Delco battery dealer will show you one that is the right one for you.



Delco-Battery

Replace with a **DELCO** Battery

WHEN IT'S AN...
Exide
YOU START



Exide BATTERIES

Exide and the face of the open space, have all made will lead to success, in the motor. Wherever you are - in the city or in the country, Exide will take you where you want to go. Without Exide you have a feeling of uncertainty and anxiety before the start. "When it's an Exide - you start." Exide Batteries are the mark of a car that has the best of everything. Exide Batteries are the mark of a car that has the best of everything. Exide Batteries are the mark of a car that has the best of everything. Exide Batteries are the mark of a car that has the best of everything.

THE WORLD'S LARGEST MANUFACTURER OF STORAGE BATTERIES FOR EVERY PURPOSE

Twinvicta





MAINS-BATTERY PORTABLE
£18.9.9 TAX PAID
MADE IN ENGLAND BY TWINVICTA RADIO LTD
2500 WIND, FURNIVILLE ROAD, LONDON, E.C.

30 DAYS' TRIAL

DR. DYE'S
VOLTAIC
BELT

(BEFORE - AND - AFTER)

Electric Appliances are sent on 30 Days' Trial. **TO MEN ONLY, YOUNG OR OLD,** WHO are suffering from NERVOUS DEBILITY, LOST VITALITY, LACK OF NERVE FORCE AND VIGOR, WASTING WEAKNESSES, and all those diseases of a PERSONAL NATURE resulting from ABUSES and OTHER CAUSES. Speedy relief and complete restoration of HEALTH, VIGOR and MANHOOD GUARANTEED. The grandest discovery of the Nineteenth Century. Send at once for Illustrated Pamphlet free. Address **VOLTAIC BELT CO., MARSHALL, MICH.**





March, 1941 THE BATTERY MAN 27

Get Your Profits Ready-Made

Use our Whitaker Cables and Whitaker acids, ready-made. There's no work in a Whitaker replacement—just take the plugs, wash cable and re-plug it. You never touch what really is behind your own customer's Whitaker panels. Whitaker cables are regularly and accurately made. No variations. No a complicated plant. No chance for telephone accidents. In addition, I add you get the best quality, a genuine quality, in these cables. In addition, prices, too, to be ready.

Get Your Cables' Attention About
 Our New Whitaker Ready-Made

WHITAKER BATTERY SUPPLY CO.
 Kansas City, Mo. Independence, Mo.

WHITAKER BATTERY CABLES

"My wife was right"

3-Point Superiority

PHILCO
 DIAMOND-OXIDE
 BATTERIES

PHILADELPHIA
 BATTERY

Your "B" Battery to the Life of your Radio Set

EVEREADY
 Radio Batteries
 —they last longer

A STRICTLY LOCAL STATION



Whether you're a station or a listener, you know the radio is the most important part of your life. It's the only way you can stay in touch with the world. It's the only way you can hear the news, the music, the sports, the entertainment. It's the only way you can stay informed, entertained, and inspired. It's the only way you can stay connected to the world around you. It's the only way you can stay alive.

WOLFEBURG, CALIFORNIA, 1937
 The first radio station in the world was established in 1895. It was called the Marconi Wireless Telegraphy Company. It was the first radio station in the world. It was the first radio station in the world. It was the first radio station in the world.



Radio is better with battery power.

New Lower Prices




Now \$2.75
 Formerly \$3.75

RADIO IS BETTER WITH BATTERY POWER

Ray-O-Vac Radio Batteries are the only batteries that are guaranteed to last for a year. They are the only batteries that are guaranteed to last for a year. They are the only batteries that are guaranteed to last for a year.

Which is really "Hopalong Cassidy"?



Batteries also look alike but **AUTO-LITE STA-FUL** NEEDS WATER ONLY 3 TIMES A YEAR!



AUTO-LITE sta-ful

YOU CAN'T LOSE

AS LONG AS YOU OWN YOUR CAR... THIS NEW-TYPE GOODRICH BATTERY IS GUARANTEED NEVER TO COST YOU A CENT FOR REPAIRS OR REPLACEMENT



Goodrich KATHARODE Electro-Pak

GUARANTEED AS LONG AS YOU OWN YOUR CAR

NEW CAR BATTERY!

COLD TOLD SOLD

GLOBE

SPINNING POWER

SPLIT-SECOND STARTING

BATTERIES

Attic Ads

Battery buying simplified

Exide

Vintage Ads & More

Vitogen

Is the Most Reliable Antiseptic Dressing Powder

THE PEERLESS AUTOMATIC ELECTRIC BATTERY

THE PEERLESS AUTOMATIC ELECTRIC BATTERY

PEERLESS BATTERY COMPANY, 221 FIFTH AVENUE, CHICAGO

The New Medical Battery.

The Earth-Magneto. THE BEST OF ALL ELECTRICAL DISCOVERIES

INDORSED BY PHYSICIANS, ELECTRICIANS AND SCIENTISTS.

THE STATIC-MAGNETIC-GALVANIC.

Can be used by the most nervous or sensitive man, woman, or child.

IT GIVES NO SHOCK OR SENSATION.

The Earth-Magneto will persistently cure all forms of Nervous Diseases, Gout, Dyspepsia, Constipation, Rheumatism, Neuralgia, Sciatica, Tetanus or Sleeplessness, Melancholia, Paralysis, Lumbago, Pains in the Back or Limbs, and Kidney, Bladder or Liver Complaints, Headaches, Nervousness, Female Complaints, Wasting Diseases, etc., etc.

The Earth-Magneto Medical Battery Co.,
19 Union Square, West, New York.

The Long-Life Battery for Your Car

What makes a battery economical?

Long service is what makes a battery a good buy. There's the purchase price to spread that over enough miles to keep your used battery economical.

Even before the present low price was in effect, Exide was known for exceptional economy at the economical battery.

Because of its exceptionally long life. And Exide repair jobs are usually little or nothing.

Get your next battery at the nearest Exide Dealer's. You will also find a complete line of Exide Radio Batteries at Exide Dealers and at radio dealers.

EXIDE BATTERY CO.
 1200 N. 17th St., Philadelphia, Pa.
 19103

"Someday... I want to meet Hopalong Cassidy!"

Batteries also look alike, but **AUTO-LITE STA-FUL** needs water only 3 times a year!

AUTO-LITE sta-ful

"My wife was right"

3-Point Superiority

PHILCO DIAMOND-WORLD BATTERIES

PHILADELPHIA BATTERY

Prest-O-Lite SERVICE

Storage Battery

WONDERFUL DISCOVERY!

The Crowning Medical and Scientific Triumph of the 19th Century!

"The Blood is the Life."

As Lightning Purifies the Air, so must Electricity Purify the Blood!

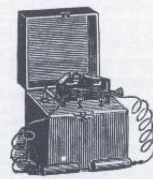
Portable Electro-Medical Batteries.

These magnetic instruments whose agency physicians effected almost miraculous cures. Our most learned doctors and physicians acknowledge their efficiency in even the worst cases of paralysis, rheumatism, neuralgia, and in fact, all nervous diseases. These machines may be used by all invalids with perfect safety. When doctors fail to effect a cure with drugs and medicines, and electricity is resorted to in the last stage of disease, even then, under such immense disadvantages, electricity often cures.



24175 Gaiffe's Battery, three currents, with silk covered conducting cords, two insulated handles, one metallic brush, one olive shaped exciter, one spherical exciter and one vial of bisulphate of mercury. In polished mahogany case, 7 1/2 x 4 x 1 1/4 in. Complete, with full directions. Weight, 1 1/4 lbs. \$7.75

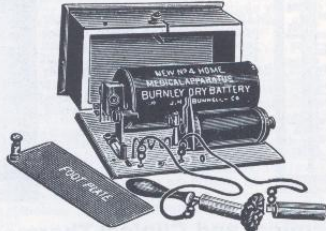
24176 Gaiffe's Battery, with same size coil as in preceding, producing two currents instead of three. Mounted in single cover mahogany case, 6 1/2 x 4 x 1 1/4 inches, containing two insulated handles and one vial bisulphate of mercury. Weight, 1 pound. Each.....\$6.25



24177 The Crown Family Battery. The merits of this battery will be easily appreciated as possessing neatness of design and simplicity of operating. A pleasant and uniform electric current, both mild and powerful. Three different and distinct currents are produced—the primary, secondary, and both combined in intensity. Mounted in polished cherry case with nickel handles. Size, 6 x 5 1/4 x 5 1/4 inches, with full directions for using. Highly recommended. Weight, 2 3/4 lbs. Price, complete.....\$3.50



24178 Alpha Faradic Family Medical Battery, constructed upon improved scientific principles and designed for private or professional use. Full description of apparatus, directions for operating and directions for making solution furnished with each instrument. Weight, 3 1/2 lbs. Each.....\$5.00

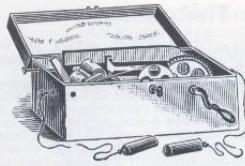


24179 The New Home Electro-Medical Apparatus, with dry battery. This battery is the most convenient and reliable of any hundreds of forms ever introduced. It is reliable, because with its dry battery so much less care is necessary to avoid getting it out of order than is required with any other known form. The entire absence of acids, liquors or salts will be appreciated by any one who has ever had occasion to use a medical battery. The appliance furnished with the apparatus consists of foot-plate, sponge, cords and handles (electrodes). The electrode having a wooden handle is used as a sponge-holder when required. The size of the apparatus is 3 1/4 x 5 x 8 1/4 inches. Weight, 4 pounds.

Price, complete.....\$7.00 Extra battery, per cell \$0.75
 Extra Sponge Holder.....50 Extra Handles, pair.....75
 Extra Metallic Hair Brush, electrode.....1.25
 Extra Cords, 4 feet, per pair.....50

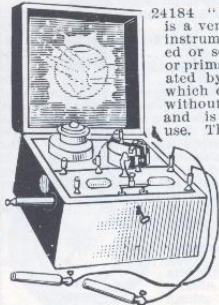


24180 The Genuine Smith & Shaw Portable Pocket Battery. Powerful current. The most practicable and thorough pocket battery made. Cells cannot spill contents. Price, with two cells (weight, 1 1/4 lb.)...\$8.50
 Price, with three cells (weight, 2 lbs.)...\$10.00



Magnetic Electro Battery.

24182 Davis & Kidder's Genuine Magneto-Electric Machines. Price, each \$7.25
 Weigh, 6 3/4 lbs.

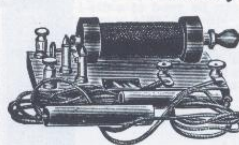


24184 "Family" Battery. This is a very effective and portable instrument, produces the induced or secondary, and the direct or primary current, and is operated by an open battery which can be used for months without changing the solution and is constantly ready for use. The power may be increased by gradually withdrawing the tube from the helix. In polished black walnut case with cords and handles; weight, 8 lbs. Each.....\$10.00

Medical Battery Parts.

- Order No. 24185 and be sure to specify what Battery the parts are for. Each.
- Zincs for the Crown Family Battery.....\$0.20
 - Carbons for same.....25
 - Glass Jars for same.....25
 - Tops complete for same, zinc and carbon attached.....65
 - Zincs for the Alpha Battery.....25
 - Carbons for same.....25
 - Glass Jars for same.....25
 - Zinc for Family Battery. Per pair.....50
 - Postage on pair zincs.....18
 - Platinas for same.....1.00
 - Clamps for same.....25
 - Cords for same. Per pair.....50
 - Glass Jars for same.....25
 - Metal Springs for Magnetic Battery.....10
 - Cord belt for same.....05
 - Bisulphate Mercury for use with batteries Nos. 24175, 24176 and 24180 per ounce.....10
 - Price, per 1/4 lb. bottle.....75
 - Price, per 1 lb. bottle.....1.25
 - Bichromate Potassium for use with batteries, Nos. 24177 and 24178. Per lb.....35

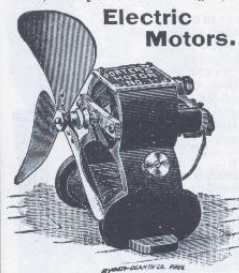
Medical Induction Coil, Without Battery.



24186 Induction Coil, mounted on neat wooden stand with pair of hand electrodes and sponge holder of best quality. Can be operated with any acid battery. Price, without battery.....\$3.50

24187 Same as above, complete with dry battery cell, ready for use. Weight, 3 1/2 pounds. 4.00

Electric Motors.



The Porter Electric Motor, a practical machine for a little money. An entirely novel principle underlies the construction both electrically and mechanically, insuring simplicity, low cost, reduced size, diminished weight, higher speed and wonderful economy in power required to operate them.

24189 The No. 1 Motor, although a very small one in size, is highly efficient. With one

cell of acid battery it will operate a small dental lathe, a fan, a revolving window stand, an egg beater, a music-box, etc. It is no toy. Its electrical efficiency is about 1/3 horse power, or from 35 to 40 watts on a continuous run. No better motor can be furnished to meet the wishes of young students engaged in the study of experimental physics. Its efficiency will surprise the user. Weight, 1 1/4 pounds. Price, each.....\$2.90

24191 The No. 2 Motor, same construction as above, but larger size, weighing 3 pounds and capacity of 1/3 horse power. Price.....4.75

WE CARRY IN STOCK a full line of DRUGS, CHEMICALS, PHARMACEUTICAL PREPARATIONS, Etc., Etc., and can fill orders promptly and correctly. An experienced druggist is in charge, and he will compound prescriptions when so ordered. Send for our Drug List. Mailed free.

1.35
ow-
ag).
han
han
1.40
4.25
.50
5.00
.80
6.00
6.25
.75
7.50
.85
8.50
DS.
ustic
ly of
self-
rew
tele-
ine 1/2
atest,
work-
hone
ones,
feet
s and
g the
order
\$5.00
o. 18.
pound
\$0.31
18.00
35.00
24218.

Live sellers right now!

*These exclusive features
mean new big sales—*

Radio storage batteries with these new and exclusive features are bound to attract a lot of favorable attention and stimulate battery sales immediately.

The dealers who display them now will benefit first and most, of course.

These storage batteries have been tested and endorsed by many of the leading technical experts. Due to their construction they cannot short-circuit, shed material nor buckle. They are unconditionally guaranteed for one year.

This battery is 4 volts, 12.000 MA for UV 199 tubes. Lists at \$4.00.



The Wonder Cell. This battery replaces dry cell. Is 2 volts, 12,000 MA. Lists at \$1.50.



This battery is 6 volts for UV 201A for one and two tube sets. Can also be used for larger sets if a turtle charger is used. List at \$4.50.



This charger recharges all type "B" Batteries. Lists at \$3.00.

**Introductory offer to dealers—
50% discount**

Buy your sample order from us. Buy your stock order from your jobber.

The Joyce Bros. Wonder Cell has been patented in America and Europe.

*Distributors, Jobbers, Dealers
Write for details.*

Factory Representatives of Joyce Bros. Products:

Wm. H. Kreeb, 2505 Union Central Bldg., Cincinnati, Ohio. Leonard C. Kohn-Noah Co., 317 Phoenix Bldg., Minneapolis, Minn. Leonard Kohn Co., 625 Security Bldg., Omaha, Neb. Strimple & Gillette, 149 Jackson Street, Seattle, Wash. Strimple & Gillette, Corbett Bldg., Portland, Oregon. Stephen Brown, Ft. Smith, Arkansas. Park Co., 128 No. Wells St., Chicago, Ill. William Reed Sales Co., 308 E. 17th St., Kansas City, Missouri. L. C. Kohn-Noah Co., 201 Somerset Building, Winnipeg, Canada. I. D. Livingston, 1529 Hutchinson St., Montreal, Canada.

New Joyce Products!

**Wonder Cell Filter
Circuit**

Can be used in conjunction with Bakelite, Tungar, and Rectigon Chargers from 2 1/2 amp. to 5 amps. capacity. Designed for use with any of the standard rectifiers and smooths out the rectifier current and therefore allows the operation of radio tubes direct from lighting circuit without any humming noises. Approximate dimensions 4 1/2 x 7 1/4 high. Solves the problem of electric radio. List \$19.00.



Trickle Charger

Full Wave Trickle Chargers for charging Joyce Bros. Wonder Cells or other low capacity storage batteries. Can be hooked up to the electric light socket while set in operation. List \$19.00.



**Joyce Bros. A
Eliminator**

Noiseless, Humless. Simple—attach to electric light socket and forget about it. Fits Radio Sets 4 to 12 tubes. Inexpensive to operate. It is the last word in Radio Electric Sets. Made to fit all type sets. List \$40.00.



**Joyce Bros.
Power Unit
Type U V 201 A
& U V 199**

Hooks up to light socket and electrifies your set. Simple, Noiseless and neat. No fuss. No recharging. Simply turn switch. List \$19.50.



JOYCE BROS.

71 Chestnut St., Boston, Mass., U. S. A.



"My wife was right"

"She warned me to play safe—to get a Philco Battery. But I couldn't see the point. Thought our old battery good enough. And here's the sequel"—writes H. L. D.

"A long, stiff hill, a stalled engine, and the battery flunked—petted clean out. . . . With my daughter at the emergency brake—two men at the back—I toiled and sweat and CRANKED until that big, stiff-jointed motor started."

"But never again!" adds H. L. D. For then HE got a Philco—the long-life, high-powered battery that whirrs the stiffest engine—gives you steady white-hot ignition—keeps your lights brilliant hour after hour.

Thousands upon thousands of other motorists—with similar hand-cranking experiences behind them—are replacing their ordinary batteries with Philcos. They demand Philco's MARGIN OF SAFETY—its tremendous surplus power in reserve for emergencies.

Why not get YOUR Philco now and be safe? A Philco Battery, with Diamond-Grid Plates and Slotted-Rubber Retainers, carries a TWO-YEAR Guarantee and now costs you no more, in many cases even less, than just an ordinary battery.

See your nearest Philco Service Station at once. Write for a complimentary copy of our new booklet, "How to Stretch Your Battery Dollar."

Philadelphia Storage Battery Co., Philadelphia

Philco Batteries are standard for Buick "A" and "B," electric passenger cars and trucks, wire locomotives and other battery uses where long-lasting, low-cost service is essential. Whatever you use Batteries for, write Philco.

PHILCO

DIAMOND-GRID BATTERIES



3-Point Superiority

1. **The Famous Diamond-Grid**—the diagonally braced frame of a Philco plate. Built like a bridge, CAN'T buckle—CAN'T warp—can't short-circuit. Double lapped to lock active material (power-producing chemicals) on the plates. Longer life. Higher efficiency.

2. **The Philco Slotted-Rubber Retainer**—a slotted sheet of hard rubber. Retains the solids on the plates, but gives free passage to the current and electrolyte. Prevents plate disintegration. Prolongs battery life at per cent.

3. **The Quarter-Sawn Hard-Wood Separator**—made only from giant trees 1,000 years old; quarter-sawn to produce alternating hard and soft grain. Hard grain for perfect insulation of plates. Soft grain for perfect circulation of acid and current—quick delivery of power. Another big reason why Philco is the battery for your car.

LOOK FOR THIS SIGN of Philco Service. Over 2,100 stations—all over the United States. There is one near you. Write for address, if necessary.

**PHILADELPHIA
DIAMOND-GRID
BATTERY**

With the PHILCO Slotted Retainer



\$10.00 for \$4.00

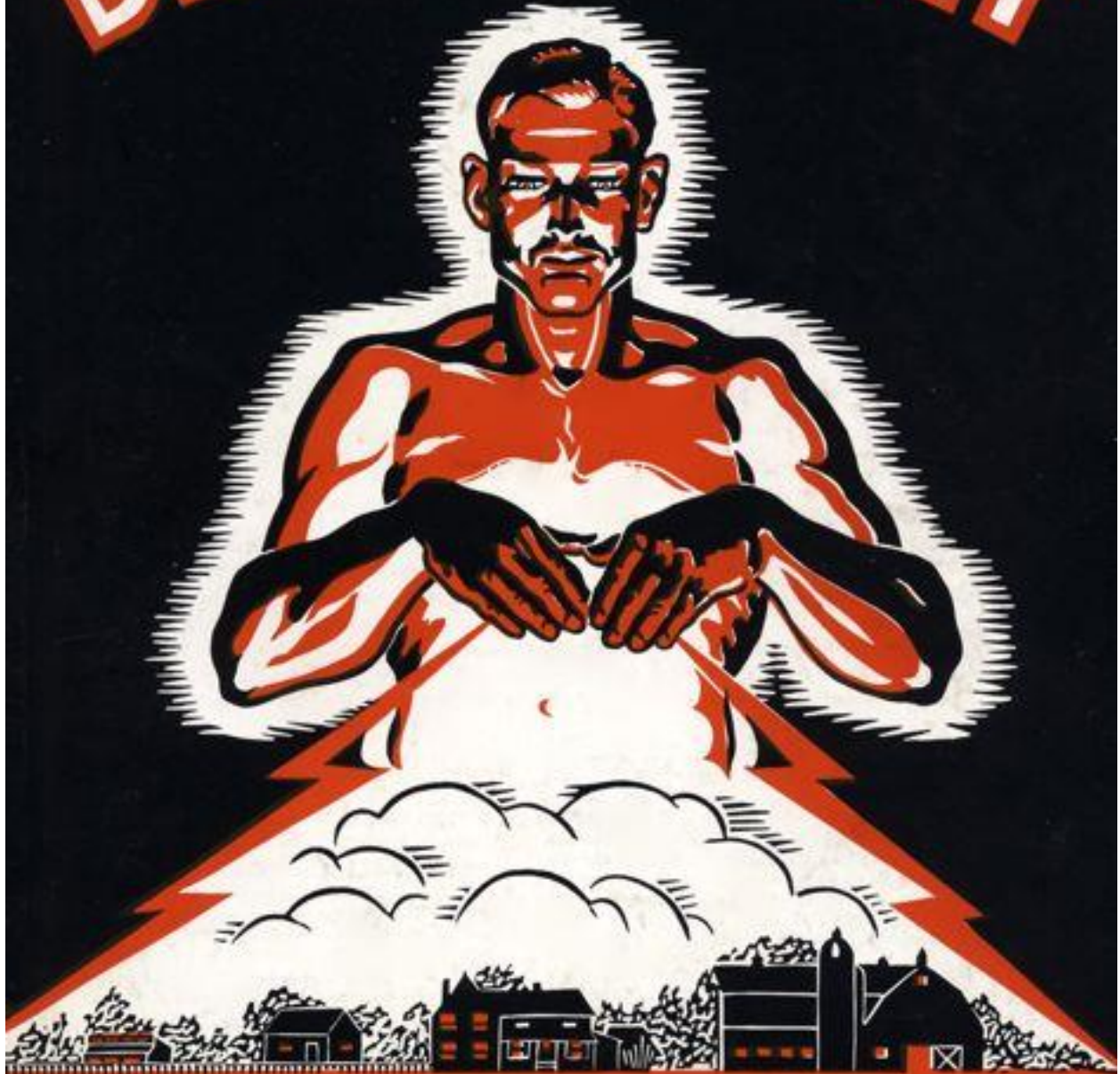
A finely finished **Ten Dollar No. 4 D. D. Medical Battery**, complete with five electrodes, connecting

cords and large medical guide-book, by express on receipt of \$4.00. Circulars free.

J. H. BUNNELL & CO.,
20 Park Place, New York

Mfrs. of Electrical Apparatus and Supplies
Established 1879. Send for catalogue.

DELCO-LIGHT



ELECTRIC POWER and **LIGHT PLANTS**
for direct and alternating current service



Equipages of
Colonial Dames

Post Chaise of the Wife of
Pierre Van Cortland

Series III
Number III

COACH BUILDERS

WE HAVE BEEN

OVER SIXTY YEARS

**Rauch & Lang
Electrics**

WORM DRIVE

Electric Car Supremacy

The Electric offers in its diversified uses, a car of exceptional merit—as the family car it stands supreme.

Every member of your family can drive it—no chauffeur needed. It offers all of the best qualities of a gasoline car without any disagreeable features—danger from gasoline—offensive odors of oil—grime, dirt and the difficulties attending its operation.

The electric car will do everything a gasoline car does (except tour) with greater ease—cleaner and better. Its upkeep is far below that of the gas car, to say nothing of the depreciation difference. It can be driven over any road over which a gasoline car can be propelled—up any hill on which the wheels can find traction.

No machinery to get out of order—no mechanic needed—no engine trouble—no nerve racking gear clashing—no exhaust noise to disconcert the timid—nothing, but *just* the enjoyment of rapid transit in an easy, luxurious, delightful manner—that is what you secure in a Rauch & Lang Electric—the only Top-Mounted, Straight-Type, Worm Drive Electric built.

ITS SUCCESS MERITS AN INVESTIGATION.

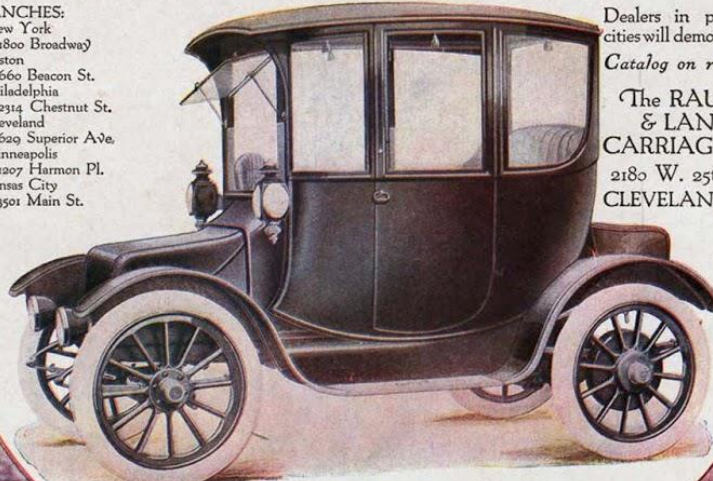
BRANCHES:

- New York
1800 Broadway
- Boston
660 Beacon St.
- Philadelphia
2314 Chestnut St.
- Cleveland
620 Superior Ave.
- Minneapolis
1207 Harmon Pl.
- Kansas City
3501 Main St.

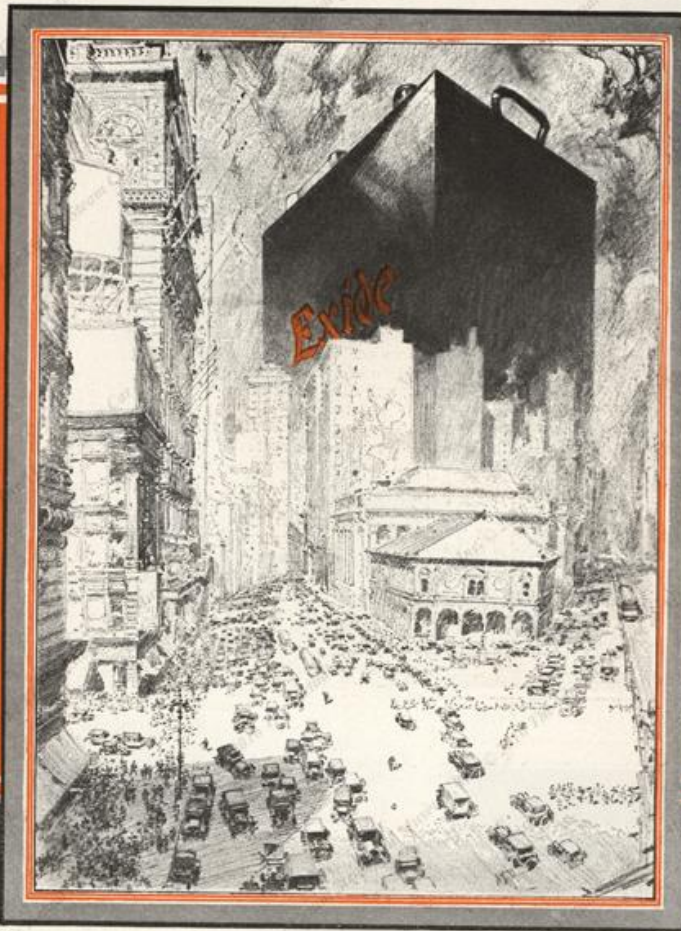
Dealers in principal cities will demonstrate.

Catalog on request.

The RAUCH & LANG CARRIAGE Co.
2180 W. 25th St.
CLEVELAND, O.



Exide
BATTERIES



Why *Exide* spells economy

THERE are two traits *built into* Exide Batteries that result in economy. Both of these qualities are known the world over. They are Dependability and Durability.

You can depend on an Exide being right on the job in your car whenever you need it. And it stays right on the job for so long a time that it proves a true economy. The first cost of an Exide is surprisingly low—the final cost, lowest.

You will find the economical battery for *your* car at a nearby Exide Dealer's. Also, you can get Exide Radio Batteries at Exide Dealers and at radio dealers.

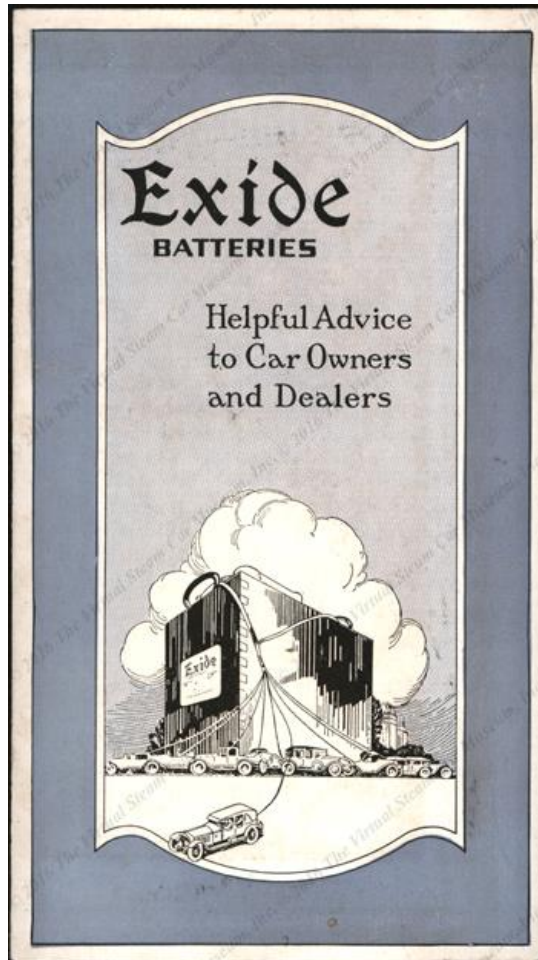
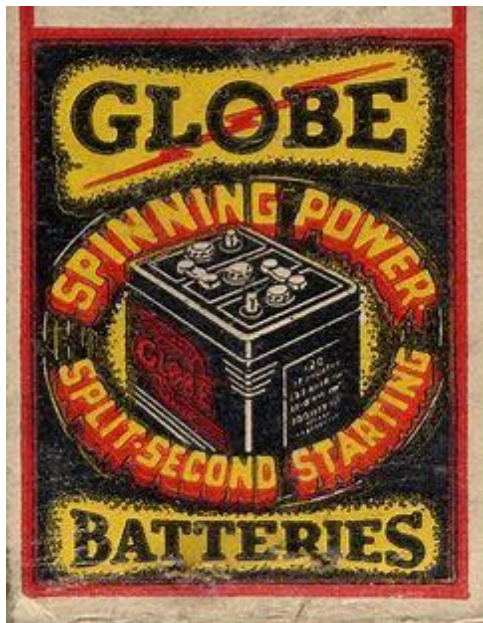
THE ELECTRIC STORAGE BATTERY CO., Philadelphia

Exide Batteries of Canada, Limited, 153 Dufferin Street, Toronto

ABOVE THE EARTH

Dependable battery performance is a vital factor in the safety of modern aviation. That is why Exide Batteries are used on government, private and commercial airplanes.

THE LONG-LIFE BATTERY FOR YOUR CAR



FLAWLESS PROOF

A majority of the Electric Vehicle Manufacturers—a majority that makes an overwhelming majority of all the Electric Vehicles manufactured—equip their cars with

The “Exide” Battery

They pay a higher price for the “Exide” than for substitutes and have done so for years—that’s Flawless Proof of “Exide” superiority.

Dealers and Users get their electric cars equipped with the “Exide” Battery at the same price as though substitute batteries had been used.

The extra cost of the “Exide” falls on the Manufacturer, but to his credit be it said, he stands the difference to give you the best—if you buy of the Manufacturers here named.

“Exide” Batteries can be had of all the following Electric Vehicle makers:

Baker Motor Vehicle Co.	Couple Gear Freight Wheel Co.	C. P. Kimball & Co.
S. R. Bailey & Co., Inc.	Columbia Motor Car Co.	Rauch & Lang Carriage Co.
Broc Carriage & Wagon Co.	General Vehicle Co.	Studebaker Automobile Co.
Columbus Buggy Co.		The Waverley Co.
Champion Wagon Co.		Woods Motor Vehicle Co.

BUY WHAT THE EXPERTS BUY

Prompt shipments from large stocks in Philadelphia, Boston, Cleveland, Chicago and San Francisco.



Send us your name on a postal to-day for the “Exide” Battery Booklet. New facts about Batteries. Keep up-to-date.

THE ELECTRIC STORAGE BATTERY CO.

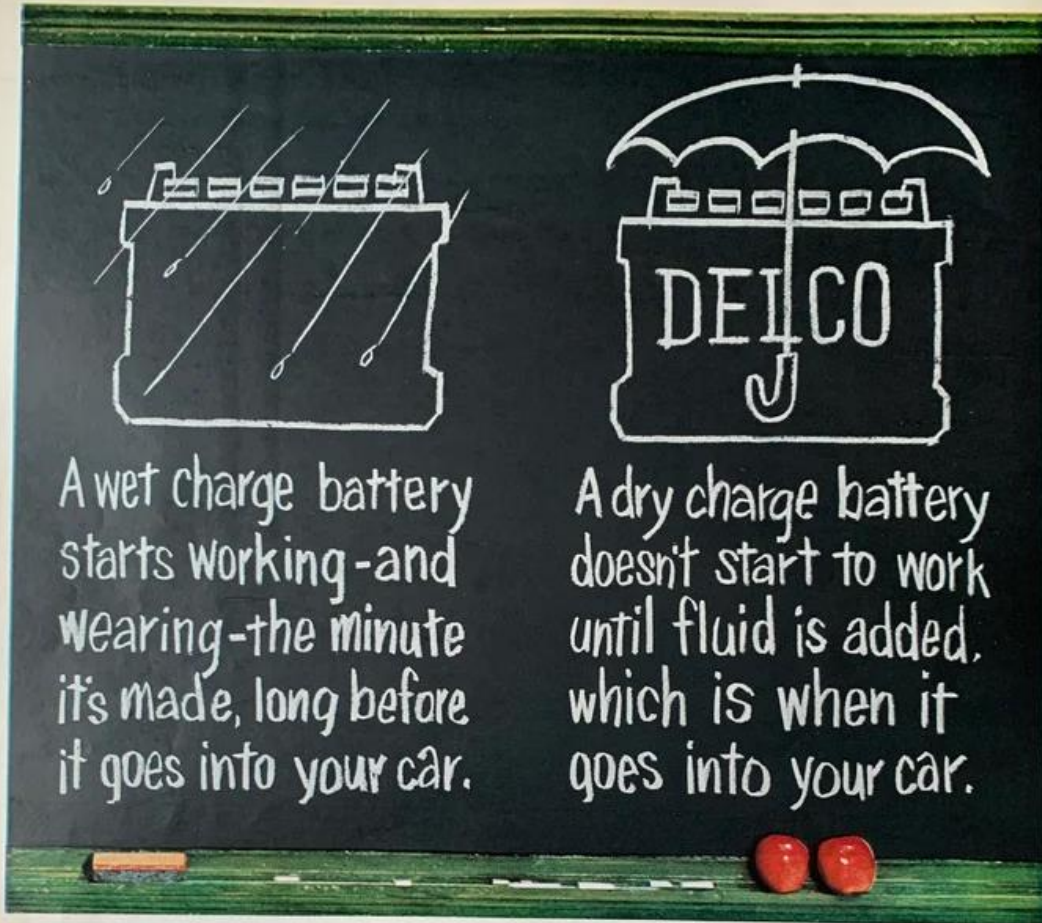
PHILADELPHIA, PA.

1888
1909

New York Boston Chicago St. Louis Cleveland Atlanta San Francisco Toronto

715 Distributors throughout the United States. Write for the name of the Distributor nearest you

See our “Exide” Sparking Battery advertisement at top of page 105



A wet charge battery starts working - and wearing - the minute it's made, long before it goes into your car.

A dry charge battery doesn't start to work until fluid is added, which is when it goes into your car.



Any Delco Battery you buy from your dealer will be a fresh dry charge battery

simply say Delco

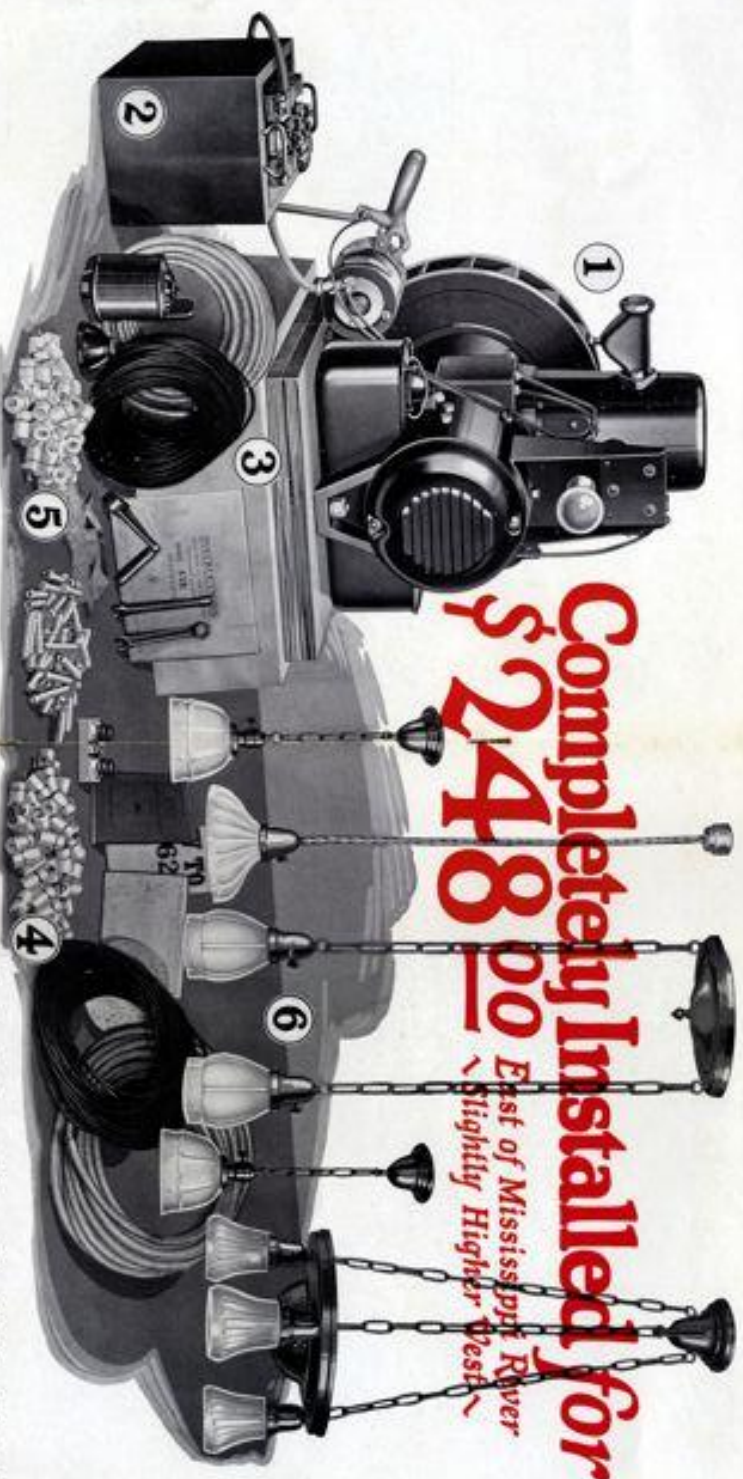
LOOK FOR THIS SIGN WHEREVER YOU DRIVE



See "Tom Haveran Sports Show," ABC Radio, and the "Wide World of Sports," ABC-TV, Saturday.

UNITED MOTORS SERVICE, Division of General Motors

Completely Installed for
\$248.00
East of Mississippi River
Slightly Higher West



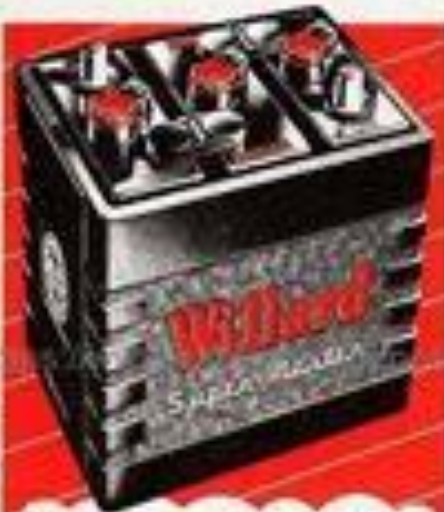
This Model 625 Delco-Light Can Be Completely Installed in the Home Ready to Turn on the Lights, For Only \$248. [East of the Mississippi River]

Complete Installation Consists of

1. One Model 625 Delco-Light 32 Volt Generating Unit, equipped with Delco Starter.
2. Standard 6 Volt Exide Starting Battery.
3. Set-up of Plant, [concrete base to be furnished by Purchaser.]
4. Wiring house for 5 outlets, to be located wherever specified by purchaser.
5. All supplies necessary, including wire, insulators, etc.
6. Standard Set of 5 Fixtures, complete with bulbs.
7. Price includes freight paid to all points east of the Mississippi.
8. Easy terms to suit convenience of purchaser.

Get **100%** more protection against the No.1 battery killer

with **Willard METALEX**



greatest battery improvement
in 25 years!



Now, incorporated in the No. 1 Battery Killer, Willard METALEX is the most advanced lead-acid battery ever. It has all the latest corrosion-inhibiting technology in the grid—the lead alloy treatment which holds it

plus the unique protective active material, which prolongs the plate-plating action during the life of the battery—delays the point at which corrosion

sets in. Willard METALEX is the most advanced lead-acid battery ever. It has all the latest corrosion-inhibiting technology in the grid—the lead alloy treatment which holds it plus the unique protective active material, which prolongs the plate-plating action during the life of the battery—delays the point at which corrosion

ADVANTAGES OF METALEX

is that the demand for Willard Super Master

is growing so fast that it is difficult to keep up with the demand. Willard Super Master is the most advanced lead-acid battery ever. It has all the latest corrosion-inhibiting technology in the grid—the lead alloy treatment which holds it plus the unique protective active material, which prolongs the plate-plating action during the life of the battery—delays the point at which corrosion

Why today's driving conditions make the Willard Super Master the most advanced lead-acid battery ever. It has all the latest corrosion-inhibiting technology in the grid—the lead alloy treatment which holds it plus the unique protective active material, which prolongs the plate-plating action during the life of the battery—delays the point at which corrosion

<p>THE METALEX GRID Willard METALEX is the most advanced lead-acid battery ever. It has all the latest corrosion-inhibiting technology in the grid—the lead alloy treatment which holds it plus the unique protective active material, which prolongs the plate-plating action during the life of the battery—delays the point at which corrosion</p>	<p>ADVANCED ACTIVE MATERIAL Willard METALEX is the most advanced lead-acid battery ever. It has all the latest corrosion-inhibiting technology in the grid—the lead alloy treatment which holds it plus the unique protective active material, which prolongs the plate-plating action during the life of the battery—delays the point at which corrosion</p>	<p>ADVANCED ACTIVE MATERIAL Willard METALEX is the most advanced lead-acid battery ever. It has all the latest corrosion-inhibiting technology in the grid—the lead alloy treatment which holds it plus the unique protective active material, which prolongs the plate-plating action during the life of the battery—delays the point at which corrosion</p>	<p>ADVANCED ACTIVE MATERIAL Willard METALEX is the most advanced lead-acid battery ever. It has all the latest corrosion-inhibiting technology in the grid—the lead alloy treatment which holds it plus the unique protective active material, which prolongs the plate-plating action during the life of the battery—delays the point at which corrosion</p>
--	--	--	--


New Willard Super Master with METALEX

AUTO

BATTERIES

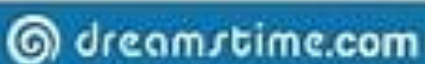

EXTRA LIFE

100% MONEY BACK GUARANTEE!



PREMIUM QUALITY!

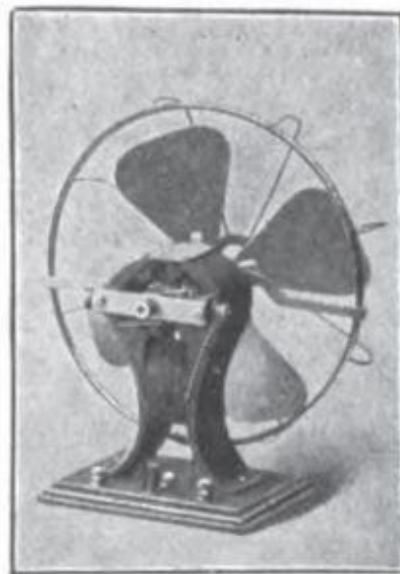
LONGER LIFE WITH LOWER COST!

Fan Motor Outfits, with Gordon Primary Cells

With the advent of hot weather we desire to call the attention of the public to the comfort which the use of these outfits will bring to the home and office. Especially would we recommend the use of the Fan Motor Outfits **IN EVERY TELEPHONE EXCHANGE** throughout the country, especially at places where there is no direct street current.

**NO OPERATOR
SHOULD BE
WITHOUT ONE.**



These outfits are supplied in three sizes, designated respectively:

Type B— 6-inch Fan, with 2 or 3 No. 1 Gordon Cells.

Type C— 8-inch Fan, with 3 or 4 No. 1 Gordon Cells.

Type D— 10-inch Fan, with 4 or 5 No. 1 Gordon Cells.

These outfits give the highest speed at the lowest cost of maintenance for primary cell outfits, at a cost of from \$12 to \$27.50, according to type of outfit and number of cells. Over 150 actual running hours without labor or attention before recharging is required. Speed about 800 revolutions per minute.

For catalogue, price list and full particulars, apply to

GORDON BATTERY CO.

594 Broadway, NEW YORK.

DECEMBER, 1899

*Electrical Engineering
and
Telephone Magazine*

113 - Appendix A

Battery Insulators, Oil Insulators, and Chloride Accumulators

by Charles & Sandi Iron

(Reproduced here with permission)

**Battery Insulators, Oil Insulators,
and Chloride Accumulators**



Battery Insulators,

From the first time that a cell or battery was used to supply electricity ... a way was needed to prevent or reduce the leakage of electric current. This leakage occurred when over the surface of the cell or battery (and the support that it was placed on) became coated with a fine deposit of acid-laden moisture and dust.

It was found that electric leakage was reduced if each cell or battery (a series of cells) was isolated from the support on which it sat.

Wood framing was used, but it was discovered that, over time, the wood would absorb the acid-laden moisture and created a direct path for electrical leakage, and eventually the acid moisture would cause the wood to rot.

Battery Insulators were used with DC electric systems as low as 1-2 volts and up to 600 volts and greater.

Lower DC voltage was used for a short time with telegraphs, alarms, and railroad signals. Higher voltage was used for lighting, motors, pumps, etc.

Originally, plain glass battery insulators were placed between wooden stringers and the battery tank. This proved to be *insufficient* ... so, glass insulators were added between the wood stringers and the floor. This combination became known as "Double Insulation." However, this did not prevent the decay of the wooden stringers ... so the Electric Storage Battery Company (E.S.B. Co.) designed and developed the combination of an oil insulator and an earthenware pedestal that solved the problem of the wood decaying. This earthenware pedestal / oil insulator became the standard for the industry and made it possible to finally do away with the wooden stringers.

In the display there is a COMPLETE Pedestal/Oil Insulator UNIT ... consisting of the cupped lead washer, alloy cap, Y lead washer, oil insulator, and the insulator pedestal. You can now see how the insulator and the pedestal look together. I believe that this is a one-of-a-kind ... COMPLETE UNIT. Also displayed is a copy of the patent for this invention that was granted to Cornelius Ambruster of Roslywn, Pennsylvania, on July 13, 1915.



The oil insulator / earthenware pedestal was used to support a battery tank that was constructed of wood and lined with lead. The exterior was coated

Oil Insulators, and Chlo

with asphaltum. Four to six CD-35s or CD-36s were used to support this style of Battery Tank (see Patent Sheet).

Please notice the base of the pedestal ... The uneven design at the base of the pedestal allowed water and foreign material to pass under the support when flushing the Battery Room Floor.

* * * * *

BIRDFEEDERS



The nickname "Birdfeeder" was given to the CD-35 and CD-36 around 1969. The collectors at that time thought they resembled a bird feeder. There are five of these displayed. These battery insulators were very unique because they used a nonconductive oil that was put in the circular trough and was then covered by a lead-alloy cap. The purpose of the cap was to exclude, as far as possible, all spray or other foreign matter from getting into the oil space and to protect it from being splashed when flushing the Battery Room Floor.

* * * * *

GLASS TRAY

The tray displayed is a No. 7 and it is embossed with "E.S.B. Co. No. 7 Made in U.S.A."

Jars that *were not sealed* were set on separate glass trays or boxes filled with sand. This was necessary due to the absence of a sealed cover which allowed acid-laden moisture to run down the outside of the jar and attack the wooden support (susceptible to rot) that the battery sat on.

* * * * *

GLASS THREAD SCREW BATTERY INSULATORS

This type of Battery Insulator has a very fragile Male Glass Thread Screw. It is believed that the thread was used to secure the insulator in the wooden stringers that supported the battery so that the insulator and support could be moved as a unit.



* * * * *

WHAT IS A WELL?

The wells (circular trough) that are a part of some of these insulators were used to collect Chlorides that would seep down the sides of the cell (battery jar). This type of battery insulator is known as a "Chloride Accumulator" and some are embossed with that information.

ide Accumulators

UNITED KINGDOM BATTERY INSULATORS

British Battery Insulators are different from Battery Insulators that were made in the United States.



The British Battery Insulators are in two parts ... a Base Unit and a Top. The smaller size bases have a round bump in the center that matches a depression in the top's center to locate and secure the two-pieces together.

Four two-part styles are known (of which two are in this exhibit). Until a year ago, the only colors known to exist in the two-part battery insulators were light green and light aqua.

Displayed is a CLEAR base battery insulator that is believed to be the only one known at this writing.

The only known light green "unipart" in the U.S.-style has a solid center instead of hollow center and has a corrugated base.

The style numbers and letters of the United Kingdom battery insulators were assigned by Ian Mackey. (These are not "officially" recognized numbers by the insulator-collecting community at this time.)

* * * * *

COLORS FOR BATTERY INSULATORS

COLORS of Battery Insulators range from various shades of • Aqua to Green • Clear • Smoke • Lavender • 7-up Green • Emerald Green • Yellow-Green • Cobalt Blue • Blue • Amber.

* * * * *

WHAT ARE GLASS BATTERY PLATE SPACERS?

It is believed that the "U" Shaped Glass Bars were part of a failed attempt to insulate the positive and negative plates from each other in a cell. At this writing, no proof has been found to support this theory.



The only reference found was to "Rods" being used in a patent issued to Stanley C.C. Currie of Philadelphia, PA, October 14, 1890, #438,532 ... "Insulated from one another by means of rods."

"Plate Spacers" have been found in various shades of aqua, blue, and green.

MANUFACTURERS

Some of the manufacturers known to have produced Battery (Rests) Insulators are: Brookfield Glass Company, Old Bridge, New Jersey; The Elmer Glass Co., Elmer, New Jersey; Hemingray Glass Co., Muncie, Indiana. Dumps that were used by these companies have been excavated by collectors. Battery Insulators, shards of, and warming pours of battery insulators were found at some of the manufacturer's dumps.

The following is a list of Battery Insulators (or pieces of such) that have been found in some of the Manufacturer's dumps.

Brookfield Dump – Old Bridge, New Jersey	
CD-20 Gould	CD-29 No Embossing
CD-53 U.S.L.	
Hemingray Dump – Muncie, Indiana	
CD-24 U.S. Light & Heating Co.	
CD-24 National Battery Co.	
CD-33 No Embossing	
Elmer Glass Co. Dump – Elmer, New Jersey	
CD-35 No Embossing	CD-36 E.S.B. Co.

* * * * *

EARLIEST PATENT DATE

The earliest known patent date for a Glass Battery Insulator is July 12, 1870. The patent number was 105,252 and was granted to Orris W. Robertson of Milwaukee, Wisconsin.

* * * * *

E.S.B. CO.

The Electric Storage Battery Co. (E.S.B.Co.) of Philadelphia, Pennsylvania, was founded in 1888 by W. W. Gibbs, and by 1908 they were using glass for their battery (rests) insulators.

This information is supported by copies of various patents that accompany this display.

* * * * *

GOULD

Gould Storage Battery Co. was founded in 1898 by Charles Gould of New York, and they applied for their first patent for a Battery Insulator in 1913.

U.S.L.

In 1898 the National Battery Company was formed. Electric Autolite later gained control of National Battery Company and operated it under the name of U.S.L. Battery Company.



* * * * *

NO WRITTEN HISTORY

The collecting of "Battery (Rests) Insulators" is a specialty within the hobby of Insulator Collecting. Although we are learning more about how the Battery Insulators were used and who made them, the history of the Battery Insulators has yet to be written.

We need more written documentation.

At this time there are still unlisted colors and styles just waiting to be discovered.

* * * * *

AS COLLECTORS OUR GOAL ... We hope that by viewing this display you will become more aware of the different styles (CD numbers) and the range of colors ... as well as some basic history of the Battery Insulators, Oil Insulators, and Chloride Accumulators.

CHARLES AND SANDI IRONS - 2005

SOURCES:

History & Guide to North American Insulators,
.....John and Carol McDougald
Gould Electronics Inc.Judy Kokal
EnerSys (Exide).....Deb Burkhart
Patent InformationGlenn Drummond
American/British Battery
Rest Gallery websiteIan Mackey
Patent InformationElton Gish
Storage BatteriesE. W. Allen
NIA (National Insulator Association)web site
ResearchSmithsonian Institute, Washington, D.C.
ICONBill Meiers
Hemingray Dump InfoDarin Cochran
Hemingray Dump InfoBob Stahr
Brookfield Dump InfoDavid Sztramski

Appendix B. Batteries & Extras, Charles & Sandi Irons

BATTERY INSULATORS, OIL INSULATORS and CHLORIDE ACCUMULATORS



Figure 2: "Birdfeeder" battery insulator.



Figure 4: USL No 2, light aqua

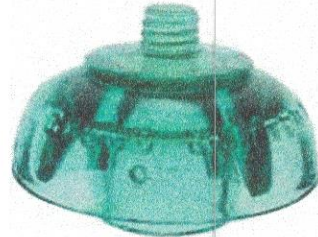


Figure 6: Gould Battery (R)
Patented Dec. 1. 1896, light green



Figure 7a: Chloride Accumulator /
The E.S.B. Co., aqua



Figure 7b: Chloride Accumulator /
The E.S.B. Co., battery rest, green.

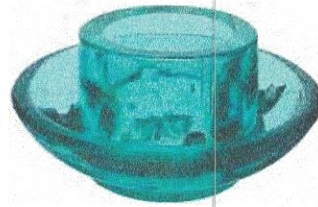


Figure 9: CD-29
no embossing, light-green



Figure 10: CD-20
E.S.B. Co.



Figure 11: CD-24 embossed The
United States Light & Heating Company, aqua



Figure 12: CD-30 embossed
Chloride Accumulator / The E.S.B. Co.,
emerald green



Figure 13: CD-22.5 embossed: (F) Gould
Battery (R) Pat. Dec.1.1896, yellow-green



Figure 15: A CD-22 with no embossing in
deep violet cobalt blue.



Figure 16: CD-40 with no embossing in
dark aqua.

This article is reproduced with permission of the authors.

By Charles and Sandra Irons, Milford, Delaware

First Place - Writer's Choice Contest - Research Info
The Delmarva Blowpipe newsletter; Delmarva Antique Bottle Club

From the first time that a cell or battery was used to supply electricity, a way was needed to prevent or reduce the leakage of electric current. This leakage occurred when the surface of the cell or battery (and the support that it was placed on) became coated with a fine deposit of acid-laden moisture and dust.

It was found that electric leakage was reduced if each cell or battery (a series of cells) was isolated from the support on which it sat.

Wood framing was used, but it was discovered that over time the wood would absorb the acid-laden moisture. This created a direct path for electrical leakage and eventually the acid moisture would cause the wood to rot.

Battery insulators were used with DC electric systems as low as 1-2 volts and up to 600 volts and greater.

Lower DC voltage was used for a short time with telegraphs, alarms, and railroad signals. Higher voltage was used for lighting, motors, pumps, etc. Originally, plain glass battery insulators were placed between wooden stringers and the battery tank. This proved to be insufficient ... so, glass insulators were added between the wood stringers and the floor. This combination became known as "Double Insulation."

However, this did not prevent the decay of the wooden stringers, so the Electric Storage Battery Company (E.S.B. Co.) designed and developed the combination of an oil insulator and an earthenware pedestal that solved the problem of the wood decaying. This earthenware pedestal / oil insulator became the standard for the industry and made it possible to finally do away with the wooden stringers.



Figure 3: Glass tray.

Illustrated on the right [Figure 1] is a complete Pedestal / Oil Insulator unit consisting of the cupped lead washer, alloy cap, Y lead washer, oil insulator and the insulator pedestal. It can be seen how the insulator and the pedestal lock together. It is believed that this is a one-of-a-kind, complete unit. The patent for this invention that was granted to Cornelius Ambruster of Roslywn, Pennsylvania on July 13, 1915.

The oil insulator / earthenware pedestal was used to support a battery tank with lead. The exterior was coated with asphaltum. Four to six CD-35s or CD-36s were used to support this style of battery tank.

Please notice the base of the pedestal. The uneven design of the base of the pedestal allowed water and foreign material to pass under the support when flushing the battery room floor.

Birdfeeders

The nickname "birdfeeder" was given to the CD-35 and CD 36 around 1969. The collectors at that time thought they resembled a bird feeder. There is an example of an aqua CD-36 embossed "The E.S.B. Co. (R) Made in U.S.A. B-15993-3" illustrated on the right [Figure 2].

These battery insulators were very unique because they used a nonconductive oil that was put in the circular trough and was then covered by a lead-alloy cap. The purpose of the cap was to exclude, as far as possible, all spray or other foreign matter from getting into the oil space and to protect it from being splashed when flushing the Battery Room floor.

Glass Tray

Jars that were not sealed were set



Figure 5: Gould Battery (R)
Patented Dec. 1, 1896, aqua



Figure 1: Pedestal oil insulator.

on separate glass trays [Figure 3] or boxes filled with sand. This was necessary due to the absence of a sealed cover which allowed acid-laden moisture to run down the outside of the jar and attack the wooden support (susceptible to rot) that the battery sat on.

Glass Thread Screw Battery Insulators

This type of Battery Insulator has a very fragile male glass thread screw. It is believed that the thread was used to secure the insulator in the wooden stringers that supported the battery so that the insulator and support could be moved as a unit. Several are illustrated [Figures 4-6].

What Is A Well?

The wells (circular trough) that are a part of some of these insulators were used to collect Chlorides that would seep down the sides of the cell (battery jar). This type of battery insulator is known as a "Chloride Accumulator" and some are embossed with that information [Figure 7a and b].

United Kingdom Battery Insulators

British battery insulators are different from battery insulators that were made in the United States.

The British battery insulators are in two parts: a base unit and a top. The smaller size bases have a round bump in the center that matches a depression in the top's center to locate and secure the two pieces together.

Four two-part styles are known. Until



Figure 8 British battery insulators are in two parts.

a year ago, the only colors known to exist in the in the two-part battery insulators were light green and light aqua. Illustrated [Figure 8] is a clear base battery insulator that is believed to be the only one known at this writing.

The only known light-green "unipart" in the U.S.-style has a solid center instead of hollow center and has a corrugated base.

The style numbers and letters of the United Kingdom battery insulators were assigned by Ian Mackey and are not "officially" recognized numbers by the insulator-collecting community at this time.

Colors for Battery Insulators

Colors of battery insulators range from various shades of aqua to green, clear, smoke, lavender, 7-Up green, emerald green, yellow-green, cobalt blue, blue and amber.

What Are Glass Battery Plate Spacers?

It is believed that the "U" shaped glass bars were part of a failed attempt to insulate the positive and negative plates from each other in a cell.

At this writing, no proof has been found to support this theory.

The only reference found was to "rods" being used in a patent issued to Stanley C.C. Currie of Philadelphia, Pa., October 14, 1890, #438,532... "insulated from one another by means of rods."

"Plate spacers" have been found in various shades of aqua, blue and green.

Manufacturers

Some of the manufacturers known to have produced battery (rests) insulators are: Brookfield Glass Company, Old Bridge, New Jersey; The Elmer Glass Co., Elmer, New Jersey; Hemingray Glass Co., Muncie, Indiana.

Dumps that were used by these companies have been excavated by collectors. Battery insulators, shards of, and warming pours of battery insulators were found at some of the manufacturer's dumps.

The following is a list of battery insulator (or pieces of such) that have been found in some of the manufacturer's dumps:

Brookfield Dump - Old Bridge, New Jersey: CD-20, Gould; CD-29, no embossing [Figure 9]; CD-53, U.S.L. [Figure 4]

Hemingray Dump - Muncie, Indiana: CD-24, U.S. Light & Heating Co. [Figure 11]; CD-24, National Battery Co.; CD-33, no embossing

Elmer Glass Co. Dump - Elmer, New Jersey: CD-35, no embossing; CD-36, E.S.B. Co. [Figure 2]

Earliest Patent Date

The earliest known patent date for a glass battery insulator is July 12, 1870. The patent number 105,252 was granted to Orris W. Robertson of Milwaukee, Wisconsin.

The E.S.B. Co.

The Electric Storage Battery Co. (E.S.B. Co.) of Philadelphia, Pennsylvania was founded in 1888 by W.W. Gibbs. By 1908 they were using glass for their battery (rests) insulators.

The information is supported by copies of various patents.

Figure 10 illustrates an E.S.B. Co. CD-20 in aqua. Figure 12 is an emerald green example CD-30 embossed "Chloride Accumulator / The E.S.B. Co."

Gould

Gould Storage Battery Co. was founded in 1898 by Charles Gould of New York. Their first patent for a battery insulator is 1913.

Figures 5 and 6 illustrate two Gould insulators. Figure 13 is a beautiful example of a yellow-green CD-22.5 patented Dec. 1, 1896 while Figure 14 features another CD-22.5 in light lavender.



Figure 14: Another CD-22.5, this one light lavender in color.

U.S.L.

In 1898 the National Battery Company was formed. Electric Autolite later gained control of National Battery Company and operated it under the name of U.S.L. Battery Company.

Figure 4 illustrates an example of a U.S.L. CD-53 insulator in light aqua.

No Written History

The collecting of "battery (rests) insulators" is a specialty within the hobby of insulator collecting. Although we are learning more about how the battery insulators were used and who made them, the history of the battery insulators has yet to be written. More written documentation is needed.

At this time, there are still unlisted styles with no history [Figures 15 and 16] and others just waiting to be discovered.

As Collectors, Our Goal

Hopes are that as you read this article you will become more aware of the different styles (CD numbers) and the range of colors, as well as some basic history of the battery insulators, oil insulators and chloride accumulators.

Resources:

John and Carol McDougald, *History & Guide to North American Insulators*.

Judy Kokal, Gould Electronics Inc.

Deb Burkhart, EnerSys (Exide).

Glenn Drummond, patent information.

Ian Mackey, American / British Battery Rest Gallery website.

Elton Gish, patent information.

E.W. Allen, storage batteries.

NIA (National Insulator Association) website.

Smithsonian Institute, Washington, D.C., research.

Bill Meier, ICON.

Dann Cochran, Hemingray dump info.

Bob Stahr, Hemingray dump info.

David Sztramski, Brookfield dump info.



This article came from a brochure created as part of Charles and Sandi's display of battery insulators, oil insulators and chloride accumulators that won three awards: Best of Show, Most Educational and People's Choice during the Lewes, Delaware show in Sept., 2005.

Appendix C Gamewell Battery Support Insulator

[R=∞ Home](#)

In the words of Elton Gish “This odd little 2-part porcelain insulator has popped up many times over the past 50 years and continues to raise curious questions. We have never addressed it before so it is time we lay out what little information we know about



it.”

Typical Gamewell insulator.

Little was known about these little two-part insulators. According to Gerald Brown's books, someone told him they held glass rods in the grooves to support batteries for Gamewell Fire Alarm Telegraph Co. systems in banks. Several years ago I did an exhaustive internet search on Gamewell and could not learn anything about the support for the batteries, but Steve Coffman was able to find a couple of references recently that confirmed how the insulators were used. One article described a Gamewell system installed in East Watertown, MA in 1906 for the Fire and Police Departments. The article in the April 14, 1917, issue of *Electrical Review and Western Electrician* gave this detailed account of the battery room in the Holyoke, MA Central Fire-Alarm Office:

The battery room at the rear of the central office contains three rows of five shelves, each of insulated metal battery racks with capacity for 500 storage cells of the couple type. These are connected on the A and B banks. The couples are mounted in glass jars on glass rods and porcelain insulators. Each set of batteries on each circuit is protected by three-ampere cartridge fuses. The batteries are connected to the storage-battery switchboard through wires concealed in the ducts, which enter floor boxes under each post. The wires enter the pipe posts from below and connect to the fuse blocks.

A private-branch-exchange telephone switchboard with 10 auxiliary lines to official and engine-house instruments is used for fire-department calls. It is also connected with the New England Telephone Company's system by three trunk lines for public calls.

The complete system was installed by the Gamewell Fire Alarm Telegraph Company, of New York, under the direction of A. D. Wheeler, its New England agent. The installation work was done by E. P. Cochrane and G. A. Broder, construction engineers for Gamewell Company.

The batteries were used to maintain current in order to send a telegraph alarm message to the fire or police departments. There are grooves in the bottom of Gamewell glass battery jars to secure them on the glass rods supported by the little porcelain insulators. Apparently the plug-bottom of the insulators fit in holes in metal battery support racks. The Watertown article stated the storage batteries were “*mounted on iron pipe racks with porcelain insulators and glass rods.*”



Gamewell glass battery jar with grooves in bottom.

Some of the insulators were originally found in a bank in Georgia or somewhere in the South. At least one insulator has been reported that was embossed on the bottom part:

GAMEWELL 60. Here is a photo of the separate parts of the 2-part Gamewell insulator.



The head on the right is very different and requires a slotted type of base that I do



not have. Perhaps it is an early version that fit in the iron pipe rack?



The above article on Gamewell battery rests is from: <https://www.r-infinity.com/Gamewellindex.htm>

114 Appendix D: Patents Related to Porous Cup.

<u>Patent #</u>	<u>Assignee</u>	<u>Date</u>
311516	C.P: Orne	February 3, 188\
342508	E.M. Gardner	May 25, 1886
368806	T.W. Bryant	August. 25,1886
380084	H.J. Brewer	March, 27, 1888
380855	H.J. Brewer	April 10, 1888
393814	P.C.Burns	December 4, 1888
400244	I. Kitsee	March 26, 1889
403955	C.B. Noble	May 28, 1889
414318	C.A. Hussy	November 5. 1889
439511	C.A. Hussy	November 28, 1889
448798	C.J. Hirlman	March 24, 1891
476296	R.P. Osgood	June 7, 1892
511514	F.G. Curtis	December 26, 1893
522559	F. Fullner	July 3, 1894
522839	F.F. Johnson	July 10, 1894
554427	S.R.V. Robinson	February 11, 1896
558091	W. Morrison	April 14, 1896
636956	F.G, Curtis	November 14, 1899
663938	C.B. Schoenmehl	November18, 1900
665609	C.B. De Lamarre	January 8, 1901
684391	S. De Ayola	November 8, 1891
688077	G.T. Eyanson	December 3, 1891
768372	P.J. Kamperslyk	August 23, 1904
792191	E.J. Blanuser	June 13, 1905
794864	P.J. Kamperslyk	July 18, 1905
821032	T.A. Edison	May 22, 1906
982729	P.J. Kamperslyk	January 24, 1911
1190025	J.M. Skemic	July 4, 1916
1276604	D.H. Wilson	August 20, 1918

115 Appendix E: Battery Section from Stout Meadowcroft Co. N.Y.

62

THE STOUT-MEADOWCROFT CO., NEW YORK.

BATTERIES.

THE NEW "LAW PRISM" BATTERY.

CORRUGATED PRISMS, LOCK TOPS.

PATENTED.

For telephones, gas lighting, burglar alarms, electric clocks, annunciators, medical purposes, Morse learners, and all kinds of electric bells— Everything that can advantageously use an "Open Circuit Battery." Size over all $4\frac{1}{4} \times 4\frac{1}{4} \times 7\frac{1}{2}$.

Thousands of Cells are now in use in all parts of the land, and thousands are being added to the number monthly.



Justly celebrated throughout the United States. Hundreds of testimonials to its worth have been received.

PRICE LIST.

Complete Cell, with Sal Ammoniac.....\$1.50

Subject to Discount, for quantities only.

PARTS.

Jar and its Rubber Ring.....	\$0 30
Cover, with small Carbon sealed in.....	35
Carbon Connector.....	12
Zinc Connector.....	08
Rubber Bolt.....	12
Zinc and its Rubber Ring.....	12
Sal Ammoniac, 6 oz. in bag.....	08
Pairs of Prisms.....	50

THE LECLANCHÉ "DISQUE" BATTERY.

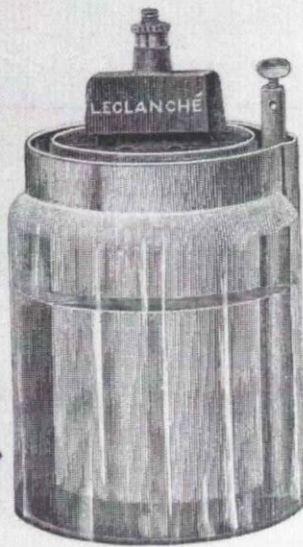
FOR ALL OPEN CIRCUIT WORK.

Telegraphs,

Telephones,

Bells,

Annunciators,



Burglar

Alarms,

Medical

Machines,

Etc., Etc.

This battery is well known throughout the world for its many good qualities. Thousands are sold every year.

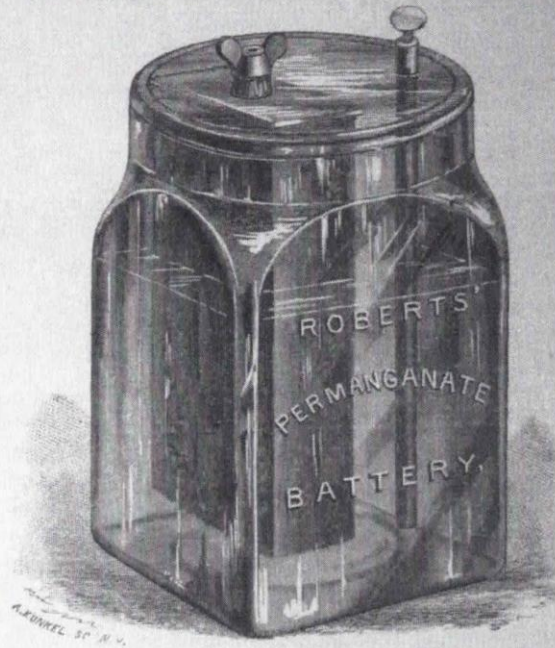
PRICE LIST.

Battery, complete.....	\$1 25
Porous Cup.....	90
Glass Jar.....	18
Zinc, with Connector.....	10
Sal-Ammoniac.....	08

Special Discount to the Trade.

ROBERTS' PERMANGANATE BATTERY.

Patented in the United States February 3, 1885, No. 311,852; February 3, 1885, No. 311,853; May 5, 1885, No. 317,206; also in England and France.



This is a simple, easily set up and cheap battery, for open circuit work. It is put into operation by simply adding water to the powder in the cell. The battery when set up gives from 1.7 to 1.9 volts of electro-motive force, and about 2.5 *amperes*. The internal resistance is about one-half of an *ohm*. One cell will be found sufficient for ordinary bell-ringing work. It is also used for telephones, bell-ringing, gas-lighting or open circuit work generally, and can also be used for lighting incandescent lamps where only flashes for a few seconds at a time are required. There is scarcely any trouble from climbing salts, and the liquid evaporates so slowly that expensive air-tight covers are not necessary.

PRICE LIST.

Price.....\$1 00 per cell.

PRICES OF PARTS OF PERMANGANATE BATTERY.

Glass Jars.....	\$0 30
Zincs.....	10
Carbons.....	25
Covers.....	10
Bag of Powder.....	35

Directions on each Cell.

THE GRENET BATTERY.

This battery is especially adapted for experimental and illustrative purposes. It occupies but little space, furnishes a large quantity of current, is beautiful in design, and, as the zinc can be raised from the fluid, may be kept charged, ready for use, for several weeks, and can be set in action any time when required by simply depressing the brass rod which slides through the centre of the cover of the cell, and to which the zinc is attached.

For operating induction coils and electro-medical instruments its qualities are well known. It is also well adapted for electric lighting purposes, for doctors' and dentists' use and scientific purposes; also for charging storage purposes. Electro-motive force, a little over two volts.



PRICE LIST, GRENET BATTERY.

	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
Inches high.....	6	8	10	12	12*
Price each.....	\$2 00	\$3 50	\$4 50	\$5 50	\$9 00

* Has double zincs and carbons.

Extra Zincs, Nos. 1 and 2..... 20c. each.
 " " " 3 and 4..... 35c. "

DIRECTIONS.

To make the solution: To three pints of cold water add five fluid ounces of sulphuric acid; when this becomes cold, add six ounces (or as much as the solution will dissolve) of finely pulverized bi-chromate of potassa; mix well.

To charge the battery: Pour the above solution into the glass cell until it nearly reaches the top of the spherical part; then draw up the zinc and place the elements in the cell. The fluid should not quite touch the zinc when it is drawn up.

CARBON BATTERIES.

ELECTRO-MOTIVE FORCE, 2 VOLTS.

	4 x 4. No. 1.	4½ x 4½. No. 2.	6 x 8. No. 3.
Cell complete.....	\$1 35	\$1 70	\$4 25
Jar only.....	25	25	35
Zinc only.....	40	50	2 35
Zinc Connector.....	15	15	20
Porous Cups only.....	12	12	25
Carbon only.....	12	35	50
Carbon Connector.....	22	22	50
Carbon Clamp.....	10	15	25

BUNSEN BATTERY.

ELECTRO-MOTIVE FORCE, 1.5 VOLTS.

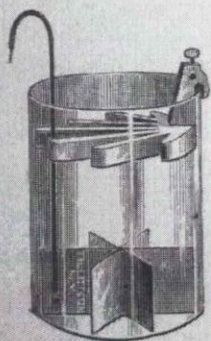
	HALF PINT.	ONE PINT.	ONE QUART.	TWO QUARTS.	ONE GALLON.	TWO GALLONS.
Cell complete.....	\$0 90	\$1 20	\$1 50	\$2 00	\$3 00	\$5 75
Glass Jar.....	13	20	25	30	35	75
Zinc and Connector...	30	40	60	70	1 10	1 75
Porous Cup.....	12	13	15	20	25	75
Carbon.....	10	12	12	35	50	1 40
Carbon Connections ...	25	40	40	45	80	1 10

GROVE BATTERY.

ELECTRO-MOTIVE FORCE, 2.1 VOLTS.

Cell complete.....	\$1 60	Jar, 4 x 4	\$0 20
Zinc.....	45	Platinum	80
Porous Cup.....	15	Platinum Standard	50

"CROW FOOT" GRAVITY BATTERY.



	MAIN. 5 x 7 INCHES.	LOCAL. 6 x 8 INCHES.
Cell, complete.....	\$0 75	\$0 90
Jar.....	25	30
Zinc, with Hanger and Connector	30	40
Copper.....	20	20

STORAGE BATTERIES.

We have four styles of secondary batteries. The sizes and prices are as follows:

SIZES AND PRICES.

STYLE.	SIZE—INCHES.	E. M. F. VOLTS.	AMPERE HOURS.	PRICE.
No. 514.	$3\frac{1}{2} \times 1\frac{3}{4} \times \frac{5}{8}$	2	1	\$4 00
“ 514 $\frac{1}{2}$.	$3\frac{1}{2} \times 1\frac{1}{2} \times 1\frac{1}{8}$	2	2 $\frac{1}{2}$	5 00
“ 515.	$4 \times 2\frac{3}{4} \times \frac{7}{8}$	4	1	6 00
“ 516.	$4\frac{1}{8} \times 3\frac{1}{4} \times 1\frac{1}{8}$	4	2 $\frac{1}{2}$	9 00

Styles 515 and 516 for brilliant scarf pins, bouquets, surgical and dental lamps, theatrical lamps, microscopic lamps, etc., etc.

We have the various attachments for the above-described purposes, and are prepared to furnish attachments for use with the storage batteries, as follows:

Scarf-pin lamp, connecting cord with terminal and switch	\$2 50
Hair-pin lamp, with reflector, cords and switch	3 00
Portable battery case, with lamp, reflector and switch, specially adapted for use in families and hospitals	3 50
Primary battery for re-charging	3 00

Where batteries are treated with ordinary care, that is, not subjected to rough usage, and when charged and discharged in the manner and at the rate given in the directions for use, they should do excellent work for many months.

Where the battery is used to light a scarf-pin or other lamp by flashing only at intervals, it will last a longer time at one charging than if burned continuously.

MISCELLANEOUS SUPPLIES.

HARD RUBBER, in sheets.....	Per lb., \$1	75
" " in rods.....	" "	2 00
RED VULCANIZED FIBRE, in sheets, below $\frac{1}{16}$ -in. thick,	" "	60
" " " $\frac{1}{8}$ to $\frac{3}{16}$ -in. thick.....	" "	60
" " " $\frac{1}{4}$ to $\frac{1}{2}$ -in. thick.....	" "	50
BLACK VULCANIZED FIBRE, in sheets,		
" " " Below $\frac{1}{16}$ -in. thick.....	" "	65
" " " $\frac{1}{8}$ to $\frac{3}{16}$ -in. thick.....	" "	65
" " " $\frac{1}{4}$ to $\frac{1}{2}$ -in. thick.....	" "	55
SQUARE RODS VULCANIZED FIBRE, in random lengths,		
" " " " $\frac{1}{4}$ to $\frac{1}{2}$ -in. square. Per lb.,	" "	60
" " " " $\frac{3}{8}$ to $\frac{7}{8}$ -in. square. "	" "	70

PLATINUM WIRE.

NUMBER.	PER INCH.	NUMBER.	PER FOOT.
No. 12.....	\$0 80	No. 26.....	\$0 60
" 14.....	50	" 28.....	50
" 16.....	35	" 30.....	30
" 18.....	25	" 32.....	20
" 20.....	20	" 34.....	15
" 22.....	15	" 35.....	10
" 24.....	08	" 40.....	06

Nos. 12 to 22.....Per dwt., \$0 60
 " 24 to 30..... " 75

PRESSED CARBONS.

FOR BATTERY AND OTHER PURPOSES.

INCHES.			PRICE EACH.	INCHES.			PRICE EACH.	INCHES.			PRICE EACH.
Long.	Wide.	Thick.		Long.	Wide.	Thick.		Long.	Wide.	Thick.	
3	2	$\frac{1}{4}$	\$.05	9	6	$\frac{1}{8}$	\$.30	12	6	$\frac{3}{8}$	\$.70
3 $\frac{1}{2}$	2 $\frac{1}{2}$	$\frac{1}{4}$	.06	9	6	$\frac{1}{4}$	.40	12	6	$\frac{1}{2}$	.80
4 $\frac{1}{4}$	1 $\frac{3}{8}$	$\frac{1}{4}$	.06	9	6	$\frac{3}{8}$	.55	12	12	$\frac{1}{8}$	.90
4 $\frac{3}{4}$	1 $\frac{3}{8}$	$\frac{1}{4}$	.06	9	6	$\frac{1}{2}$	.65	12	12	$\frac{1}{4}$	1.00
5 $\frac{1}{4}$	1 $\frac{7}{8}$	$\frac{1}{4}$	.08	10	6	$\frac{1}{4}$	.40	12	12	$\frac{3}{8}$	1.15
6	$\frac{3}{4}$	$\frac{3}{8}$	.08	10	6	$\frac{3}{8}$	.55	12	12	$\frac{1}{2}$	1.40
6	1 $\frac{1}{8}$	$\frac{3}{8}$	.20	10	6	$\frac{1}{2}$	.65	12	12	$\frac{3}{8}$	1.50
6	3	$\frac{1}{2}$	.25	11	6	$\frac{1}{4}$	.50	12	12	$\frac{3}{4}$	1.65
7	1 $\frac{1}{2}$	$\frac{1}{4}$	.07	11	6	$\frac{3}{8}$	.60	18	12	$\frac{1}{4}$	3.00
7	4 $\frac{1}{2}$	$\frac{1}{2}$	.35	11	6	$\frac{1}{2}$	.75	18	12	$\frac{1}{2}$	3.50
8	5 $\frac{1}{4}$	$\frac{1}{8}$	.30	11	9	$\frac{1}{4}$	.75	18	15	$\frac{1}{4}$	3.75
8	5 $\frac{1}{4}$	$\frac{1}{4}$	.35	11	9	$\frac{3}{8}$	.90	18	15	$\frac{1}{2}$	4.50
9	2	$\frac{3}{8}$	.30	11	9	$\frac{1}{2}$	1.10	18	18	$\frac{1}{4}$	4.75
9	4 $\frac{1}{2}$	$\frac{1}{2}$	.40	12	6	$\frac{1}{4}$	.60	18	18	$\frac{1}{2}$	5.25

Special Sizes made at Short Notice.

Carbon Buttons, $\frac{3}{8} \times \frac{3}{16}$	Per 100, \$4 00
“ “ $\frac{1}{16} \times \frac{1}{16}$	“ 8 00

BATTERY CHEMICALS AND METALS.

ACID, SULPHURIC.....	Per lb., \$0 10
“ CHROMIC.....	Per oz., 14
BI-CHROMATE POTASH.....	Per lb., 25
BI-SULPHATE MERCURY.....	“ 1 25
MERCURY.....	“ 75
SULPHATE OF ZINC.....	“ 10
SAL AMMONIAC.....	“ 20

ZINC PLATES, best quality, cut to sizes required, 18 to 35 cents per lb.

miscellaneous

*912
217
157*

A Few Illustrations
Selected from
220 Installations
of the
“Chloride Accumulator”
operated in
Street Railway Service
installed by
THE ELECTRIC STORAGE BATTERY CO.
PHILADELPHIA

*Street Railway Convention
Detroit, October, 1903*

A Few Illustrations

Selected from

220 Installations

of the

“Chloride Accumulator”

operated in

Street Railway Service

installed by

THE ELECTRIC STORAGE BATTERY CO.

PHILADELPHIA

*Street Railway Convention
Detroit, October, 1902*

THE ELECTRIC STORAGE BATTERY CO.

PHILADELPHIA

MANUFACTURER OF

TRADE MARK

TRADE MARK

The "Chloride Accumulator" and The "Eride Accumulator"

REGISTERED SEPTEMBER 11, 1894.

REGISTERED APRIL 2, 1901.

SALES OFFICES

PHILADELPHIA,
Allegheny Ave. and 19th St.

NEW YORK,
100 Broadway.

BOSTON,
60 State St.

CHICAGO,
Marquette Building.

BALTIMORE,
Continental Trust Building.

CLEVELAND,
New England Building.

ST. LOUIS,
Wainwright Building.

SAN FRANCISCO,
Nevada Block.

DETROIT,
Michigan Electric Co.

HAVANA, CUBA,
G. F. Greenwood, Mgr.
34 Empedrado St.

It is hoped that these few illustrations of Railway Battery installations will prove of interest to the members and visitors attending the Street Railway Convention.

The development of the use of "Chloride Accumulators" in connection with the power systems of Electric Street Railways is indicated by the following figures:

Installations to October 1, 1901, 152, aggregating 98,000 K. W. Hours

Installations to October 1, 1902, 220, aggregating 130,000 K. W. Hours

The representatives of the Company will be pleased to furnish information regarding the application of batteries to Street Railway Service.

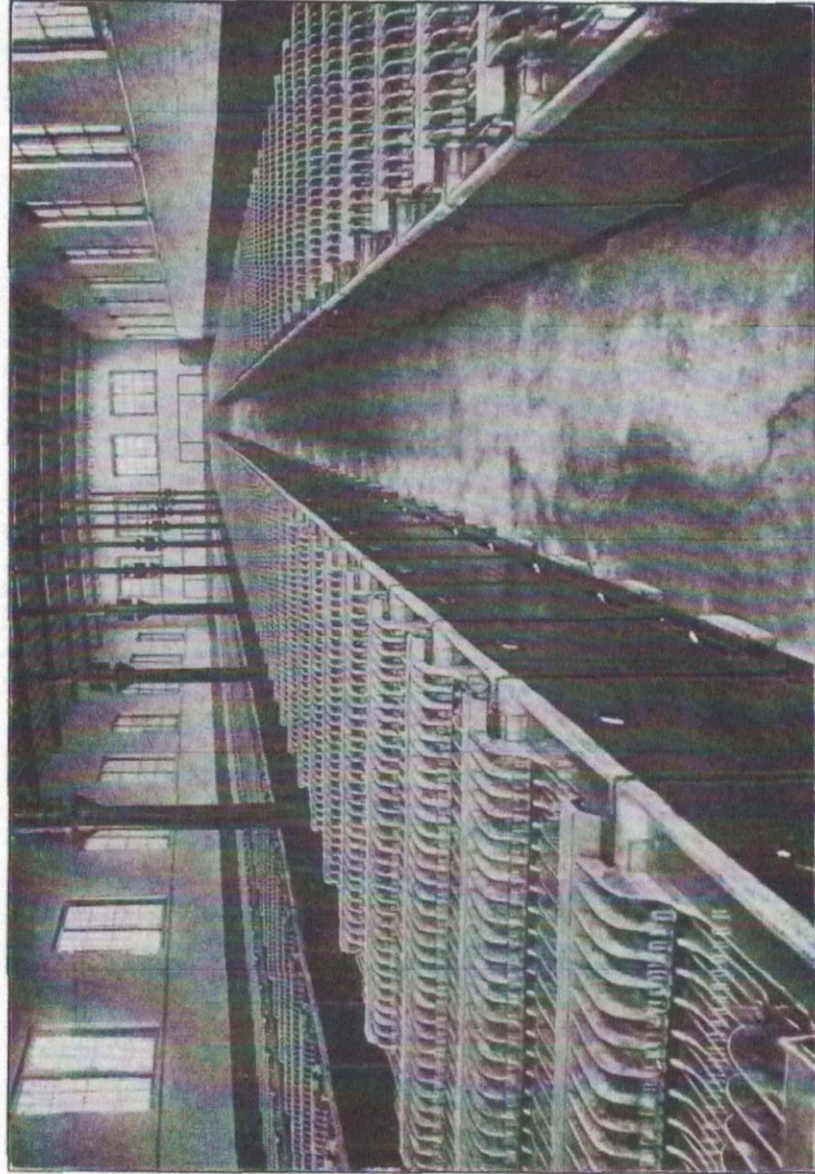
THE ELECTRIC STORAGE BATTERY CO.

PHILADELPHIA

Detroit, Michigan, October, 1902.

312/83 COMPANY'S PUBLICATION

THE ELECTRIC STORAGE BATTERY CO.

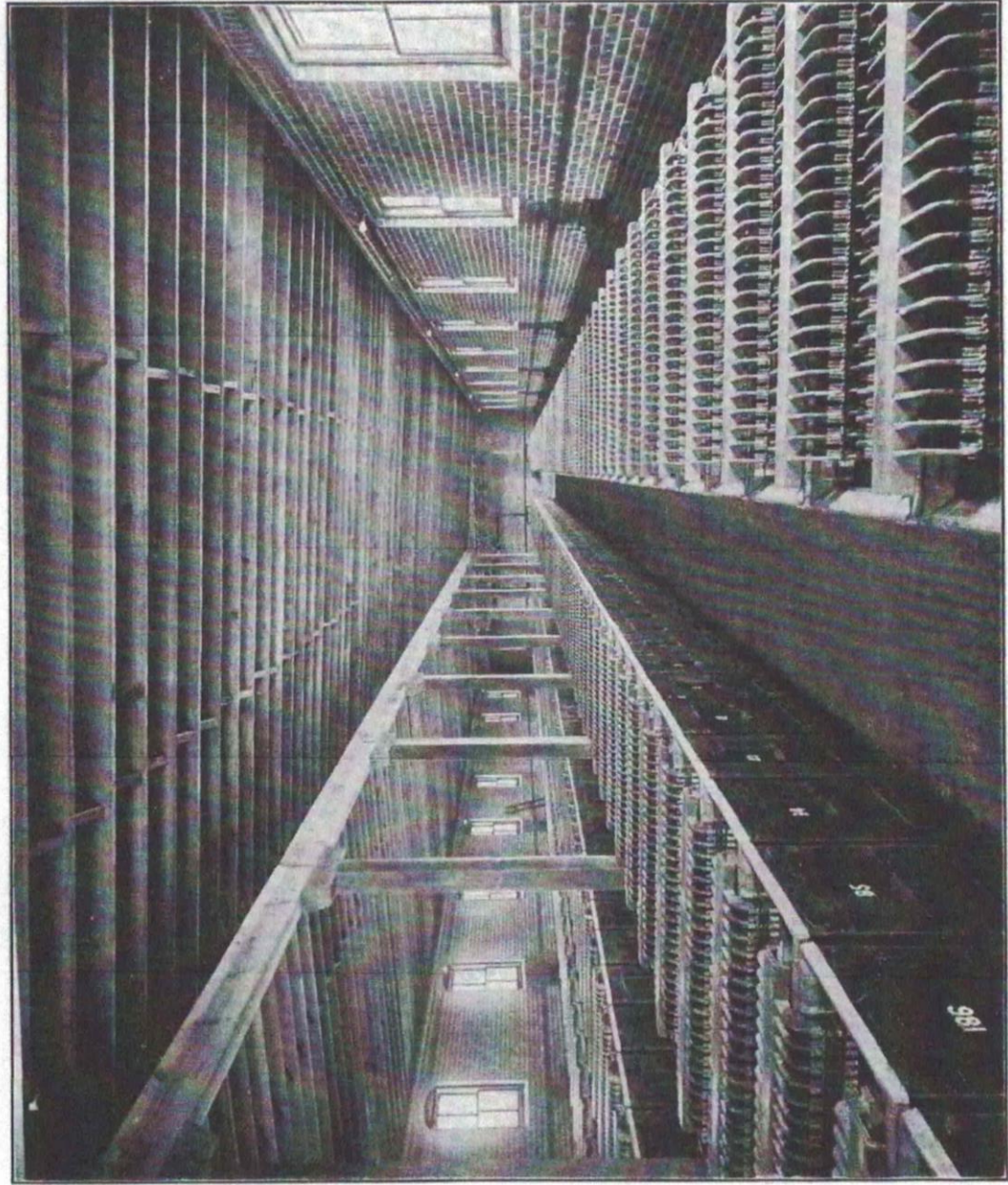


4

DETROIT UNITED RAILWAY.—BATTERY No. 1

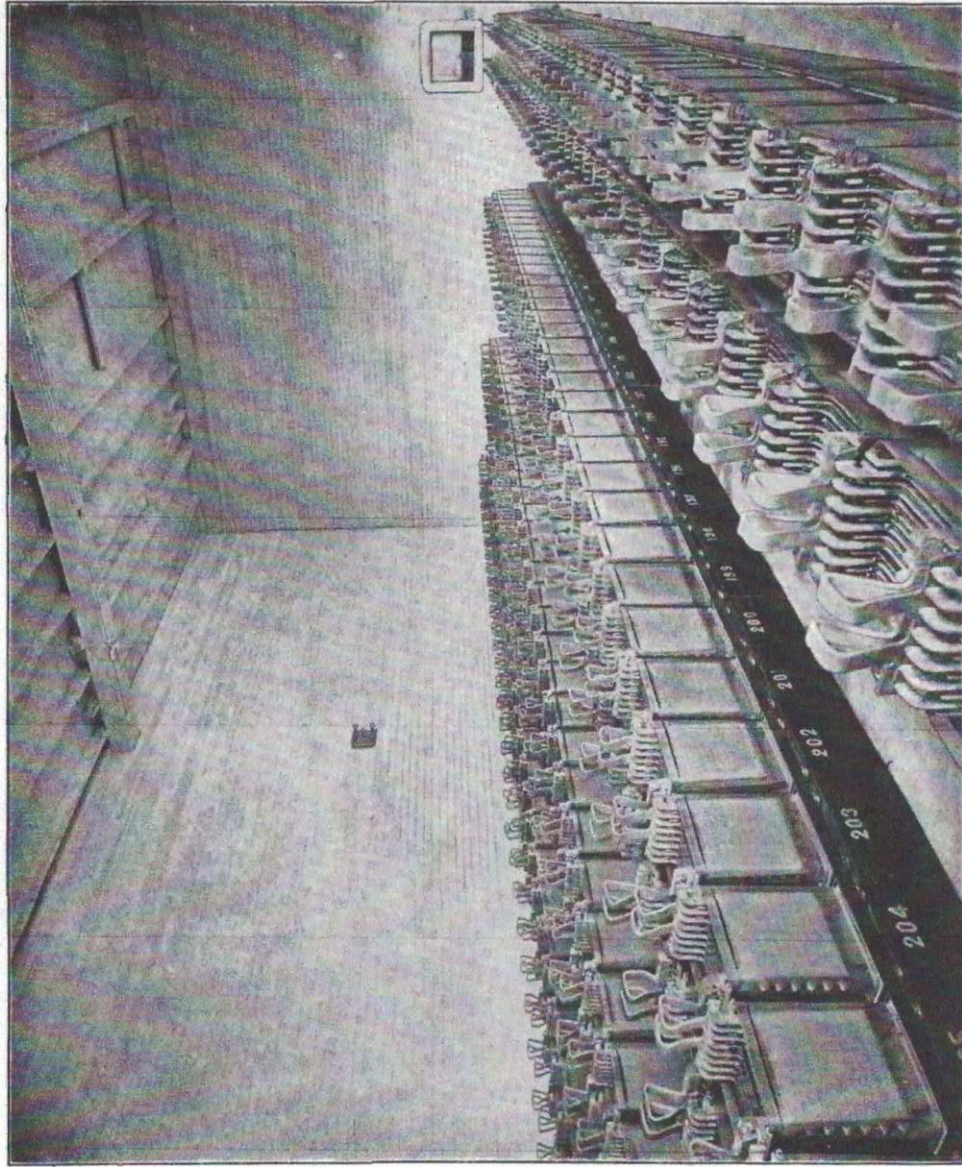
The First Battery of "Chloride Accumulators" installed for the Detroit United Railway is located opposite the Power House and consists of 267 elements, with a capacity of 2500 ampères. It was installed in August, 1900.

THE ELECTRIC STORAGE BATTERY CO.



DETROIT UNITED RAILWAY.- BATTERY No. 2
The Second Battery of "Chloride Accumulators" installed for the Detroit United Railway is located at the Third Street Sub-Station, a distance of three miles from the Power House, and consists of 250 elements, having a capacity of 250 amperes. Installed January, 1902.

THE ELECTRIC STORAGE BATTERY CO.



6

DETROIT UNITED RAILWAY—BATTERY No. 3
The Third Battery of "Chloride Accumulators" installed for the Detroit United Railway is located at Ecorse, on the Wyandotte Division, a distance of eleven miles from the Power House, and consists of 276 elements in glass jars, having a capacity of 280 amperes. It was installed in May, 1902.

THE ELECTRIC STORAGE BATTERY CO.

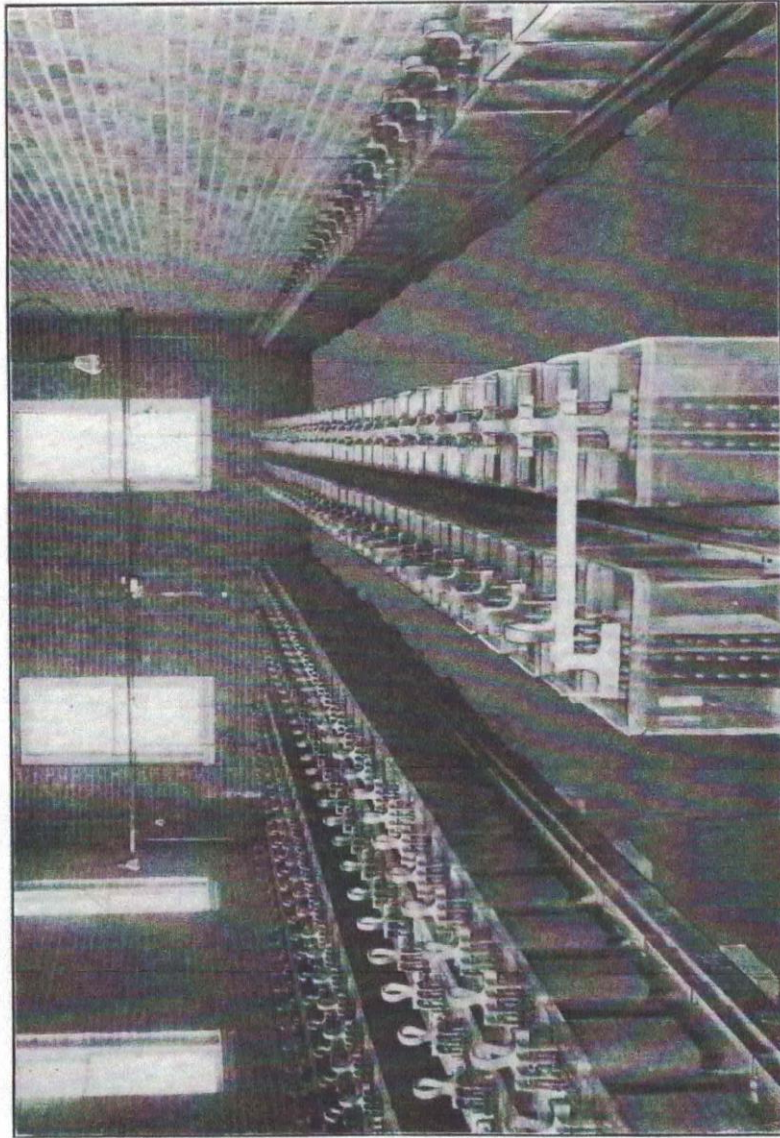


7

PHILADELPHIA RAPID TRANSIT COMPANY

This Battery of "Chloride Accumulators" is the first one installed for the Philadelphia Rapid Transit Company. It is located at Chestnut Hill and was put into operation September, 1896. It consists of 250 elements, having a capacity of 480 amperes. The Philadelphia Rapid Transit Company now operates six Batteries of "Chloride Accumulators."

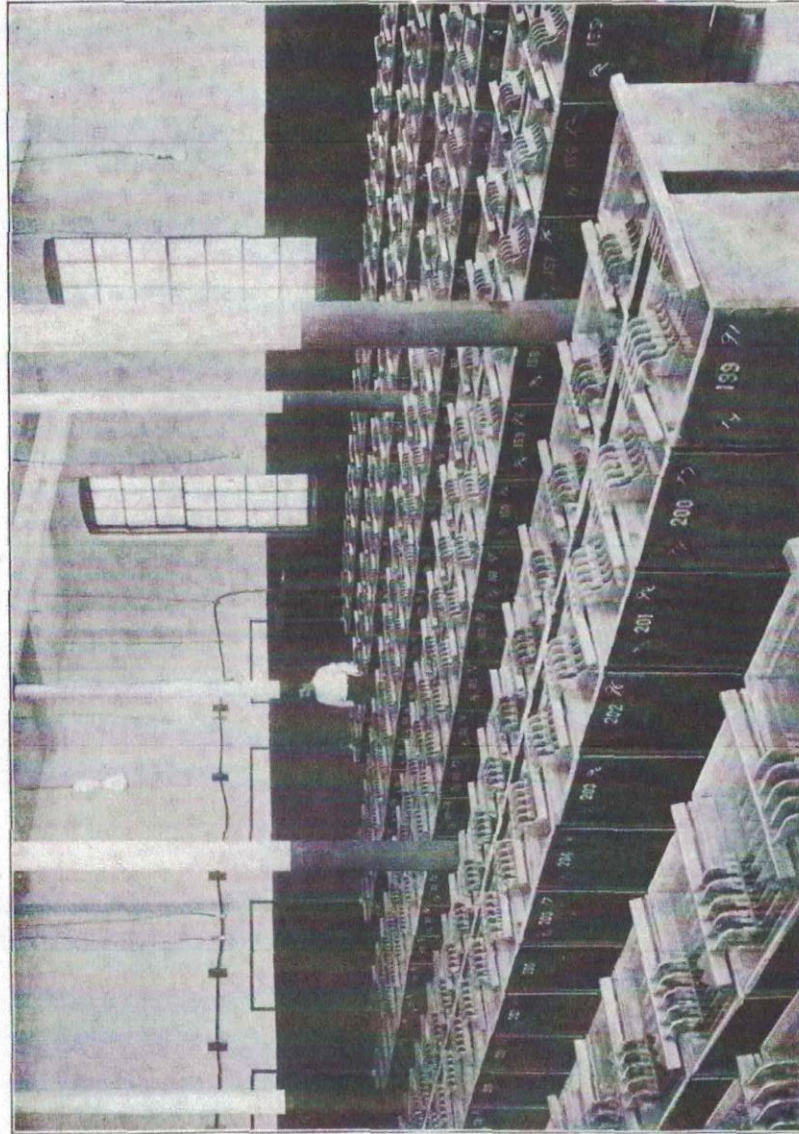
THE ELECTRIC STORAGE BATTERY CO.



CAMDEN INTERSTATE RAILWAY

This Battery, installed for the Camden Interstate Railway, is located at Ironton, Ohio, and consists of 288 elements, having a capacity of 120 amperes. Installation made June, 1902. An increase in the capacity of this Battery, by addition of plates, is now under way. In July, 1902, this Company installed a second Battery, located at Ceredo, W. Va., having a capacity of 200 amperes.

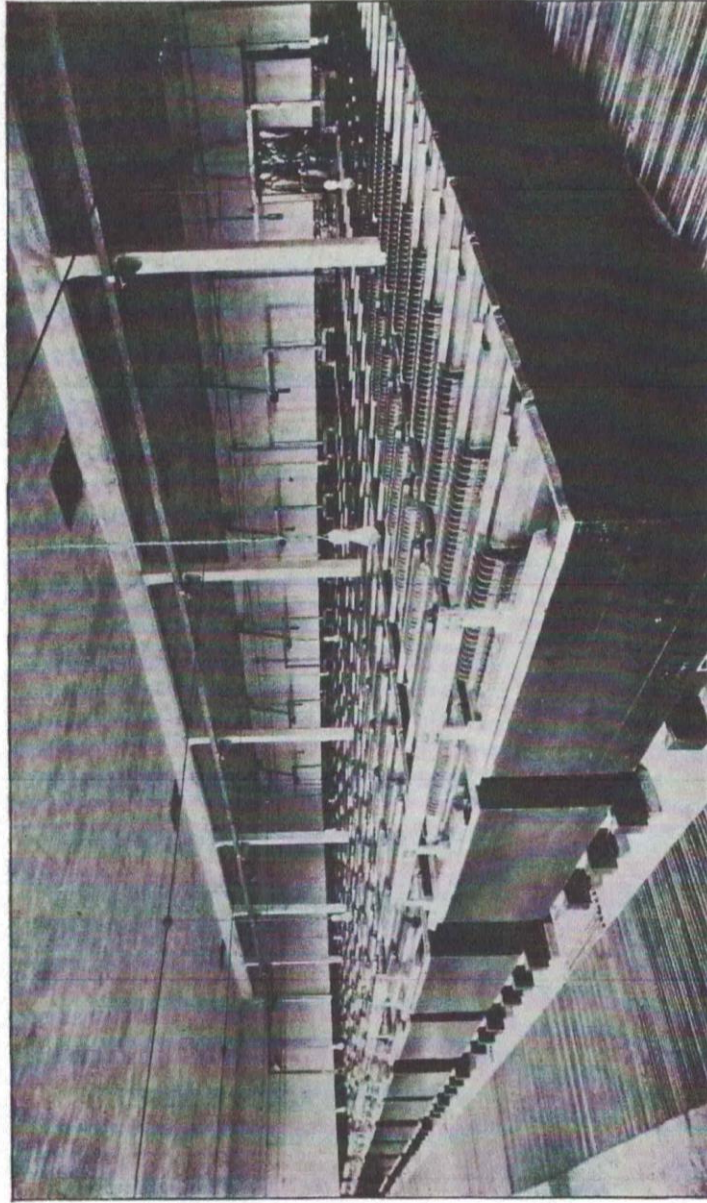
THE ELECTRIC STORAGE BATTERY CO.



HAMILTON ELECTRIC LIGHT AND CATARACT POWER COMPANY

The above Battery, installed in January, 1901, for the Hamilton Electric Light and Cataract Power Company, of Hamilton, Ontario, consists of 264 cells, having a capacity of 400 amperes. This Battery is operated in conjunction with rotary converters, the main station being operated by water power.

THE ELECTRIC STORAGE BATTERY CO.

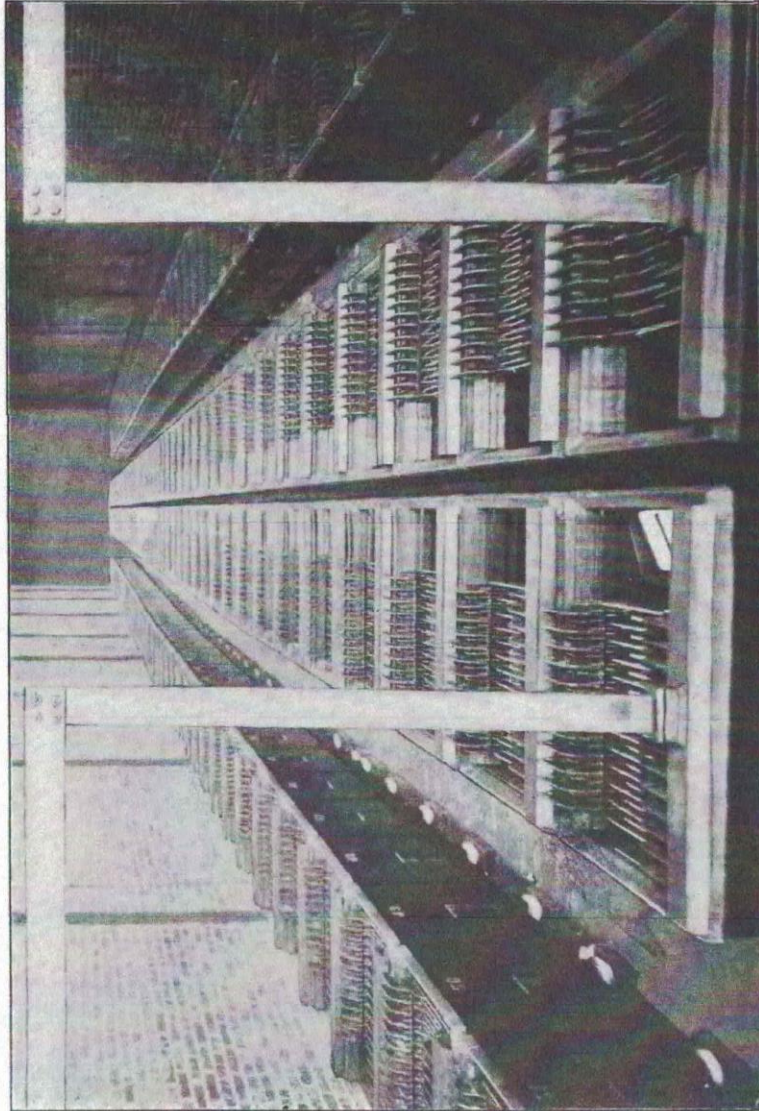


10

BUFFALO RAILWAY COMPANY

The Buffalo Railway Company operates three Batteries of "Chloride Accumulators." The first was installed at Niagara Street, in April, 1898, and consisted of 270 cells, having a capacity of 1380 amperes. This was increased by the addition of plates in June, 1901, to the full capacity of the tanks and now has a capacity of 2480 amperes. The above photograph was taken before increase was made. In July, 1900, the Cold Springs Sub-Station was equipped with 280 cells, and in September, 1900, the Eagle Street Sub-Station with a similar number. The capacity of each of these Sub-Station Batteries is now 2680 amperes.

THE ELECTRIC STORAGE BATTERY CO.

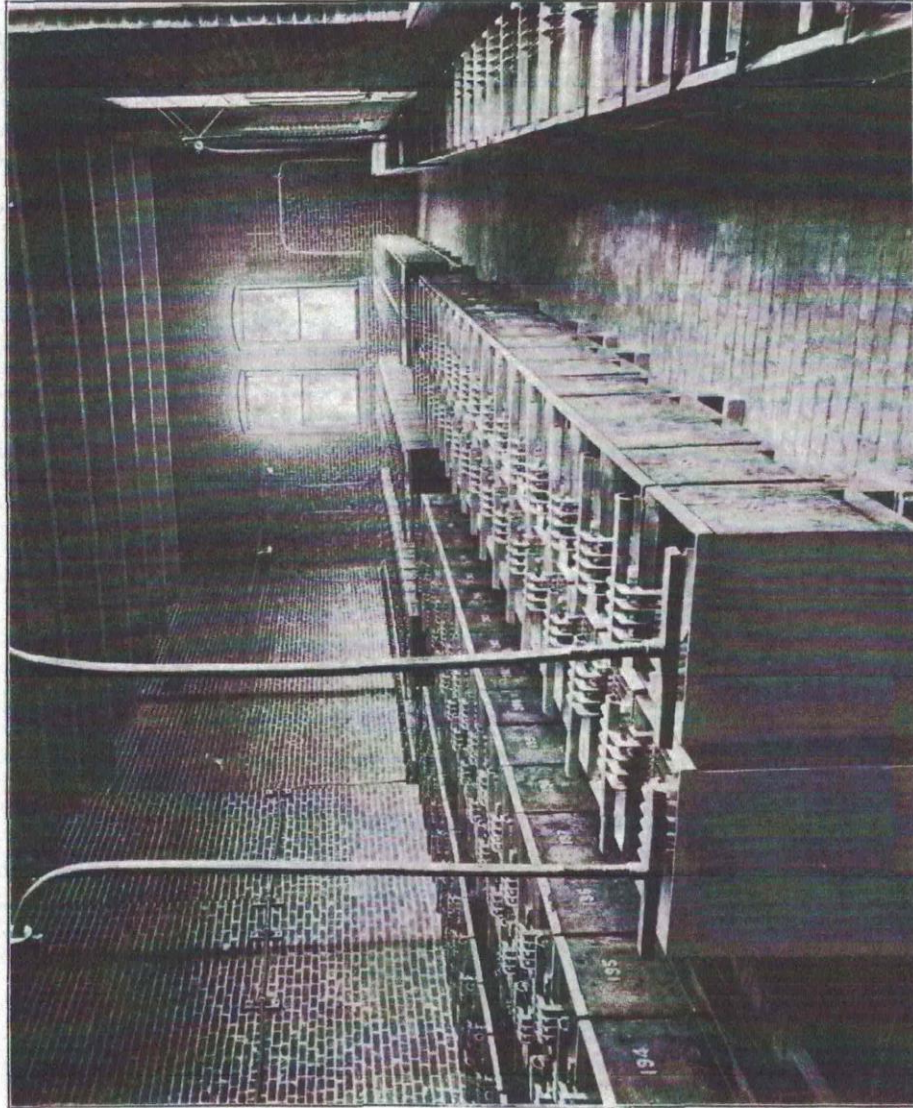


11

THE PITTSBURGH RAILWAYS COMPANY

The Pittsburgh Railways Company now operates ten Batteries of "Chloride Accumulators." This illustration shows the Battery located at McKeesport, Pa., which was installed in June, 1902, and consists of 264 cells, having a capacity of 960 amperes.

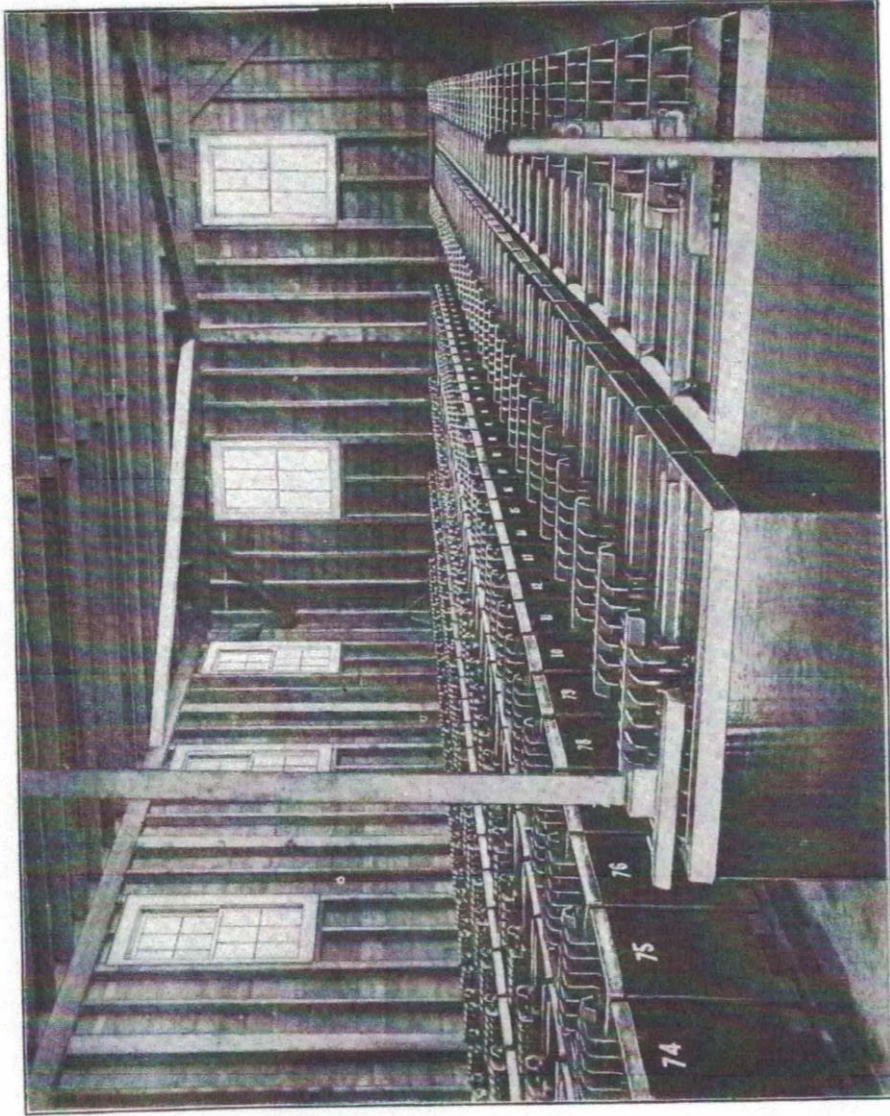
THE ELECTRIC STORAGE BATTERY CO.



12

THE UNION TRACTION CO., OF INDIANA
The Union Traction Co., of Indiana, operates nine Batteries of "Chloride Accumulators." The Battery illustrated above is located at Elwood, Indiana, and consists of 164 cells, having a capacity of 320 amperes. Installed July, 1900.

THE ELECTRIC STORAGE BATTERY CO.

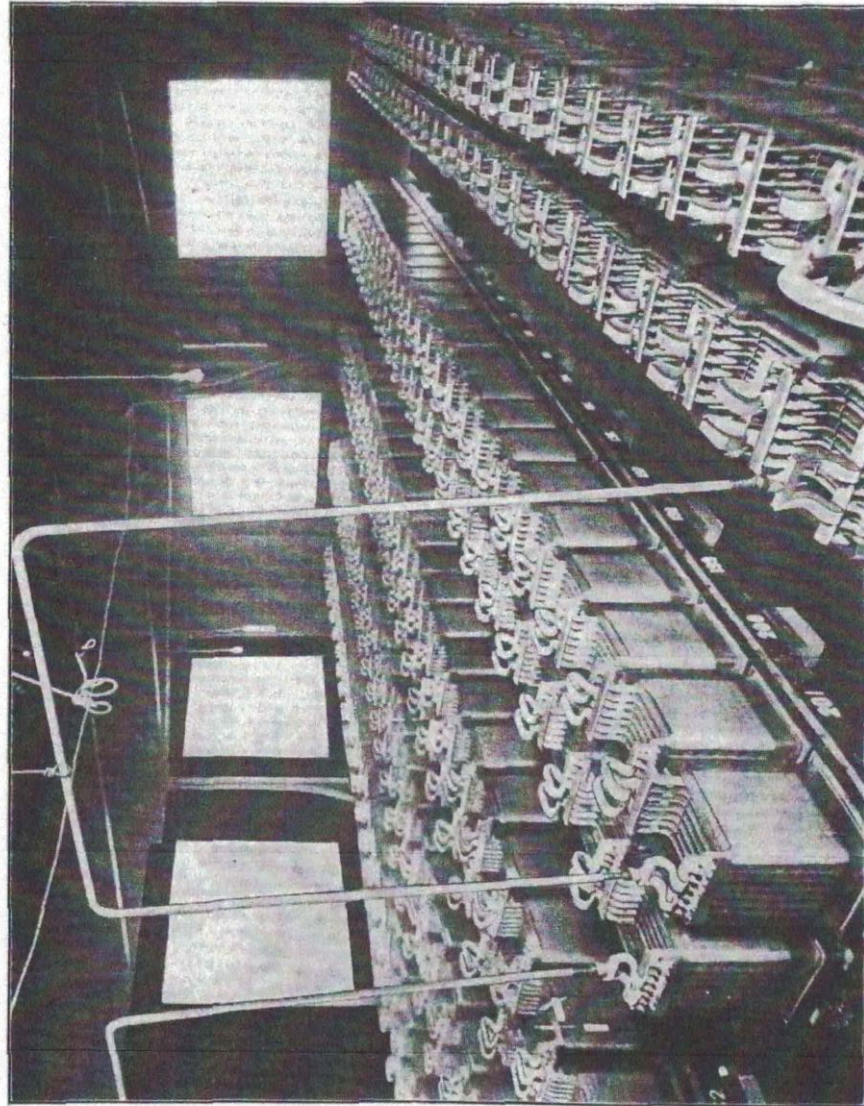


13

THE LEXINGTON AND BOSTON STREET RAILWAY COMPANY

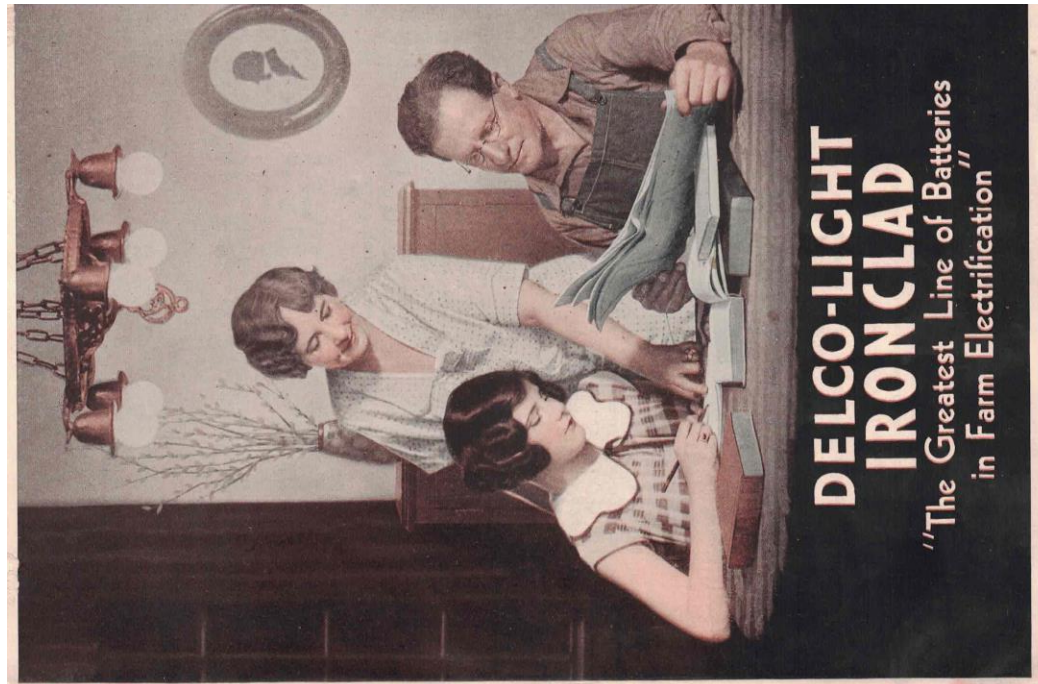
The Lexington and Boston Street Railway Company operates two Batteries of "Chloride Accumulators," located at Concord and South Billerica, Mass., respectively. They were installed in August, 1901, and each consists of 216 elements, having a capacity of 240 amperes. The illustration above is taken from the Concord Installation.

THE ELECTRIC STORAGE BATTERY CO.



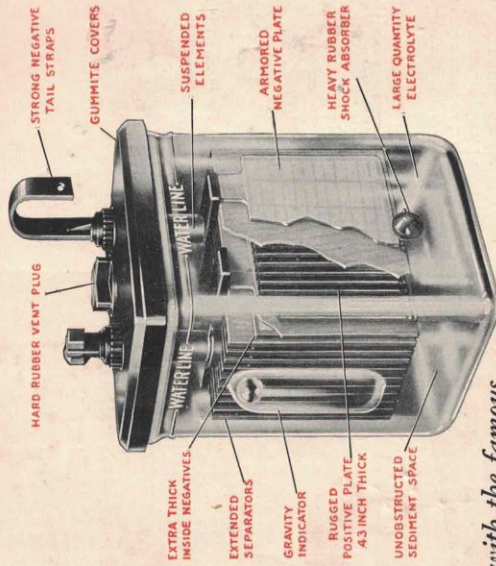
STEUBENVILLE TRACTION AND LIGHT CO.

The above is an illustration of the Battery for the Steubenville Traction and Light Co., installed June, 1902, at Allkanna, Ohio. It consists of 252 cells in glass jars, having a capacity of 240 amperes.



**DELCO-LIGHT
IRONCLAD**
"The Greatest Line of Batteries
in Farm Electrification"

Delco-Light IRONCLAD
POINTS OF SUPERIORITY



- HARD RUBBER VENT PLUG
- STRONG NEGATIVE TAIL STRAPS
- GUMMITE COVERS
- SUSPENDED ELEMENTS
- ARMORED NEGATIVE PLATE
- HEAVY RUBBER SHOCK ABSORBER
- LARGE QUANTITY ELECTROLYTE
- UNOBSTRUCTED SEDIMENT SPACE
- RUGGED POSITIVE PLATE .43 INCH THICK
- GRAVITY INDICATOR
- EXTENDED SEPARATORS
- EXTRA THICK INSIDE NEGATIVES
- WATER LINE
- WATER LINE

— with the famous

TEA-BALL CONSTRUCTION

THE action of the cell solution on the active material in the IRONCLAD positive plate can be compared to the brewing of a pot of tea. The boiling water passes through the little cloth bag and makes the tea. The leaves remain in the bag. In the Delco-Light IRONCLAD Battery, the positive active material is confined in hard-rubber tubes. The cell solution comes in contact with the active material through slots in the tubes.

DELCO APPLIANCE CORPORATION
Rochester, N. Y., U.S.A.
Toronto, Canada

Printed in U.S.A.

Form ADL-316—100M—6-31

Unquestionably!

The Greatest Battery Ever Made FOR FARM POWER AND

THE battery is one of the most vital parts of your individual electric plant. That's why a good battery is so highly important; why it has so much to do with the service and satisfaction you get from your plant.

Your battery must function instantly and always. You depend on it for constant, reliable, year-after-year service—without break or interruption. It must answer every call you make on it—from the smallest electric bulb to the unusually large output required in starting a motor. It must take care equally well of every load demand, small or large.

THE DELCO-LIGHT IRONCLAD BATTERY

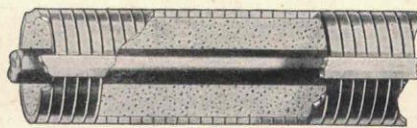
The Delco-Light IRONCLAD is the kind of a battery that's used on Uncle Sam's submarine boats . . . the kind that pulls powerful electric donkey engines. It's the same kind of a battery that drives thousands of electric delivery trucks. It's the kind of a battery that's used wherever there is a need for an extra-powerful battery that can be depended upon . . . wherever there is a heavy drain on stored current. It is a battery that is still going strong long after the ordinary type battery has been replaced or has required expensive rebuilding and repairs.

TEA BALL CONSTRUCTION

The superiority of the Delco-Light IRONCLAD battery is due to the construction of the positive plates.

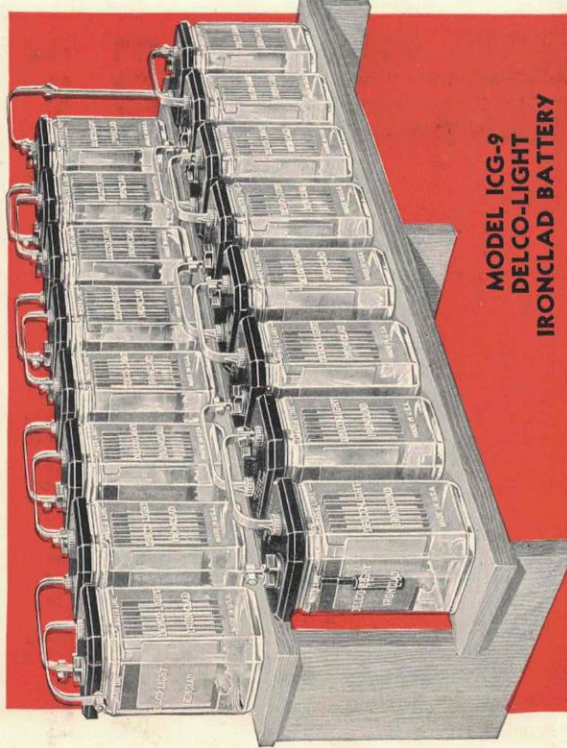
You've often seen a pot of tea made. You know how the boiling water passes through the little cloth bag and brews the tea, the leaves remaining enclosed in the cloth bag.

This same principle is used in the Delco-Light IRONCLAD battery. The positive plates are made up of a series of finely



Cross section of the slotted hard-rubber tube in the IRONCLAD positive plate. This feature insures greater power, dependability and long life.

The Delco-Light IRONCLAD is available in two sizes



**MODEL ICG-9
DELCO-LIGHT
IRONCLAD BATTERY**

PICTURED here is the Delco-Light IRONCLAD 9-plate Battery. This battery is essentially the same as the 13-plate battery illustrated on the preceding page except that it has 9 plates instead of 13. It costs less than its powerful big brother but it is of the same sturdy construction, and carries the same warranty. It is the ideal battery for all ordinary home lighting and power uses.

THE IRONCLAD IS WARRANTED

With every Delco-Light IRONCLAD battery sold, Delco-Light issues a written warranty. Should the battery prove defective during the time of the warranty it will be replaced.

The Delco-Light Ironclad, either 9 or 13 plates, is used to supply 110-volt service as well. In this case, 56 cells are required.

If you have not yet electrified your home, get in touch with your Delco-Light dealer. Let him show you how easy it is to enjoy the comfort and convenience that only electricity can bring.

RECEIVE THE FULL BENEFITS OF DEPEND

de LIGHT

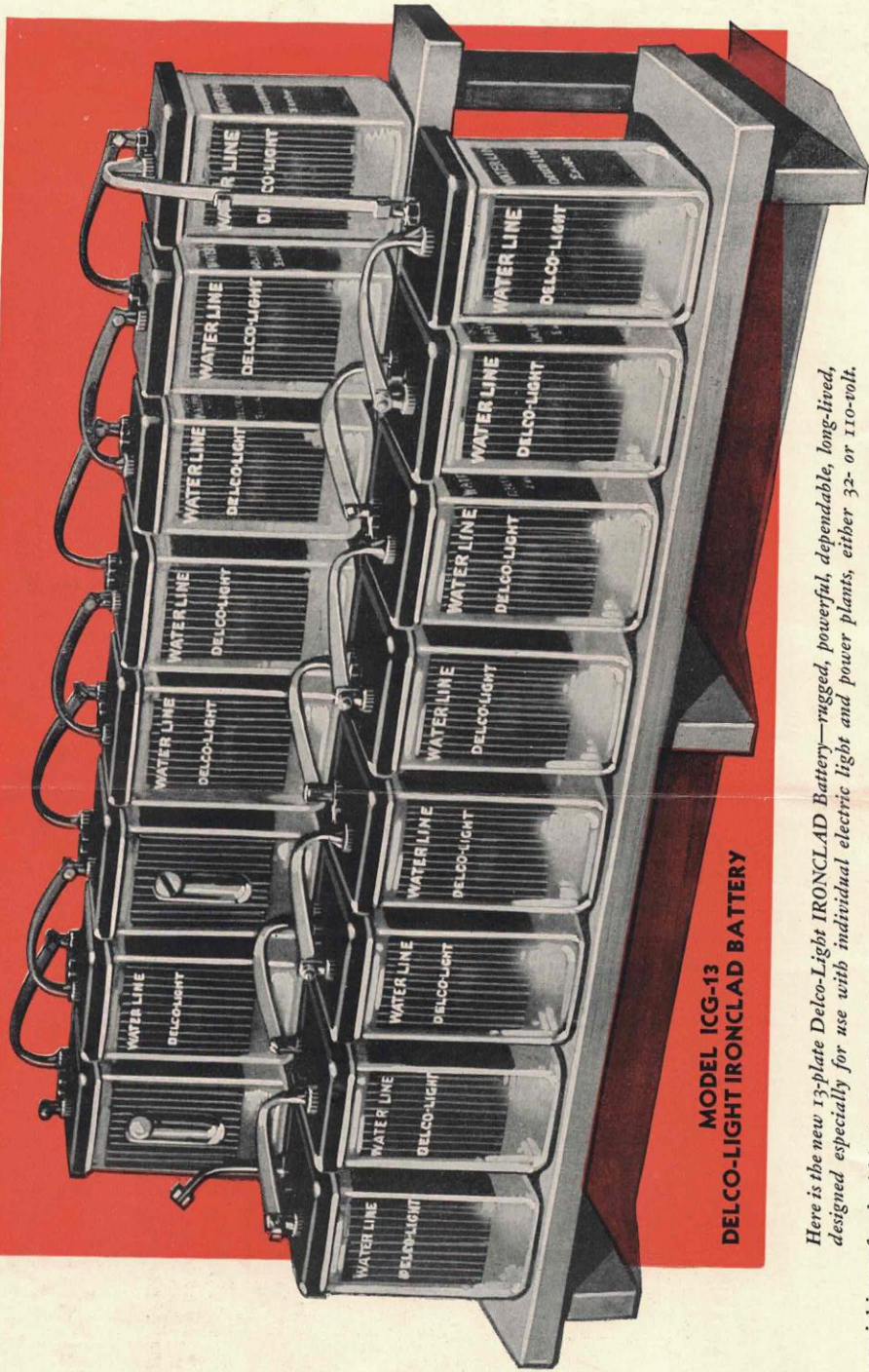
slotted hard-rubber tubes as shown in the picture. These hollow tubes contain the active material. They allow the liquid solution in the cell to reach this active material without releasing it from the plate.

CANNOT PEEL OR SHED

In ordinary storage batteries the active material is applied to the positive plate, in the form of paste. Under heavy duty work, the active material is apt to crack, peel off and shed. This happens because there is nothing to hold the active material in place and to keep it from breaking away from the plate.

But this is not true of the IRONCLAD. Here the active material is confined within hard-rubber tubes exactly like the one pictured. These tubes are finely slotted in order to permit the cell solution to come in contact with the active material. The positive active material in the Delco-Light IRONCLAD is held firmly in place—it *can't* get away!

Because of this special construction, IRONCLAD plates are thicker, heavier and more rugged. The IRONCLAD is always ready for any emergency—with a tremendous reserve



**MODEL ICG-13
DELCO-LIGHT IRONCLAD BATTERY**

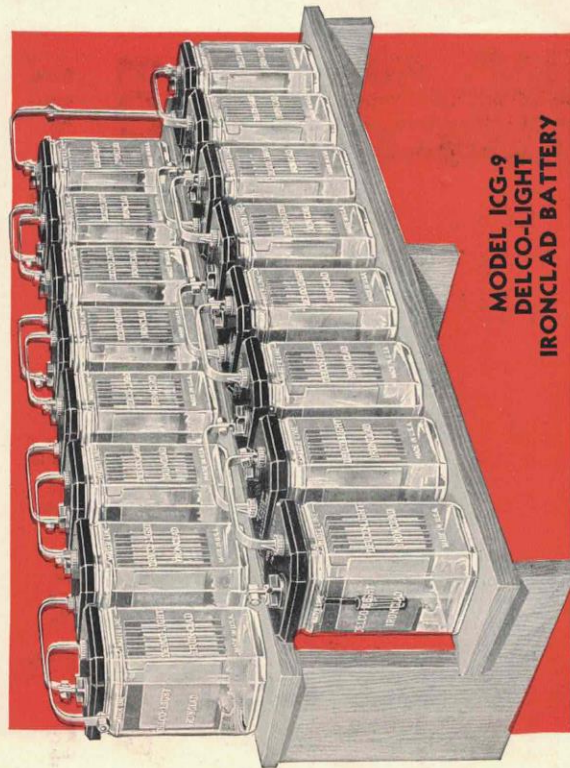
Here is the new 13-plate Delco-Light IRONCLAD Battery—rugged, powerful, dependable, long-lived, designed especially for use with individual electric light and power plants, either 32- or 110-volt.

of power—at any time of day or night—regardless of weather or atmospheric conditions.

And in addition to all these advantages, the hard-rubber tubes act as special separators and assist the specially selected wood separators in maintaining the proper amount of spacing and insulation between the plates. This results in longer life, better service and greater all-around satisfaction.

ABLE ELECTRICITY. REPLACE YOUR WORN-OUT BATTERY WITH A DELCO-LIGHT IRONCLAD

The Delco-Light IRONCLAD is available in two sizes



PICTURED here is the Delco-Light IRONCLAD 9-plate Battery. This battery is essentially the same as the 13-plate battery illustrated on the preceding page, except that it has 9 plates instead of 13. It costs less than its powerful big brother, but it is of the same sturdy construction, and carries the same warranty. It is the ideal battery for all ordinary home lighting and power uses.

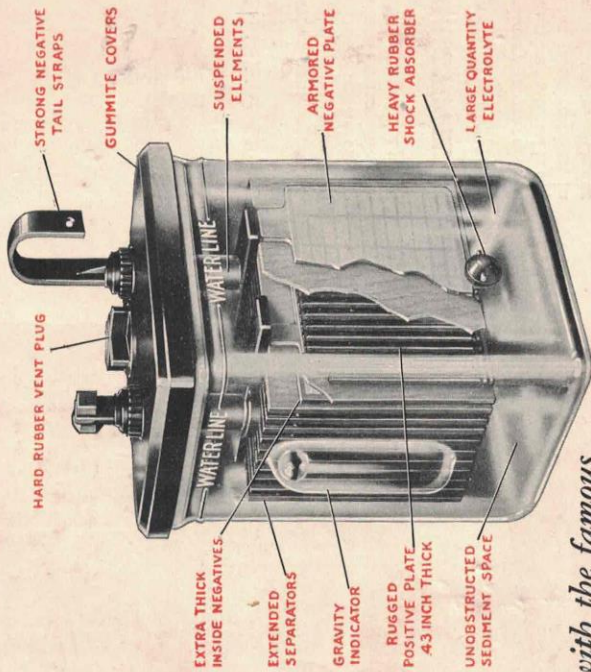
THE IRONCLAD IS WARRANTED

With every Delco-Light IRONCLAD battery sold, Delco-Light issues a written warranty. Should the battery prove defective during the time of the warranty, it will be replaced.

The Delco-Light Ironclad, either 9 or 13 plates, is used to supply 110-volt service as well. In this case, 56 cells are required.

If you have not yet electrified your home, get in touch with your Delco-Light dealer. Let him show you how easy it is to enjoy the comfort and convenience that only electricity can bring.

Delco-Light IRONCLAD POINTS OF SUPERIORITY



—with the famous

TEA-BALL CONSTRUCTION

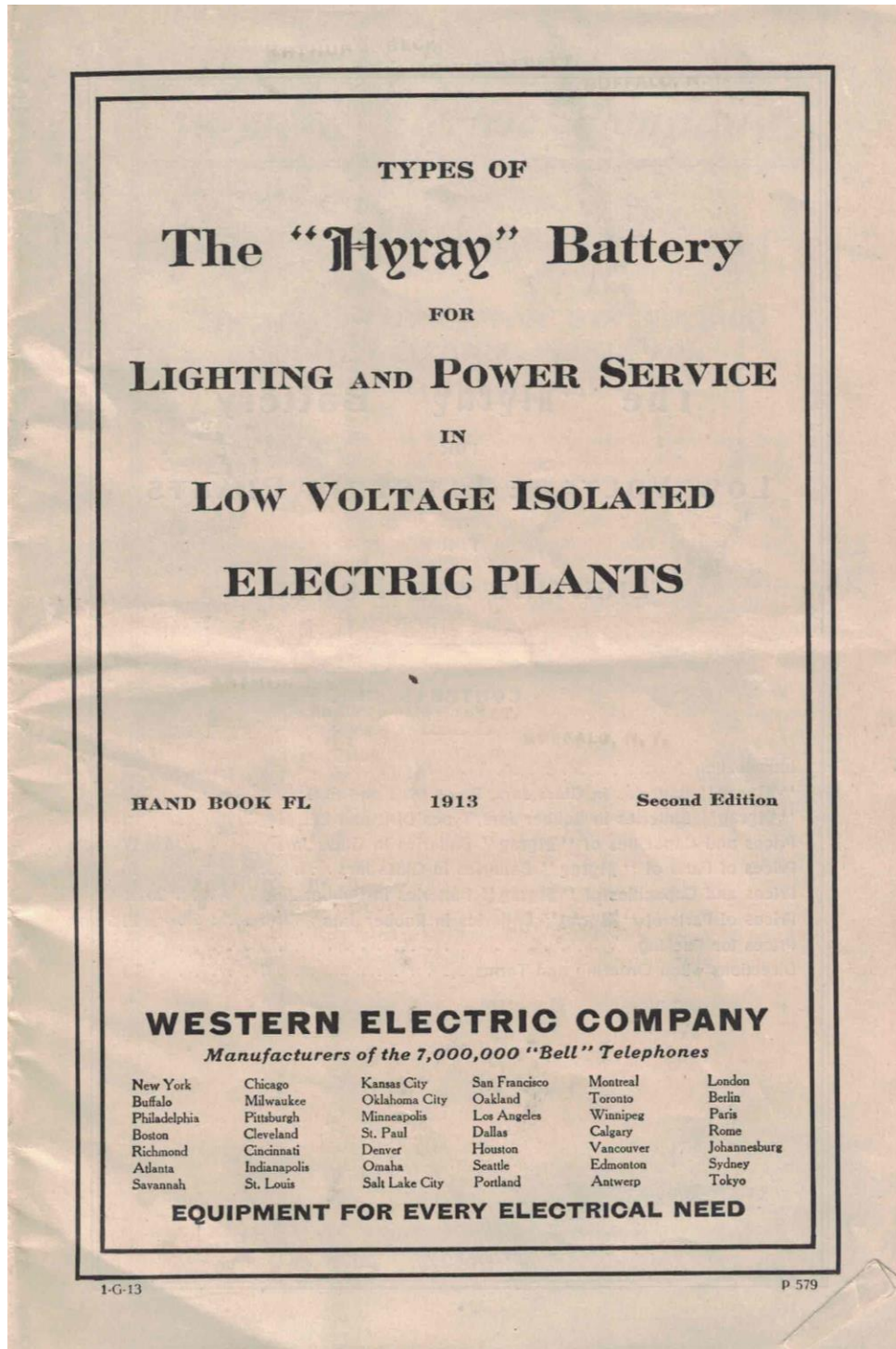
THE action of the cell solution on the active material in the IRONCLAD positive plate can be compared to the brewing of a pot of tea. The boiling water passes through the little cloth bag and makes the tea. The leaves remain in the bag. In the Delco-Light IRONCLAD Battery, the positive active material is confined in hard-rubber tubes. The cell solution comes in contact with the active material through slots in the tubes.

DELCO APPLIANCE CORPORATION
Rochester, N. Y., U.S.A.
Toronto, Canada

Form ADL436-100M-6-31

Printed in U.S.A.

Appendix H: The HYRAY Battery



Western Electric Company

ARTHUR J. BECK
339 COLMAN STREET,
BUFFALO, N. Y.

"Hyrap" BATTERIES FOR LOW VOLTAGE ISOLATED ELECTRIC PLANTS FOR LIGHT AND POWER

"Hyrap" Batteries have been designed for use in connection with low voltage isolated electric lighting and power plants where a battery is desired of less expensive type than the "Chloride Accumulator."

The "Hyrap" Battery is assembled in glass jars similar to the assembly of the "Chloride Accumulator" as listed in Hand Book HL, and can be shipped knocked down, to be assembled and charged by the purchaser.

The "Hyrap" Battery is also so designed that it can be assembled and charged in rubber jars before shipment so that in this form it will be ready for use upon arrival at destination.

"Hyrap" Batteries are of the "pasted plate" type, and are made of the same materials and have the same general design as the powerful "Exide" Stand-by Batteries furnished by this Company and used in large numbers by the Central Lighting and Power Stations in New York, Chicago, Boston, Brooklyn and other large cities.

The design of the plates used in this battery has been approved by the most able and experienced electrical engineers in the country and in the use of this battery thoroughly satisfactory results are obtained.

"Hyrap" Batteries in glass jars are designated as Types DDG and EEG and those in rubber jars as DDR and EER. Batteries in glass jars have the advantage of being very easily inspected, while those in rubber jars require smaller space.

The "Hyrap" Batteries listed herein will operate at from about 32 volts, at beginning of the discharge at the 8 hour rate, to about 28 volts at the end of the discharge.

The following pages give the list prices and capacities of complete "Hyrap" Batteries and these prices can be substituted if desired in the place of the prices of complete "Chloride Accumulator" Batteries of similar capacities given in Hand Book HL.

Western Electric Company

The "Hyrap" Battery

The "Hyrap" Battery

FOR

LOW VOLTAGE ELECTRIC PLANTS

FOR

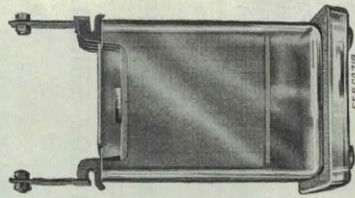
LIGHTING AND POWER

CONTENTS

	Page
Introduction	1
"Hyrap" Batteries in Glass Jars, Types DDG and EEG	2
"Hyrap" Batteries in Rubber Jars, Types DDR and EER	3
Prices and Capacities of "Hyrap" Batteries in Glass Jars	5 to 17
Prices of Parts of "Hyrap" Batteries in Glass Jars	18
Prices and Capacities of "Hyrap" Batteries in Rubber Jars	20-21
Prices of Parts of "Hyrap" Batteries in Rubber Jars	22
Prices for Packing	23
Directions when Ordering and Terms	23

Western Electric Company

"Hayray" BATTERIES IN GLASS JARS



These batteries are assembled in glass jars, the plates being provided with suspension lugs which rest on the edges of the jars. The wood separators are hung between the plates by means of hard rubber pins inserted through the separators above the plate tops and resting on adjacent plates. Glass hold-downs are provided to keep the wood separators in place. A Type E Hydrometer is furnished with each battery for testing the specific gravity of the electrolyte.

Type DDG plates are 5 $\frac{1}{8}$ inches wide and 6 inches high and the elements consist of 5, 7, 9, 11, 13 or 15 plates. Type EEG plates are 7 $\frac{3}{8}$ inches wide and 7 $\frac{3}{8}$ inches high and elements consist of 5, 7, 9, 11, 13, 15 or 17 plates.

Elements for these batteries are shipped knocked down, to be assembled by the purchaser, which can be easily done with the aid of the simple and detailed instructions furnished with each battery.

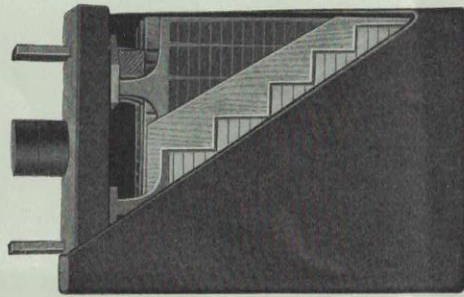
Batteries in glass jars should be installed on suitable wood racks or shelves, the general arrangement of the assembly being similar to that of the "Chloride Accumulator", described in Hand Book 5192-2. Working drawings, from which the purchaser may construct the necessary rack, will be furnished free on request. When desired, however, substantial wooden racks, complete with designating cell numbers and vitrified brick and arranged for convenient setting up, can be furnished and are listed in connection with each battery. A typical rack is shown on page 4.

The over all height of Type DDG cells, trays and insulators is 17 $\frac{1}{8}$ inches, and of EEG cells, trays and insulators 19 $\frac{1}{8}$ inches. In arranging shelves or racks a clearance above the over all height of the cells of not less than 5 inches in the case of Type DDG and 6 $\frac{1}{2}$ inches in the case of Type EEG batteries must be allowed for the proper installation and operation of the battery.

The "Hayray" Battery

Western Electric Company

"Hayray" BATTERIES IN RUBBER JARS



These batteries are assembled in trays containing 4 cells each and joined by bolted connections. Complete 16 cell batteries in rubber jars are assembled in 4 trays, each tray having 4 cells, and when required an additional tray (with one spacing block) is added for the three counter electromotive force cells. The cells are equipped with rubber covers, assembled, sealed and fully charged ready for use. A Type S-1 hydrometer syringe for testing the specific gravity of the electrolyte in the cells is furnished with each battery.

Type DDR plates are 5 $\frac{1}{8}$ inches wide and 6 inches high and the elements consist of 5, 7, 9, 11, 13 or 15 plates. Type EER plates are 7 $\frac{3}{8}$ inches wide and 7 $\frac{3}{8}$ inches high and the elements consist of 5, 7, 9, 11, 13, 15 or 17 plates. The rubber jars used in these batteries have 1 inch ribs in the bottoms on which the plates rest.

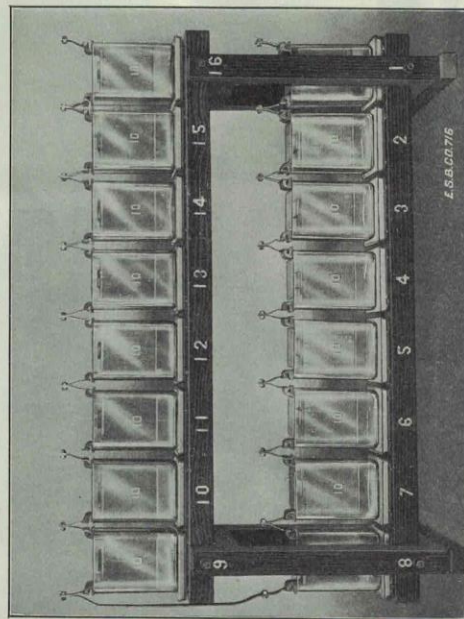
The tables on pages 20 and 21 give the approximate dimensions of the various sizes of each of the 4 cell trays in which these batteries are assembled.

Detailed information on low voltage electric plants, including engines, dynamos, switchboards and batteries, is contained in Hand Book 5192-2. Similar information on 110 volt equipments is given in another Hand Book. Copies of these books can be secured from any sales office of this Company.

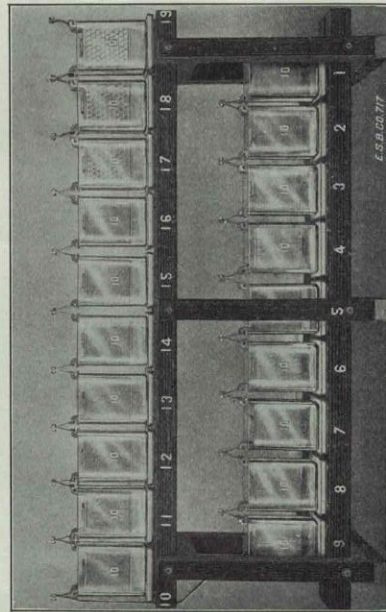
The "Hayray" Battery

Western Electric Company

THE "Hyray" BATTERY IN GLASS JARS



16 Cells, Type EEG-7 "Hyray" Battery in Glass Jars Mounted on Rack



16 Cells and 3 C. E. M. F. Cells, Type EEG-7 "Hyray" Battery in Glass Jars Mounted on Rack

The "Hyray" Battery

[4]

Western Electric Company

"Hyray" BATTERIES IN GLASS JARS TYPE DDG-5

CAPACITY OF BATTERIES, CATALOGUE NOS. 4950 AND 4980

When fully charged, expressed in Tungsten Lamps, rated at 1.25 watts per candle power

Lamps of	16 candle power	8 candle power
For 3 hours	12	38
or 5 hours	8	26
or 8 hours	5 1/2	18

This consists of 16 Cells and comprises the following material:

★ Cat. No.	MATERIAL	List Price
4040	16 "Hyray" Elements, Type DDG-5	\$72.80
423	16 Glass Jars, Type DDG-5	\$13.60
6605	16 Glass Covers, Type DDG-5	1.20
9254	16 Glass Sand Trays, Type DDG-5	6.40
6403	2 extra Glass Covers	1.15
6404	2 extra Glass Sand Trays	.80
7696	4 extra Wood Separators	.14
7100	2 1/2 feet Lead Tape, Type H	.17
7082	2 Socket Wrenches, Type D	2.50
7087	1/2 bushel of Sand	.15
9889	130 pounds Electrolyte	3.90
9890	1 Carboy (see note below)	4.40
7207	1 Hydrometer	1.50
7201	1 Hydrometer, Type E	3.20
	Packing for Battery of 16 Cells and above material, packed, Catalogue No. 4950, F. O. B. factory, Philadelphia, Pa.	\$113.31

Approximate shipping weight, packed, 1,020 pounds.

COUNTER ELECTROMOTIVE FORCE CELLS

CATALOGUE No. 4965

When required, 3 C. E. M. F. Cells can be furnished in connection with the battery listed above, comprising the following material:

★ Cat. No.	MATERIAL	List Price
4055	3 "Hyray" Counter Electromotive Force Elements, Type DDG-5	\$9.30
423	3 Glass Jars, Type DDG-5	\$2.55
6605	3 Glass Covers, Type DDG-5	.23
9254	3 Glass Sand Trays, Type DDG-5	1.20
9889	25 pounds Electrolyte	.75
9880	1-30 pound Jug	.60
7082	4 Bolt Connectors, Type D	.60
	Packing	.60
	Price for 3 C. E. M. F. Cells and above material, packed, Catalogue No. 4965, F. O. B. factory, Philadelphia, Pa.	\$15.83

Approximate shipping weight, packed, 165 pounds.

CATALOGUE No. 4980

This consists of Battery, Catalogue No. 4950, together with the 3 Counter Electromotive Force Cells, and Carboys, Jugs and Jars, all the material listed above.

Total price of Battery of 16 Cells and 3 C. E. M. F. Cells, Catalogue No. 4980, packed, F. O. B. factory, Philadelphia, Pa. \$129.14

Approximate shipping weight, packed, 1,485 pounds.

BATTERY RACKS

MATERIAL

★ Cat. No.	MATERIAL	List Price
4035	Rack for Battery, Catalogue No. 4950, complete, with Cell Numbers and 4 Vitrified Brick	\$24.50
4036	Rack for Battery, Catalogue No. 4980, complete, with Cell Numbers and 4 Vitrified Brick	\$30.55

★ Catalogue Numbers apply to one of each item only.

The "Hyray" Battery

[5]

Western Electric Company

"Hyray" BATTERIES IN GLASS JARS TYPE DDG-7

CAPACITY OF BATTERIES, CATALOGUE Nos. 4951 AND 4981
When fully charged, expressed in Tungsten Lamps, rated at 1.25 watts per candle power.

For	Lamps of	
	Amperes	16 candle power
3 hours	18	29
5 hours	12	19
8 hours	9 1/4	13

CATALOGUE No. 4951

This consists of 16 Cells and comprises the following material:

★ Cat. No.	MATERIAL	List Price
4041	16 "Hyray" Elements, Type DDG-7	\$103.20
423	16 Glass Jars, Type DDG-7	\$13.60
6065	16 Glass Covers, Type DDG-7	1.20
9254	3 Glass Sand Trays, Type DDG-7	6.40
424	2 extra Glass Jars	1.15
6065	2 extra Glass Covers	.15
9254	2 extra Glass Sand Trays	.80
7696	2 extra Wood Separators	.17
7100	2 extra Bolt Connectors, Type H	2.70
7082	18 Bolt Connectors, Type D	.50
7087	2 Socket Wrenches, Type D	.15
9889	1/2 bushel of Sand	3.60
9889	1 35 pounds Electrolyte	1.50
7207	1 Hydrometer, Type E	3.20
	Packing	
	Price for Battery of 16 Cells and above material, packed, Catalogue No. 4951, F. O. B. factory, Philadelphia, Pa.	\$143.05

Approximate shipping weight, packed, 1.075 pounds.

COUNTER ELECTROMOTIVE FORCE CELLS

CATALOGUE No. 4966

When required, 3 C. E. M. F. Cells can be furnished in connection with the battery listed above, comprising the following material:

★ Cat. No.	MATERIAL	List Price
4056	3 "Hyray" Counter Electromotive Force Elements, Type DDG-7	\$12.90
423	3 Glass Jars, Type DDG-7	\$2.55
6065	3 Glass Covers, Type DDG-7	1.20
9254	3 Glass Sand Trays, Type DDG-7	.75
9880	25 pounds Electrolyte	.60
7082	4 Bolt Connectors, Type D	.60
	Packing	
	Price for 3 C. E. M. F. Cells and above material, packed, Catalogue No. 4966, F. O. B. factory, Philadelphia, Pa.	\$19.43

Approximate shipping weight, packed, 180 pounds.

CATALOGUE No. 4981

This consists of Battery, Catalogue No. 4951, together with the 3 Counter Electromotive Force Cells, Catalogue No. 4966, comprising all the material listed above.

Total price of Battery of 16 Cells and 3 C. E. M. F. Cells, Catalogue No. 4981, packed,
F. O. B. factory, Philadelphia, Pa. \$162.48

Approximate shipping weight, packed, 1.255 pounds.

BATTERY RACKS

MATERIAL

★ Cat. No.	MATERIAL	List Price
4035	Rack for Battery, Catalogue No. 4951, complete, with Cell Numbers and 4 Verified Brick	\$24.50
4036	Rack for Battery, Catalogue No. 4981, complete, with Cell Numbers and 4 Verified Brick	30.55

★ Catalogue Numbers apply to one of each item only.

The "Hyray" Battery

Western Electric Company

"Hyray" BATTERIES IN GLASS JARS TYPE DDG-9

CAPACITY OF BATTERIES, CATALOGUE Nos. 4952 AND 4982
When fully charged, expressed in Tungsten Lamps, rated at 1.25 watts per candle power.

For	Lamps of	
	Amperes	16 candle power
3 hours	24	38
5 hours	16	26
8 hours	11	17

CATALOGUE No. 4952

This consists of 16 Cells and comprises the following material:

★ Cat. No.	MATERIAL	List Price
4042	16 "Hyray" Elements, Type DDG-9	\$16.00
424	16 Glass Jars, Type DDG-9	6.70
6066	16 Glass Covers, Type DDG-9	2.40
9254	3 Glass Sand Trays, Type DDG-9	2.00
424	2 extra Glass Jars	.15
6066	2 extra Glass Covers	.80
9254	2 extra Glass Sand Trays	.17
7696	2 extra Wood Separators	2.70
7100	2 extra Bolt Connectors, Type H	.50
7082	18 Bolt Connectors, Type D	1.15
7087	2 Socket Wrenches, Type D	4.00
9889	1/2 bushel of Sand	1.40
9889	1 35 pounds Electrolyte	3.20
9889	1 Canboy (see note below)	45.85
7207	1 Hydrometer, Type E	3.20
	Packing	
	Price for Battery of 16 Cells and above material, packed, Catalogue No. 4952, F. O. B. factory, Philadelphia, Pa.	\$179.45

Approximate shipping weight, packed, 1.240 pounds.

COUNTER ELECTROMOTIVE FORCE CELLS

CATALOGUE No. 4967

When required, 3 C. E. M. F. Cells can be furnished in connection with the battery listed above, comprising the following material:

★ Cat. No.	MATERIAL	List Price
4057	3 "Hyray" Counter Electromotive Force Elements, Type DDG-9	\$16.50
424	3 Glass Jars, Type DDG-9	3.00
6066	3 Glass Covers, Type DDG-9	.23
9254	3 Glass Sand Trays, Type DDG-9	1.20
9880	35 pounds Electrolyte	1.05
7082	4 Bolt Connectors, Type D	.60
	Packing	.60
	Price for 3 C. E. M. F. Cells and above material, packed, Catalogue No. 4967, F. O. B. factory, Philadelphia, Pa.	7.48

Approximate shipping weight, packed, 215 pounds.

CATALOGUE No. 4982

This consists of Battery, Catalogue No. 4952, together with the 3 Counter Electromotive Force Cells, Catalogue No. 4967, comprising all the material listed above.

Total price of Battery of 16 Cells and 3 C. E. M. F. Cells, Catalogue No. 4982, packed,
F. O. B. factory, Philadelphia, Pa. \$203.43

Approximate shipping weight, packed, 1.455 pounds.

BATTERY RACKS

MATERIAL

★ Cat. No.	MATERIAL	List Price
4035	Rack for Battery, Catalogue No. 4952, complete, with Cell Numbers and 4 Verified Brick	\$24.50
4036	Rack for Battery, Catalogue No. 4982, complete, with Cell Numbers and 4 Verified Brick	30.55

★ Catalogue Numbers apply to one of each item only.

The "Hyray" Battery

Western Electric Company

"Hyray" BATTERIES IN GLASS JARS TYPE DDG-11

CAPACITY OF BATTERIES, CATALOGUE Nos. 4953 AND 4983
When fully charged, expressed in Tungsten Lamps, rated at 1.25 watts per candle power.

Amperes	16 candle power	8 candle power
For 3 hours	30	48
or 5 hours	32	64
or 8 hours	22	44

This consists of 16 Cells and comprises the following material:

*Cat. No.	MATERIAL	List Price
4043	16 "Hyray" Elements, Type DDG-11	\$164.00
424	16 Glass Jars, Type DDG-11	\$16.00
6606	16 Glass Covers, Type DDG-11	1.20
9254	16 Glass Sand Trays, Type DDG-11	2.00
6606	2 extra Glass Jars . . . . .	.15
9254	2 extra Glass Sand Trays . . . . .	.80
7696	10 extra Wood Separators . . . . .	.35
7082	16 extra Lead Tape, Type H	2.70
7087	2 Socket Wrenches, Type D . . . . .	.50
	1/2 bushel of Sand . . . . .	.15
9889	170 pounds Electrolyte	2.00
9880	2 Carboys (see note below)	1.50
7207	1 Hydrometer, Type E	3.20
	Packing Battery of 16 Cells and above material, packed, Catalogue No. 4953, F. O. B. factory, Philadelphia, Pa.	\$209.42

Approximate shipping weight, packed, 1,320 pounds.

COUNTER ELECTROMOTIVE FORCE CELLS

CATALOGUE No. 4968

When required, 3 C. E. M. F. Cells can be furnished in connection with the battery listed above, comprising the following material:

*Cat. No.	MATERIAL	List Price
4058	3 "Hyray" Counter Electromotive Force Elements, Type DDG-11	\$20.10
424	3 Glass Jars, Type DDG-11	\$3.00
6606	3 Glass Covers, Type DDG-11	1.20
9254	3 Glass Sand Trays, Type DDG-11	1.05
9898	220 pound Jugs . . . . .	.80
7082	4 Bolt Connectors, Type D . . . . .	.60
	Packing . . . . .	.60
	Price for 3 C. E. M. F. Cells and above material, packed, Catalogue No. 4968, F. O. B. factory, Philadelphia, Pa.	\$27.58

Approximate shipping weight, packed, 225 pounds.

CATALOGUE No. 4983

This consists of Battery, Catalogue No. 4953, together with the 3 Counter Electromotive Force Cells, Catalogue No. 4968, comprising all the material listed above.

Total price of Battery of 16 Cells and 3 C. E. M. F. Cells, Catalogue No. 4983, packed, F. O. B. factory, Philadelphia, Pa. \$237.00

Approximate shipping weight, packed, 1,545 pounds.

BATTERY RACKS

*Cat. No.	MATERIAL	List Price
4035	Rack for Battery, Catalogue No. 4953, complete, with Cell Numbers and 4 Vitri-fied Brick	\$24.50
4036	Rack for Battery, Catalogue No. 4983, complete, with Cell Numbers and 4 Vitri-fied Brick	30.55

* Catalogue Numbers apply to one of each item only.

The "Hyray" Battery

F. B.

Western Electric Company

"Hyray" BATTERIES IN GLASS JARS TYPE DDG-13

CAPACITY OF BATTERIES, CATALOGUE Nos. 4954 AND 4984
When fully charged, expressed in Tungsten Lamps, rated at 1.25 watts per candle power.

Amperes	16 candle power	8 candle power
For 3 hours	36	57
or 5 hours	38	62
or 8 hours	26	52

This consists of 16 Cells and comprises the following material:

*Cat. No.	MATERIAL	List Price
4044	16 "Hyray" Elements, Type DDG-13	\$194.40
425	16 Glass Jars, Type DDG-13	\$21.60
6607	16 Glass Covers, Type DDG-13	1.44
9254	16 Glass Sand Trays, Type DDG-13	2.70
6607	2 extra Glass Jars . . . . .	.18
9254	2 extra Glass Sand Trays . . . . .	.80
7696	12 extra Wood Separators . . . . .	.42
7100	2 1/2 feet Lead Tape, Type H	2.70
7082	16 bolt Connectors, Type D . . . . .	.50
7087	2 Socket Wrenches, Type D . . . . .	.15
	1/2 bushel of Sand . . . . .	.15
9889	220 pounds Electrolyte	6.00
9880	2 Carboys (see note below)	1.50
7207	1 Hydrometer, Type E	3.20
	Packing Battery of 16 Cells and above material, packed, Catalogue No. 4954, F. O. B. factory, Philadelphia, Pa.	\$230.76

Approximate shipping weight, packed, 1,535 pounds.

COUNTER ELECTROMOTIVE FORCE CELLS

CATALOGUE No. 4969

When required, 3 C. E. M. F. Cells can be furnished in connection with the battery listed above, comprising the following material:

*Cat. No.	MATERIAL	List Price
4059	3 "Hyray" Counter Electromotive Force Elements, Type DDG-13	\$23.70
425	3 Glass Jars, Type DDG-13	\$4.05
6607	3 Glass Covers, Type DDG-13 . . . . .	.27
9254	3 Glass Sand Trays, Type DDG-13	1.20
9898	45 pounds Electrolyte	1.35
7082	4 Bolt Connectors, Type D	1.00
9889	150 pound Jug . . . . .	.60
	Packing . . . . .	.60
	Price for 3 C. E. M. F. Cells and above material, packed, Catalogue No. 4969, F. O. B. factory, Philadelphia, Pa.	\$32.77

Approximate shipping weight, packed, 260 pounds.

CATALOGUE No. 4984

This consists of Battery, Catalogue No. 4954, together with the 3 Counter Electromotive Force Cells, Catalogue No. 4969, comprising all the material listed above.

Total price of Battery of 16 Cells and 3 C. E. M. F. Cells, Catalogue No. 4984, packed, F. O. B. factory, Philadelphia, Pa. \$285.53

Approximate shipping weight, packed, 1,795 pounds.

BATTERY RACKS

*Cat. No.	MATERIAL	List Price
4035	Rack for Battery, Catalogue No. 4954, complete, with Cell Numbers and 4 Vitri-fied Brick	\$24.50
4036	Rack for Battery, Catalogue No. 4984, complete, with Cell Numbers and 4 Vitri-fied Brick	30.55

* Catalogue Numbers apply to one of each item only.

The "Hyray" Battery

Western Electric Company

"Hyray" BATTERIES IN GLASS JARS TYPE DDG-15

CAPACITY OF BATTERIES, CATALOGUE Nos. 4955 AND 4985

When fully charged, expressed in Tungsten Lamps, rated at 1.25 watts per candle power.

For	Amperes	Lamps of
3 hours	28	134
5 hours	31	62
8 hours	19 1/4	31

CATALOGUE No. 4955

This consists of 16 Cells and comprises the following material:

*Cat. No.	MATERIAL	List Price
4045	16 "Hyray" Elements, Type DDG-15	\$224.80
425	16 Glass Jars, Type DDG-15	\$21.60
6607	16 Glass Covers, Type DDG-15	1.44
9254	3 Glass Sand Trays, Type DDG-15	6.40
9255	2 extra Glass Covers	2.18
6607	2 extra Glass Sand Trays	.80
9254	14 extra Wood Separators	.49
7696	14 extra Lead Tapes, Type H	2.17
7697	14 extra Bolt Connectors, Type D	2.50
7082	2 Socket Wrenches, Type D	.15
7097	1/2 bushel of Sand	6.30
9889	210 pounds Electrolyte	8.00
7207	1 Hydrometer, Type E	3.20
	Packing	56.13
	Price for Battery of 16 Cells and above material, packed, Catalogue No. 4955, F. O. B. factory, Philadelphia, Pa.	\$280.93

Approximate shipping weight, packed, 1,615 pounds.

COUNTER ELECTROMOTIVE FORCE CELLS

CATALOGUE No. 4970

When required, 3 C. E. M. F. Cells can be furnished in connection with the battery listed above, comprising the following material:

*Cat. No.	MATERIAL	List Price
4060	3 "Hyray" Counter Electromotive Force Elements, Type DDG-15	\$27.30
425	3 Glass Jars, Type DDG-15	\$4.05
6607	3 Glass Covers, Type DDG-15	.27
9254	3 Glass Sand Trays, Type DDG-15	1.20
9898	20 pounds Electrolyte	.60
7082	4 Bolt Connectors, Type D	.80
	Packing	.60
	Price for 3 C. E. M. F. Cells and above material, packed, Catalogue No. 4970, F. O. B. factory, Philadelphia, Pa.	8.72
	Approximate shipping weight, packed, 265 pounds.	\$36.02

Approximate shipping weight, packed, 265 pounds.

CATALOGUE No. 4985

This consists of Battery, Catalogue No. 4955, together with the 3 Counter Electromotive Force Cells, Catalogue No. 4970, comprising all the material listed above.

Total price of Battery of 16 Cells and 3 C. E. M. F. Cells, Catalogue No. 4985, packed,
F. O. B. factory, Philadelphia, Pa. \$316.95

Approximate shipping weight, packed, 1,880 pounds.

BATTERY RACKS

*Cat. No.	MATERIAL	List Price
4035	Rack for Battery, Catalogue No. 4955, complete, with Cell Numbers and 4 Vitrified Brick	\$24.50
4036	Rack for Battery, Catalogue No. 4985, complete, with Cell Numbers and 4 Vitrified Brick	30.55

* Catalogue Numbers apply to one of each item only.

The "Hyray" Battery

Western Electric Company

"Hyray" BATTERIES IN GLASS JARS TYPE EEG-5

CAPACITY OF BATTERIES, CATALOGUE Nos. 4957 AND 4987

When fully charged, expressed in Tungsten Lamps, rated at 1.25 watts per candle power.

For	Amperes	Lamps of
3 hours	33	66
5 hours	37	33
8 hours	19 1/4	15

CATALOGUE No. 4957

This consists of 16 Cells and comprises the following material:

*Cat. No.	MATERIAL	List Price
4047	16 "Hyray" Elements, Type EEG-5	\$97.60
377	16 Glass Jars, Type EEG-5	\$21.60
6614	16 Glass Covers, Type EEG-5	8.00
9259	3 Glass Sand Trays, Type EEG-5	2.70
6614	2 extra Glass Covers	.18
9259	2 extra Glass Sand Trays	1.00
7697	14 extra Wood Separators	.16
7697	14 extra Lead Tapes, Type H	2.70
7082	14 Bolt Connectors, Type D	.50
7097	1/2 bushel of Sand	6.15
9889	210 pounds Electrolyte	8.00
7207	1 Hydrometer, Type E	1.50
	Packing	4.80
	Price for Battery of 16 Cells and above material, packed, Catalogue No. 4957, F. O. B. factory, Philadelphia, Pa.	\$156.54

Approximate shipping weight, packed, 1,380 pounds.

COUNTER ELECTROMOTIVE FORCE CELLS

CATALOGUE No. 4972

When required, 3 C. E. M. F. Cells can be furnished in connection with the battery listed above, comprising the following material:

*Cat. No.	MATERIAL	List Price
4062	3 "Hyray" Counter Electromotive Force Elements, Type EEG-5	\$9.75
377	3 Glass Jars, Type EEG-5	\$4.05
6614	3 Glass Covers, Type EEG-5	.27
9259	3 Glass Sand Trays, Type EEG-5	1.20
9898	20 pounds Electrolyte	.60
7082	4 Bolt Connectors, Type D	.80
	Packing	.90
	Price for 3 C. E. M. F. Cells and above material, packed, Catalogue No. 4972, F. O. B. factory, Philadelphia, Pa.	\$19.07

Approximate shipping weight, packed, 205 pounds.

CATALOGUE No. 4987

This consists of Battery, Catalogue No. 4957, together with the 3 Counter Electromotive Force Cells, Catalogue No. 4972, comprising all the material listed above.

Total price of Battery of 16 Cells and 3 C. E. M. F. Cells, Catalogue No. 4987, packed,
F. O. B. factory, Philadelphia, Pa. \$175.61

Approximate shipping weight, packed, 1,465 pounds.

BATTERY RACKS

*Cat. No.	MATERIAL	List Price
4035	Rack for Battery, Catalogue No. 4957, complete, with Cell Numbers and 4 Vitrified Brick	\$24.60
4036	Rack for Battery, Catalogue No. 4987, complete, with Cell Numbers and 4 Vitrified Brick	30.65

* Catalogue Numbers apply to one of each item only.

The "Hyray" Battery

Western Electric Company

"Hyrap" BATTERIES IN GLASS JARS TYPE EEG-7

CAPACITY OF BATTERIES, CATALOGUE Nos. 4958 AND 4988

When fully charged, expressed in Tungsten Lamps, rated at 1.25 watts per candle power.

For	Amperes	16 candle power	8 candle power
3 hours	31	68	46
or 5 hours	21	49	33
or 8 hours	14%	33	23

This consists of 16 Cells and comprises the following material:

*Cat. No.	MATERIAL	List Price
4048	16 "Hyrap" Elements, Type EEG-7	\$138.40
377	16 Glass Jars, Type EEG-7	\$21.60
6614	16 Glass Covers, Type EEG-7	8.40
9259	16 Glass Sand Trays, Type EEG-7	2.70
377	2 extra Glass Jars	1.18
9259	2 extra Glass Covers	1.00
7697	6 extra Wood Separators	.19
7100	2% feet Lead Tape, Type H	2.70
7082	16 Bolt Connectors, Type D	.50
7097	1/2 bushel of Sand	4.00
9889	185 pounds Electrolyte	5.15
9898	2 Jugs, capacity 20 and 50 pounds respectively	1.40
9899	1 Hydrometer, Type E	1.50
7207	Packing	4.80
	Price for Battery of 16 Cells and above material, packed, Catalogue No. 4958,	55.98
	F. O. B. factory, Philadelphia, Pa.	\$104.38

Approximate shipping weight, packed, 1,390 pounds.

COUNTER ELECTROMOTIVE FORCE CELLS

CATALOGUE No. 4973

When required, 3 C. E. M. F. Cells can be furnished in connection with the battery listed above, comprising the following material:

*Cat. No.	MATERIAL	List Price
4063	3 "Hyrap" Counter Electromotive Force Elements, Type EEG-7	\$13.50
377	3 Glass Jars, Type EEG-7	\$4.05
6614	3 Glass Covers, Type EEG-7	1.27
9259	3 Glass Sand Trays, Type EEG-7	1.50
9898	2-20 pound Jugs	1.05
7082	4 Bolt Connectors, Type D	.60
	Packing	.90
	Price for 3 C. E. M. F. Cells and above material, packed, Catalogue No. 4973,	9.17
	F. O. B. factory, Philadelphia, Pa.	\$22.67

Approximate shipping weight, packed, 210 pounds.

CATALOGUE No. 4988

This consists of Battery, Catalogue No. 4958, together with the 3 Counter Electromotive

Force Cells, Catalogue No. 4973, comprising all the material listed above.

Total price of Battery of 16 Cells and 3 C. E. M. F. Cells, Catalogue No. 4988, packed,

F. O. B. factory, Philadelphia, Pa. \$217.05

Approximate shipping weight, packed, 1,600 pounds.

BATTERY RACKS

*Cat. No.	MATERIAL	List Price
4035	Rack for Battery, Catalogue No. 4958, complete, with Cell Numbers and 4	\$24.60
4036	Verified Brick	30.65
4036	Rack for Battery, Catalogue No. 4988, complete, with Cell Numbers and 4	30.65
4036	Verified Brick	30.65

* Catalogue Numbers apply to one of each item only.

The "Hyrap" Battery

Western Electric Company

"Hyrap" BATTERIES IN GLASS JARS TYPE EEG-9

CAPACITY OF BATTERIES, CATALOGUE Nos. 4959 AND 4989

When fully charged, expressed in Tungsten Lamps, rated at 1.25 watts per candle power.

For	Amperes	16 candle power	8 candle power
3 hours	41%	68	46
or 5 hours	29%	49	33
or 8 hours	19%	33	23

This consists of 16 Cells and comprises the following material:

*Cat. No.	MATERIAL	List Price
4049	16 "Hyrap" Elements, Type EEG-9	\$179.20
378	16 Glass Jars, Type EEG-9	\$24.00
6615	16 Glass Covers, Type EEG-9	1.92
9259	16 Glass Sand Trays, Type EEG-9	3.00
378	2 extra Glass Jars	1.00
6615	2 extra Glass Covers	.24
9259	2 extra Glass Sand Trays	1.00
7697	6 extra Wood Separators	.36
7100	2% feet Lead Tape, Type H	2.70
7082	16 Bolt Connectors, Type D	.50
7097	1/2 bushel of Sand	4.80
9889	200 pounds Electrolyte	8.40
9898	2 Jugs, capacity 20 and 50 pounds respectively	1.00
9899	1 Hydrometer, Type E	1.50
7207	Packing	4.80
	Price for Battery of 16 Cells and above material, packed, Catalogue No. 4959,	65.76
	F. O. B. factory, Philadelphia, Pa.	\$244.96

Approximate shipping weight, packed, 1,695 pounds.

COUNTER ELECTROMOTIVE FORCE CELLS

CATALOGUE No. 4974

When required, 3 C. E. M. F. Cells can be furnished in connection with the battery listed above, comprising the following material:

*Cat. No.	MATERIAL	List Price
4064	3 "Hyrap" Counter Electromotive Force Elements, Type EEG-9	\$17.25
378	3 Glass Jars, Type EEG-9	\$4.50
6615	3 Glass Covers, Type EEG-9	.36
9259	3 Glass Sand Trays, Type EEG-9	1.65
9898	2-20 pound Jugs	1.20
7082	4 Bolt Connectors, Type D	.60
	Packing	.90
	Price for 3 C. E. M. F. Cells and above material, packed, Catalogue No. 4974,	10.71
	F. O. B. factory, Philadelphia, Pa.	\$27.96

Approximate shipping weight, packed, 255 pounds.

CATALOGUE No. 4989

This consists of Battery, Catalogue No. 4959, together with the 3 Counter Electromotive

Force Cells, Catalogue No. 4974, comprising all the material listed above.

Total price of Battery of 16 Cells and 3 C. E. M. F. Cells, Catalogue No. 4989, packed,

F. O. B. factory, Philadelphia, Pa. \$272.92

Approximate shipping weight, packed, 1,950 pounds.

BATTERY RACKS

*Cat. No.	MATERIAL	List Price
4035	Rack for Battery, Catalogue No. 4959, complete, with Cell Numbers and 4	\$24.60
4036	Verified Brick	30.65
4036	Rack for Battery, Catalogue No. 4989, complete, with Cell Numbers and 4	30.65
4036	Verified Brick	30.65

* Catalogue Numbers apply to one of each item only.

The "Hyrap" Battery

Western Electric Company

"Hyrap" BATTERIES IN GLASS JARS TYPE EEG-11

CAPACITY OF BATTERIES, CATALOGUE Nos. 4960 AND 4990

When fully charged, expressed in Tungsten Lamps, rated at 1.25 watts per candle power.

For	Amperes	16 candle power	8 candle power
3 hours	83	166	78
5 hours	35	56	112
8 hours	24%	39	78

CATALOGUE No. 4960

This consists of 16 Cells and comprises the following material:

★ Cat. No.	MATERIAL	Last Price
4050	16 "Hyrap" Elements, Type EEG-11	\$220.00
378	16 Glass Jars, Type EEG-11	
6615	3 Glass Covers, Type EEG-11	\$24.00
9259	16 Glass Sand Trays, Type EEG-11	1.92
378	2 extra Glass Jars	8.00
6615	2 extra Glass Covers	3.00
7697	10 extra Wood Separators	1.70
7100	2 1/2 feet Lead Tape, Type H	45
7082	18 Bolt Connectors, Type D	19
7087	2 Socket Wrenches, Type D	2.70
9889	2 Carboys (see note below)	7.80
9880	1 30 pound Jug	8.00
7207	1 Hydrometer, Type E	1.50
	Price for Battery of 16 Cells and above material, packed, Catalogue No. 4960	4.80
	F. O. B. factory, Philadelphia, Pa.	\$284.85

Approximate shipping weight, packed, 1,800 pounds.

COUNTER ELECTROMOTIVE FORCE CELLS

CATALOGUE No. 4975

When required, 3 C. E. M. F. Cells can be furnished in connection with the battery listed above, comprising the following material:

★ Cat. No.	MATERIAL	Last Price
4065	3 "Hyrap" Counter Electromotive Force Elements, Type EEG-11	\$21.00
378	3 Glass Jars, Type EEG-11	
6616	3 Glass Covers, Type EEG-11	\$4.50
9259	3 Glass Sand Trays, Type EEG-11	36
9899	50 pounds Electrolyte	1.50
7082	1 50 pound Jug	1.00
	4 Bolt Connectors, Type D	1.00
	Packing	.90
	Price for 3 C. E. M. F. Cells and above material, packed, Catalogue No. 4975	10.36
	F. O. B. factory, Philadelphia, Pa.	\$31.36

Approximate shipping weight, packed, 265 pounds.

CATALOGUE No. 4990

This consists of Battery, Catalogue No. 4960, together with the 3 Counter Electromotive Force Cells, Catalogue No. 4975, comprising all the material listed above.

Total price of Battery of 16 Cells and 3 C. E. M. F. Cells, Catalogue 4990, packed, F. O. B. factory, Philadelphia, Pa., \$316.21

Approximate shipping weight, packed, 2,065 pounds.

BATTERY RACKS

★ Cat. No.	MATERIAL	Last Price
4035	Rack for Battery, Catalogue No. 4960, complete, with Cell Numbers and 4 Vitriified Brick	\$24.60
4036	Rack for Battery, Catalogue No. 4990, complete, with Cell Numbers and 4 Vitriified Brick	30.85

★ Catalogue Numbers apply to one of each item only.

The "Hyrap" Battery

Western Electric Company

"Hyrap" BATTERIES IN GLASS JARS TYPE EEG-13

CAPACITY OF BATTERIES, CATALOGUE Nos. 4961 AND 4991

When fully charged, expressed in Tungsten Lamps, rated at 1.25 watts per candle power.

For	Amperes	16 candle power	8 candle power
3 hours	62	99	46
5 hours	42	67	134
8 hours	29%	46	92

CATALOGUE No. 4961

This consists of 16 Cells and comprises the following material:

★ Cat. No.	MATERIAL	Last Price
4051	16 "Hyrap" Elements, Type EEG-13	\$290.80
379	16 Glass Jars, Type EEG-13	
6616	3 Glass Covers, Type EEG-13	\$27.20
9260	16 Glass Sand Trays, Type EEG-13	1.92
379	2 extra Glass Jars	3.40
6616	2 extra Glass Covers	.24
9260	2 extra Glass Sand Trays	1.20
7100A	2 1/2 feet Lead Tape, Type H, each 7 1/2 feet long	.34
7082	18 Bolt Connectors, Type D	2.70
7087	2 Socket Wrenches, Type D	.50
	1 bushel of Sand	10.23
	2 Carboys (see note below)	12.00
9889	3 Hydrometers, Type E	1.50
7207	1 Hydrometer, Type E	4.80
	Packing	76.56
	Price for Battery of 16 Cells and above material, packed, Catalogue No. 4961	\$337.36
	F. O. B. factory, Philadelphia, Pa.	

Approximate shipping weight, packed, 2,170 pounds.

COUNTER ELECTROMOTIVE FORCE CELLS

CATALOGUE No. 4976

When required, 3 C. E. M. F. Cells can be furnished in connection with the battery listed above, comprising the following material:

★ Cat. No.	MATERIAL	Last Price
4066	3 "Hyrap" Counter Electromotive Force Elements, Type EEG-13	\$24.75
379	3 Glass Jars, Type EEG-13	
6616	3 Glass Covers, Type EEG-13	\$5.10
9260	3 Glass Sand Trays, Type EEG-13	36
9899	65 pounds Electrolyte	1.80
9899	1 20 and 1 50 pound Jug	1.40
7082	4 Bolt Connectors, Type D	.60
	Packing	.90
	Price for 3 C. E. M. F. Cells and above material, packed, Catalogue No. 4976	12.11
	F. O. B. factory, Philadelphia, Pa.	\$36.86

Approximate shipping weight, packed, 315 pounds.

CATALOGUE No. 4991

This consists of Battery, Catalogue No. 4961, together with the 3 Counter Electromotive Force Cells, Catalogue No. 4976, comprising all the material listed above.

Total price of Battery of 16 Cells and 3 C. E. M. F. Cells, Catalogue No. 4991, packed, F. O. B. factory, Philadelphia, Pa., \$374.22

Approximate shipping weight, packed, 2,485 pounds.

BATTERY RACKS

★ Cat. No.	MATERIAL	Last Price
4035	Rack for Battery, Catalogue No. 4961, complete, with Cell Numbers and 4 Vitriified Brick	\$24.60
4036	Rack for Battery, Catalogue No. 4991, complete, with Cell Numbers and 4 Vitriified Brick	30.85

★ Catalogue Numbers apply to one of each item only.

The "Hyrap" Battery

Western Electric Company

"Hyray" BATTERIES IN GLASS JARS TYPE EEG-17

CAPACITY OF BATTERIES, CATALOGUE Nos. 4963 AND 4993

When fully charged, expressed in Tungsten Lamps, rated at 1.25 watts per candle power.

Amperes	16 candle power	8 candle power	Lamps of
For 3 hours	132	90	264
or 5 hours	82 2/3	56	180
or 8 hours	56	39	124

This consists of 16 Cells and comprises the following material:

* Cat. No.	MATERIAL	List Price
4053	16 "Hyray" Elements, Type EEG-17	\$342.40
380	16 Glass Jars, Type EEG-17	\$29.60
6617	16 Glass Covers, Type EEG-17	2.40
9260	16 Glass Sand Trays, Type EEG-17	9.60
6579	2 extra Glass Jars	3.70
9260	2 extra Glass Sand Trays	1.20
7697	16 extra Wood Separators	1.72
7100A	2 pieces Lead Tape, Type H, each 2 1/2 feet long . . . . .	.38
7082	18 Bolt Connectors, Type D	2.70
7697	3/4 bushel of Sand . . . . .	.23
9889	415 pounds Electrolyte	12.45
9888	3 Carboys (see note below)	2.70
7207	1 Hydrometer, Type E	1.50
	Packing	4.80
	Price for Battery of 16 Cells and above material, packed, Catalogue No. 4963, F. O. B. factory, Philadelphia, Pa.	83.48

Approximate shipping weight, packed, 2,695 pounds.

COUNTER ELECTROMOTIVE FORCE CELLS

CATALOGUE No. 4978

When required, 3 C. E. M. F. Cells can be furnished in connection with the battery listed above, comprising the following material:

* Cat. No.	MATERIAL	List Price
4068	3 "Hyray" Counter Electromotive Force Elements, Type EEG-17	\$32.25
380	3 Glass Jars, Type EEG-17	\$5.55
6617	3 Glass Covers, Type EEG-17	1.80
9260	3 Glass Sand Trays, Type EEG-17	2.40
9880	60 pounds Electrolyte	1.60
7082	2-30 pound Jugs . . . . .	.90
	Packing . . . . .	.60
	Price for 3 C. E. M. F. Cells and above material, packed, Catalogue No. 4978, F. O. B. factory, Philadelphia, Pa.	\$45.55

Approximate shipping weight, packed, 370 pounds.

CATALOGUE No. 4993

This consists of Battery, Catalogue No. 4963, together with the 3 Counter Electromotive Force Cells, Catalogue No. 4978, comprising all the material listed above.

Total price of Battery of 16 Cells and 3 C. E. M. F. Cells, Catalogue No. 4993, packed, F. O. B. factory, Philadelphia, Pa. \$471.43

Approximate shipping weight, packed, 2,975 pounds.

BATTERY RACKS

MATERIAL

* Cat. No.	MATERIAL	List Price
4035	Rack for Battery, Catalogue No. 4963, complete, with Cell Numbers and 4 Vitriined Brick	\$24.60
4036	Rack for Battery, Catalogue No. 4993, complete, with Cell Numbers and 4 Vitriined Brick	30.65

* Catalogue Numbers apply to one of each item only.

The "Hyray" Battery

Western Electric Company

"Hyray" BATTERIES IN GLASS JARS TYPE EEG-15

CAPACITY OF BATTERIES, CATALOGUE Nos. 4962 AND 4992

When fully charged, expressed in Tungsten Lamps, rated at 1.25 watts per candle power.

Amperes	16 candle power	8 candle power	Lamps of
For 3 hours	116	78	232
or 5 hours	72 1/2	49	156
or 8 hours	49	34 1/2	106

This consists of 6 Cells and comprises the following material:

* Cat. No.	MATERIAL	List Price
4052	16 "Hyray" Elements, Type EEG-15	\$301.60
379	16 Glass Jars, Type EEG-15	\$27.70
6616	16 Glass Covers, Type EEG-15	1.92
9260	16 Glass Sand Trays, Type EEG-15	9.60
6579	2 extra Glass Jars	3.40
9260	2 extra Glass Sand Trays	1.70
7697	14 extra Wood Separators . . . . .	.63
7100A	2 pieces Lead Tape, Type H, each 2 1/2 feet long . . . . .	.38
7082	18 Bolt Connectors, Type D	2.70
7697	3/4 bushel of Sand . . . . .	.23
9889	330 pounds Electrolyte	9.50
9888	3 Carboys (see note below)	12.00
7207	1 Hydrometer, Type E	1.50
	Packing	4.80
	Price for Battery of 16 Cells and above material, packed, Catalogue No. 4962, F. O. B. factory, Philadelphia, Pa.	76.20

Approximate shipping weight, packed, 2,285 pounds.

COUNTER ELECTROMOTIVE FORCE CELLS

CATALOGUE No. 4977

When required, 3 C. E. M. F. Cells can be furnished in connection with the battery listed above, comprising the following material:

* Cat. No.	MATERIAL	List Price
4067	3 "Hyray" Counter Electromotive Force Elements, Type EEG-15	\$28.50
379	3 Glass Jars, Type EEG-15	\$5.34
6616	3 Glass Covers, Type EEG-15	1.80
9260	3 Glass Sand Trays, Type EEG-15	2.40
9880	60 pounds Electrolyte	1.80
7082	2-30 pound Jugs	1.20
	Packing . . . . .	.90
	Price for 3 C. E. M. F. Cells and above material, packed, Catalogue No. 4977, F. O. B. factory, Philadelphia, Pa.	\$40.26

Approximate shipping weight, packed, 325 pounds.

CATALOGUE No. 4992

This consists of Battery, Catalogue No. 4962, together with the 3 Counter Electromotive Force Cells, Catalogue No. 4977, comprising all the material listed above.

Total price of Battery of 16 Cells and 3 C. E. M. F. Cells, Catalogue No. 4992, packed, F. O. B. factory, Philadelphia, Pa. \$418.06

Approximate shipping weight, packed, 2,610 pounds.

BATTERY RACKS

MATERIAL

* Cat. No.	MATERIAL	List Price
4035	Rack for Battery, Catalogue No. 4962, complete, with Cell Numbers and 4 Vitriined Brick	\$24.60
4036	Rack for Battery, Catalogue No. 4992, complete, with Cell Numbers and 4 Vitriined Brick	30.65

* Catalogue Numbers apply to one of each item only.

The "Hyray" Battery

Western Electric Company

"Hyray" BATTERIES IN GLASS JARS

PRICES OF PARTS

Type of Battery	Element		C. E. M. F. Element		Glass Jar		Glass Cover		Glass Sand Tray	
	Price	Cat.No.	Price	Cat.No.	Price	Cat.No.	Price	Cat.No.	Price	Cat.No.
DDG-5	\$4.55	4040	\$3.10	4055	\$0.85	423	\$0.07½	6605	\$0.40	9254
DDG-7	6.45	4041	4.30	4056	.85	423	.07½	6605	.40	9254
DDG-9	8.35	4042	5.50	4057	1.00	424	.07½	6606	.40	9254
DDG-11	10.25	4043	6.70	4058	1.00	424	.07½	6606	.40	9254
DDG-13	12.15	4044	7.90	4059	1.35	425	.09	6607	.40	9254
DDG-15	14.05	4045	9.10	4060	1.35	425	.09	6607	.40	9254
EEG-5	6.10	4047	3.25	4062	1.85	377	.09	6614	.50	9259
EEG-7	8.65	4048	4.50	4063	1.35	377	.09	6614	.50	9259
EEG-9	11.20	4049	5.75	4064	1.50	378	.12	6615	.50	9259
EEG-11	13.75	4050	7.00	4065	1.50	378	.12	6615	.50	9259
EEG-13	16.30	4051	8.25	4066	1.70	379	.12	6616	.60	9260
EEG-15	18.85	4052	9.50	4067	1.70	379	.12	6616	.60	9260
EEG-17	21.40	4053	10.75	4068	1.85	380	.15	6617	.60	9260

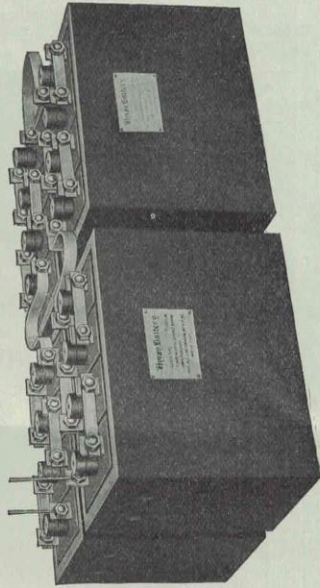
	Price	Cat.No.
Wood Separator, Type DDG	\$0.03½	7696
Wood Separator, Type EEG	.04½	7697
Bolt Connector, Type D	.15	7082
Lead Tape, Type H, per foot	.07	7100
Sand, per bushel	.30	
Hydrometer, Type E, each	1.50	7207
Electrolyte, per 100 pounds	3.00	
Carboys, each	4.00	9889
Jug to hold 10 pounds (1 gallon) of Electrolyte, each	.20	9879
Jug to hold 20 pounds (2 gallons) of Electrolyte, each	.40	9898
Jug to hold 30 pounds (3 gallons) of Electrolyte, each	.60	9880
Jug to hold 50 pounds (5 gallons) of Electrolyte, each	1.00	9899

See page 23 for Packing Charges.

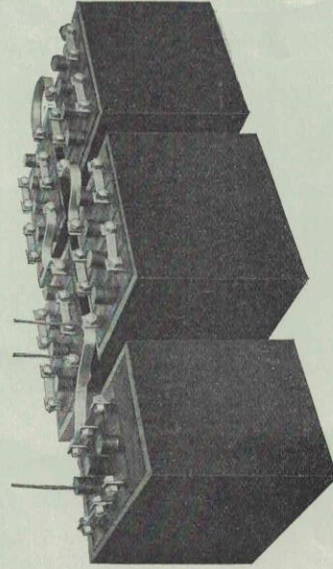
The "Hyray" Battery

Western Electric Company

THE "Hyray" BATTERY IN RUBBER JARS



16 Cells, Type DDR-7 "Hyray" Battery in Rubber Jars



16 Cells and 3 C. E. M. F. Cells, Type DDR-7 "Hyray" Battery in Rubber Jars

The "Hyray" Battery

Western Electric Company

No. of Cells	Type of Battery	Capacity in Amperes			Approximate Dimensions of one Tray in Inches			Ship- ping F. O. B. Factory Price	Cat. No.
		3 Hrs.	5 Hrs.	8 Hrs.	Length	Width	Height over all		
19	DDR-5	12	8	5 1/2	19	7 1/2	11	\$147.90	2980
19	DDR-7	18	12	8 1/2	13 1/2	7 1/2	11	182.95	2981
19	DDR-9	24	16	11	16 1/2	7 1/2	11	219.20	2982
19	DDR-11	30	20	13 1/2	18 1/2	7 1/2	11	257.40	2983
19	DDR-13	36	24	16 1/2	22 1/2	8	11	294.65	2984
19	DDR-15	42	28	19 1/2	25 1/2	8	11	329.95	2985
19	EER-5	20 1/2	14	9 1/2	10 1/2	9 1/2	13	192.55	2987
19	EER-7	31	21	14 1/2	13 1/2	9 1/2	13	239.30	2988
19	EER-9	41 1/2	28	19 1/2	16 1/2	9 1/2	13	288.45	2989
19	EER-11	51 1/2	35	24 1/2	19 1/2	9 1/2	13	338.85	2990
19	EER-13	62	42	29 1/2	22 1/2	9 1/2	13	386.65	2991
19	EER-15	72 1/2	49	34 1/2	25 1/2	9 1/2	13	434.80	2992
19	EER-17	82 1/2	56	39 1/2	28 1/2	9 1/2	13	484.45	2993

The "Hyray" Battery

"Hyray" BATTERIES IN RUBBER JARS

16 CELLS AND 3 C. E. M. F. CELLS

No. of Cells	Type of Battery	Capacity in Amperes			Approximate Dimensions of one Tray in Inches			Ship- ping F. O. B. Factory Price	Cat. No.
		3 Hrs.	5 Hrs.	8 Hrs.	Length	Width	Height over all		
19	DDR-5	12	8	5 1/2	19	7 1/2	11	\$147.90	2980
19	DDR-7	18	12	8 1/2	13 1/2	7 1/2	11	182.95	2981
19	DDR-9	24	16	11	16 1/2	7 1/2	11	219.20	2982
19	DDR-11	30	20	13 1/2	18 1/2	7 1/2	11	257.40	2983
19	DDR-13	36	24	16 1/2	22 1/2	8	11	294.65	2984
19	DDR-15	42	28	19 1/2	25 1/2	8	11	329.95	2985
19	EER-5	20 1/2	14	9 1/2	10 1/2	9 1/2	13	192.55	2987
19	EER-7	31	21	14 1/2	13 1/2	9 1/2	13	239.30	2988
19	EER-9	41 1/2	28	19 1/2	16 1/2	9 1/2	13	288.45	2989
19	EER-11	51 1/2	35	24 1/2	19 1/2	9 1/2	13	338.85	2990
19	EER-13	62	42	29 1/2	22 1/2	9 1/2	13	386.65	2991
19	EER-15	72 1/2	49	34 1/2	25 1/2	9 1/2	13	434.80	2992
19	EER-17	82 1/2	56	39 1/2	28 1/2	9 1/2	13	484.45	2993

Western Electric Company

No. of Cells	Type of Battery	Capacity in Amperes			Approximate Dimensions of one Tray in Inches			Ship- ping F. O. B. Factory Price	Cat. No.
		3 Hrs.	5 Hrs.	8 Hrs.	Length	Width	Height over all		
16	DDR-5	12	8	5 1/2	19	7 1/2	11	\$128.80	2950
16	DDR-7	18	12	8 1/2	13 1/2	7 1/2	11	160.40	2951
16	DDR-9	24	16	11	16 1/2	7 1/2	11	193.00	2952
16	DDR-11	30	20	13 1/2	18 1/2	7 1/2	11	227.40	2953
16	DDR-13	36	24	16 1/2	22 1/2	8	11	260.80	2954
16	DDR-15	42	28	19 1/2	25 1/2	8	11	292.60	2955
16	EER-5	20 1/2	14	9 1/2	10 1/2	9 1/2	13	169.55	2957
16	EER-7	31	21	14 1/2	13 1/2	9 1/2	13	212.55	2958
16	EER-9	41 1/2	28	19 1/2	16 1/2	9 1/2	13	257.35	2959
16	EER-11	51 1/2	35	24 1/2	19 1/2	9 1/2	13	303.40	2960
16	EER-13	62	42	29 1/2	22 1/2	9 1/2	13	347.10	2961
16	EER-15	72 1/2	49	34 1/2	25 1/2	9 1/2	13	390.70	2962
16	EER-17	82 1/2	56	39 1/2	28 1/2	9 1/2	13	436.55	2963

The "Hyray" Battery

COUNTER ELECTROMOTIVE FORCE CELLS—3 CELLS

No. of Cells	Type of Battery	Capacity in Amperes			Approximate Dimensions of one Tray in Inches			Ship- ping F. O. B. Factory Price	Cat. No.
		3 Hrs.	5 Hrs.	8 Hrs.	Length	Width	Height over all		
3	DDR-5	1	1	1	10 1/2	7 1/2	11	\$19.10	2965
3	DDR-7	1	1	1	13 1/2	7 1/2	11	22.55	2966
3	DDR-9	1	1	1	16 1/2	7 1/2	11	26.20	2967
3	DDR-11	1	1	1	19 1/2	7 1/2	11	30.00	2968
3	DDR-13	1	1	1	22 1/2	8	11	33.85	2969
3	DDR-15	1	1	1	25 1/2	8	11	37.85	2970
3	EER-5	1	1	1	10 1/2	9 1/2	13	22.80	2972
3	EER-7	1	1	1	13 1/2	9 1/2	13	26.75	2973
3	EER-9	1	1	1	16 1/2	9 1/2	13	31.10	2974
3	EER-11	1	1	1	19 1/2	9 1/2	13	35.45	2975
3	EER-13	1	1	1	22 1/2	9 1/2	13	39.55	2976
3	EER-15	1	1	1	25 1/2	9 1/2	13	43.60	2977
3	EER-17	1	1	1	28 1/2	9 1/2	13	47.90	2978

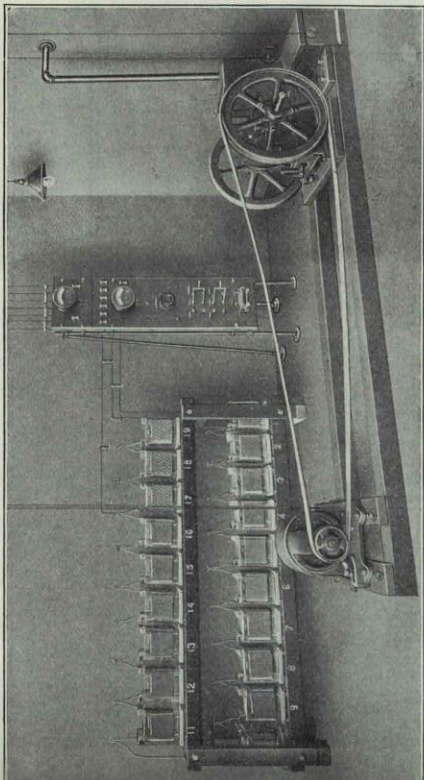
"Hyray" BATTERIES IN RUBBER JARS—16 CELLS

No. of Cells	Type of Battery	Capacity in Amperes			Approximate Dimensions of one Tray in Inches			Ship- ping F. O. B. Factory Price	Cat. No.
		3 Hrs.	5 Hrs.	8 Hrs.	Length	Width	Height over all		
16	DDR-5	12	8	5 1/2	19	7 1/2	11	\$128.80	2950
16	DDR-7	18	12	8 1/2	13 1/2	7 1/2	11	160.40	2951
16	DDR-9	24	16	11	16 1/2	7 1/2	11	193.00	2952
16	DDR-11	30	20	13 1/2	18 1/2	7 1/2	11	227.40	2953
16	DDR-13	36	24	16 1/2	22 1/2	8	11	260.80	2954
16	DDR-15	42	28	19 1/2	25 1/2	8	11	292.60	2955
16	EER-5	20 1/2	14	9 1/2	10 1/2	9 1/2	13	169.55	2957
16	EER-7	31	21	14 1/2	13 1/2	9 1/2	13	212.55	2958
16	EER-9	41 1/2	28	19 1/2	16 1/2	9 1/2	13	257.35	2959
16	EER-11	51 1/2	35	24 1/2	19 1/2	9 1/2	13	303.40	2960
16	EER-13	62	42	29 1/2	22 1/2	9 1/2	13	347.10	2961
16	EER-15	72 1/2	49	34 1/2	25 1/2	9 1/2	13	390.70	2962
16	EER-17	82 1/2	56	39 1/2	28 1/2	9 1/2	13	436.55	2963

Western Electric Company

"Hray" BATTERIES IN RUBBER JARS
PRICES OF PARTS

TYPE OF BATTERY	Price	Cat.No.	Price	Cat.No.	Price	Cat.No.	Price	Cat.No.	Price	Cat.No.
Element	\$4.05	4070	\$2.30	4058	\$1.63	6020	\$0.34	6040	\$1.40	6120
C. E. M. F. Element	5.80	4071	3.20	4056	1.77	6021	.37	6041	1.50	6121
Rubber Jar	DDR-5	4072	4.10	4057	1.91	6022	.41	6042	1.80	6122
Rubber Jar with Vent	DDR-7	4073	5.00	4058	2.05	6023	.44	6043	2.00	6123
Rubber Cover	DDR-9	4074	5.90	4059	2.19	6024	.48	6044	2.50	6124
4 Cell Tray for C. E. M. F. Cells and Dummy	DDR-11	4075	6.80	4060	2.33	6025	.51	6045	2.65	6125
4 Cell Tray for 16 Cell Battery	DDR-13	4076	7.55	4061	2.55	6026	.54	6046	2.80	6126
Lead Tape	DDR-15	4077	8.40	4062	2.76	6027	.56	6047	2.95	6127
Lead Link	DDR-17	4078	9.30	4063	2.97	6028	.58	6048	3.10	6128
	DDR-9	4079	10.25	4064	3.18	6029	.60	6049	3.25	6129
	DDR-7	4080	11.05	4065	3.39	6030	.62	6050	3.40	6130
	DDR-5	4081	12.60	4066	3.60	6031	.64	6051	3.55	6131
	DDR-13	4082	14.95	4067	3.81	6032	.66	6052	3.70	6132
	DDR-15	4083	17.30	4068	4.02	6033	.68	6053	3.85	6133
Bolt Connectors, Type D, each	EER-17	4084	19.65	4069	4.23	6034	.70	6054	4.00	6134
Hard Rubber Cylinder, Vent only, each	EER-15	4085	2.45	4092	2.55	6027	.36	6047	1.70	6127
Lead Tape, Type H, per foot	EER-13	4086	3.40	4093	2.76	6028	.40	6048	1.85	6128
Hydrometer Syringe, Type S-1, each	EER-11	4087	4.35	4094	2.97	6029	.42	6049	2.00	6129
Electrolyte, per 100 pounds	EER-9	4088	5.30	4095	3.18	6030	.44	6050	2.15	6130
	EER-7	4089	6.25	4096	3.39	6031	.46	6051	2.30	6131
	EER-5	4090	7.20	4097	3.60	6032	.48	6052	2.45	6132
	EER-3	4091	8.15	4098	3.81	6033	.50	6053	2.60	6133
	EER-1	4092	9.10	4099	4.02	6034	.52	6054	2.75	6134
	EER-17	4093	10.05	4100	4.23	6035	.54	6055	2.90	6135
	EER-15	4094	11.00	4101	4.44	6036	.56	6056	3.05	6136
	EER-13	4095	11.95	4102	4.65	6037	.58	6057	3.20	6137
	EER-11	4096	12.90	4103	4.86	6038	.60	6058	3.35	6138
	EER-9	4097	13.85	4104	5.07	6039	.62	6059	3.50	6139
	EER-7	4098	14.80	4105	5.28	6040	.64	6060	3.65	6140
	EER-5	4099	15.75	4106	5.49	6041	.66	6061	3.80	6141
	EER-3	4100	16.70	4107	5.70	6042	.68	6062	3.95	6142
	EER-1	4101	17.65	4108	5.91	6043	.70	6063	4.10	6143
	EER-17	4102	18.60	4109	6.12	6044	.72	6064	4.25	6144
	EER-15	4103	19.55	4110	6.33	6045	.74	6065	4.40	6145
	EER-13	4104	20.50	4111	6.54	6046	.76	6066	4.55	6146
	EER-11	4105	21.45	4112	6.75	6047	.78	6067	4.70	6147
	EER-9	4106	22.40	4113	6.96	6048	.80	6068	4.85	6148
	EER-7	4107	23.35	4114	7.17	6049	.82	6069	5.00	6149
	EER-5	4108	24.30	4115	7.38	6050	.84	6070	5.15	6150
	EER-3	4109	25.25	4116	7.59	6051	.86	6071	5.30	6151
	EER-1	4110	26.20	4117	7.80	6052	.88	6072	5.45	6152
	EER-17	4111	27.15	4118	8.01	6053	.90	6073	5.60	6153
	EER-15	4112	28.10	4119	8.22	6054	.92	6074	5.75	6154
	EER-13	4113	29.05	4120	8.43	6055	.94	6075	5.90	6155
	EER-11	4114	29.95	4121	8.64	6056	.96	6076	6.05	6156
	EER-9	4115	30.85	4122	8.85	6057	.98	6077	6.20	6157
	EER-7	4116	31.75	4123	9.06	6058	1.00	6078	6.35	6158
	EER-5	4117	32.65	4124	9.27	6059	1.02	6079	6.50	6159
	EER-3	4118	33.55	4125	9.48	6060	1.04	6080	6.65	6160
	EER-1	4119	34.45	4126	9.69	6061	1.06	6081	6.80	6161
	EER-17	4120	35.35	4127	9.90	6062	1.08	6082	6.95	6162
	EER-15	4121	36.25	4128	10.11	6063	1.10	6083	7.10	6163
	EER-13	4122	37.15	4129	10.32	6064	1.12	6084	7.25	6164
	EER-11	4123	38.05	4130	10.53	6065	1.14	6085	7.40	6165
	EER-9	4124	38.95	4131	10.74	6066	1.16	6086	7.55	6166
	EER-7	4125	39.85	4132	10.95	6067	1.18	6087	7.70	6167
	EER-5	4126	40.75	4133	11.16	6068	1.20	6088	7.85	6168
	EER-3	4127	41.65	4134	11.37	6069	1.22	6089	8.00	6169
	EER-1	4128	42.55	4135	11.58	6070	1.24	6090	8.15	6170
	EER-17	4129	43.45	4136	11.79	6071	1.26	6091	8.30	6171
	EER-15	4130	44.35	4137	12.00	6072	1.28	6092	8.45	6172
	EER-13	4131	45.25	4138	12.21	6073	1.30	6093	8.60	6173
	EER-11	4132	46.15	4139	12.42	6074	1.32	6094	8.75	6174
	EER-9	4133	47.05	4140	12.63	6075	1.34	6095	8.90	6175
	EER-7	4134	47.95	4141	12.84	6076	1.36	6096	9.05	6176
	EER-5	4135	48.85	4142	13.05	6077	1.38	6097	9.20	6177
	EER-3	4136	49.75	4143	13.26	6078	1.40	6098	9.35	6178
	EER-1	4137	50.65	4144	13.47	6079	1.42	6099	9.50	6179
	EER-17	4138	51.55	4145	13.68	6080	1.44	6100	9.65	6180
	EER-15	4139	52.45	4146	13.89	6081	1.46	6101	9.80	6181
	EER-13	4140	53.35	4147	14.10	6082	1.48	6102	9.95	6182
	EER-11	4141	54.25	4148	14.31	6083	1.50	6103	10.10	6183
	EER-9	4142	55.15	4149	14.52	6084	1.52	6104	10.25	6184
	EER-7	4143	56.05	4150	14.73	6085	1.54	6105	10.40	6185
	EER-5	4144	56.95	4151	14.94	6086	1.56	6106	10.55	6186
	EER-3	4145	57.85	4152	15.15	6087	1.58	6107	10.70	6187
	EER-1	4146	58.75	4153	15.36	6088	1.60	6108	10.85	6188
	EER-17	4147	59.65	4154	15.57	6089	1.62	6109	11.00	6189
	EER-15	4148	60.55	4155	15.78	6090	1.64	6110	11.15	6190
	EER-13	4149	61.45	4156	15.99	6091	1.66	6111	11.30	6191
	EER-11	4150	62.35	4157	16.20	6092	1.68	6112	11.45	6192
	EER-9	4151	63.25	4158	16.41	6093	1.70	6113	11.60	6193
	EER-7	4152	64.15	4159	16.62	6094	1.72	6114	11.75	6194
	EER-5	4153	65.05	4160	16.83	6095	1.74	6115	11.90	6195
	EER-3	4154	65.95	4161	17.04	6096	1.76	6116	12.05	6196
	EER-1	4155	66.85	4162	17.25	6097	1.78	6117	12.20	6197
	EER-17	4156	67.75	4163	17.46	6098	1.80	6118	12.35	6198
	EER-15	4157	68.65	4164	17.67	6099	1.82	6119	12.50	6199
	EER-13	4158	69.55	4165	17.88	6100	1.84	6120	12.65	6200
	EER-11	4159	70.45	4166	18.09	6101	1.86	6121	12.80	6201
	EER-9	4160	71.35	4167	18.30	6102	1.88	6122	12.95	6202
	EER-7	4161	72.25	4168	18.51	6103	1.90	6123	13.10	6203
	EER-5	4162	73.15	4169	18.72	6104	1.92	6124	13.25	6204
	EER-3	4163	74.05	4170	18.93	6105	1.94	6125	13.40	6205
	EER-1	4164	74.95	4171	19.14	6106	1.96	6126	13.55	6206
	EER-17	4165	75.85	4172	19.35	6107	1.98	6127	13.70	6207
	EER-15	4166	76.75	4173	19.56	6108	2.00	6128	13.85	6208
	EER-13	4167	77.65	4174	19.77	6109	2.02	6129	14.00	6209
	EER-11	4168	78.55	4175	19.98	6110	2.04	6130	14.15	6210
	EER-9	4169	79.45	4176	20.19	6111	2.06	6131	14.30	6211
	EER-7	4170	80.35	4177	20.40	6112	2.08	6132	14.45	6212
	EER-5	4171	81.25	4178	20.61	6113	2.10	6133	14.60	6213
	EER-3	4172	82.15	4179	20.82	6114	2.12	6134	14.75	6214
	EER-1	4173	83.05	4180	21.03	6115	2.14	6135	14.90	6215
	EER-17	4174	83.95	4181	21.24	6116	2.16	6136	15.05	6216
	EER-15	4175	84.85	4182	21.45	6117	2.18	6137	15.20	6217
	EER-13	4176	85.75	4183	21.66	6118	2.20	6138	15.35	6218
	EER-11	4177	86.65							

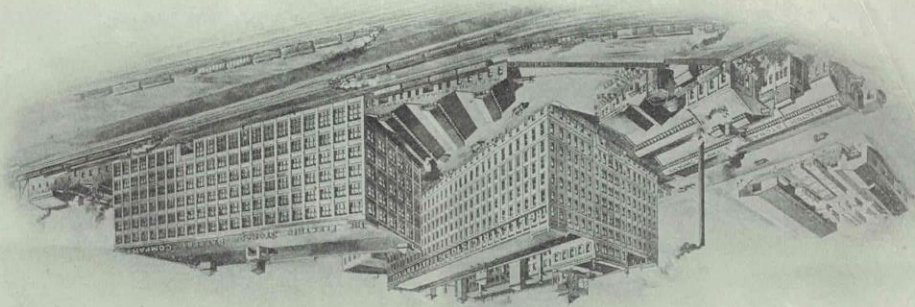


A Typical Installation of a *Western-Electric* Isolated Electric Lighting Plant, showing the Apparatus and Battery used in the 20, 30, 40 and 60 Ampere Plants

WRITE TO OUR NEAREST HOUSE
FOR PRICES ON

**LOW
VOLTAGE
PLANTS**

Complete with Engine, *Western-Electric* Dynamo,
"Chloride Accumulators," C. E. M. F.
Cells and Switchboard



THE ELECTRIC STORAGE BATTERY CO.
General Offices and Works
Allegheny Avenue, 18th to 20th Streets
Philadelphia, Pa.

Appendix I Reminiscing of Frank Stewart

AND OLD TIMES

The following reminiscences appeared in the November, 1912, issue of the "Popular Engineer," and are copied here in the belief that they will be of some interest to our friends:

REMINISCENCES OF THE ELECTRICAL SUPPLY BUSINESS.

By Frank H. Stewart.

I am not an old man, and ordinarily a person of my age would not be in a position to write or say anything of an historical nature based on his own experience. The changes, however, in the electrical supply business have been so fast and great during the last twenty years that I am an old-timer, despite my intention to remain as young as I can, as long as I can.

I was born in May, 1873, and in May, 1892, my association with the electrical industry began. I commenced work with an electrical supply and contracting house located on the south side of Walnut street, a few doors above Eighth street. The store and office were located in the basement, and I was the office man or boy, at a salary of seven and one-half dollars per week. I was the bookkeeper and stenographer, and everything else around the office, because the business was small, or "just in its infancy," as I am frequently told today about my own business.

In September, 1892, I was put on the road selling incandescent lamps and supplies. The price of 16 c. p. bamboo filament lamps was forty cents each in 1,000 lots. My first trip lasted two weeks, and I was in practically every town in Pennsylvania that used electricity, east of Johnstown. There were very few electrical contractors in those days capable of doing wiring for electric lights. I cannot recall more than half a dozen, although a great many boys were engaged in putting up door bells, which were more of a novelty then than now. The electric lighting companies did nearly all the

Twenty-three

wiring on their own circuits, and in most cases did not want anyone else to work on their lines. This tendency was fostered to some extent by the fact that they issued certificates for the underwriters, and held a rigid position.

In 1893, when the lamp litigation was on, I sold lamps as high as fifty-five cents each in thousand lots.

When I started in business for myself, in January, 1894, the first order for lamps I took was for eleven hundred, priced as follows:

16-c. p., 31 cents; 32-c. p., 51 cents; 50-c. p., 81 cents.

Better lamps are sold today at sixteen cents each than those sold at the prices mentioned above.

The test of quality in those days was simply the length of life. Nearly every town had its lamps noted for their age and blackness. It made no difference how much the candle power depreciated, providing the lamp would still burn. Lamps were measured in amperes and not in watts. I suppose watt meters were in use in those days, but I never saw a central station with one. When salesmen began to carry watt meters they were regarded with great suspicion. It was even risky to carry a volt meter. I have tested many a circuit unbeknown to the central station man. Nowadays things are different.

In 1892 there were four electrical supply salesmen traveling Eastern Pennsylvania and parts of New Jersey, Delaware and Maryland. We always had an eye open for a big building on which our houses could bid on the wiring.

At that time a great many people were afraid to use electricity for illumination, and I recall a salesman who sold gas plants, who carried a series of clippings about lightning, short circuits, etc., etc., to prove that gas was safer than electricity. He even advised me to get out of the electrical business because he thought it had no future.

I compiled the first complete electrical supply catalog published in the City of Philadelphia. It had over one hundred pages, but the listings contained in the present day

catalog make it look like a small price list. It does not contain porcelain tubes, iron conduit, non-metallic flexible conduit, flush switches, enclosed fuses, iron boxes, electric heating or cooking devices. It, however, does contain lots of things which are only a memory, such as unlined sockets, uncovered S-M cutouts, horse shoe cutouts, bug cutouts, fireproof cord, hard rubber tubing, vulca tubing, desk fans without guards, glass floor tubes, Remhof shade holders, dovetail rosettes, etc.

In the early days of electricity, the manufacturers of dynamos tried to furnish a complete line of wiring devices, and for a long time Brush-Swan, United States, Mather, Thomson-Houston, Westinghouse and Edison base fittings competed with each other for supremacy. There were other systems that helped to make the chaos of fittings a little more complicated, but I have forgotten the names. I remember the lamp and socket manufacturers worked together to standardize on the Edison base a few years ago with beneficial results to all concerned.

The low tension arc lamp, to work two in series on 110 volts, was followed by the enclosed arc lamp. Tens of thousands of these one-time efficient products went to the scrap heaps in about fifteen years.

I well remember the howl that went up when the underwriters very wisely required an entrance switch on each building. Every improvement in those days which meant a little extra cost was met by criticism. I put out a few new appliances, such as the metal thread socket handle, wood moulding blocks, adjustable handles, and threaded brass pipe for cluster stems; but it was hard work to introduce a new thing.

When I entered the electrical supply business, porcelain, slate and fibre were displacing wood and rubber as insulations. I remember very well the wood cleats, ceiling rosettes, cutouts, snap switches, receptacles, attachment plugs, etc., etc. I have a collection of these wooden antiques now.

Porcelain was very troublesome at first because of its

OUR NEW HOME

warping and unequal shrinkages, but of late years this seems to have been entirely overcome. Slate and fibre had to be used on some devices for a long time because of the trouble with porcelain. The first fibre sample grip ever made in this country was made for me out of electrical sheet fibre. It is still in good condition.

In these days of co-operation, when it is possible to sit down at a banquet with several hundred electrical people, as I did a few nights ago, it seems a long hark back to the first successful attempt at co-operation, when Mr. Vallee and I called a meeting of the allied electrical interests together on a common basis, i. e., Credit.

The wireless telephone and telegraph, like the flaming arc lamp and the Mazda lamp, seem recent; but it has been many years ago since Mr. Collins, the pioneer inventor of wireless telephony, invited me to witness the first public demonstration of a working wireless telephone. He worked hard, and is entitled to the recognition given him.

My connection with the electrical business has been interesting. I have listened to those who were experimenting almost before I was born. I have heard of the times when bare wires were used, and the leakages down the metallic decorations of the wall papers would make the onlookers think of electrical snakes.

I have talked with men who worked on the first telephones, made the first electric lamps, the first insulated wires, the first dynamos; but they would never trouble themselves with recording their experiences. Many of them are gone and the history is lost.

The cornerstone of the new building was laid in the afternoon of January 27, 1912. The photographs reproduced were taken by representatives of the Philadelphia newspapers. The following news item appeared in the "Philadelphia

Inquirer" of January 28th. Similar articles appeared in the "Public Ledger," and other newspapers:

OLD MINT BUILDING CORNERSTONE LAID.

ELECTRIC COMPANY WILL OCCUPY NEW STRUCTURE TO BE ERECTED ON HISTORIC SITE.

Before hundreds of persons the cornerstone of the Old Mint Building, which will be erected on the site of the old United States Mint, at 37 North Seventh street, was laid yesterday afternoon with impressive exercises. The building will be occupied by the Frank H. Stewart Electric Company.

The stone was laid by Wilfred Jordan, curator of Independence Hall, and the invocation pronounced by Rev. Frederick Blazer, pastor of the Pitman, N. J., Baptist Church. The benediction was pronounced by Rev. Alexander Corson, pastor of the Paulsboro, N. J., Methodist Church. Mr. Stewart, head of the firm of Frank H. Stewart, made a short address, in which he spoke of the historic site that his company had selected for its new headquarters.

In the cornerstone was placed a black lead box. Its contents were as follows: Eight silver dollars, of dates from 1795 to 1803; ten silver half-dollars, 1795-1817; five quarters, 1815-25; five dimes, 1821-31; ten pennies, 1794-1829; seven one-half cent pieces, 1793-1828, all coined in the old mint, and other coins bearing the stamp of 1911, and other mementos.

The address referred to was as follows, and is copied from the "Peirce School Alumni Journal," of April, 1912:

MR. STEWART'S ADDRESS.

Every one of us here assembled owes a tribute to the past and a legacy to the future, and the laying of this cornerstone is a partial discharge of our duty as I see it.

Within the boundaries of these walls the first great men of our nation have stood. The old building we tore down was the first United States mint, and also the first public building erected by authority of Congress. It was erected in

1792, and the first coins made here were coined from silver household plate delivered personally by Washington. They are now known as Washington half-dimes, and he referred to them in his fourth annual message to Congress. The first regular coinage of copper began in 1793; silver, in 1794, and gold, in 1795.

The old mint was in operation for a period of about forty years before the removal to Juniper and Chestnut streets. During that time 148,885,742 pieces of gold, silver and copper were coined, having a total value of \$45,047,733, which today would not be enough to give each person in the United States two pieces of money each, and I am sure that we all have more than two pieces each today. The old mint was a hard-worked institution. It began work at five o'clock each morning and closed at six in the evening, with only two holidays a year—Christmas and the Fourth of July.

When Washington caused this ground to be purchased for the purpose of erecting a mint, the United States was bounded on the west by the Mississippi and on the south by Florida, which reached like a crescent from its southernmost point to the Mississippi, so that we were hemmed in on both the south and the west by the Spanish possessions.

Napoleon was then a young lieutenant on furlough. Franklin had just died, and the United States troops, which then amounted to a force of 5,000 men, were largely engaged in fighting Indians in the northwestern territory, Ohio and Michigan.

We had no navy and paid an annual tribute to the Barbary pirates.

The cotton gin was not yet invented; gas lights, railroads and waterworks in this country were as yet unknown.

Philadelphia was then the Capital of the United States.

The coinage of money began a long time ago—about 500 years before Christ—and specimens now existing prove that the Greeks and Romans could do artistic work with crude appliances.

It is recorded that Thales of Miletus, 600 years before Christ, discovered that a piece of amber well rubbed had the power of attracting light bodies, as a magnet attracts a needle. Franklin, in 1750, proved that lightning and electricity are one and the same thing. Shortly after, he invented the lightning rod, on which there has been practically no improvement since, and it is interesting to me, at least, to mention that my father sold lightning rods on the western prairies of Indiana and Illinois for a period of seventeen years before and after the Civil War.

The first telegraph line in this country was in 1844. The telephone was patented in 1876, and only this week I heard Mr. Cattell say that he worked for Jay Cooke, who had the first telephone in this section, and that he would frequently be called upon to repeat telephone conversations back to the sender, in order to prove that articulate speech could actually be transmitted over a wire. He said that the great majority of people thought they were being fooled by some trick played by some one in concealment nearby.

The first practical arc lamp was invented by Charles Brush, of Cleveland, in 1878, and the man for whom I worked always claimed that he was an errand boy for Brush, and that he also at one time traveled with a circus exhibiting a portable electric light plant, which was just as great a curiosity as the wild beasts of tropical jungles.

The first incandescent central station in this country was the New York-Edison Company, started in 1882. The first central station in Pennsylvania was in Sunbury, and I well remember the old bi-polar machine I first saw there in 1892, while making my first trip on the road.

It was told me that Edison himself ordered every one out of the building before he started the plant, because he did not know what might happen.

The completion of this building helps make good a prediction I made to my friend, John Mustard, of the Wagner Company, when we as boys boarded on Green street, this city.

OUR NEW HOME

I told him then that we would undoubtedly live to see the time when electrical supply stores would be occupying whole buildings. We have occupied a whole building, with warehouses besides, for years, but when I made the suggestion I had no idea of the short length of time necessary for its accomplishment.

This building represents my life's work. It is built of enduring steel and concrete. It is the best that I can do.

When the old building was erected in 1792, the great men of the nation did the work now done by subordinates, but in most cases they did things more thoroughly than we do them today.

Washington, Jefferson, Hamilton, Rittenhouse and Boudinot stood here one hundred and twenty years ago, and, while our efforts cannot compare with theirs, we can, however, be just as true and honest, so let us work that the glory of being pioneers in a great business of unprecedented growth and opportunities may never be tarnished by the lapse of time.

(Placing of lead box in cornerstone by Wilfred Jordan, Curator of Independence Hall, at this point.)

I endeavored to make the contents of this box of real interest to future generations. It contains a request that the finder of box and contents replace it in any new building which may be erected on this site:

Letters from L. B. Moffett, Reverend Frederick Blazer, John H. Landis, Creth & Sullivan.

Names of officers and employees of the Frank H. Stewart Electric Company.

Business cards of architect and contractors doing work on the building.

Pictures of the Old Mint.

"Ye Olde Mint" booklet.

History of the Stewart family of New Jersey.

Membership lists of Trimble, Ionic and Rising Star Lodges.

Appendix : Reminiscing of an early wireman

AND OLD TIMES

a right to expect even better stocks and service than we have been able to offer and give them in the past.

We were the first, and consequently now the oldest, to do an exclusively electrical supply business in the City of Philadelphia, and it is a curious coincidence that we should occupy the site of the first U. S. Mint, as well as the first property purchased for the erection of the first public building by authority of congress, during the first administration of our first president, the immortal George Washington. Certain rare coins made in the old buildings we tore down have recently sold at auction at prices ranging from one hundred to thirty-six hundred dollars each. Individual examples of each of the gold, silver and copper coins made in the first U. S. Mint in perfect condition would bring more at auction than it cost to erect our new building, and that is no small sum. We have a modest collection, sufficiently large enough to enthuse those interested in old and rare coins, some of which were found on the site of the old mint building.

We invite you to investigate our new building, stock and equipments. Any one of our officers or employees will take great pleasure in showing you the many new ideas which will be used in our electrical supply house for the first time. Our business was established in January, 1894, and we are making a collection of electrical antiquities which were in use at the time we started in business nineteen years ago, to show you, if you are interested in the great strides made in electrical appliances.

The following was penned for us by a man who started as a wireman in December, 1882. His experience in the electrical installation branch of business has been continuous, and he is one of that constantly decreasing number of pioneers of the electrical business.

He is now employed in a semi-public capacity, and we regret that his modesty is such that he asked us not to publish his name. He, however, is one of the best known local elec-

trical men of the day. Our museum contains a piece of wire he installed twenty-five years ago, during the blizzard of 1888.

EARLY WIRING.

"A few brief remarks on early electrical construction may be appropriate at this time, considering the numerous changes which have taken place during the thirty years of incandescent electric light construction and insulation. To look back to that period from the present time is to smile and wonder how it could have been so crude.

"The writer recalls when there was only one grade of insulation used and two colors of wire. The grade of insulation was what was afterward known as Underwriters, and the colors were black and white. The method of installing was that white wire was used for positive, and black wire was used for negative, throughout the entire plant, and should it be necessary to make extensions the same rule was followed and the impression was given the mechanic that if the colors were changed the circuits would not work. It was not out of the ordinary for an employee going out on repairs and extensions, to request two colors of wire for the job.

"The cutouts in use in that period were constructed entirely of wood and were of a single pole type, and the two colored wires coming from them were always connected so that the fuse was on the same line throughout the entire job, and should perchance one be connected on the wrong line, the man was required to change it, and given the impression it would only work one way—and he really believed it.

"An odd theory, which was of very short duration, originating with some of the superintendents of work at that period, was that cutouts of easy access were not necessary, and they have been known to install them between the floor and ceiling, and then nail the floors down and relay the carpets. When questioned regarding the use of them, they stated that they were a protecting device and were fused heavily enough so that they would not possibly blow out.

and therefore it would not be necessary to take the floor up again. I recall this conversation between a householder and a young man in charge of the work, who later became an engineer of recognized ability.

"The matter of insulation was far from what it is today, when insulated conductors of 500,000 and 2,000,000-C. M. capacity are almost common. At the time of which I write it was impossible to obtain in the market insulated wire above No. 1 B & S gauge, and the writer recalls that he once found it necessary to use No. 4/0 copper in connecting two buildings, and when the order was sent for same he was informed by the office of the company who employed him that it was impossible to get insulated wire of such a size. The order was filled by sending to the job ten coils, each 100 feet long, of $\frac{1}{2}$ -inch soft drawn copper and 25 pounds of tape, with specific instructions to cover the wire with two layers of tape to make the insulation equivalent to that which was insulated by machinery.

"Installations of wiring at the time of which we speak were plain open work held in position by wooden cleats, in direct contact with foreign substances, very similar to what is known as low potential bell wiring of today, or encased in wooden moulding, similar to moulding of today, but with no thought of depreciation or additional protection when wires passed through floors, etc.

"When concealed work was desired, the floors were raised, and in some cases the joists were notched out, similar to installing gas pipe, and both wires laid in one groove, or in separate grooves, without additional protection, and the floors relaid. It was very soon discovered that the nails driven through the floors cut the wires off, and the practice of boring joists below any possibility of a nail reaching the wire was then adopted, and the wire being drawn through the holes without any additional protection, as the insulation on the wire at that time was considered sufficient protection against any trouble.

"The rule regarding drop in voltage on the line was not regulated as it is today by sizes of copper. If an installation had been made, and it was found that the drop in voltage was too great on the upper floors, the matter was adjusted by using lamps of lower voltage as the distance increased from the generating point. There was a plant in this city where 86-volt lamps were used on the fifth floor and 92-volt lamps were used on the first floor and basement, to maintain normal candle power.

"The general idea in those days was—there is your machinery and material; install the work and make it go. This was the advice given to the superintendent in charge of the work, and if the matter did not turn out O. K., he was in for an explanation.

"But in reviewing matters of the above period, and considering that the highest voltage in use at that time was about the 100 mark, many things could be allowed without harm coming from them, which in this age of much higher voltages could and would not be considered a safe practice under any consideration. So, while it will be seen that work of installing incandescent lights was in those days very crude, other things were correspondingly in the embryo conditions, which made a great difference. Electricity has become at this time a master unit in the world's mechanical and commercial work."

OLD MINT DEED.

The government deed for the old mint property could not be found at the time of sale to the president of our Company, and the search for and final recovery of this deed would make an interesting story in itself. Suffice it to say that it was finally found in an old safe by Mr. Louis Kates, who gladly gave it to our president. It is a piece of parchment and the penmanship is above reproach.

The great seal of the United States, the seal of the City of Philadelphia, and the seal of the County of Philadelphia are all affixed—the latter two on the back of the deed. Mayor

Bibliography

1. Apocalypse Delayed-The Story of Jehovah's Witnesses (University of Toronto Press, 1985)
2. Aurora Battery: Electrical World, Vol. 7, No. 14, p.154.
3. Auto Lite: <https://en.wikipedia.org/wiki/AutoLite>
4. The AXO Battery: **Western Electrical, Feb. 9, 1889, vol. 4, no. 6, p. 71, col. 2**
5. Baghdad Battery: https://en.wikipedia.org/wiki/Baghdad_Battery
6. Balkite Battery Charger: The Wireless Engineer, April 1923, page 439
7. Batteries and early railway telegraph lines: membersKos.net/sdagnon/te4.html
8. Batteries Not Included: FOHBC Bottles & Extras, November – December 2010
9. Batteries: Types and History: <https://edisontechcenter.org/batteries.html>
10. Battery Cell Container, Patent, T.A. Edison , July 30, 1912. 1,034,003
11. Battery History://<https://www.theinventors.org/library/inventors/blbattery.htm>
12. Battery Insulators , Oil Insulators and Chloride Accumulators , Charles & Sandi Irons, 2005.
13. Battery Insulators , Oil Insulators and Chloride Accumulators , Charles & Sandi Irons, www.fohbc.org/wp-content/uploads/2014/06/BatteryInsulators-JanFeb2007.pdf
14. Battery Jar Patent, No. 1,152,247, Aug. 341, 1915:
<https://patents.google.com/patent/US1,152,247A/en>
15. Battery Jars: <https://sha.org/bottle/miscellaneous.htm#battery%20jars>
16. Battery Operated Radios: <https://www.radiology.com/info/about%20battery%20radio.htm>
17. Bell System: https://beatriceco.com/porticus/bell/bell_systems-history.htm/
18. Bell System: https://beatriceco.com/porticus/bell/bellsystem_history.html
19. Benjamin Franklin and Electricity: <http://www.revolutionary-war-and-beyond.com/Benjamin-franklin-and-electricity.html>
20. Benjamin franklin's Pioneering Electrical Work Influenced Today's Technology: <https://American.history.si.edu/press/releases/Benjamin-franklin-electrical-influence>
21. Birth of Electrochemistry: <https://electrochem.org/birth-of-electrochemistry>
22. Brach, L.S. Mfg. Co. by Dan Howard, Old Familiar Strains, Volume 2, No. 4/5, August/October 1995
23. Brief History of Electricity: First 100 Tears History Timeline: <https://powertrical.com/history-of-electricity>
24. Brief History of Electricity: www.ecmag.com/section/your-business/brief-history-electricity
25. Bunnell, J.H. & Co. from a presentation by Dr. Joseph Jacobs at the 1994 Antique Wireless Association Conference. www.jhbunnell.com/bunnellcohistory.html
26. Bunnell vs. Bunnell; www.telegraph-history.org/j-h-bunnell/index.html
27. Bunnell Telegraphic and Electrical Co.: www.telegraph-history.org/bunnell-tel-tel-eect-catalog
28. Bunnell, History of J.H. & Company: based upon a presentation by Dr. Joseph Jacobs at the 1994 Antique Wireless Association Conference. (www.jhbunnell.com/bunnellcohistory.shtml)
29. Bunnell Telegraph Apparatus, 1918: www.dieterbrachmann.de/morsetasten/memo-pages/M_catalog.htm
30. Bunsen Battery: https://en.wikipedia.org/w/index.php?title=Bumsen_cell&oldid=1006871799
31. Catalog: J,C, Vetter & Co. New York: Dry LeClanche, Galvanic and Faradic Batteries.
32. Catalog: Davis & Kidder's Magneto- Electric Machine

33. Catalog: The Electric Storage Battery Co. Chloride Accumulator, 1906
34. Catalog: Frank H Stewart, Electrical Supplies, 1904
35. Catalog: Voltamp. The Faradic Current in the Treatment of Disease,
36. Catalog: Illinois Glass Company, 1906
37. Catalog: Partrick and Carter Electric Supplies, 1888
38. Catalog: Edison Lalande Batteries, 1910
39. Catalog: Westinghouse Electrical Supplies; Home of ANDRAE,
40. Catalog: Hemingray Glass Insulators; 1903
41. Catalog: Supplemental Price List, Whitall Tatum, 1894
42. Catalog: Electrical House Goods, Circa 1924
43. DC to AC: www.bluetipower.com/blogs/news/dc-to-ac-power-converter-understandinghow-it-works#:~:text=how%20to%20convert%20co
44. Dry Cell Chloride of Silver Battery Catalog: Faradic Batteries
45. Charles Chardin: <https://fr.wikipedia.org/charles-chardin>
46. Civil War Artifact Across the Decades: Davis & Kidder 's Patent Magneti-Electric Machine: <https://civilwarmed.org/surgeons-call/magneto-electric-machine/>
47. Classic Atlas Mason Jars: A Quick Guide for Collectors, Sarah Caldwell: <https://theoldtimey.com/atlas-mson-jars/>
48. Columbia Dry Cell Battery: <https://www.asc.org/content/acs/en/educational/what-is-chemistry/landmarked/drycellbattery.html>
49. Consolidated Edison: https://en.wikipedia.org/w/index.php?title=Consolidated_Edison&oldid=1121926813
50. Corning Glass: https://en.wikipedia.org/wiki/Corning_Inc.
51. "Cumberland Glass Mfg. Co." catalog of Bottles, Window Glass, Fruit and Battery Jars. Jan. 1, 191 (See NIA.org)
52. Cumberland Glass Mfg. Co., Lockhart, Schreiber, Lindsey, Serr. (<https://sha.org/bottle/pdffiles/cumberlandglassco.pdf>)
53. Current Wars: Why did Westinghouse (AC) Beat Edison (DC): www.bloguscusa.org/mark-specht/the-current-war-why-Westinghouse-ac-beat-Edison-dc/
54. Daniel Cell: https://en.wikipedia.org/wiki/Daniel_cell
55. Daniel Cell: www.sciencedirect.com/topics/engineering/daniel-cell
56. Double Day Hill Electric Co. : <https://abaa.org>
57. Radio Amateur: Double Day Hill: www.earlyradiohistory.us/1920dh.htm
58. THE Dating Game: THATCHER Glass Mfg. Co. https://sha.org/bottle/pdffiles/Thatcher_Blockhart.pdf
59. Davis & Kidder, The Real History of : Guide to Electrotherapy Instruments and History of Their American Makers by Dean P. Currier: Excerpts: www.electrotherapymuseum.com/2010/DavisKidder/index.htm
60. Davis & Kidder: www.electrotherapymuseum.com/2010/daviskidder/index.htm
61. Davis & Kidder's patent Magneto-Electric Machine for Nervous Diseases: https://americanhistory.si.edu/collections/search/object/nmask_727990
62. Davis & Kidder: Improved Magneto-Electric Machine

63. Delaware & Atlantic Telephone & Telegraph co.:
https://www.reddit.com/r/manholeporn/comments/17odxzt/delaware_and_atlantic_telegraph_and_telephone?
64. "Delco Batteries, History of ". https://garageart.com/history_of_delco_batteries?
65. Delco-Light Plant, Sam Moore. (<https://www.farmcollector.com/community>
66. [/farm-show/delco-light-plant-zmlz13janzbeal](#))
67. " Disque LeClanche Battery, in Electrical World, Saturday, August 9, 1884. Vol,=. 4, no. 6, p. 46, col 2.
68. Electronics: ([https:// en.wikipedia.org/wiki/Delco Electronics](https://en.wikipedia.org/wiki/Delco_Electronics))
69. Electrotherapy, What is? Overview & How It Works. Sports Therapy, April 8, 2020. Verified by Luke Hughes
70. Delco Edison Storage Battery Company Building:
https://en.wikipedia.org/w/index.php?title=Edison+Storage_Battery_Company_Building&oldid=1014875331
71. Delco: www.delcolight.com2.htm
72. Delco Light Plants, Collecting : www.delcolight.com/2w.htm
73. www.earlyradiohistory.us/1920dh.htm
74. Edison, Thomas and the Electric Storage Battery:
www.hemmings.com/stories/2013/05/09/exhibit-on-thomas-edison-and-the-electric-storage-battery-opens
75. Edison's Thomas, \$39 Million Mistake: www.wealthdaily.com/article/Thomas/edison-s-39-million-mistake/100938
76. Edison Battery – 1903: <https://nationalmaglab.org/e3ducation/magnetacademy/history-of-electricity-magnetism/museum/edison-battery>
77. Edison Tech Center, Batteries: Types and History: <https://edisontechcenter.org/batteries.html>
78. Edison, Thomas A. Papers: <https://edison.rutgers.edu/battpats.htm>
79. Electrical Engineer, The : Trade Magazine; Oct. 21, 1891, Vol. 12, no. 181, p.465, 470, col. 1,2.
80. Edison, Thomas A. : <https://en.wikipedia.org/wiki/Thomas-Edison?msclkid=b2f55fa5ca2611cc82b598a7c745c069>
81. Edison, Thomas A. Inc.: https://en.wikipedia.org/wiki/Thomas_A_Edison_Inc.
82. Edison: <https://edison.rutgers.edu/company.htm>
83. Edison Lalande Battery Catalogue, 1910:
84. Edison Cell: www.nutsvolts.com/magazine/article/february2012_Noon
85. Edison vs. Westinghouse: A Shocking Rivalry:
86. Edison, Tesla, & Ford – Their shared History of EVs. Jason Waterman, Nov. 3, 2020
87. Edison vs. Westinghouse, An Implausible Electricity War, by Dorthey Duenas. A 43-page booklet, March 18, 2021, From Amazon. ISBN: 9798724434010
88. Edison was right about the Electric Car: <https://EarthboundReport/2021/02/18/edisonwasrightabouttheelectriccar/#:~:text=->
89. Electric Goods Manufacturing Company: [://waywiser.fas.harvard.edu/people/8301/electric-goods-manufacturing-company](http://waywiser.fas.harvard.edu/people/8301/electric-goods-manufacturing-company)
90. Electrical Industries, (trade journal) March 1891, Vol.2, No. 3, p. 74-75, col. 1-2
91. Storage Battery Manual –[Design and Construction" by Lucius C. Dunn, 1920, published by The Lord Baltimore Press, Baltimore, MD

92. Electrical Supply Companies and Their Insulators, General Electric.
(www.nia.org/history_and_guide/chapters/vol_1-19_theelectricalsupplycompanies.pdf)
93. Electro-Medical-Guide and Directions for the use of the Smith & Shaw Closed Cell Pocket Battery, issued by Smith & Shaw Electric Co., Personal Copy
94. Electrochemistry: Primary and Secondary Batteries:
www2.chem.wisc.edu/deptfiles/genchem/netorial/rottosen/tutorial/modules/electrochemistry/o6battery/18_61.htm
95. Electrode for Storage Battery, T.A. Edison , March 24, 1903 723,449
96. Electropon: Webster's Revised Unabridged Dictionary
97. Exide: <https://en.wikipedia.org/wiki/exide>
98. Exide: <https://en.wikipedia.org/wiki/exide>
99. Exide: <https://en.wikipedia.org/wiki/exide>
100. Exide: <https://en.wikipedia.org/w/index.php?title=exide&oldid=1069048259>
101. Experiences with NICAD Cells from Pacific West Supply: Home Power#15 February/March 1990
102. Fansteel Inc.: Encyclopedia of Chicago,
103. "Farm Lighting Batteries – Section III." https://.powerstream.com1922/battery-1922_WITTE/batteryfiles/chapter17.htm
104. "Farm Lighting Batteries – Section III." https://.powerstream.com1922/battery-1922_WITTE/batteryfiles/chapter17.htm
105. Farm Radios: <https://www.farmcollector.com/equipment/farm-radio/>
106. Findlay Bottle Co.: Lockhart, Schreiber, Lindsey and Serr, <https://sha.org/bottle/pdf/FindlayBottleCo.pdf>
107. Fire Engineering .co: <https://fireengineering.com/leadership/the-gamewell-fire-alarm-company/>
108. Fire Alarm Call Box:
https://en.wikipedia.org/w/index.php?title=Fire_alarm_call_box&oldid=1053472235
109. Fulmen Battery Co.: https://en.wikipedia.org/wiki/Fulmen_Batteries
110. Ford, Edison and the EV that almost was Dan Stroh, Gear, June 18, 2018
111. Funnel for Filling Storage Battery Cans Analogous Purposes, T.A. Edison , March 3, 1903, 721,870
112. Gamewell Battery Support Insulators: www.r-infinity.com/Gamewellindex.htm
113. "The Gamewell Company" Crown Jewels of the Wire: February 1989, page 17
114. Gamewell, Fire Alarm Telegraph: <https://fireengineering.com/leadership/the-gamewell-fire-alarm-telegraph/>
115. Gamewell Fire Alarm Co; <https://leadership/the-gamewell-fire-alarm-company/>
116. Gamewell: <https://securitysystemsnews.com/article/honeywell-acquires-gamewell-co.>
117. Gaston Plante : Journal of Power Sources; Volume 195, Issue 14, 15 July 2010, pages 4424-4434
118. Gayner Glass Works "Electrical Record" (New York, New York) October 1907
119. Gayner Glass Works , Lockhart, Schreiber, Lindsey and Serr
120. Gayner, J. William: nia.org/historytechguide/chapter/vol_1-14_J_William_gayner.pdf
121. Gayner Glass Works: American Glass review; Dec. 24, 1927; Vol. 47, no. 13, p.15-17
122. General Electric Company: www.en.wikipedia.org/wiki/general_electric
123. General Electric Company:
https://companyhistories.com/GeneralElectric_Company_History.html

124. George Westinghouse used Tesla Power to defeat Edison in Currents War:
geekhistory.com/content/George-westinghouse-used-tesla-power-defeat-edison-currents-war.
125. Glass Lancaster and Lockport, NEW York by Jean W. Dunn:
bechsd,nylearns.org/pdf/low/glass%20lancaster%20and%20lockport%20new%20york.pdf
126. Golden Age, Sept. 13, 1933, p.777; Sept. 8, 193, p. 773; Aug. 5, 1931, pp. 727-728; Sept. 23, 1936, p. 810; April 22, 1925, pp.453-454; August 5, 1931, p.728; April 7, 1926, p.438.
127. Golden Age; April 22, 1925, pp.453-454.
128. Gordon Primary Battery Jar: American Electrician, January 1898, Vol. 10, no. 1, p. 45
129. Gordon Primary Battery: Telephony Trade Journal. Jan. 1903, Vol. 5. No, 1, p. 78-80.Column 1.
130. Gould Electronics: [www.company-histories.com/Gould-Electronics-Inc-CompanyHistory,htm](http://www.company-histories.com/Gould-Electronics-Inc-CompanyHistory.htm)
131. Greeley, E.S.: L. G. Tillotson & Company (telegraph-history.org) Part 2Guide to the street Lighting History Collection: City of Boston Archives
132. Grenet and Fuller Batteries: Bichromate Batteries: Electrical Review, Saturday, July 4, 1885, vol. 1, no. 18, p.3
133. Hazel-Atlas Glass Co., Lockhart, Schreiber, Lindsey, Serr, Hawkins:
<https://sha.org/bottle/pdf/Hazel-Atlas.pdf>.
134. The Hemingray Glass Co.:
https://en.wikipedia.org/wiki/Hemingray_Glass_Company
135. Hemingray Glass Co.: [https://ohio history central.org/Hemingray_Glass_Company](https://ohiohistorycentral.org/Hemingray_Glass_Company)
136. Hemingray Glass Co.: https://en.wikipedia.org/wiki/Hemingray_Glass_Company
137. Hires, Charles E.: <https://www.encyclopedia.com/education/economics/history/hires-charles-elme>
138. History of Battery Technology: [https://Liossmart.com/en/history-of-battery- technology/](https://Liossmart.com/en/history-of-battery-technology/)
139. History of the Battery:
https://chemeurope.com/en/encyclopedia/history_of_the_battery.html
140. History of the Battery: <https://en.wikipedia.org/wiki/history-of-the-battery>
141. History and Development of the Battery: <https://Britannica.com/technology/battery-electronics/development-of-the-battery>
142. History of the Electric Club of Philadelphia:https://eap.org/EAP/EAP/About/History_of_the_EAP.aspx
143. History of Electricity: [https://electricity forum.com/history-of-electricity](https://electricityforum.com/history-of-electricity)
144. History of Electricity:
<https://www.hcusd2.org/vimages/shared/vnews/stories/5863e7aa1c11e/history%20of%20electricity.pdf>
145. History of Electricity: [https://electrical curiosity.com/history-of-electricity/](https://electricalcuriosity.com/history-of-electricity/)
146. History of Electricity: <https://Thehistoricalarchive.com/happenings/57/the-history-of-electricity-a-timeline/>
147. History of Electricity: <https://info.elumisfoundation.org/history-of-electricity/>
148. History of Electricity:
[hcusd2.org/vimages/shared/vnews/stories/5683e7aa1c11e1History%20of%20electricity.pdf](https://www.hcusd2.org/vimages/shared/vnews/stories/5683e7aa1c11e1History%20of%20electricity.pdf)

149. History and Timeline of the Battery: <https://thoughts.com/battery-timeline-1991340phys.org/news/2015-04-history-batteries.html>
150. History of Philips, A Complete Guide, The: <https://history-computer.com/the-history-of-philco-a-complete-guide/>
151. Holtzer-Cabot: Wikipedia. <https://en.wikipedia.org/w/index.php?title=Holtzer-Cabot&oldid=981877470>
152. How Batteries Work: Battery Reactions and Chemistry: Brain, Bryant & Pumphrey, (<https://electronics.howstuffworks.com/everyday-tech/battery3.htm>)
153. How Batteries Work: Battery History: Brain, Bryant & Pumphrey, (<https://electronics.howstuffworks.com/everyday-tech/battery1.htm>)
154. How Batteries Work: Anatomy of a Battery: Brain, Bryant & Pumphrey, (<https://electronics.howstuffworks.com/everyday-tech/battery2.htm>)
155. How Edison, Tesla and Westinghouse battled to electrify America. Elizabeth Nix. Updated :Oct 24, 2019. Original: Jan 30, 2015
156. Hussy Battery: Electrical World, Nov. 2, 1889
157. Illinois Glass Co. : Lockhart, Schulz, Schreiver, Lindsey, Serr, with Hoenig and Whitten. (<https://shs.org/bottle/pdffiles/IGCo.pdf>)
158. In 1912 Henry Ford & Edison Came Together to Conceive a Low-Priced Electric Car.: Goran Blazeski, Oct. 18, 2016
159. India Rubber, Gutta Percha and Telegraph Works Co. https://en.wikipedia.org/wiki/India_Rubber_Gutta_Percha_and_Telegraph_Works_Co.
160. Insulators, Catalog of Screw Glass, Battery Jars, Electric Light Globes, etc., Manufactured by Hemingray Glass Co. May 1, 1903: Copy obtained from Bob Stahr
161. Insulators, A History and Guide to North American Glass Pintype Insulators, Volumes 1 & 2, John & Carol McDougald.
162. Internet Archives: <https://ia803004.us.archive.org/29/items/illustrated/catalogandpricelistofeverythingelectrical>
163. I Really Go For Go Withs: Crown Jewels of the Wire, November 2002pg. 16 by Roger Lucas.
164. [image.storage.googleapis.com/7f/aa/f6/080f0/co4475a51/US2004007970714A1.p d](https://image.storage.googleapis.com/7f/aa/f6/080f0/co4475a51/US2004007970714A1.pdf)
165. [Inverse.com/Outlet/9793](https://www.inverse.com/outlet/9793)
166. Jacobs Wind Electric: www.jacobswind.net/history
167. Jacobs Wind Electric: [://en.wikipedia.org/wiki/Jacobs_wind](https://en.wikipedia.org/wiki/Jacobs_wind)
168. "Jehovah's Witnesses and Healing", Dr. George D. Chryssides, University of Birmingham, UK: Paper presented at the CESNUR 2014 International Conference in Baylor University, WACO, TX.
169. Laclede Carbon & Electric Moves to Kokomo, IN: Electrical Industries Journal, Nov. 1894, Vol. 4 no. 11, Col. 1
170. Lamont Glass Co. : <https://sha.org/bottle/pdffiles/LamontGlassCo.>
171. "Law" Battery, The New.: Electrical World (trade journal) March 31, 1888, Volume 11, No. 13, page 168, col 3

172. Law Battery Made by Whitney Glass Works: Electrical World, Saturday, May 19, 1888, Vol. 11, No. 20, page 259, col 1-2.
173. Law Telegraph Co.:
https://en.wikipedia.org/w/index.php?title=law_telegraph_company&oldid=963845940
174. image.storage.googleapis.com/7f/aa/f6/080f0/co4475a51/US20040079714A1.pdf
175. Lead-acid battery, Maintenance and Usage of (abstract): Journal of Power Sources: Volume 195, Issue 14, 15 July 2010, page 4423
176. Lead Acid Battery: Working, Construction and Charging/Discharging (tutorial/lead-acid-battery-working-construction-and-charging-discharging) by Sourav Gupta, Dec. 19, 2018. <HTTPS://CIRCUITDIGEST.com/power-electronics>.
177. Learners Telegraphic Instrument: Patent; No. 336,284, Emmor Bonsall, Feb. 16, 1886
178. LeClanche Cell: <https://nationalmaglab.org/education/magnet/academy/history-of-electricity-magnetism/museum/leclanche-cell>
179. LeClanche, Georges; <https://en.wikipedia.org/wiki/Georges-Leclanche> \
180. LeClanche: https://en.wikipedia.org/wiki/LeClanche_cell
181. LeClanche Cell – 1866: (<https://nationalmaglab.org/education/magnet-academy/history-electricity-magnetism/museum/leclanche-cell>)
182. Leyden Jar: https://en.wikipedia.org/wiki/Leyden_jar
183. Little Giant Battery: Electrical Review, August 1, 1885
184. Lockport Glass Works: Lockhart, Schreiber, Lindsey Serr
185. Main Storage Batteries, Chapter 5, Description, San Francisco Maritime National Park Association. Version 1.10, 22 Oct 2004 telegraph00smit/page/22/mode/2up.
186. Making Battery Jars and carboys at Gayner Using Compressed Air: American Glass Review, Dec. 24, 1927, Vol. 47, no. 13, p. 15-17.
187. Manual of Telegraph: http://ia802901.us.archive.org/a7/items/manual_of_telegraph00yorkgoog/manual_of_telegraph00yorkgoog.pdf
188. Manual of Telegraphy and Catalogue of Electrical Instruments & Supplies: https://ia800604.us.archive.org/11/items/Bunnell_Telegraph_and_Electronic_Catalogue_Courtesy_of_K4TJP/Bunnell_Telegraphic_and_Electrical_Catalogue_Courtesy_of_K4TJP.pdf
189. Medical Battery, The in the U.S. (1870 – 1920) Electrotherapy at home and in the Clinic: <https://academia.org/jhmas/articla/22/21/66/3073507>
190. Medical Battery in the United States (1870-1920): Electrotherapy at Home and in the Clinic: Journal of the History of Medicine and Allied Sciences, Volume 72, Issue 2, April 2017, pp. 166-192
191. Medical Battery in the United States (1870-1920): Electrotherapy at home and in the Clinic by Anna Wexler: Journal of the History of Medicine and Allied Sciences, Vol. 72, No. 2, pp. 1-27
192. Medical Battery in the United States (1870-1920): Electrotherapy at Home and in the Clinic: Anna Wexler. Journal of the History of Medicine and Allied Sciences, Volume 72, Issue 2, April 2017, pages 166-192, (<https://doi.org/10.1093/jhmas/jrx001>).

193. "Medical Use of Electricity" by George Miller Beard, MD & A.D. Rockwell, MD; With special reference to general electrization as a tonic in neuralgia, rheumatism, dyspepsia, chorea, paralysis, and other afflictions associated with general debility. Originally published in 1867 by William Wood & Co. Reprint published by Legare Street Press.
194. Monsieur Callaud: Mysterious Frenchman: <https://upsbatterycenter.com/blog/monsieur-Callaud/>
195. Musically made in New Jersey: www.GardenStateLegacy.com Issue 35 March 2017
196. National Carbon CO., Case Western Reserve.
(<https://case.edu/ech/article/n/nationalcarbon-co.>)
197. National Carbon Company:
https://en.wikipedia.org/wiki/National_Carbon_Company
198. National Carbon Co. : <https://remarkableOhio.org/index.php?/category/249>
199. Ness, History: A history written by Chris Minicola.
200. New Form of Prism Battery: *Electrical Review*, Vol. 4, no.10, ps
201. New Law Battery: *Electrical World*, March 31, 1888
202. New Law Prism Battery, *Electrical Review* Dec. 6, 1884
203. New Improved Laclede Battery: *The Electrical Engineer Journal*, Nov. 29, 1893, Vol. 16. No.291, p. 480
204. Niagara Power Project: www.nypa.gov/power/generation/niagara.power.prtoject.
205. Niagara Power Project: https://en.wikipedia.org/wiki/Robert_Moses_Niagara_Power_Plant
206. Northern Electric Co.: <https://canadian.vintageradio.com/wp-content/uploads/2020/06/NE-WWII-product-lines.jpg>
207. National Telephone Company: https://en.wikipedia.org/wiki/National_Telephone_Company
208. Franchise History of the New York, Westchester, and Boston Railway (1912):
[www.nycsubway.org/wikw/franchise_history_of_the_newyork_westchester_boston_railway_\(1912\)](http://www.nycsubway.org/wikw/franchise_history_of_the_newyork_westchester_boston_railway_(1912))
209. New York, Westchester, and Boston Railway:
www.wikiped9ia.org/wiki/new_york_westchester_and_boston_railway#:~:text=the%20new_yo%20york%20C%20westchester%20and%20boston%20railway%20company,westcheste%20county%20C%20New%20york%20from%20201912%20to%201937.
210. Online Archives of California:
<https://oac.org.cdlib.org/findaid/ark:/13030/c8028pxm/>
211. Orne Battery: *Electrical World*, Dec 27, 1884
212. F.G. Otto and Sons, Catalogue and Price List: 1875. Classic Reprint Series ,
Forgotten Books (See NIA.org)
213. Patent for Battery Rack, US 2004/007914A1, April 29, 2004, Andrew et al. <https://patent>
214. Patent: Mold for Glass Battery Jars, US Pat. # 478,792, July 12, 1892 to John Gayner
215. Patent, Battery Cell, July 22, 1890 by Henry Waite U.S. PAT # 432,681
216. Patent, Battery Cell, Dec. 3, 1935 to C.K. Bamber US PAT # 2,022,998
217. Patent, Galvano-Faradic Machine to Luis Drescher M.D. July 4. 1871 US #116,695
218. Patent, Telegraph Battery Jar, Jan. 19, 1897 to A.L. Werner, US # 575,449
219. Patent, Voltaic Battery, June 17, 1890, to T.A. Edison, US #430,279
220. Paul Seiler: *Crown Jewels of the Wire*, May 1979, P

221. Peru Electric Manufacturing Co.: Western Electrician Journal, March 18, 1899, Vol.24, no. 11 page 163
222. Pettingill-Andrews; <https://www.insulators.info/wiki/Pettingill-Andrews>
223. Philco Library: Lamps to Batteries. (<https://philcoradio.com/library/index.php/philco-history/chapter\ -1-lamps-to-batteries/>)
224. Pile LeClanche : https://fr.wikipedia.org/wiki/Pile_Leclanche
225. Pile Leclanche: <https://piles2017.wordpress.com/pile-leclanche>
226. Plante Battery – 1859: <https://nationalmaglab.org/education/magnet-academy/history-of-electricity-magnetism/museum/plantebattery>
227. Powering Your Antique Radio: Radio Wrinkles, <https://antiqueradio.org.bsupply.htm>
228. [www.powerstream.com/1922/battery_1922_WITTW/battery files](http://www.powerstream.com/1922/battery_1922_WITTW/battery_files)
229. www.Powerstream.com/1922/battery_1922_WITTE/definitions.htm
230. www.Powerstream.com/1922/battery_1922_WITTE/chapter04.htm
231. Practical Chapters on Static Electricity.: S.H. Monell, M.D. published by Galvano-Faradic Manufacturing Co. (Van Houten & Ten Broeck, Proprietors)
232. Pre-Industrial History of Electricity: <https://expresselectricalservices.com/a-brief-history-of-electricity>
233. Primary Cell: www.britannica.com/biography/georges-LeClanche
234. Quack Medicine; Queen, James W. & Co.
235. www.railroadiana.org/globe/pgRRGlassColors.
236. Railway Signaling; <https://econstructioncareers.com/news-insight/how-trains-change-track>
237. Railway Signaling; <https://econstructioncareers.com/news-insight/rail-signaling>
208. Railway Signaling; www.chartertoconductor.com/railroadsignals
239. Railway Signaling; <https://railroadsignals.us>
240. Railway Storage Battery Car Co, (Federal Storage Battery Car Co.)
<https://midcontinent.org/rollingstock/biilders/railwaystorbat.htm>
241. Red Book No. 12: The Collectors Guide to Old Fruit Jars; by Douglas M. Leybourne, Jr.; REDBOOKJARS.COM
242. Rechargeable Batteries and Dry Cells: <https://en.wikipedia.org/wiki/history-of-the-battery>
243. Self-Winding Clock: https://en.wikipedia.org/wiki/self_winding_clock_company
244. Self-Winding Clock: <https://clockdoc.org/default.aspx?aid=6381>
245. Silvertown: <https://en.wikipedia.org/wiki/silvertown>
246. the Smith and Shaw Closed Cell Pocket Battery, Ad cut from magazine, Personal Copy
247. the Smith and Shaw Closed Cell Pocket Battery, manufactured by the Smith & Shaw Electric Co. With Testimonials., Personal Copy
248. Southern Bell Telephone co.: <https://historyatlanta.com/southern-bell-telephone-company-building/>
249. Southern California Edison:
https://en.wikipedia.org/windex.php?title+Southern_California_Edison&oldid=1077213986
250. Storage Battery Patent, T.A. Edison Sept. 16, 1913, 1,073,10
251. Star Tracks – Collecting Glass Insulators: Insulators.com/misc/stars.ph

252. "Storage Batteries" by Ralph Ritter. Published by International Textbook Company, Scranton, PA
253. Teaching Kids about Batteries & Photovoltaics: Home Power#15 February/March 1990
254. Telegraph Batteries: <https://www.scientific American.com/article/telegraph-batteries-1853-07-30/>
255. THOMAS A. EDISON, An Inspiring Story for Boys: by Francis Trevelyan Miller, published by the John C. Winston Co., 1940, 320 pages
227. Thomas Edison & Henry Ford's Electric Cars: Leftfield Bikes, <https://www.leftfieldbikes.com/>
256. Thomas Edison: Unacknowledged Driver of Today's EVs: Tim Nostrand; December 26, 2019; Winter 2019.
257. Thomas Edison to Henry Ford: Forget Electric Cars (revisited): Robert Bradley Jr. August 8, 2009
258. Thomas Edison & Henry Ford's Electric Cars: LeftFieldBikes.com/
259. Thomson-Houston Electric Co. : https://infogalactic.com/w/index.php?title=Thomson-Houston_Electric_Company&oldid=1087108090
260. Thomson-Houston Electric Co. : Vintagemachinery.org/mfgindex/detail.aspx?id=3085
261. Thomson-Houston Electric Co. : https://infogalactic.com/w/index.php?title=Thomson-Houston_Electric_Company&oldid=4480705
262. Tillotson, L.G.: L. G. Tillotson & Company (telegraph-history.org)
263. Types of Battery – Primary cell & Secondary cell: <https://byjus.com/chemistry/battery-type/>
264. Trademark Registration by The LeClanche Battery Company for Gonda Brand Electric Batteries. Oct. 7, 1898
265. Tray for Battery Cells, Patent, J.F.Monahan, No. 1,304,588, May 27, 1919: <https://patents.google.com/patent/US1304585/en>
266. Battery Patent. TA Edison : No. 1,266,780, May 21, 1918:
267. Storage Battery Tray Patent, No. 754,858, TA Edison, March 15, 1904:
268. Storage Battery Manual including Principles of Storage Battery Construction and Design with the application of Storage Batteries to the Naval Service, By Lucius C. Dunn, 1920, The Lord Baltimore Press. <http://w2ww.archive.org/details/cu31924002939712>
269. Submarine Batteries, Maintenance and Usage of by Robert Derencin, <https://www.uboat.net/article/id154>
270. Thatcher Glass:<https://blog.cmog/2017/05/10thatcher-history/>
271. Travis Glass Co.: <https://sha.org/bottle/pdffiles/travisglass/pdf>
272. The Turner Bros. and William F. Modes: <https://sha.org/bottle/pdffiles/turnerglass.pdf>.
273. Carbide Corp.: <https://www.unioncarbide.com/history.html>
274. Union Carbide & Carbon Corp.: <https://www.company-histories.com/Union-Carbide-Corporation-company-history.html>
275. Southern Bell: <https://historyatlanta.com/southern-bell-telephone-company-building/>
276. Universal Batteries, The Radio Dealer, August 1922.
277. Uranium Glass: https://en.wikipedia.org/wiki/uranium_glass

278. "U.S. Patent No. 1, 919,341" for Gayner Glass Works of Salem, NJ... "Storage Battery", Patented July 25., 1933.
279. Vaseline Glass: https://www.the_sprucecrafts.com/about-vaseline-glass-4157863
280. Viaduct Mfg. CO.: [C:/Users/glass/Downloads/Viaduct_Facts%20\(3\).pdf](C:/Users/glass/Downloads/Viaduct_Facts%20(3).pdf)
281. Viaduct Mfg. Co. : www.telegraph-history.org/manufacturers/misc/viaduct.htm
282. Viaduct Mfg. Co. : www.telegraph-history.org/manufacturers/early-manufacturersoftelegraph&electricalequipment
283. Viaduct Mfg. Co. www.radiomuseum.org/dsp_hersteller_detail.cfm?company_id=766
284. Victor Jars: <https://sha.org/bottle/pdf/VictorJar.pdf>
285. Voltamp Trains:
www.tcawestern.org/voltamp.htm#:~:text=voltamp%20was%20an%20early%20AAmerican%20manufacturer%20of%20a%20Baltimore%20stive%20dealer%20in%20the%201890%20s.
286. Waite & Bartlett Manufacturing CO. Illustrated Price List of Electro-Medical and Electro-Surgical Instruments for Physicians and Surgeons, 1895-1896, Published by Legare Street Press, an imprint of Creative Media Partners. (See NIA.org)
287. Western Electric Co.: (https://en.wikipedia.org/wiki/Western_Electric
288. Western Electric Company History: <https://www.westernelectric.com/company.history>
289. Westinghouse Electric Corp. International Directory of Company Histories. Vol. 12. St. James Press
290. Westinghouse Electric Corporation:
https://en.wikipedia.org/wiki/Westinghouse_Electric_Corporation
291. History of Westinghouse: www.historyofbranding.com/Westinghouse
292. Westinghouse Electric Corporation:
www.britannica.com/westinghouse_electric_corporation
293. What is Electricity: <https://learn.sparkfun.com/tutorial/what-is-electricity>
294. What is Electricity: <https://thoughtco.com/what-is-electricity-4019643>
295. When Was the First Battery Invented?: <https://www.avrl.org/when-was-the-battery-invented>
296. Whitall Tatum & Co. 1880, illustrated catalog. American Historical Catalog Collection, The Pyne Press, Princeton, 1971 (See NIA.org)
297. Whitall Taum & CO. Glass Ware, Philadelphia and New York, 1879, Reprint.
298. Whitney Glass Works : Lockhart, Schreiber, Lindsey, Serr and Brown.
(https://sha.org/bottle/pdf/Whitney_Glass.pdf)
299. Who Invented the Electric Battery: www.Wordatlas.com/article/who-invented-the-electric-battery.html
300. William Robinson & the track Circuit: American Railway Association Signal Section. The Invention of the Track Circuit: The History of Dr. William Robinson's Invention of the track Circuit. New York, NY, USA, 1922
301. Willard Storage Battery Co <https://case.edu/ed/article/willard-storage-battery-co>.
302. William Robert Grove: https://en.wikipedia.org/wiki/William_Robert_Grove
303. Wincharger: Wincharger.com
304. Wincharger: www.farmcollector.com/equipment/charged_by_the_wind/

305. Wonders of Physics: <https://wonders.physics.wisc.edu/what-is-electricity>

Index

- 50008, 126
9BJ1, 131
9BJ2, 129
9BJ4, 128, 140
9BJ5, 130, 141
9BJ11, 127, 139
9BJ13, 138
A.R.A., 67
A.R.S., 67
R.S.A. 67
Acme Water Cooler: 458
Alexander Graham Bell: 14
Allesandro Volta: 13
Alternating Current: 2American
Electric Telephone Co: 108
American Speaking Telephone Co.:
92
Anchor Electric Co. 493
Anode: 20
Ansonia Electric Co.: 93
Apex: 481
Associated Equipment: 578
Automatic Water Fill: 260
Avata: 568
AXO trade mark: 349
Bakelite: 500
Balkite: 71, 267
Bambairtite: 562
Battery Bridge Resta: 40, 581
Battery Patents: 591
Battery Rests: 21, 42
Battery Supply Co.: 181
Battery Trays: 45
Battery Variants: 27, 28, 33, 36
Bazar /DElectricque: 568
Beacon: 202, 510, 529
Brach, L.S.: 94
Brookfield: 98
Burn's Microphone Cell: 116
Battery Plate Spacers: 578
Bunnell Telegraphic & Electrical
Co.: 100
Bunnell, J.H. Co.: 100
Burnley: 482
Burns, Peter Cooper: 108
Burns Microphone Cell: 578
California Electric Works: 120
Callaud: 27
Campbell Bros. 586
Carbonaire: 189
Cathode: 20
Cell: 110
Chardin, Charles: 574
Charge Control Unit : 238
Chloride of Silver: 6, 57, 122
City of Light: 14
COBRA: 94
Consolidated Edison: 208
Corning Glass Works: 124
Crescent: 480
Crown: 142
Crows Foot: 145
CLYDE;: 567
Cnx: 125
Cumberland Glass Mfg., Co. : 148
Currents, War of: 16,22
Dancer Cell: 27
Daniel Cell: 27
Davis & Watts: 149
Dawson Electric Co.: 530
Delaware & Atlantic Telephone &
Telegraph Co.: 151
Delco: 152
Direct Current: 21
Double Day Hill Electric Co.: 172
Drescher, Luis: 451
Eagle Charger Corp.: 174
Early Lineman Reminiscing: 735
Edelman, E. & Co. 179
Edison Companies: 180
Edison Mfg. Co.: 181
Edison Storage Battery Co.: 15, 181
Edison, Thomas: 122, 23

Edison, Thomas A. Inc.: 181
Electric Current: 17, 20
Electric Gas Light Co (EGL): 212

Electrical Engineering Co.: 210
Electrical Goods Mfg. Co. (EGM):
224
Electricity: 17
Electrodes: 25
Electrolyte: 4Electrons: 17, 18
Empire City Electric Co. 496
Entrekin Elder Electric Co.: 499
Evans: 551
Exide: 229
Electric Vehicles: 58
Fansteel Products Co. 2, 67, 71
Faraday, Michael: 13
Farm/Home: 81
Faure, Camille: 13
Findlay Bottle Co.: 276
Findlay Glass & Carbon CO. 108
Finch & Hahn: 155, 509, 533
Fire Alarm Call Box: 288
Fitch, D.H. & Sons: 278
Flemming, Otto: 57, 280
Fly Ball Governor: 87
The Florence: 376
Ford, Henry: 16
Franklin Electric Co.: 529
Fruit Jars: 282
Fuller, Seth E. & Co. 282
Fulmen: 558
Gaiffe: 573
Galvano Faradic Mfg. Co.: 426
Gamewell: 284
Garrett Osborn Co.: 571
Gayner Glass Works: 292
GBRAC: 94
Genco Light: 304
General Electric Co.: 301
Gladstone Lalande: 193, 337
Globe: 568
GONDA: 120, 341

Edison Lalande:" 192
Electric Auto Lite: 587
Electric Storage Battery Co. (ESB)
: 115, 229

Gordon Battery Co.: 306
Gorgon Burnham: 306
Gorke, H.J. Electric Co.: 313
Gould Battery Co.: 314
Grant Battery Co.: 321
Guide for North American Type
Insulators: 21
H.S.: 485
H & VW Co. : 497
Harrison Brothers: 324
Hays: 387
Hemingray: 329
Hercules Battery: 209
Hydro Puroc: 598
Hires, Charles E, Co. 588
HYRAY: 445, 714
Illinois Electric Co.: 332
Illinois Glass Co.: 331
India Rubber Co.: 565
IRONCLAD: 169, 709
Irons & Irons: 670, 676
Johnson Electric Service Co.: 333
Joyce Bros.: 573
Kimble Glass Co.: 334
Kleist, George von: 12
Kluckhuhn, Charles: 543
L.B. Co.: 117
L. C. & E. Co.: 115, 117, 118
Law Telegraph Co.: 338
Leclanche: 24, 341
Leeds & Northrup: 351
Little Giant: 352
Lutz Lockwood: 309, 354
Manchex: 238
Medical Batteries: 52
Miamisburg Electric Co.: 481
Miller, J. Franklin: 461
Monarch: 356
Morgan, J.C.: 23

Morse, Samuel: 13
Mussenchenbrock, Pieter: 12
National Commercial Co. : 484
National Carbon: 357
NOSMAS: 220
Novelty Electric Co.: 366
New York, Westchester & Boston:
 363
Observations: 35
Ohm, George: 13
Old Ironsides: 368
Ostrander, W.R. & Co.: 372
Otto, F.G. & Sons: 373, 454
Outside the U.S.: 558
P & C Co.: 505
P.F. & Bros.” 542
Parallel Connections: 19
Pertrick & Carter: 377
Patented: 378
Peru Electric Mfg. Co.:108
Pettingell Andrews: 381
Philco: 61, 71, 135, 383
Plante, Gaston: 13
Phonograph: 77
Porous Cup: 346, 382, 504
Prism Battery: 346, 395
Providence Electric Co. 509
R.S.A.: 67
Radio: 71
Railway Signaling: 67
Railway Storage Battery Car Co.:
 400
Rural Electrification Act (REA):
Samson Battery: 224
Samson Electric Co.: 402
Sand Trays: 45
Scharfer’s Patent: 528, 536
Self Winding Clock Co.: 405
Series Connections: 29
Seroco: 486
Shasta: 589 Shaw, J. Elliott: 408
Shaw, J. Elliott: 408
Shell Oil Co.: 569
National Telephone Co.: 361
Niagara Power Project: 90
Northern Electric Co. 365
Ness, McLaren & Bates: 363
Short Circuit: 30
Silvertown: 566
Souther Rlectric Co. 201
Southern Gross: 569
Specialty batteries:
Stewart, Frank: 410
 Stewart, Frank Reminiscing: 727
Storage Battery Simplified: 31
Stout Meadowcroft Co. 685
Street Cars: 62
Street Car Power Plants: 694
Submarine: 474
Telegraph: 80
Telephone: 80
Terminal: 40
Tesla, Nikola: 14
Thatcher Glass: 411
Thaxter, Samuel & Sons:
 412, 478 , 496
Thomson Houston Electric Co.:
 23, 413
Tillotson: 414
Trickle Charger: 174
Trolleys: 62
Tudor, Henri: 14
U.S. Battery Co.: 590
U.S.L. Battery Co. 417
Union Carbide: 418
Union Carbide & Carbon Co.: 418
Universal Battery Co.: 420
Unknown Manufacturers: 480
U.S.S. Holland” 476
Vallee Bros. & Co. 540
Van Houtn & Tenbroeck: 424
Vaseline (Uranium) Glass: 2246,
488, 501, 502, 557
Viaduct Electric Co. 428

Vintage Advertisements: 557
Violet Ray:
Voltamp: 430
Waite & Bartlett: 432
Walker & Kepler: 434
War of the Currents: 16, 22
Wannamaker, John: 437, 465
Water Cooler: 456
Waterbury: 438

Zenith: 82, 589

Water Power: 88
Western Electric: 441
Westinghouse: 447
Westinghouse, George: 14, 23
Whitall Tatum: 54, 453
Whitney Glass Works: 466
Willard: 71, 467
Wincharger: 82
Wind, Jacob Electric Co. 86

Author's Comments

I sincerely hope I have done justice to this important era of our history. For approximately a century, all, or parts of America got its electricity from a jar. I have tried to highlight the problems associated with this form of energy, and how they were coped with. I mentioned that at the time there were those who felt that electricity was a great invention in search of a use. Suffice to say, uses were not long in coming; telephones, telegraph, door-bells, fire alarms, electric lights, railroad signaling, trolleys, phonographs, electric vehicles, etc. The list goes on and on.

I have learned so much in the process of compiling this information, that I almost feel guilty. I can only hope that you get as much from it. Keep in mind that what I have given you is only an overview of each topic, and I filled over 700 pages to do it. Each of the various topics could easily be expanded to several volumes. I have attempted to give you all my sources to enable you to dig deeper into any topics you may be interested in.

I will continue to search for new battery jars and information related to them. I plan on up-dating on an annual basis, if sufficient new material is available.